Family environmental influences on food avoidant eating behaviour during early childhood: a longitudinal and observational study

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FAMILY ENVIRONMENTAL INFLUENCES ON FOOD AVOIDANT EATING BEHAVIOUR DURING EARLY CHILDHOOD; A LONGITUDINAL AND OBSERVATIONAL STUDY

By

FAYE CAROLINE POWELL

A Doctoral Thesis
Submitted in Partial Fulfilment of the Requirements
For the Award of
Doctor of Philosophy of Loughborough University
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ABSTRACT

A prospective, longitudinal and observational study, using a non-clinical population of mother-child dyads was conducted to evaluate the contribution of family-environmental factors in predicting child food avoidance and feeding problems across early childhood. The contribution of maternal feeding practices, mealtime structure and interactional behaviour during mealtimes, were explored in predicting child food avoidance between 2 and 5 years, whilst also evaluating the role of maternal psychopathology and child temperament. This thesis also assessed the validity of maternal reports of child eating behaviour and feeding practices by obtaining independent observations of these constructs, and explored the longitudinal stability and continuity of both independent observations and maternal reports of child eating behaviour and maternal feeding practices. Concurrently and prospectively, observations of mothers eating with their child, displaying high sensitivity, low control, and more positive emotion and verbalisation during mealtimes predicted less avoidant child eating behaviour. Reports of mothers providing a healthy food-related home environment, encouraging balanced food intake, and involving their child in food planning, in addition to a less emotional child temperament, were also significant longitudinal predictors of less avoidant child eating behaviour. Maternal descriptions of their child’s eating behaviour were validated by independent observations; however maternal descriptions of their own feeding practices were not. Child eating behaviour and maternal feeding practices were predominantly stable and continuous across early childhood, with the exception of child difficulty to feed and maternal pressure to eat which decreased between the ages of 3 and 4. This thesis demonstrates many interesting and novel findings but primarily through the utilisation of observational and longitudinal data it demonstrates the important causal contribution of family-environmental factors in the development of food avoidant eating behaviours during early childhood.

KEY WORDS: Food avoidance, feeding problems, children, feeding practices, mealtime structure, temperament, psychopathology, longitudinal
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PUBLISHED PAPERS & PRESENTATIONS


Chapter 4 (edited version) will be submitted for publication as: Powell, F. C. Farrow, C., & Meyer, C. (2012). The impact of mealtime structure, mealtime behaviours and feeding practices on food avoidance during early childhood: an observational study.


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Chapter 7 will be submitted as Powell, F. C., Farrow, C. V., & Meyer, C. (2012). *The continuity and stability of maternally reported and independently observed child eating behaviours and maternal feeding practices from 3 to 4 years of age*

The format and content of some Chapter’s presented within this these has been altered from that of the published/in preparation papers in order to maintain consistency within the thesis.
CHAPTER 1

Literature Review

1.1 Aims of the literature review

This literature review will introduce the concept of food avoidant eating behaviour in childhood and define and describe the features of food avoidance and feeding problems, their prevalence and potential consequences. It will then review and discuss the current literature investigating the correlates, predictors, antecedents and risk factors for food avoidance in childhood. This review will appraise the literature exploring the family-environmental influences on food avoidant eating behaviours. Specifically, it will evaluate and critically review the association of child food avoidant eating behaviours with maternal feeding practices and interactional behaviour during mealtimes, mealtime structure and maternal psychopathology. In addition, the literature exploring the association between food avoidance with inherent child characteristics such as child temperament will be discussed. Finally, this chapter will conclude with a presentation of the aims and hypotheses of this thesis.

1.2 Child feeding problems & food avoidant eating behaviours

1.2.1 Definition and prevalence

Feeding problems are one of the most common behavioural disturbances in young children (Sanders, Patel, Le Grice & Sheppard, 1993) and they are reported to affect between 25% to 50% of children (Chatoor, Egan, Geston, Menville, & O’Donnell, 1988; Wright and Birks, 2000). Feeding problems have been referred to as “troublesome eating behaviours” (Marchi & Cohen, 1990, p. 112) and reflect difficulties that relate to disruption or failure of the child’s feeding process (Alridge, Dovey, Martin & Meyer, 2010). They range from transient, relatively minor difficulties at mealtimes (e.g., disruptive mealtime behaviour, fussy tendencies) that do not involve considerable health risks to life-threatening food refusal (Luiselli, 1989; Williams, Field & Seiverling, 2010). These behaviours are considered medically diagnosable feeding disorders if they result in significant weight loss, inadequate growth or have a negative impact on child development (American Psychiatric Association, 1994), which are evident in around 1–2 % of children (Dahl & Sundelin, 1986).
Whilst the definition, severity and persistence of feeding problems vary, many parents have concerns that their children are reluctant or avoidant eaters (Sanders et al., 1993), displaying behaviours such as food refusal, selective, picky or fussy eating, eating slowly, being less interested in food and having a small appetite (Carruth, Ziegler, Gordon & Barr, 2004; Marchi & Cohen, 1990; Reau, Senturio, Lebailly & Christoffel, 1996; Sanders et al., 1993). These behaviours are an important health concern as they are known to have adverse consequences for both children and their caregivers (e.g., Hagekull & Dahl, 1987; Harris & Booth, 1992; Wright & Birks, 2000; see section 1.2.2 for further details). These include low weight gain (Marchi & Cohen, 1990; Wright & Birks, 2000), essential nutrient deficiency and poor dietary variety (Golloway, Fiorito, Lee & Birch, 2005). Parental concerns about their children’s eating patterns are commonly reported in community surveys (Jacobi, Agras, Bryson & Hammer, 2003; McDermott, Mamum, Najman, Williams, O’Callaghan & Bor, 2008) and one in four parents report concerns about their child’s eating during routine paediatric check-ups (Chatoor, Ganiban, Harrison & Hirsch, 2001). Yet caregivers receive little positive advice on how to deal with challenging mealtimes and how to actively decrease food refusal and fussy eating (American Dietetic Association, 2010; van der Horst, 2012; Murashima, Hoerr, Hughes & Kaplowitz., 2011).

In addition whilst these feeding problems and behaviours have been readily explored amongst clinical samples (e.g., Chatoor, 2002; Manikam & Perman, 2000; Nicholls, Chater, & Lask, 2000) less is known about the feeding disturbances experienced in non-clinical community samples of children. Much of the research in non-clinical groups has focused on the concept of picky or fussy eating (Galloway et al., 2005) rather than exploring the range of avoidant eating behaviours and feeding problems displayed by children during mealtimes. Problems reported by parents (in 33-52% of toddlers) include not always being hungry at mealtimes, trying to end meals after a few bites, picking eating and strong feeding preferences and dislikes (Reau, Senturia, Lebailly & Christoffel, 1996). Wardle, Guthrie, Sanderson, and Rapoport (2001) define and measure four ‘food avoidance eating behaviours’ which reflect an avoidant eating style characterised by a lower appetite and interest in food and greater food fussiness during early childhood; they call these ‘food fussiness’, ‘slowness in eating’, ‘satiety responsiveness’, and ‘lack of enjoyment in food’. These behaviours are suggested to be implicated in risk of underweight and feeding problems, and small scale preliminary studies having identified higher levels of food fussiness and slowness in
eating in underweight samples of children when compared to healthy and overweight groups (Viana, Sinde, & Saxton, 2008; Webber, Hill, Saxton, Van Jaarsveld & Wardle, 2009). Further exploration of the predictors of these food avoidant eating behaviours could provide important insights into the risk factors for feeding problems and how they could be prevented.

Similarly to this taxonomy (Wardle et al., 2001), for the purpose of this thesis food avoidant eating behaviours are defined as those behaviours which reflect a reluctant or avoidant eating style characterised by food fussiness and food refusal, slowness in eating, a lack of enjoyment of food and a low appetite; behaviours previously associated with feeding problems and poor dietary variety and intake (Carruth, et al., 2004; Marchi & Cohen, 1990; Reau et al., 1996; Sanders et al., 1993). Each of these avoidant eating behaviours will now be defined and discussed.

1.2.1.1 Food fussiness

Food fussiness has been defined as failure to consume an adequate variety of foods through rejection of both familiar and unfamiliar foods (e.g., Dovey, Staples, Gibson & Halford, 2008; Galloway, Lee & Birch, 2003; Smith, Roux, Naidoo & Venter, 2005; van der Horst, 2011) and pickiness with regard to the type of food a child is willing to eat (Wardle et al., 2001). Food fussiness or pickiness has largely been disparately labelled, defined and measured (Potts & Wardle, 1998), however certain characteristics that reflect picky or fussy eating have been identified. Picky eaters have been found to eat a limited variety of foods (Carruth, Skinner, Houck, Moran, Coletta & Ott, 1998a; Mascola, Bryson & Agras, 2011), and especially be more likely to avoid fruits and vegetables (Galllowy et al., 2005; Jacobi et al., 2003), be less likely to accept new foods and have strong likes and dislikes (Mascola et al., 2010).

Picky or fussy eating has been associated with lower weight (Marchi & Cohen, 1990), possibly because this trait has been associated with general disinterest in food, food refusal and eating small amounts (Rydell, Dahl & Sundelin, 1995); behaviours previously associated with feeding problems and potential low weight. Yet food fussiness has also been associated with elevated BMI in children (Carruth & Skinner, 2000) and the consumption of higher amounts of fat (Galloway et al., 2005) and more sweetened foods (Carrurth et al., 2004). This highlights that food fussiness may represent a barrier to healthy food consumption and a healthy BMI. In addition, food fussiness represents a concern for caregivers and can result in frequent struggles with
their child over food and arguments about the child's eating habits (Jacobi et al., 2003; Mascola et al., 2010), highlighting its implications for both caregivers and children. Given that the prevalence in young children is reasonably high, with 50% of caregivers at 2 years and 24% at 5 years describing their children as picky eaters (Carrurth et al., 2004), and it’s associations with poor dietary variety, essential nutrient deficiency and risk of over and underweight it marks an important area to explore.

1.2.1.2 Food refusal

Food refusal is broadly and often disparately defined (Chatoor & Egan, 1983; Dahl & Sundelin, 1986; Dovey et al., 2009; Lindberg et al., 1991; Linberg, Bohil, Hagekul & Palmerus, 1996; Williams et al., 2010) and is commonly used without clear definition (Chatoor & Egan, 1983; Dahl & Sundelin, 1986; Lindberg et al., 1991; Williams et al., 2010). It can be defined as a specific feeding problem where the child’s refuses to eat all or most foods presented, resulting in failure of child to meet caloric nutritional needs (Field, Garland, & Williams, 2003; Williams et al., 2010). Alternatively, it has been used a general term encompassing a range of problems (Douglas et al., 2002) such as a child head turning or refusing to open their mouth when food is offered, being slow and disinterested in eating, spitting out food, gagging or vomiting, selective eating and texture aversion (Bakwin & Bakwin, 1972; Chatoor, Kerzner, Zorc, Persinger, Simenson & Mrazek, 1992; Douglas et al., 2002; Lindberg, Bolin, & Hagekull, 1994). It is one of the most challenging and dangerous child feeding problems (Dahl & Kristiansson, 1987; Lindberg et al., 1996) as it can lead to restricted or inadequate intake of nutrients, and inappropriate feeding patterns in relation to the child’s age (Dahl, 1987; Linscheid & Rasnake, 1985). It is most commonly encountered during infancy and tends to begin around the time of weaning (Dahl & Sundelin, 1986; Linberg et al., 1991). Importantly, many feeding behaviours, whether transient or longer-lasting, involve some level of refusing food (Dovey et al., 2009).

There is also a variation between children about the motives, nature and function of food refusal. It is not simply that food refusal is a choice whereby child controls his or her intake, it is a complex feeding problem whose development and maintenance involves multiple factors (Williams et al., 2010). Researchers have highlighted the role of behavioural and learning mechanisms and it has becoming increasingly apparent that analysis of the functional nature of feeding behaviours is
important (Babbitt et al., 1994; Piazza et al., 2003; Luiselli & Luiselli, 1995; Wilder, Normand, & Atwell, 2005; Field & Williams, 2003).

Food refusal can also be functional in nature, for example tangible or for attention or escape (Babbitt et al., 1994; Cooper et al., 1999; Hoch, Babbitt, Coe, Krell & Hackbert, 1994; Piazza et al., 2003). Behavioural intervention studies support the idea that, in those children who possess the physiological skills to enable functional swallowing and eating, food is rejected for a reason and thus rejection is motivated (e.g., Babbitt et al., 1994; Cooper et al., 1999; Field & Williams, 2003; Hoch et al., 1994). For instance a child may either refuse food to decrease the likelihood of something happening (e.g., choking, eating less preferred food, experiencing fear towards foods) or to increase the likelihood of something happening (e.g., attention from caregiver, escape from the situation, being offered an alternative or preferred food; Babbitt et al., 1994; Cooper et al., 1999; Field & Williams, 2003; Hoch et al., 1994).

Motivationally based feeding problems are often maintained by the child’s environment (Field & Williams, 2003; Drotar, Eckerle, Satola, Pallota & Wyatt, 1990). Thus, food refusal can be externally motivated, for example being environment or learning dependent, whereby the rejection of food is dependent on the child’s experience with it. For example due to lack of experience or exposure and food neophobia, which has been evidenced in studies on the rejection of novel foods (Zajonc, 1968; Pliner & Hobden, 1992) and social influences helping to reduce neophobia (Birch & Fisher, 1995; Wardle, 1995; Cullen, Baranowski, Rittenberry, Cosart, Hebert & de Moor, 2001). It is likely that such food refusal is common yet often transient amongst non-clinical groups dependent on individual’s experiences with food and their environment.

Food refusal can also be internally-motivated, for example fear based, where phobia’s express themselves through refusal to eat (Dovey et al., 2009). A child may have a phobia about eating a specific food or phobia’s about chewing, swallowing or choking on food which often follows a significant negative experience. This form of food refusal is often associated with more severe feeding difficulties such as a very restricted diet or complete refusal of solids and liquids and thus an increased risk of health problems (Nock, 2002).

The prevalence of food refusal varies dependent on definitions and populations. Within clinical groups it is a common paediatric problem with between 26-42% of toddlers refusing to eat meals or trying to end meals after a few bites (Reau et al., 1996). In non-clinical populations total refusal to eat is rare (< 4%) but many parents do
report that their children refuse certain or all types of food at least once a day (51%) (Coulthard & Harris, 2003). In fact, one study found that the average 1 year old refuses food 11 times per meal (Young & Drewett, 2000), suggesting that it is a common feature of children’s eating. It may be that food refusal in community samples reflects a normal developmental response which children use to mark preferences and indicate fullness. However, several authors have suggested that more severe early food refusal can lead to disturbed physical growth development, behaviour problems and other feeding problems during childhood and adolescence (Chatoor et al., 1992; Illingworth, 1991), therefore its exploration in early childhood amongst non-clinical groups is essential.

1.2.1.3 Slowness in eating

One of the behaviours reported by clinicians and parents of children with feeding difficulties is excessive slowness when eating meals (Blissett & Harris, 2002; Reau et al., 1996; Sanders et al., 1993). For example, within clinical groups, slowness in eating has been identified in 53% of children (under 7 years of age) with severe feeding difficulties (Douglas & Byron, 1996). Slowness in eating has also been associated with feeding problems and low weight in non-clinical groups (e.g., Reau et al., 1996; Webber et al., 2009). For instance, in a non-clinical sample of infants and toddlers, picky eaters were found to eat more slowly than non-picky eaters (means 23.3 vs 19.7 minutes, p<.04), and slowness in eating was related to the persistence of feeding problems between 6 and 12 months (Reau et al., 1996). Small scale preliminary studies have also identified greater slowness in eating in underweight samples of children when compared to healthy and overweight groups (Viana et al., 2008; Webber et al., 2009). In addition whilst slowness in eating itself may not always pose a health concern (provided the child consumes adequate nutrients and calories over the course of the meal), slow eating can have negative consequences for the interaction between parents and children during meals. Many parents will feel the need to pressure a slow eater during meals to ensure they get enough to eat or in an attempt to get them to eat more quickly. As will be discussed later in this review, it is these parental behaviours, in an attempt to influence their child’s eating behaviour or increase food intake, which may have negative implications for the child’s concurrent and future eating behaviour (Blissett & Harris, 2002) and can make mealtimes more stressful for both the caregiver and the child (Harris & Booth, 1992; Skuse, 1993; Blissett, Harris & Kirk, 2000).
1.2.1.4 Lack of enjoyment of food

Another problematic aspect of child eating can be a lack of child enjoyment of food, often characterised by negativity or distress at mealtimes. A lack of eating enjoyment and food fussiness have been found to be highly correlated (van der Horst, 2011) and a lack of interest in food and eating has been identified in children displaying avoidant and choosy eating behaviours (Rydell et al., 1995). Reports of high food fussiness and low enjoyment of food have been shown to be more prevalent in underweight children compared to healthy and overweight groups (Viana et al., 2009), suggesting that an appetitive profile characterised by these traits may make children susceptible to feeding disturbances. In addition, studies comparing children with growth faltering and healthy controls have also found that children with growth faltering display less enjoyment of food (Wright & Birks, 2000; Wright, Parkinson & Drewett, 2006) and have more unhappy, stressful, and chaotic mealtimes (Heptinstall, Puckering, Skuse, Start, Zur-Szpiro & Dowdney, 1987). This suggests that lack of food enjoyment may be an important behaviour implicated in both clinical and community samples.

Low food enjoyment may lead to eating conflicts, struggles with food, and unpleasant mealtimes for children and their caregivers, outcomes which have been found to predict the later development of eating disorders (Kotler, Cohen, Davies, Pine & Walsh, 2001). In a study of children aged 6-12 years, low food enjoyment mediated the relationship between pressure to eat and fussy eating (van der Horst, 2011), suggesting that low eating enjoyment may serve an important factor in the development of children’s picky-eating behaviour. This is particularly important as pressure to eat can create a negative environment around food and healthy eating and thus further decrease eating enjoyment and increase picky eating (van der Horst, 2011).

1.2.1.5 Low appetite

Another common feeding concern reported by parents is that their child has a low appetite (Harris & Booth, 1992; Richman, Stevenson & Graham, 1975). Low appetite has been identified in young children with feeding problems (Kasese-Hara, Wright & Drewett, 2002) and growth faltering (Wright & Birks, 2000; Wright, Parkinson & Drewett, 2006; Wilensky, Ginsberg, Altman, Tulchinsky, Yishay & Auerbach, 1996) and also been reported by parents within community samples, with 17% of 3 year olds described by their caregivers as having a poor appetite in a UK population study (Richman, Stevenson & Graham, 1975). Whilst children are largely
able to regulate their own energy intake according to their individual requirements (Birch, Johnson & Jones, 1993; Hetherington, Wood, & Lyburn, 2000). Shea, Stein, Basch, Contento, & Zybert, 1992) many parents perceive smaller child appetites as low or insufficient and may become concerned that poor feeding has implications for the child’s growth and health (Blissett et al., 2000). Thus, whilst inherent child appetite may be an important risk factor for low weight or growth faltering (Wright et al., 2006) maternal anxiety about feeding and well-being, which can lead parents to begin to coax or pressure their child to eat to try to improve their child’s food intake (Wright et al., 2006, Harris & McDonald, 1992), may also have an adverse influence on child appetite. Maternal pressure to eat can cause mealtimes to become negative, with food and feeding becoming aversive to the child (Harris & Booth 1992) which in turn can cause children’s appetite and food intake to decrease further (Skuse, 1993).

Whether low appetite represents a risk factor for poor dietary intake and low weight (Kasese-Hara et al., 2000; Wright et al, 2006) or effective child satiety responsiveness, misinterpreted by caregivers (Blissett et al., 2000), low appetite has been associated with negative outcomes in terms of child eating behaviour and well-being and parental feeding practices. Further research is needed, particularly using longitudinal designs within community samples, to better understand appetite and satiety responsiveness and the family environmental influences that predict them.

### 1.2.2 The effects of food avoidant eating behaviours and feeding problems

Feeding problems and food avoidant eating behaviours are an important health concern as they are known to have adverse consequences for both children and their caregivers (Hagekull & Dahl, 1987). For the child these include low weight gain (Marchi & Cohen, 1990; Wright & Birks, 2000), essential nutrient deficiency and poor dietary variety (Golloway et al., 2005). Prolonged feeding difficulties can result in growth faltering (previously known as failure to thrive) and cognitive and developmental delays (Chatoor et al., 1988; Corbett & Drewett, 2004; Wright & Birks, 2000). However, data from a large population based cohort study (Gateshead Millennium Baby Study) found that whilst weight faltering is more common in children with eating problems, eating problems in the majority of toddlers are associated with normal growth (Wright, Parkinson, Shipton & Drewett, 2007). In addition, Drewett, Corbett and Wright (2006) report that failure to thrive in infancy is not associated with adverse
emotional development in childhood, in a sample of 89 children followed up at 12 years old.

Avoidant eating behaviours can also represent a strong barrier to healthy eating (van der Horst, 2012), which is a particular concern given that many children are not eating the recommended five portions of fruits and vegetables a day (Yngve et al., 2005) and that global levels of childhood obesity are on the increase and set to continue (Stamatakis, Zaninotto, Falaschetti, Mindell & Head, 2010). As will be described in the section below, feeding problems are also an important concern as they can show consistency and persistence into mid-adolescence and adulthood (McDermot et al., 2008; Mikkila, Rasanen, Raitakari, Pietinen & Viikari, 2004).

The implications for caregivers can include high anxiety and stressful mealtimes (e.g., Harris & Booth, 1992; Lindberg, Bohlin, Hagekull & Thunström, 1994). When a child is displaying avoidant eating behaviour and their food intake is lower than parental expectations, parents can become very anxious (Harris & Booth, 1992). Lindberg et al. (1994) found positive associations between maternal wellbeing and periods of food refusal in infancy. In addition, in a clinical sample of infants, colic, vomiting or refusal to eat were associated with mothers having more negative emotions and experiences about feeding and about their child (Hagekull & Dahl, 1987).

1.2.3 Persistence and later eating problems

Food avoidant eating behaviours can demonstrate consistency and persistence from early childhood into mid-adolescence and adulthood (McDermot et al., 2008; Mikkila et al., 2004). For example, a recent longitudinal community study found that approximately 40% of children who were fussy eaters at 5 years of age remained fussy eaters at age 14, and that the persistence of eating problems at age 5 and 14 years was significantly related to feeding problems at 6 months of age (McDermott et al., 2008). Dahl, Rydell & Sundelin (1994) also found that refusal to eat during infancy and childhood was associated with more eating problems during primary school children at 8-9 years of age. Other studies have found that parent reports of food fussiness, slowness in eating, and lack of food enjoyment are significantly correlated over time in children aged 2-5 years (Farrow & Blissett, 2012) and 4-11 years (Ashcroft et al., 2008), suggesting these behaviours show stability across childhood. Food preferences have also been shown to be stable in children between 2 and 8 years old (Skinner, Carruth, Wendy & Ziegler, 2002) and fruit and vegetable consumption and dietary
intake track across childhood into adulthood (Bertheke, Post de Vente, Kemper & Twisk, 2001; Nicklaus, Boggio, Chabanet & Issanchou, 2005; Vierup, Lien, Klepp & Bere, 2004). Nicklaus et al., (2005) reported that fussy avoidant eaters with limited dietary variety at aged 2-3 tend to display similar behaviours from 4 up to 22 years of age. In addition, early feeding problems, struggles with food, and unpleasant meals in early childhood have also been associated with the later development of eating disorders (Kotler et al., 2001; Marchi & Cohen, 1990; Rastam, 1992).

Whilst overall evidence seems to suggest that parent’s descriptions of child food avoidant eating behaviours may show individual stability across childhood, it still remains unclear whether there is consistency in mean group levels across childhood. It is important to consider that whilst feeding problems are relatively common among healthy infants and children these difficulties can be transitory (Kerwin, 1999). For instance, whilst Farrow and Blisssett (2012) suggest good consistency in mean levels of food avoidant eating behaviours between 2-5 years of age, Ashcroft et al., (2008) report decreases in avoidant eating behaviour over time in 4-11 year olds. Whilst discrepancies are evident, there was large variation between the Farrow and Ashcroft studies in sample size; 322 compared to 31, respectively. Thus replication using a larger sample size of 2-5 year olds is necessary to ascertain whether these behaviours are stable and continuous or in fact transient over this period. Amongst clinical groups, there is also evidence that feeding problems are transient and not associated with future problems. Data from the large ALSPAC cohort study, found that the anthropometric profile of children at age 13, who had had weight faltering in infancy, were within population norms and did not differ compared to controls (ud Din, Emmett, Steer & Emond, 2013). Whilst this suggests a ‘catch up’ by the time children reached later childhood, this is specifically related to anthropometrics and does not shed light on trajectory of specific feeding problems and eating behaviours over childhood.

The majority of the studies cited have relied on maternal report, with some using retrospective accounts from caregivers of early child eating behaviour. These methods can be subject to bias, therefore prospective designs utilising observational measures to validate maternal reports would provide a better insight into the developmental trajectory of food avoidance. Given that eating behaviours and food preferences can develop very early in childhood (Birch & Fisher, 1998; Cashdan, 1994; Illingworth & Lister, 1964) and can persist into adulthood (McDermott et al., 2010; Mikkila et al., 2004) it is essential to explore the early trajectory of these behaviours...
before they become embedded and engrained (Jacobi et al., 2003; Kelder, Perry, Klepp & Lyte, 1994; Alridge et al., 2010; Savage, Fisher, & Birch, 2007).

1.2.4 Summary

The preceding literature demonstrates the high prevalence of food avoidant eating behaviours, the potential implications for child health and well-being, and the possibility of consistency and persistence of these behaviours across childhood and into adulthood. Whilst they are common, for many children they can be transient and it is important to explore how or why this is the case. In order to prevent the onset of feeding problems during childhood and improve the diet and eating behaviour of young children, a thorough understanding of the early life risk and protective factors for child food avoidance is essential. Below, research which has examined the correlates and predictors of food avoidance and feeding problems during childhood will be discussed, with a focus on the contribution of family-environmental influences and individual child characteristics.

1.3 Parent and child factors associated with food avoidant eating behaviours

Although genetic factors are undoubtedly implicated in the development of children’s emerging eating behaviours (e.g., Bouchard, Depres & Tremblay, 1991; Carnell, Haworth, Plomin & Wardle, 2008; Cecil et al., 2007; Hetherington & Cecile, 2010; Llewellyn, van Jaarsveld, Johnson, Carnell & Wardle, 2010), the increasing prevalence of obesity and feeding problems suggests that environmental factors, such as the home environment and parental influences, are of particular importance (e.g., Carnell & Wardle, 2008; McGarvey, Keller, Forrester, Williams, Seward & Suttle, 2004). Interest in the feeding interactions of parents and their children has led to research exploring the contribution of the child and the caregiver in the development of children’s eating behaviours and weight. As feeding is a dynamic bidirectional process (Cabanac, 1987), it is likely that both children and their caregivers will influence children’s emerging eating behaviours, preferences and attitudes. Therefore this section, whilst it will predominantly focus on the contribution of the caregiver, it will also conclude by also considering the contribution of the child in the feeding process and the development of food avoidant eating behaviours and feeding problems.
1.3.1 Parental factors

The family is the primary social institution influencing young children, thus, it is likely that there are many modifiable risk factors for feeding problems and food avoidance with substantial roots within the family context (Ventura & Birch, 2007). Parents are generally believed to constitute one of the strongest socialising agents for children (e.g., Baumrind, 1993; Bugental & Goodnow, 1998) and are believed to play a role in influencing their children’s health behaviours (Anderssen, Wold & Torsheim, 2006). Parents influence their children through the use of specific parenting practices and by modelling specific behaviours and attitudes, which creates a home environment that promotes certain behaviours, expectations, beliefs, and social norms (Rhee, 2008). Due to this overarching influence, parents play an important role in the development and persistence, as well as the prevention and treatment, of feeding problems (Harris & Booth, 1992; Rhee, 2008; Whitehouse & Harris, 1998; Wolke & Skuse, 1992). Several researchers have noted the importance of social learning factors within the family in both the origin and maintenance of problematic feeding behaviour in young children (Babbit et al., 1994; Finney & Christophersen, 1983; Iwata, Riordan, Wohl & Finney, 1982) and parents of young children are now often the focus of public health interventions designed to improve child dietary intake and promote healthy and adaptive eating behaviours (Clark, Goyder, Bissell, Blank & Peters, 2007).

Research examining the influence of caregivers on child feeding problems and food avoidant eating behaviours has expanded in recent years (e.g., Coulthard & Harris 2003; Farrow & Blissett, 2006; Farrow & Blissett, 2008; Keller et al., 2007) and we have begun to understand the potential scope of parental influence on the development and treatment of feeding problems. Whilst some elements of children’s eating behaviour, such as appetite, may reflect intrinsic characteristics of the child (Wright et al., 2006), it has been suggested that feeding problems are to some extent learned behaviours that develop as a result of a child’s interactions with the environment, part of which involves parents or caregivers (Piazza et al., 2003). Parents are likely to influence the development and maintenance of children’s eating behaviours through the feeding environment they provide, the parenting and feeding practices they employ, the quality of interactions and dyadic communication at mealtimes, their own eating behaviours and attitudes and their mental health and well-being. This section will therefore focus on the contribution of these parental factors to the development of children’s food eating behaviours.
Whilst there is no doubt that the father makes an important and unique contribution to children’s upbringing and development (Radin, 1981; Lamb, 2004), the mother, who is often the primary caregiver, has been the focus of most research studies investigating the role of caregivers in the development of child feeding problems and eating behaviours. Failing to attend to the contribution of fathers’ to child feeding has restricted and biased knowledge about feeding problems (Patel, Wheatcroft, Park & Stein, 2002), yet whilst understanding of their role is growing (e.g., Davison & Birch, 2001; Field, Camargo, Taylor, Berkey, Roberts & Colditz, 2001; Olrick, Pianta & Marvin, 2002; Haycraft & Blissset, 2008; Haycraft & Blissset, 2011) a focus on mothers remains prominent. This is partly due to the fact that mothers tend to be the caregivers who offer to participate in research (e.g., Patrick, Nicklas, Hughes & Morales, 2005), with studies suggesting that only 2-8% of respondent to questionnaires sent to parents/caregivers are fathers (Patrick et al., 2005; Wardle, Carnell & Cooke, 2005). In addition, it remains widely accepted that mothers tend to have more responsibility than fathers for feeding children (Haycraft & Blissett, 2011) and maternal factors have generally been found to be more important than paternal factors in the prediction of child eating disturbance (Davison & Birch, 2001; Werhtheim, Mee & Paxton, 1999). Therefore the majority of the studies reviewed below will explore maternal influences on child feeding, and the role paternal factors will not be explored within this thesis.

### 1.3.1.1 Parental feeding practices

Parental child-feeding practices have been identified as a contributing environmental factor in the development, persistence and prevention of food avoidance and feeding problems (Galloway et al., 2005; Harris & Booth, 1992; Sanders et al., 1993). Feeding practices are the specific strategies that parents use in an attempt to maintain or modify their child’s eating style and diet (Ventura & Birch, 2008). Although parents may use child-feeding behaviours with the intention of improving children’s dietary intake (Klesges, Klesges, Eck & Shelton, 1995), research has suggested that some feeding practices can be unintentionally detrimental, such as using high levels of control (Birch, McPhee, Shoba, Steinberg & Krehbiel, 1987; Lindberg et al., 1996; Savage, Fisher & Birch, 2007). Controlling feeding strategies are commonly reported in mother-child dyads with feeding problems (Sanders et al., 1993; Lindberg, et al., 1996) and have been found to be associated with both child eating behaviour and weight status (e.g., Keller et al., 2007; Fisher, Mitchell, Smiciklas-Wright & Birch
Food avoidance in children

2002; Lindberg, et al 1996; Sanders et al., 1993; Wardle et al., 2005). Yet other feeding practices and behaviours, such as modelling, exposure and involvement have been recognised as positive and adaptive and may help promote healthy eating attitudes and behaviours (e.g., Batsell, Brown, Ansfield & Paschall, 2002; Heim, Bauer, Stang & Ireland, 2011; Marshall, Golley & Hendrie, 2011; Ventura & Birch, 2008). The influence of these different practices will be evaluated in the following sections.

1.3.1.1 Pressure to eat

Pressure to eat can be defined as parents’ attempts to control the amount and type of food that the child eats (Birch, Fisher, Grimm-Thomas, Markey & Sawyer, 2001) or pressuring the child to consume more food at meals (Musher-Eizenman & Holub, 2007). Pressure to eat does not just involve verbally encouraging or demanding the child to eat, it can also involve physical prompts. Physical prompts have been defined as parental use of physical encouragements to get child to eat, usually by offering food to the child (Haycraft & Blissett, 2008). Pressuring children to eat healthy food has been associated with increased picky eating, lower fruit and vegetable intake and longer mealtime duration in children (Fisher et al., 2002; Galloway et al., 2005; Klesges et al., 1983). In addition, pressure to eat has been associated with increased levels of dietary restraint and disinhibition in young girls (Carper, Fisher & Birch, 2000). Retrospective studies have suggested that many common food dislikes can be traced back to experiences of being pressured to eat certain foods during childhood (Batsell et al., 2002). Higher levels of pressure to eat have also been associated with increased consumption of ‘problematic foods’ (e.g., snacks, fast food) in both boys and girls during early childhood (2–6 years) (Kroller & Warschburger, 2008).

Overall cross-sectionally, pressure to eat has been readily documented to be associated with lower child weight status and higher levels of feeding problems and avoidant eating behaviours (e.g., Fisher et al., 2002; Lindberg et al., 1996; Sanders et al., 1993; Wardle et al., 2005). However, whilst pressure to eat has also been found to prospectively predict lower weight status in 1-2 year old (Farrow & Blissett, 2008), 5-7 years old (Faith, Berkowitz, Stallings, Kerns, Storey & Stunkard, 2004a) and 7-9 year old children (Galloway et al., 2005), few longitudinal studies have examined associations between pressure to eat and child eating across early childhood. Galloway et al., (2005) found that maternal use of pressure to eat with 7 year olds predicted their picky eating at age 9, however this study was limited to girls and failed to examine
eating behaviours earlier in childhood. In addition, a one year prospective study with pre-school children failed to find a prospective relationship between pressure to eat and food fussiness (Gregory, Paxton & Brozovic, 2010). Yet the same authors, using a younger sample found that maternal use of pressure to eat at 1 year predicted lower child frequency of fruit consumption at 2 years (Gregory, Paxton & Brozovic, 2011). Longitudinal evidence appears to be inconsistent and equivocal; therefore further research beginning in early childhood is essential.

1.3.1.1.2 Restriction of food intake

Restriction of children's food intake, which has been defined as parents’ attempts to control their child’s eating by restricting access to foods, including the type and amount of food (Birch, Fisher, Grimm-Thomas, Markey, Sawyer & Johnson, 2001), has been most often attributed to a higher risk for overweight. Parental restriction has been associated with disinhibited eating and poor self-regulation of calorie intake (Fisher & Birch, 1999; Birch et al., 2003), a greater preference for restricted foods (Fisher & Birch, 1999) and higher child weight (Faith et al., 2004a; Faith, Scanlon, Birch, Francis & Sherry, 2004b; Francis, Hofer & Birch, 2001). However, Farrow & Blissett (2008) found restrictive feeding practices during infancy actually predicted lower child weight at 2 years of age. In addition, Gubbels et al., (2009) found that restrictive parenting practices were related to less consumption of the restricted (unhealthy) items and higher consumption of items considered to be healthy, in a large sample of 2 year old children. These findings may reflect the age of the children involved with younger children being less capable of over-eating independently, and the longer term consequences of exposure to restriction early in life are as yet unclear. Furthermore, it is unclear whether restrictive feeding practices causally predict child weight and eating, or whether food restriction is used in response to these characteristics. Section 1.3.1.1.7 will review the bi-directional nature of associations between maternal feeding practices and child eating behaviour.

1.3.1.1.3 Incentives and conditions

Other commonly used feeding practices include the use of verbal incentives, rewards and conditions to attempt to increase children’s food consumption, for example “eat this then you can have pudding” (Haycraft & Blisett, 2008). The research findings within this area are particularly controversial, as the use of rewards have been
associated with both positive (e.g., Hendy, Williams, & Camise, 2005; Lowe, Horne, Tapper, Bowdery, & Egerton, 2004) and negative (e.g., Newman & Taylor, 1992; Kroller & Warschburger, 2008) outcomes in terms of food intake and preferences. Rewards can be classed as a coercive strategy (Brown & Ogden, 2004), as adults may employ contingencies involving food and eating to control children’s behaviour or to regulate their food intake (Birch, Marlin & Rotter, 1989). It can be argued that rewarding a child for engaging in a particular task can undermines their intrinsic motivation for that task (e.g., Deci et al., 1999). In terms of eating behaviour, rewarding a child for eating a disliked food with another food can lead to a decline in the preference for the task food, and increased preference for the reward food (Newman & Taylor, 1992; Birch, Marlin & Rotter, 1984; Vereecken, Keukelier & Maes, 2004). For example, in a sample of children aged 4–7 years, using snack food items that were initially ranked equally in preference by the child, those given as a reward increased in preference, while the snack that participants were required to eat before getting the reward decreased in preference (Newman & Taylor, 1992). Therefore while initially this practice may be successful in increasing consumption of disliked foods (Rhee, 2008) it could in fact exacerbate fussy eating behaviour and feeding problems. Indeed, Kroller & Warschburger (2008) found that parental use of food as a reward for eating other foods, predicted lower intake of fruit and vegetables in a sample of 2–6 year old children at risk of overweight.

However, results have also been somewhat conflicting, and other research has pointed to the potentially positive outcomes associated with the use of rewards for eating (e.g., Cooke, Chambers, Añez, Croker, Boniface, Yeomans & Wardle, 2011). For example, clinical studies of children with feeding problems such as food refusal have found that rewards can produce immediate increases in food intake (Coe et al., 1997; Kern & Marder, 1996). Intervention studies amongst non-clinical groups have also been successful in improving child dietary intake. For instance the Kids Choice school-lunch program, where tangible reinforcers are given to children for trying fruits and vegetables, found that these rewards increased fruit and vegetable intake (Hendy et al., 2005). Similarly, the Food Dudes intervention, which combines peer modelling with rewards, was related to substantial increases in fruit and vegetable intake, even after rewards were withdrawn (Lowe et al., 2004). However, as rewards were conflated with modelling it is unclear how much this effect can be uniquely explained by the use of rewards.
Results are mixed but overall, there appears to be evidence that when used appropriately, rewards can be very effective at altering behaviour such as children’s food consumption. Perhaps with regard to parental contingencies, what may be important is that rewards are desirable and thus potent reinforcers and that they signal to the child that they are for behaviour that is both enjoyable and high status (e.g., Cameron, Banko & Pierce, 2001; Dickinson, 1989; Lowe, Dowey & Horn, 1998; Lowe et al., 2004). Further research is needed to explore the idea in more depth. In addition, it may that using one food as a reward for eating another food is not adaptive but that using other non-food related incentives and rewards may help to encourage children to try foods which they would otherwise refuse. Orrell-Valente and colleagues (2007) suggest the need to sub-categorise conditions and rewards; distinguishing using food as a reward from using non-food related items as rewards (e.g. play, a sticker) and categorising conditions into threats to withdraw desired foods and threats to withdraw non-food privileges (e.g., play, TV watching). However, whilst they found that 30% of parents (in a sample of pre-school aged children) used food as a reward for consuming another food, other types of rewards and conditions were relatively infrequently used (Orrell-Valente, Hill, Brechwald, Dodge, Pettit & Bates, 2007). Further research is needed to evaluate the role of tangible rewards in the development of eating behaviour in young children.

It is also important to consider verbal rewards such as praise, which can be an effective tool for changing behaviour (Blumenfeld, Pintrich, Meece, & Wessels, 1982; Cooke et al., 2011; Delin & Baumeister, 1994). Praise, perhaps because it is often given unannounced, can have less of an undermining effect on motivation than tangible rewards, which are often promised in advance of engaging in a desired (Cooke et al., 2011; Deci et al., 1999). Thus it may be expected that praise could be more effective in improving children’s eating behaviour and food intake than tangible rewards. However, an early study by Birch and colleagues (1984) exploring praise and tangible rewards, actually found that liking of an unfamiliar drink decreased both in those individuals praised for trying it and those of offered a movie ticket as a tangible reward. Despite this, more recent evidence suggests that praise can in fact be a useful tool to increase healthy eating in children (e.g., Epstein et al., 2001; Nicklas et al., 2001). For example, several successful interventions for healthy eating in children have included praise as a component (Epstein et al., 2001; Stark et al., 1986) and praising children for consuming healthy foods is related to higher intake (Nicklas et al., 2001; Vereecken, Keukelier,
Maes, 2004). Thus future studies exploring the role of rewards in the development of eating behaviour should not only assess tangible rewards but also consider verbal rewards such as praise.

1.3.1.1.4 Use of food for emotion regulation

Using food to regulate children emotional states (Musher-Eizenman & Holub, 2007), similar to using food as reward, uses food in response to external factors rather than in response to hunger and satiety. It is possible that if food is used for comfort, a child may develop a pattern of responding to emotional arousal with food intake (Bruch, 1973) and it has been proposed that such feeding practices may unintentionally cause children to use food to address emotional arousal (Carper et al., 2000; Van Strein & Bazelier, 2007). If parents use food to regulate their child’s emotional states, they may unintentionally ‘teach’ their child to respond to emotional states by eating thus leading to the development of emotional eating. Support for this premise is evident within a recent lab based study which found that maternal use of food to regulate emotions predicted child consumption of cookies in the absence of hunger and in the presence of negative emotion (Blissett, Haycraft & Farrow, 2010). However, less is known about whether emotional feeding practices may be associated with children's food avoidant eating behaviours.

1.3.1.1.5 Food availability and exposure

Research has also explored other potentially positive feeding practices that may be associated with improved dietary variety and less avoidant eating behaviour in children. These include increasing children’s exposure to a variety of foods (e.g., Batsell et al., 2002), making more healthy foods available in the home (Ventura & Birch, 2008), and encouraging balanced and varied food intake (Musher-Eizenman & Holub, 2007). Previous research on exposure has found that parents who fail to expose their children to a wide variety of foods and textures, or do not allow adequate exposures, are likely to encounter greater rejection of food (Birch, 1999; Carruth et al., 2004). In contrast, high exposure to a variety of foods may foster increased liking and higher consumption of exposed foods (Wardle, Herrera, Cooke & Gibson, 2003) and research has suggested that children tend to choose to eat the foods that they are served most often, and often prefer to eat foods that are readily available in the home (Birch & Marlin, 1982; Birch et al., 1987; Reinaerts, de Nooijer, Candel & de Vries, 2007). Thus
is it possible that providing a healthy food-related home environment may represent a protective factor for food avoidance and further exploration of the prospective relationship between these variables is essential.

Whilst longitudinal studies are rare, the frequency of providing home-cooked fruit and vegetables at 6 months of child age has been found to positively predict consumption of fruit and vegetables at 7 years (Coulthard, Harris & Emmett, 2009). Adolescents also report that food availability is one of the most influential factors in their food choices and preferences (Story, Neumark-Sztainer & French, 2002). Given that food acceptance patterns develop early in life, and childhood is a critical time for developing food preferences (Cashdan, 1998; Illingworth & Lister, 1964), food availability, accessibility and exposure during this time may be important factors in preventing avoidant eating behaviours and promoting balanced and varied food intake. Further prospective research across early childhood would help to highlight how these behaviours influence children’s emerging eating behaviours.

1.3.1.1.6 Involvement

Involving children in food related activities such as food planning and preparation has also been suggested to be important for the development of healthy and adaptive eating behaviours (Heim et al., 2011; Marshall et al., 2011; Van der Horst, 2012). Co-participation in food related activities has been associated with lower food fussiness, greater food enjoyment and increased fruit and vegetable intake (Heim et al., 2011; Marshall et al., 2011; Van der Horst, 2012). For example, a garden-based nutrition education programme in children aged 8-11 years, following a ‘seed to table’ approach involving fruit and vegetable preparation and taste tests over 12 weeks, reported significant increases in fruit and vegetable intake and preference post invention (Heim et al, 2011). However the experimental nature of the study limits its generalisability, expansion to explore how involvement in food preparation within the home environment influences child food intake and eating behaviour, would provide further insight into how this approach could be utilised within the home interventions.

A recent study by Van der Horst (2012) found an association between cooking enjoyment with lower picky eating and greater eating enjoyment in 6-12 year olds. The results of this study highlight that co-participation in hands on food-related activities, as well as exposure to healthy foods within the home may be important during childhood. Van der Horst (2012) suggests that ‘the effects of food exposure may be evaluated
based on the context in which they are experienced’ (pp. 6). It is likely that hands on activities like cooking and food preparation give children positive feelings such as ownership and pride (Heim et al., 2011) and lead to a positive evaluation of the food experience increasing liking of foods and willingness to try them (Van der Horst, 2012). However as these studies conflated exposure and involvement it is not possible to ascertain the unique contribution of involvement. In addition, research suggests that eating behaviours and food preferences can develop very early in childhood (Birch & Fisher, 1998; Cashdan, 1998; Illingworth & Lister, 1964), therefore whilst positive associations were found within these studies, replication in younger samples is essential. Parents lack clear strategies with which to deal with avoidant eating behaviours, and further research within the home environment would provide a greater insight into whether involvement and co-participation in food related activities could be utilised as adaptive strategies to help to reduce avoidant eating behaviours and improve dietary intake in children.

1.3.1.1.7 Bi-directional nature of feeding interactions

Whilst many studies infer that parental feeding practices may be causally implicated in the development of child eating behaviour, longitudinal evidence is limited and there is also evidence that parental feeding practices may be employed in response to the child’s eating behaviour and weight status (Birch & Fisher, 2000; Chatoor et al., 1988; Drucker et al., 1999; Faith et al., 2004a; Faith et al., 2004b; Farrow, Galloway & Fraser, 2009; Iannotti, O’Brien & Spillman, 1994; McKenzie et al., 1991). For instance, a recent siblings study with children aged approximately 5 years, found that parents used different feeding practices for children in the same family in response to their eating behaviour, reporting higher levels of pressure to eat with children who were fussier, emotionally under-eat and were more responsive to internal satiety cues (Farrow et al., 2009). In addition Keller et al., (2006) found that mothers reported using less pressure to eat for their heavier children than they did with their lighter children whereas Birch and Fisher (2000) found that mothers of girls who were overweight were more likely to use restriction than mothers of girls who were not overweight. Whether controlling feeding practices are a cause or consequence of children’s emerging eating behaviours, the research evidence suggests that they may negatively contribute to the development, reinforcement and exacerbation of child feeding problems and avoidant eating behaviours (Harris & Booth, 1992; Manikam & Perman, 2000). This is particularly
important given findings from a recent observational study with parents of children aged 4–6 years showing that 85% of parents tried to get children to eat more at mealtimes (Orrell-Valente et al., 2007).

### 1.3.1.1.8 Summary

In conclusion, whilst overly controlling maternal feeding practices have been associated with lower child weight status and higher levels of feeding problems and avoidant eating behaviour within cross-sectional studies, longitudinal evidence in young children remains limited, and further research is needed to evaluate these relationships during early childhood. Moreover, recent research has begun to explore other parental feeding practices, such as the use of food as a reward, or for emotion regulation, and the effects of food availability, exposure, and the home food environment in predicting child eating behaviour. However, some of these feeding practices remain relatively sparsely explored, and it is not yet clear whether they prospectively predict avoidant eating behaviours in children. Many of the aforementioned studies are also limited by their reliance purely on maternal self-report measures, and independent observations are necessary to validate these reports and explore maternal feeding practices in more depth. Research in this area has tended to focus on feeding practices used by parents to modify children’s dietary intake but few studies have examined the affective nature and quality of dyadic interactions during mealtimes. In order to better understand the social contexts of family mealtimes and its relation to child eating it is important to consider how mothers interact with their child at mealtimes in terms of their sensitivity, warmth and positivity or the degree of conflict and negativity. The research examining the maternal interactional correlates of child food avoidance eating behaviour and feeding problems will now be reviewed.

### 1.3.1.2 Interactional behaviour at mealtimes

Researchers have explored the role of parent-child interactions within mealtimes, in addition to the effects of feeding practices per se (e.g., Robertson, Puckering, Parkinson, Corlett & Wright, 2011; Moens, Braet & Soetens, 2007). It is generally accepted that maternal child interaction is of high importance to child development (Chatoor, 2000; Robertson et al., 2011) and several studies highlight the importance of parental warmth, support, sensitivity, responsiveness and involvement for the well-being of children and adolescents (e.g., Ainsworth, Blehar, Water & Wall,
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1978; Baumrind, 1993; Maccoby & Martin, 1983). Similar features are likely to be important during feeding interactions (Chatoor, 2000; Rhee, Lumeng, Appugliese, Kaciroti & Bradley, 2006; Kremers, Brug, de Vries & Engels, 2003; Patrick et al., 2005). Preliminary cross-sectional studies have pointed to the importance of maternal warmth, sensitivity, interpersonal involvement, modelling, praise, positivity and enthusiastic comments during mealtime interactions (e.g., Hendy & Raudenbush 2000; Patterson et al., 1992; Moens et al., 2007; Patrik et al., 2005; Robertson et al., 2011), as effective means of encouraging healthy food consumption.

In contrast, maternal behavioural correlates of feeding problems include negativity and insensitivity, behaviours that are often ingrained in interactional deficiencies within mother-child dyads (Boddy & Skuse, 1994; Harris & Booth, 1992; Skuse, 1985; Skuse, Wolke & Reilly, 1992). For example, mothers of infants with feeding problems have been described to be cold and negative in their interactions (Dahl & Sundelin, 1986). Research with clinical samples has also described mothers’ of children with a feeding disorder as more negative, aversive, critical and angry during feeding and non-feeding situations compared to control mothers (Sanders et al., 1993; Chatoor et al., 1988). Similarly, mothers of children with feeding problems have been seen to be less sensitive to their child’s cues and wants during feeding (Lindberg et al., 1996) as well as less responsive and more intrusive and inconsistent (Chatoor, Dickson, Scaefer, Egan, 1985; Chatoor et al., 1988). However much of this research is cross-sectional and it likely that having a child with a feeding problem will lead to stress and negativity at mealtimes, rather these maternal behaviours being causally implicated in the development of feeding problems.

In addition, little research has looked at these constructs in relation eating behaviours amongst non-clinical groups and further research with non-clinical samples is essential. Evidence from a recent observational study of 200 family mealtimes with children aged between 5-12 years old with an asthma diagnosis, found that families who had a child of healthy weight spent more time engaged with each other during the meal, expressed more positive communication, and considered mealtimes more important and meaningful than families who had a child who was overweight or obese (Fiese, Hammons & Grigsby-Toussaint, 2012). This suggests that positive communication and engagement may be potentially beneficial to healthy weight and eating behaviour, but no research to date has explored the association of these variables in relation to child food avoidance across early childhood.
1.3.1.2.1 Summary

Overall it seems the affective nature and quality of dyadic communication during child mealtimes is important, with interactional deficiencies being associated with feeding problems. However, many of these studies are limited by their cross-sectional nature and it is possible that difference may be in response to variations in child eating behaviour. In addition, whilst there is some preliminary evidence, very little research has explored the relationship between maternal interactional correlates such as sensitivity, positivity/negativity and conflict with a broad range of avoidant eating behaviours displayed in non-clinical community samples. Another aspect that may be important when considering parents’ socialisation of their children’s eating is their mealtime structure and environment, such as whether the family eat together, whether the child has choice in foods served and whether a the TV or another distractor is used during the meal. The following section of this review will explore the aspects of the mealtime environment that have been associated with child eating behaviour.

1.3.1.3 Mealtime structure and environment

The mealtime environment, including structure and organisation at mealtimes, and whether families eat together, has been explored in relation to child eating behaviour (Orrell-Valente et al., 2007; Cooper, Whelan, Woolgar, Morrell & Murray, 2004). Several cross-sectional studies have found positive associations between the frequency of family meals and positive child eating behaviour, such as the consumption of healthier foods (e.g., Gillman et al., 2000; Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003). A longitudinal study during adolescence found that parental presence at evening meals was positively associated with higher consumption of fruits, vegetables, and dairy foods (Videon & Manning, 2003). Research both cross-sectionally and longitudinally in adolescent samples has also found that frequent family meals, a positive atmosphere at family meals, and a more structured family meal environment are associated with a decreased risk of adolescent disordered eating (Neumark-Sztainer, Wall, Story & Fulkerson, 2004; Neumark-Sztainer, Eisenberg, Fulkerson, Story & Larson, 2007; Neumark-Sztainer, Wall, Haines, Story, Sherwood & van den Berg, 2007). Regular family meals provide an opportunity for the role modelling of healthy eating patterns and social interactions among family members, and may thus help to reinforce healthy eating patterns and prevent disordered eating behaviours from developing (Neumark-Sztainer et al., 2004). However, these studies were carried out in
adolescent samples and less is known about the relationship between family mealtimes and avoidant eating behaviours in early childhood.

It may not just be presence of a parent or family members at a mealtime, but also whether they consume the same food as the child that may be important. For example, evidence has shown that children tend to sample unfamiliar foods more readily when an adult is eating the food compared to when such a food is merely offered (Harper & Sanders, 1975). Research with children aged 2-5 years within a lab-setting has found that children accepted a novel food more quickly and ingested more of that food when an adult was eating a similar food of the same colour rather than when the adult was just sitting with them but not eating (Addessi, Galloway, Visalberghi & Birch, 2005). Children’s intake of novel foods has also been found to be influenced by their teacher enthusiastically consuming the food in front of them (Hendy & Raudenbush, 2000). These findings suggest that both the presence of caregivers at mealtimes and caregivers eating the same or similar foods as children may help to reduce avoidant child eating behaviours, however further research, particularly using longitudinal designs is needed.

In addition, whilst the frequency of family meals appears to be important, many studies rely on retrospective self-report and few studies have looked at additional mealtime structure variables. A recent observation study, exploring parents’ socialisation of children’s eating at mealtimes, noted the frequency of several mealtime structure variables (e.g. whether parents are present, where mealttime took place, the use of distractors to feed) in high and low socioeconomic status families but failed to explore the association of these variables with child eating behaviour or feeding problems (Orrell-Valente et al., 2007). Another observational study comparing children with and without feeding problems, found that mealtime disorganisation (not eating with parents, eating in the living room, using distractions at meals) was related to the presence of child feeding problems (Cooper et al., 2004). These variables significantly distinguished between children with feeding problems and those without, and were also found to mediate the association between maternal eating psychopathology and child feeding disturbances (Cooper et al., 2004). Unfortunately observational studies of the home mealtime environment, particularly in non-clinical groups, are rare, often only involve small samples and focus predominantly on feeding practices, such as pressure to eat (e.g., Klesges et al., 1983). Therefore further research utilising observational measures, is needed to enable researchers to better understand the socialisation of
mealtimes, and identify family-environmental influences on children’s food avoidance eating behaviours.

1.3.1.4 Summary

The maternal correlates of child food avoidant eating behaviours discussed thus far have focused on maternal feeding practices, mother-child dyadic interaction at mealtimes, and mealtime structure. These factors and behaviours are particularly important due to the fact that they are potentially modifiable. With further investigation to ascertain their temporal precedence, so that directional inferences can be drawn, research findings could be used to inform the development of preventative interventions to improve child eating behaviour and food intake. Another maternal factor likely to influence children’s eating behaviour is maternal psychopathology which will be explored in the following section of this review.

1.3.1.5 Maternal psychopathology

Psychopathological functioning, particularly symptoms of maternal anxiety, depression and eating disorders are often associated with the presence and persistence of feeding problems in childhood (Ammaniti, Ambruzzi, Lucarelli, Cimino & D’Olimpio, 2004; Stein, Woolley & McPherson 1999; Blissett, Meyer & Haycraft, 2007), this literature will be described below.

1.3.1.5.1 Anxiety and depression

Both maternal anxiety and depression have been associated with child feeding problems, however findings within this area are often equivocal and contradictory. For instance some studies have demonstrated effects of maternal anxiety but not depression on difficult feeding interactions (e.g. Farrow & Blissett, 2005), whilst other studies find significant effects of both depression and anxiety (e.g. Coulthard & Harris, 2003). In a non-clinical sample of children aged 1-4, symptoms of depression were associated with feeding problems in both mothers of boys and girls, however symptoms of anxiety were only associated with feeding problems in mothers of boys (Blissett, Meyer & Haycraft, 2006). Whereas Whelan and Cooper (2000), found that mothers within a community sample of children with feeding problems, did not have significantly higher levels of anxiety and depression, compared with mothers of comparison infants. Other studies have suggested that maternal psychopathology may influence children’s eating
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behaviour through its effect on maternal feeding practices. For instance, a longitudinal study following mothers from pregnancy through to the child’s first year found that general psychological distress, particularly anxious psychopathology, was associated with restrictive feeding practices at 1 year old (Farrow & Blissett, 2005).

1.3.1.5.2 Eating related psychopathology

Research has also pointed to the importance of maternal eating behaviours and attitudes in predicting feeding interactions and subsequent eating behaviours of children (Ammaniti et al., 2004; Coulthard, Blissett & Harris, 2004; Blissett et al., 2007; Stein et al., 1999). Whilst a range of associations have been found between the eating behaviours of mothers and children (Birch & Sullivan, 1991; Cutting, Fisher, Grimm-Thomas & Birch, 1999; Francis, Ventura, Marini & Birch, 2007), eating psychopathology, eating concerns and restrained eating have been most readily documented in relation to the presence and persistence of feeding problems and food avoidant eating behaviours in children (Ammaniti et al., 2004; Coulthard et al., 2004; Blissett et al., 2007). For instance, mothers’ eating concerns have been associated with food refusal in girls (Blissett, Meyer & Haycraft, 2007) and lower child weight (Chatoor, Ganiban, Hirsh, Borman-Spurrell & Mrazek, 2000). Further research exploring symptoms of maternal eating psychopathology amongst non-clinical groups with a broad range of avoidant eating behaviours in children, will provide additional insight.

In addition maternal eating psychopathology has been associated with more controlling and less sensitive feeding practices (Chatoor et al., 2000; Stein et al., 1999; Blissett et al., 2007) It has been suggested that maternal eating disorders can interfere with sensitive parenting in the feeding context (Chatoor et al., 2000; Stein et al., 1999), whereby intrusive and conflictual parenting at mealtimes might be important in the transmission of food-related disorders (Stein, Woolley, Cooper & Fairburn, 1994; Stein et al., 1999). A similar maladaptive process is also likely with parents with non-clinical levels of eating psychopathology, where parents’ own child-irrelevant social values and concerns about a given domain can elevate concern and constraint in parenting (Costanzo & Woody, 1985). In line with this idea, mothers’ preoccupation with their own weight and eating has been linked to higher restriction of daughters’ food intake (Francis & Birch, 2005) and both mothers and fathers with non-clinical levels of eating psychopathology have been shown to be more controlling over their children’s eating
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(Blissett et al., 2007). Overall these research findings suggest that symptoms of maternal eating psychopathology may be related to food avoidant eating behaviour in children, either directly or through their influence on parental feeding practices.

1.3.1.5.3 Summary

Whilst results are mixed, there is evidence to suggest that maternal psychopathology may be important in relation to both child food avoidant eating behaviour and the feeding practices that caregivers employ. Studies exploring maternal influences on child eating behaviour would benefit from exploring the role of maternal psychopathology further, or controlling for its influence in order to gain an insight into the unique contribution of other maternal factors such as feeding practices. The contribution of symptoms of maternal psychopathology will therefore be explored and controlled for within this thesis.

1.3.2 Child temperament

Whilst parents represent an essential influence on children’s emerging eating behaviours through all of the aforementioned avenues, children are not merely passive responders to parental influences (Carnell & Wardle, 2008). Feeding is a dynamic bidirectional process and children significantly contribute to their feeding interactions (Cabanac, 1987). It is important to remember that although parenting can influence children’s eating and weight, individual child characteristics are likely to influence parenting and the way in which parents interact with their child. For example, parents have reported using different feeding practices in response to different characteristics between siblings (e.g., Brann & Skinner, 2005; Farrow et al., 2009). In addition, inherent child characteristics such as temperament are also likely to directly influence children’s eating behaviours and susceptibility to risk factors within the family environment. There has therefore been a growing interest in individual difference variables that influence food intake (Franken & Muris, 2005) and the impact that child temperament may have on eating behaviour has been explored (Haycraft et al., 2011). The following section will discuss the contribution of temperament dimensions to children’s eating behaviours, exploring how temperament may influence children’s avoidant eating.

Temperament refers to individual differences in a person’s emotional reactivity and regulation (Goldsmith, Buss, Plomin, Rothbart, Thomas & Chess, 1987) and has
been defined as “personal characteristics that are biologically based, are evident from birth onwards, are consistent across situations and have some degree of stability” (Schaffer, 2006, p.70). There are a wide variety of temperaments which a child may convey and evidence has suggested that individual differences in temperamental characteristics may influence children’s eating behaviour, either directly or through their influence on parenting (Thomas & Chess, 1987). Several dimensions of temperament are associated with variations in children’s eating behaviours such as difficult and demanding (Hagekull, Bohlin & Rydell, 1997; Lindberg et al., 1994), emotional (Agras, Hammer, McNicholas & Kraemer, 2004), and shy and unsociable temperaments (Pliner & Loewen, 1997). Child temperament has also been found to be related to the feeding practices that parents employ (e.g., Blissett & Farrow, 2007).

1.3.2.1 Difficult temperament

A more wilful or difficult temperament, characterised by irritability, emotionality, non-compliance, slow adaptability and intensity (Hagekull et al., 1997; Lindberg et al., 1987), has been associated with feeding problems and underweight in children (e.g., Hagekull et al., 1997; Pliner & Loewen, 1997). This temperament profile has been associated with food refusal and negative mealtimes in young children (Farrow & Blissett, 2006) and feeding difficulties have been found to be more prevalent in children who are difficult or demanding (e.g., Hagekull et al., 1997; Pliner & Loewen, 1997). A more difficult temperament has been identified in children with feeding problems when compared to controls (e.g., Chatoor, Ganiban, Hirsch, Borman-Spurrel & Mrazek, 2000; Mathisen, Skuse, Wolke & Reilly, 1989). For example, children with feeding problems have been shown to have higher hyperactivity and temper-tantrums (Dahl, 1987), and are described as more difficult, negative, problematic and less manageable (Chatoor et al., 1988; Lindberg et al., 1994; Mathiesen et al., 1989; Hagekull et al., 1997) and more angry and distressed (Chatoor et al., 1988). Longitudinally, a more difficult child temperament at 13 and 24 months is associated with an increased chance of feeding problems persisting at 7 years of age (Lindberg, 1999).

However, a difficult temperament has also been found to be associated with over-eating and weight gain (e.g., Niegel, Ystorm & Vollrath, 2007). Infants with difficult temperaments show more rapid weight gain up to the age of 3½ compared to controls (Darlington & Wright, 2006; Niegel et al., 2007) and such temperament
attributes in early childhood have also been associated with overweight in later childhood (Niegel et al., 2007). This suggests that this temperament profile may put children at risk of maladaptive eating behaviours, and further prospective research is needed to understand its relationship with both avoidant eating behaviour and over-consumption.

### 1.3.2.2 Emotional temperament

Emotionality is another dimension of temperament which appears to be related to child eating behaviour. There is evidence that a more emotional temperament is associated with feeding problems and food avoidant eating behaviours in children and eating concerns in later life (Haycraft et al., 2011; Martin, Wertheim, Prior, Smart, Sanson & Oberklaid, 2000). Haycraft et al., (2011) found a positive association between an emotional child temperament and more food avoidant eating behaviours, such as greater food fussiness, slowness in eating, satiety responsiveness and low enjoyment in food, in children aged 3-8. In addition, a recent study has reported that higher levels of negative emotionality in childhood are related to the development of eating concerns in later childhood (Martin et al., 2000). However this study relied on parent report and only followed up children until 12-13 years of age, thus it is unclear how this may track into adulthood. In addition, in a longitudinal study across adolescence, whilst negative emotionality was related to concurrent eating disturbances, it did not prospectively predict them over a 3-year period (Leon, Fulkerson, Perry, & Cudeck, 1993). Moreover emotionality has also been associated with overweight and obsesogenic eating behaviours (Agras et al., 2004; Pulkki-Raback, Elovainio, Kivimaki & Raitakari, 2005; Darlington & Wright, 2006). For instance, children with persistent tantrums over food during their first two years of life combined with a highly emotional temperament have been found to have an elevated risk of becoming overweight compared to children without such a temperament profile (Agras et al., 2004). Whilst,

Explanations for these links between a difficult or emotional temperament and eating behaviour remain unclear, however it could be hypothesised that children with a more difficult or emotional temperament may show heightened emotional reactivity within feeding interactions or be more difficult and demanding in terms of their food preferences and mealtime behaviours. Differences in children’s emotional reactivity, persistence and wilfulness are likely to influence the parenting process within the feeding context (Bates, Pettit, Dodge & Ridge, 1988; Rothbart, 1989). Such traits can evoke negative feelings, insensitivity and coercive feeding by parents and dyadic
feeding interactions may then be characterised by little reciprocity, more conflict and struggles for control (Chatoor & Egan, 1983). As previous sections of the Chapter have highlighted, such feeding practices can be detrimental to children’s emerging eating behaviours, with coercion being associated with low weight, feeding problems and fussy eating (Sanders et al., 1993; Lindberg et al., 1996; Farrow & Blissett, 2008; Keller et al., 2007; Manikam & Perman, 2000) and also obesogenic eating behaviours and overweight (Birch et al., 1987; Fisher & Birch 2000; Savage et al., 2007). This could perhaps explain why links have been found between these temperament profiles with both over and under consumption.

1.3.2.3 Shy temperament

Shy and unsociable temperaments have also been associated with avoidant eating behaviours in children, particularly food fussiness and food neophobia (e.g., Pliner & Lowen 1997; Kagan & Snidman, 1991). It is likely that children with qualities of fearfulness, shyness, and timidity may be inhibited by the unfamiliar and therefore more likely to be neophobic with respect to food (Kagan & Snidman, 1991). Indeed, parental reports of child shyness have been related to children's unwillingness to try new foods (Pliner & Loewen, 1997). Children with feeding problems have been described, both in feeding and non-feeding situations, as less talkative, more ambiguous in their communications and as averting their gaze (Chatoor et al., 1998; Lindberg et al., 1996). However, it is possible that these associations with shyness and unsociability, particularly in clinical samples, may reflect the child’s nutritional status being compromised rather than being causally implicated. These factors can lead to apathy and mood change (Grantham-McGregor, Stewart & Powell, 1991) which is often reduced after food supplementation (Grantham-McGregor, Powell, Walker & Himes, 1991). Interestingly, a recent study with a non-clinical sample of children aged 3-8 found no association between child food avoidance and either shyness or sociability (Haycraft et al., 2011) therefore this temperament profile requires further exploration.

1.3.2.4 Summary

Given that early temperament characteristics have been found to be a risk factor for vulnerability to later eating problems (e.g., Martin et al., 2000), identifying associations between temperamental traits and feeding disturbances at an early age marks a potentially useful tool for parents and healthcare professionals. While some
work has examined temperament and eating in infants, or with older adolescent or adult samples, there is a paucity of literature which has examined these associations during early childhood. Further research is needed as this is a key time when children are becoming more autonomous eaters (Haycraft et al., 2011) and where eating behaviours are becoming established and embedded (Savage et al., 2007). In addition, results are mixed and often equivocal, with links with both over and under consumption and explanations for these links remaining speculative. Child temperament will therefore be explored within this thesis, and its influence will be controlled for when exploring the unique contribution of maternal feeding practices.

1.4 Overall Summary and directions for research

Given the negative outcomes associated with food avoidant eating behaviours and feeding problems (e.g., Chatoor et al., 1988; Galloway et al., 2005; Wright & Birks, 2000), and evidence that they can persist across childhood and into adulthood (e.g., Kotler et al., 2001; Marchi & Cohen, 1990; McDermott et al., 2010), prospective research beginning in early childhood is essential. Eating behaviours and food preferences develop very early in childhood (Birch & Fisher, 1998; Cashdan, 1998; Illingworth & Lister, 1964) therefore an understanding of the risk factors during this critical period, before the onset of more serious feeding problems, provides opportunities for prevention and intervention. Previous research has begun to highlight the importance of child temperament (e.g., Farrow & Blissett, 2006; Martin et al., 2000), parental psychopathology (e.g., Coulthard et al., 2004; Blissett et al., 2007; Farrow & Blissett, 2005), feeding practices (Fisher et al., 2002; Sanders et al., 1993; Spruijt-Metz, Chaoyang, Cohen, Birch & Goran, 2006; Wardle et al., 2005), dyadic interactions (Chatoor, 2000; Kremers et al., 2003; Patrick et al., 2005; Rhee et al., 2006), and mealtime structure (Addessi et al., 2005; Cooper et al., 2004) in the development of child eating behaviour. However these studies have most often adopted cross-sectional designs, not used observational measures, or have failed to follow children from an early age. Longitudinal designs are needed to establish temporal precedence in order to ascertain whether these factors are a result of child eating behaviour or whether they actually play a role their development, so that the complex bi-directional nature of feeding interactions can be better understood.

In addition, no research to date has investigated how a comprehensive and broad range of feeding practices may longitudinally predict child food avoidance over and
above the contribution of other child and parent factors such as maternal psychopathology and child temperament. Such an investigation is essential given that intrinsic child characteristics such as temperament and parental psychopathology are largely stable, but parental mealtime interactions and feeding practices are potentially modifiable. In addition, previous research on parental influences has often focused on feeding practices alone and failed to explore the complex dynamics of parent-child interaction at mealtimes amongst non-clinical populations. Whilst studies that rely purely on parent-report measures can offer an insight into the aspects of maternal-child interactions during mealtimes, independent observations of mealtimes allow researchers to examine these factors in greater depth and also serve to validate maternal reports of both child eating behaviour and maternal feeding practices. Few studies have explored the early developmental trajectory of children’s eating behaviours and the stability or consistency of food avoidance across early childhood. Prospective studies tracking both child eating behaviour and maternal feeding practices and behaviours over time would help researchers to understand their trajectory. The use of non-clinical samples will allow insight into the normal variation in eating behaviour and allow researchers to better understand how to promote more successful feeding interactions and prevent negative feeding outcomes. In order to develop successful treatments and interventions for health care professionals and advice packages for parents we need a more thorough and extensive understanding of the potential risk factors. A prospective, longitudinal and observational study to evaluate the contribution of-family environmental factors in predicting child food avoidance and feeding problems throughout early childhood would be of interest to researchers, health professionals and parents alike.

1.5 Aims of the thesis

The overall aim of this thesis is to establish the relative importance of maternal feeding practices, interactional behaviour, mealtime structure, child temperament and maternal psychopathology in the prediction of validated maternal reports of child food avoidant eating behaviour, in a one year prospective study with children aged 2-5. Addressing the criticisms of previous research this thesis will employ a longitudinal design and utilise both maternal report and observational measures, allowing for directional inferences and identification of a broad range of family-environmental correlates of food avoidance over time.
1.5.1 Maternal Report

**Aims:** Firstly this thesis aims to explore, both cross-sectionally and prospectively, the relationship between child food avoidant eating behaviour with maternal reports of child temperament, symptoms of maternal psychopathology and maternal feeding practices. Specifically it seeks to establish whether parental feeding practices add to the predictive variance in child eating behaviour accounted for by child temperament and maternal psychopathology.

**Hypotheses:** It was hypothesised that maternal reports of child food avoidant eating behaviours (high food fussiness, slowness in eating, satiety responsive and low food enjoyment) at ages 3 and 4 would be positively correlated with the use of controlling feeding practices, an emotional child temperament, higher symptoms of maternal anxiety, depression and eating-related psychopathology at age 3. Whereas more adaptive practices, such as having healthy foods available in the home, promoting well-balanced and varied food intake and child involvement in meal planning and preparation would be negatively correlated with reports of food avoidant eating behaviours. It was also hypothesised that parental feeding practices at age 3 would uniquely predict reports of child food avoidant eating behaviour at age 3, and also longitudinally at age 4, after controlling for previous child eating behaviour and the contribution of inherent child characteristics and maternal psychopathology.

1.5.2 Independent observations

**Aims:** Secondly this thesis aims to evaluate the validity of maternal reports of child eating behaviour and feeding practices with independent observations of these constructs. Thirdly this thesis aims to explore both cross-sectionally and prospectively, the relationship between child food avoidant eating behaviour with independent observations of mealtime structure, maternal feeding practices and maternal interactional behaviour at mealtimes.

**Hypotheses:** It was hypothesised that maternal reports of child eating behaviour and maternal feeding practices would correlate with independent observations of these constructs. It was also hypothesised that independent observations of child eating behaviours at 3 and 4 years of age, would differ dependent on the mealtime organisation at 3 years; with children being observed to be less food avoidant (lower food refusal, faster eating rate, more positive vocalisations about food) if mothers ate with their child, allowed the child input in food choice and did not use a
distractor such as the TV or toys during the meal at 3 years. It was also hypothesised that independent observations of more avoidant eating behaviours at ages 3 and 4 would be associated with greater use of coercive feeding strategies (high pressure to eat, physical prompts, use of incentives and low feeding sensitivity) at age 3. In addition to less positive interaction by mothers’ during the mealtime (less positive expressed emotion, fewer positive comments and praise, and more interactional conflict, negative comments and negative expressed emotion by the mother) at 3 years. It was also hypothesised that maternal feeding practices and behaviours at age 3 would uniquely predict reports of child food avoidant eating behaviour at age 4, after controlling for previous child eating behaviour at age 3.

1.5.3 Consistency and stability

Aims: This thesis aims to assess the consistency and stability of independent observations and maternal reports of child eating behaviours and maternal feeding practices across early childhood.

Hypotheses: It was hypothesised that maternal reports and independent observations of children’s eating behaviours and maternal feeding practices and behaviours would be significantly correlated over time, showing good stability between 3 and 4 years of age. It was also hypothesised that there would be good consistency in mean levels of maternal reports and independent observations of children’s eating behaviours and maternal feeding practices over time.
CHAPTER 2

General Methodology

2.1 Introduction to general method chapter

This chapter will outline the methods used within this thesis. Firstly the design of previous research will be critically addressed, and the research design for this study will be described, including a detailed explanation of the measures chosen for this thesis. Finally the general data analysis strategy will be presented.

2.2 Research design

As highlighted within the literature review, many studies investigating child eating behaviour are limited by their cross-sectional, retrospective designs and often involve only small samples relying purely on maternal self-report. In order to avoid the limitations of those studies the present thesis utilises a prospective longitudinal design using both self-report questionnaire and independent observational measures with a community sample of mothers and their children. Using a prospective longitudinal design allows researchers to ascertain temporal relationships between variables, allowing inferences about the casual relationships between factors over time. However, multi-method approaches can also be helpful and whilst cross-sectional studies may be limited, and conclusions drawn solely from them are done so with caution, they remain useful for identifying initial potential factors that may be associated with the outcome of interest and, as such, they represent a good first step in the research process (Jacobi, Hayward, de Zwaan, Kraemer & Agras, 2004; Kazdin, Kraemer, Kessler, Kupfer & Offord, 1997). Therefore this thesis will first use cross-sectional methods to ascertain the relationship between the variables of interest, followed by a prospective longitudinal design to explore the temporal precedence of the variables.

The use of a samples from non-clinical, community populations is growing (e.g., Coulthard & Harris, 2003) and has important implications. In order to prevent feeding problems and improve the diet and eating behaviour of young children, we need a thorough understanding of the early risk factors and how to modify them. Whilst there is a wealth of literature investigating clinical feeding problems (e.g., Chatoor, 2002; Manikam & Perman, 2000; Nicholls, Chater, & Lask, 2000), less is known about the predictors of the broad range of problems experienced in non-clinical community
samples of children during early childhood, which marks a key area for prevention and intervention. A limitation of much of the research in this field is a reliance on maternal self-report measures, which, despite being useful, may be subject to bias. For instance, whilst some studies suggest that mothers are reasonably accurate in their reports of mealtime interactions (Cooper, Whelan, Woolgar, Morrell & Murray, 2004; Farrow & Blissett, 2005) others have found that maternal reports are not validated by independent observations (Haycraft & Blissett, 2008). Observational measures are not confounded by self-report bias yet it could be argued that they are limited in their ability to capture ‘natural’ behaviour, as parents and their children are likely to act differently when being observed. However, they can provide insight into behaviours, such as the interaction between mother-child dyads during mealtimes, which may not be easily measurable using maternal report questionnaires. To address these strengths and weaknesses, this thesis will utilise a mixed methods approach, and will observe maternal-child interactions during feeding, to both validate maternal-report of feeding difficulties and further explore the interactions of mother child dyads at mealtimes and their relationship with child eating behaviour.

For this thesis, initially a large sample of cross-sectional data was collected (N=284) to explore the relationships between the variables of interest. Then, for a 1 year prospective study, a substantial subsample (Time-point 1; TP1, N = 75, time-point 2; TP2 N = 65) of observational and self-report data were collected at two time periods, approximately 1 year apart. Mothers and their children were first observed when their child was aged between 2-4 years and then followed up approximately 1 year later. The age range was chosen as, whilst it is undoubted that early infant feeding (e.g., breast feeding, weaning) are very important to future eating (e.g., Brown & Lee, 2008), early childhood (2-5 years) marks a critical period where eating habits become established and is a time when they can become embedded (Birch & Fisher, 1998; Farrow & Blissett, 2012; Savage, Fisher, & Birch, 2007).

2.3 The research sample

Following ethical permission from Loughborough University Ethical Advisory Committee, mothers were recruited via various methods. Letters were sent to parents through pre-schools and nurseries, and mothers were approached by the researcher at sure-start centres and mother and toddler groups in Hertfordshire, Bedfordshire, Greater London, Leicestershire, Nottinghamshire and Lincolnshire. In addition advertisements
were placed on internet and social networking sites (e.g., Netmums). For the initial large cross-sectional questionnaire study (Chapter 3) data were collected both manually and using an online questionnaire hosted using SurveyMonkey.com (http://surveymonkey.com). Eligibility criteria were female caregivers, including biological parent, step-parent or guardians, of children aged 2-4 years old. Mothers who could not read and write English were not included in the study because of the need to complete questionnaires and communicate with the researcher. English language also needed to be the primary spoken language within the home for those participating in the observational aspect of the study, in order for the home mealtimes to be coded and analysed by the researcher. Parents were asked if their child had ever been hospitalized due to a feeding related problem. If parents answered yes, it was planned that they would be excluded from the study, due to the study focusing on a non-clinical sample. No participants stated yes and thus none were excluded based on this criterion.

Pre-schools and nurseries from varying demographic areas were attended and all women attending the various sure-start and mother toddler groups were approached. Thus women from a broad range of socioeconomic and ethnic backgrounds were invited to partake in this study. However, participation was optional and relied on convenience opportunity sampling therefore it is acknowledged that there may be some sampling bias. Similarly the use of the internet for recruitment has been criticised for attracting biased samples, due to a higher proportion of White, well-educated individuals use the internet (Azar, 2000). However a growing numbers of social science studies are utilising the internet as a recruitment tool (Arden, 2009; Fraley, 2003). Beneficially, it provides access to samples from a wide spread of geographic locations (Gosling, Vazire, Srivastava & John, 2004), something that many other recruitment methods fail to achieve. Importantly, exploration of the demographics and test variables, using Krusall-Wallis tests, revealed no significant differences between those participants recruited through the internet, through letters sent home, or through face-to-face recruitment at $p<.01$ level.

In total 284 women took part in the first cross-sectional aspect of the study (Chapter 3) from the various sources outlined above. Two hundred and nine participants were recruited to take part in just the questionnaire element of the study (Chapter 3; see Appendix A for internet advert, Appendix B for initial contact letter to nurseries/pre-schools; Appendix C for information sheet for online questionnaires and Appendix D for information sheet attached to questionnaires sent to nurseries/pre-schools). A further
75 participants were recruited to take part in the questionnaire and observational element of the study (Chapter’s 3 and 4; see Appendix E for advert, Appendix F for pre-recruitment information sheet and Appendix G post-recruitment information sheet). For Chapter 3, data from the two datasets were pooled to provide the final N of 284. Mann-Whitney U tests revealed that mothers who completed just the questionnaire element of the study (N=209) and mothers who completed both the questionnaire and the home observation did not significantly differ according to any of the demographic, psychopathological, behavioural, early feeding or child eating measures at .01, with the exception of maternal education level. Mothers who took part in the home mealtime reported a significantly greater number of years of post-16 education (mean 5.17 years) than those who did not (mean 3.83 years; U = 213.00, z = -1.96, p < .01). Seventy-five mothers agreed to take part in a home mealtime observation (Chapter 4) and 65 of these women took part in the 1 year follow up home visit and again completed the self-report measures (Chapters 5 & 6; see Appendix H for follow-up invitation letter). Please see Figure 1 (consort diagram) for a summary of participants and drop-outs. For the longitudinal studies within this thesis (Chapters 5 & 6), attrition rates were expected along similar lines to other studies, which have reported attrition rates of around 18%-29% (Johnson & Wardle, 2005; Stice & Agras, 1998), however there was only a 12.5% drop out rate between the two time points. There were a number of diverse reasons for discontinued participation including lack of time, moving home and disinterest. Mann-Whitney U tests revealed that mothers who discontinued participation did not significantly differ according to any demographic, psychopathological, behavioural, early feeding or child eating measure at .01 level.

For the original sample of 284, mothers has a mean age of 33.63 years (Range = 20.33-47.42, SD=5.24) and the mean child age was 3.45 years (Range = 2.00-4.83, SD = 1.00). There were 142 mothers of boys and 142 mothers of girls. Seventy-five of these mothers were recruited to take part in the principal 1 year longitudinal prospective study. These participants gave consent to complete questionnaire, participate in a home mealtime observation and have their child weighed at initial recruitment (TP 1) and to see the researcher in 12 months’ time to participate in the described measures again for the 1 year follow-up (TP 2). The mean age of the mothers at initial measurement was 35.94 years (Range = 27.42-46.92, SD= 4.19) and the mean age of the children was 3.31 years (Range = 2.00-4.75, SD = 1.17). If parents had more than one child within the age range, the child whose name fell first alphabetically participated in the study.
There were 37 boys and 38 girls. At the 12 month follow-up 66 mothers agreed to take part; 66 completed the questionnaire measures, and 65 completed both the questionnaires and were observed during a mealtime. The mean age of the mothers at the 12 month follow up was 36.89 years (Range = 28.42-48.12, SD= 4.24) and the mean age of the children was 4.50 years (Range = 3.10-5.62, SD = 1.18). There were 33 mothers of boys and 33 mothers of girls. Detailed descriptions of the demographics of the samples used are described within each empirical chapter.

Figure 2.1: Consort diagram to display participants and drop-outs.
2.4 Procedure

All women who consented completed a batch of questionnaire measures when their child was aged between 2-4 years, 75 mothers then took part in a home meal time observation and were followed up 11-13 months later (Mean = 11.84 months). The measures administered at each time point are presented in Table 2.1 and described below:

Table 2.1: Measures completed by mothers at time-point 1 (TP1; 3 years) and time point 2 (TP2; 4 years)

<table>
<thead>
<tr>
<th>Time</th>
<th>Questionnaires</th>
<th>Observations</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 &amp; 4 years</td>
<td>Child Eating Behaviour Questionnaire (CEBQ)</td>
<td>Family Mealtime Coding System (FMCS)</td>
<td>Mother and child height</td>
</tr>
<tr>
<td></td>
<td>The Child Temperament Questionnaire (EAS)</td>
<td>System (CMCS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comprehensive Feeding Practices Questionnaire (CFPQ)</td>
<td>Feeding Interaction Scale (FIS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospital Anxiety and Depression scale (HADS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Eating Disorder Examination Questionnaire (EDEQ)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TP1 = Time point 1; TP2 = Time point 2

2.5 Questionnaire measures

2.5.1 Demographic information

Participants provided background information about their own age, height, weight, education and occupation, family income as well as their child’s gender, date of birth, birth weight and current height and weight. They also provided information on whether they had breast-fed and if so for what duration of time in weeks (refer to Appendix I).

2.5.2 Child food avoidant eating behaviour

Child feeding problems and food avoidant eating behaviours have largely been disparately defined and measured. Measures that have been used include the Behavioural Paediatric Feeding Assessment Questionnaire (BPFAS; Crist, McDonnell,
Beck, Gillespie, Barrett, Mathews, 1994) and the Child Feeding Assessment Questionnaire (CFAQ: Harris & Booth, 1992), however these measures are more frequently used with clinical samples (e.g., Dovey & Martin, 2012; Byars, Burklow, Ferguson, O’Flaherty, Santoro & Kaul, 2003; Patton, Dolan & Powers, 2006) and they fail to encompass the broad range of eating behaviours experienced in non-clinical samples. In addition, much of the research in non-clinical groups has focused purely on the concept of picky or fussy eating (Galloway, Fiorito, Lee & Birch, 2005), where inconsistencies in definitions and measurement have made theoretical interpretation difficult (Dovey, Staples, Gibson & Halford, 2008). For example some studies, such as Galloway et al., (2005) have used the three item picky eating subscale from the Child Feeding Questionnaire (Birch, Fisher, Grimm-Thomas, Markey, Sawyer & Johnson, 2001) whereas others have used just a single question to measure picky or fussy eating (Jacobi, Agras, Bryson & Hammer, 2003; Mascola, Bryson & Agras, 2010). Wardle and colleagues (2001) define and measure four ‘food avoidance eating behaviours’ which reflect an avoidant eating style characterised by a lower appetite and interest in food and greater food fussiness during early childhood, these are food fussiness, slowness in eating, emotional under-eating and satiety responsiveness. The Food Avoidance subscales of the Child Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson & Gibson, 2001) provide an opportunity to psychometrically measure a broader range of eating behaviours within community samples that may be implicated in risk of feeding problems, underweight and poor dietary intake.

2.5.2.1. The Child Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson & Rapoport, 2001 – Appendix J)

Parents completed the four ‘food avoidance’ subscales of the CEBQ; a parent-report questionnaire designed to assess their child’s eating styles (Wardle et al., 2001). Parents’ were asked to rate the frequency with which their child exhibits a range of behaviours using a 5 point likert scale ranging from never (1) to always (5), with higher scores indicating a greater prevalence of that behaviour. The food avoidance subscales measure; Food fussiness, which assesses pickiness with regard to the type of food the child is willing to eat (e.g., ‘my child refuses new foods at first’); Slowness in eating with evaluates the pace at which the child consumes their food (e.g., ‘my child eats more and more slowly during a meal’); Emotional under-eating which measures a tendency to under-eat in response to negative emotional states (e.g., ‘my child eats less...
when upset’) and Satiety responsiveness which measures a child's fullness threshold (e.g., ‘my child gets full up easily’).

The CEBQ has been widely used and has been shown to have good test-retest reliability ($r = .52 - .87$), stability over time and internal validity with Cronbach’s $\alpha$ for the subscales ranging from $.72 - .91$ (Carnell & Wardle, 2007; Wardle et al., 2001). Its scales have also been found to correlate well with behavioural measures (Carnell & Wardle, 2007) and they are related to lower food intake and lower weight status (e.g., Viana, Sinde & Saxton, 2008; Webber, Hill, Saxton, van Jaarsveld & Wardle, 2009). These eating behaviour traits have also been found to show consistency across early childhood between the ages of 4 – 10 years (Ashcroft, Semmler, Carnell, van Jaarsveld & Wardle, 2008).

2.5.3 Maternal feeding practices

Research on child feeding practices has largely focused on controlling feeding practices, and the most widely used questionnaire to assess this construct is the Child Feeding Questionnaire (CFQ; Birch et al., 2001). However, there has been growing interest in several other measurable aspects of feeding that may be related to child intake (Orrell-Valente, Hill, Brechwald, Dodge, Petit & Bates, 2007; Musher-Eizenman & Holub, 2007, Kroller & Warschburge, 2008) such as using food as a reward and feeding for emotion regulation (Blissett, Haycraft & Farrow, 2010; Kroller & Warschburge, 2008) and potentially positive and adaptive feeding practices such as providing a healthy food-related home environment and involvement in food related activities (Heim, Bauer, Stang & Ireland, 2011; Marshall, Golley & Hendrie, 2011; Musher-Eizenman & Holub, 2007; Van der Horst, 2012). One of the primary aims of this thesis is to longitudinally examine the contribution of a broader range of feeding practices than previously explored in predicting child food avoidant eating behaviours, therefore the CFPQ was selected in order to allow for all the maternal feeding variables of interest to be explored.

2.5.3.1 Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007 – Appendix K)

 Mothers completed 9 subscales of the CFPQ; a self-report measure of 12 dimensions of parental feeding practices (Musher-Eizenman & Holub, 2007). Parents completed the following subscales categorised into 3 areas; Control (pressure to eat,
restriction of food for health, restriction of food for weight control, monitoring), Use of Food for Behaviour Regulation (using food to regulate child emotional states and using food as a reward) and Environment (encouraging balance and varied food intake, providing a healthy environment, involving child in food planning and preparation). Parents responded on a 5 point likert scale from 1 (never) to 5 (very often); with higher scores indicating a greater prevalence of that feeding practice. The psychometric properties of the CFPQ have been demonstrated in previous research; the mean internal reliability for the 12 dimensions of parent behaviour is .73 (range = .58–.87) and the scales have good convergent and discriminate validity (Musher-Eizenman, Lauzon-Guillainm, Holub, Leporc & Charles, 2009).

2.5.4 Maternal psychopathology
2.5.4.1 Eating psychopathology

There are a wide variety of self-report instruments used for research purposes that measure eating disorder psychopathology. For example, the Eating Disorders Examination Questionnaire (EDEQ; Fairburn & Beglin, 1994), the Eating Disorder Inventory-2 (EDI-2; Garner, 1991) and the Eating Attitudes Test (EAT; Garner & Garfinkel, 1979) to name a few. The Eating Disorders Examination Questionnaire (EDEQ; Fairburn & Beglin, 1994), which is based on the Eating Disorder Examination (EDE; Fairburn & Cooper, 1993) has important clinical usage in that it can be used as a diagnostic tool but it has also been widely used in non-clinical samples (e.g., Gee & Troop, 2003; Green et al., 2009; Meyer, McPartlan, Sines & Waller, 2009). Importantly, the EDEQ has been shown to have good validity in a community sample of women of a similar age (18–45 years old) to the mothers within this sample (Mond, Hay, Rodgers, Owen & Beumont, 2004; Mond, Hay, Rodgers & Owen, 2006) and has therefore been chosen as the measures of symptoms of eating disorder psychopathology in this thesis.

2.5.4.1.1 The Eating Disorder Examination Questionnaire (EDE-Q 22; Fairburn & Beglin, 1994 – Appendix L)

The EDE-Q is a self-report version of the interview-based Eating Disorders Examination (EDE) and provides a complete and useful assessment of eating disorder psychopathology (Mond et al., 2004). It measures four dimensions of eating disorder attitudes, which form four subscales; dietary restraint, eating concerns, shape concerns,
and weight concerns (Fairburn & Beglin, 1994). Restraint relates to the individual’s attempts to limit, avoid, reduce or set rules to control or change weight and shape. Eating concern relates to feelings of guilt, eating in secrecy, fear of losing control in the act of eating and not being able to concentrate. Shape concern relates to worries about shape, how this impacts upon self-perception, other people’s perceptions and fear of shape changing. Weight concern relates to a desire to lose weight, how weight can impact on mood and views of the self (Fairburn & Beglin, 1994).

The EDE-Q 22 comprises 22 items, measured on a 7 point likert scale that focus on the eating behaviour of the individual over the past 28 days. A mean score is calculated for each subscale, and a higher score reflects higher levels of pathology. The original EDE-Q comprises 36 item and also measures behaviours such as the reported frequency of objective binges and episodes of vomiting. As the study is using a non-clinical sample these “diagnostic” items were removed and the 22 item measure was used for screen for symptoms rather than diagnosis of eating psychopathology. The EDE-Q has good psychometric properties (e.g., Carter, Aime & Mills, 2001) and the four subscales of the EDE-Q have excellent internal consistency and test-retest reliability, suggesting that the major subscales of the EDE-Q are highly stable (Luce & Crowther, 1999). It has also been identified as having good concurrent validity and acceptable criterion validity (Mond et al., 2004) and has been used in both clinical and non-clinical studies (e.g. Gee & Troop, 2003; Sysko, Walsh & Fairburn, 2005).

2.5.4.2 Anxiety and depression

Both anxiety and depression have been linked with feeding problems and food avoidant eating behaviours (e.g., Coulthard & Harris, 2003) and there are several available measures of both anxiety and depression that have been used for research purposes. These include the State-Trait Anxiety Inventory (Spielberger, 1985), the Beck Anxiety Inventory and the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). However, due the exploration of a number of predictors within this thesis, a concise measure of both anxiety and depression was sought. The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) was chosen as it contains only 14 items but still measures the two constructs in distinct subscales, rather than just measuring general negative affect, as other measures such as the Positive and Negative Affect Schedule have (Watson, Clark, & Tellegen, 1988). Anxiety and depression are hypothesised to be unique predictors of child food avoidance therefore
distinct measures are required. Importantly the HADS has been reliably used in general populations (Crawford, Henry, Crombie, & Taylor, 2001) therefore it was deemed the most appropriate measure for this thesis.

2.5.4.2.1 The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983 – Appendix M)

The HADS is a brief self-report measure containing two 7 item subscales assessing levels of anxiety and depression. Whilst initially established as a clinical tool for patients, the HADS has been found to also be a reliable and valid measure among non-clinical populations (Crawford et al., 2001). Higher scores reflect greater psychopathology. The HADS has been found to have good psychometric properties in terms of its factor structure, internal consistency (Cronbach α ranging from .77-.85) and test retest reliability (Crawford et al., 2001; Marinus, Leentjens, Visser, Stiggelbout & van Hilten, 2002; Mykletun, Stordal & Dahl, 2001).

2.5.5 Child temperament

A variety of measures are available for examining temperament during infancy and early childhood, including the Baby Behaviour Questionnaire (BBQ; Bohlin, Hagekull & Lindhagen, 1981), the Infant Characteristics Questionnaire (ICQ; Bates, Freeland & Lounsbury, 1979), the Toddler Behavior Questionnaire (TBQ; Hagekull & Bohlin, 1981), the Child Behaviour Questionnaire (Rothbart, 1981) and the EAS Child Temperament Questionnaire (EAS; Buss & Plomin, 1984). The EAS instrument is recommended for children aged 1 to 9 years (Buss & Plomin, 1984) and has been found to have adequate psychometric properties within samples of this age range (e.g., Mathiesen & Tambs, 1999). The EAS measure also assesses four dimensions of children's temperament that have been previously associated with child feeding problems and thus is chosen for the measure of child temperament for this thesis.

2.5.6.1 EAS Child Temperament Questionnaire (EAS; Buss & Plomin 1984 – Appendix N).

Parents completed the parent rated EAS Temperament Survey for Children (Buss & Plomin, 1984) to measure four dimensions of child temperament; emotionality, shyness, activity, and sociability. Emotionality reflects a tendency to become aroused easily and intensely (e.g., ‘child tends to be somewhat emotional’); activity reflects high
levels of activity and speed of actions (e.g., ‘child is always on the go’); sociability reflects the tendency to prefer the presence of others rather than being alone (e.g., ‘child likes to be with people’) and shyness reflects the tendency to be inhibited and awkward in new social situations (e.g., ‘child tends to be shy’). Parents’ were asked to rate their children using a 5-point Likert scale (ranging from ‘not typical’ to ‘very typical’), with higher scores reflecting a higher level of each temperament indicator. The EAS has been shown to have satisfactory internal consistency (mean .83) and test-retest reliability (range = .58 - .80) (Buss & Plomin, 1984).

2.6 Observations
2.6.1 Procedure.

Mother-child dyads were observed feeding during a typical lunch or evening meal at the family’s home using a video camera. The researcher arrived at the family’s home approximately 30 minutes before they anticipated that their meal would begin. This allowed time for consent to be obtained, the camcorder to be set up, and for the children to become habituated to the presence of the researcher and the camcorder. Parents showed the researcher where the mealtime would be taking place and a video camera (Sony Handicam DCR-SR37), which was used to record the mealtime, was set up in the optimal position for observing the child. Where possible the mother and any other siblings or family members present were also included in shot.

Each of the mothers’ received instructions in advance of the visit, to prepare an ordinary meal and to feed the child and carry out the mealtime as they usually would. They were asked that the mealtime should occur in the most typical conditions. For example, if the family usually eats all together, or the father/other family members are not normally present, then the observed meal was videotaped under the same conditions. Recording started when the child was seated at the table/elsewhere or when the mother first presented the child with food, and it continued until the food was removed or the mother indicted that the mealtime had finished. During the mealtime, the researcher waited in a different room, in order that the mealtime was as typical as possible.

After the meal, the mother was asked to rate the typicality of both the mealtime in general and specifically in relation to the target child’s behaviour on a scale from “1” (very untypical meal/behaviour) to “5” (very typical meal/behaviour). Exclusion from the study was planned if any parents gave a score of less than 3, but this was not
necessary as no parents scored <3. Height and weight information was obtained by the researcher for the target child and the mother, where possible. Both mothers and their children removed their shoes and any heavy clothing. They were then asked to step onto the digital Secca scales and were then measured using a Child Growth Foundations’ Leicester height measure. Mothers and their children were measured to the nearest 0.1 centimetre and weighed to the nearest 0.1 kilogram.

2.6.2 Observational measures

Due to a lack of widely accepted comprehensive tools for coding observations of family mealtimes in either clinical or non-clinical groups, aspects from various assessment measures were combined. In order to be able to evaluate the validity of maternal reports of child eating behaviour and feeding practices, independent observations of these constructs were coded where possible. Furthermore, to explore maternal-child interactions at mealtimes and the family-environmental correlates of food avoidance in more depth, additional constructs of interest, not ascertained by maternal report, were coded. This allowed all of the variables of interest to be coded within this thesis.

2.6.2.1 Child Food Avoidant Eating Behaviour.
2.6.2.1.1 Speed of eating

For each observed mealtime, the overall mealtime duration (duration of entire meal, from when the child is seated and food offered until the meal is finished or the mother indicates such) and the total number of mouthfuls consumed by the child over the duration of the meal was coded, in order to be able to calculate the child’s speed of eating. A ‘mouthful’ was considered to be a self-insertion or the acceptance of some amount of food by the child into his/her mouth. Each bite of food from a spoon or fork, or each piece or bite of food where the child used their hands, counted as a mouthful. Speed of eating was calculated by dividing the total number of mouthfuls consumed by the duration of the mealtime. This provided an indication of the average mouthfuls consumed per minute during the course of the meal.

2.6.2.1.2 Enjoyment of food

Two subscales from the Child Mealtime Coding Scheme (CMCS; Haycraft, 2007 – Appendix O) were used to provide an index of child enjoyment of food; positive
and negative comments about food made by the child during the meal. Examples of positive, enthusiastic comments include vocalisations such as “this food is yummy”; “more please”; “I like carrots”. Negative comments included vocalisations such as “don’t like it”, “don’t want any more”, “I’m not eating it”. A count was made for every vocalisations made in each of these categories during the meal.

2.6.2.1.3 Difficulty to feed

The CMCS was also used to generate an overall index of how easy or difficult the child was to feed over the course of the meal. Once the mealtime had been coded, the target child was rated for how easy/difficult they were to feed, using 5 point likert scale from 1 (easy; usually autonomous feeder, who eats what given, with little protest or conflict, may request more food and usually uses correct implements, or eats well with fingers) to 5 (difficult; much resistance to offers of food, refusal to eat, disagreements regarding food consumed, tantrums and dislike or refusing foods given/offered). The CMSC has previously been shown to have good inter-rater reliability in a similar sample in terms of age and demographics (Haycraft, 2007).

2.6.2.1.4 Food refusal

A measure of food refusal was defined for the purpose of this thesis. Other coding schemes such as the Behavioural Coding Inventory (BCI; Young & Drewett, 2000), measure food offers rejected by the child, to get an index of food refusal. However, in order to account for the age range of children within this thesis sample and that some children may not be physically prompted or offered food by their parents as they are more autonomous and independent feeders, an adapted measure labelled ‘food refusal’ was designed and coded. Frequency of food refusals reflected any time the child refused to eat a food, whether in response to physical prompts and food offers by parents or spontaneous refusals made by the child, both verbal and physical. A refusal was coded as each time the child shook their head, turned their head away, pushed food away (either from parental prompt or around the plate), said no or commented with a similar meaning, made negative comments about not wanting to consume food, spat food out, or verbally or physically rejected certain foods on the plate. Thus this measure encompasses rejections of food offers, verbal and physical refusals and food avoidant behaviours.
2.6.2.2 Mealtime structure (Cooper, Wheelan, Woolgar, Morrel & Murray, 2004; Orrell-Valente, Hill, Brechwald, Dodge, Pettit & Bates, 2007 – Appendix P)

The mealtimes were firstly coded with 6 items relating to the environment, structure and organisation of the child’s mealtime, using a combination of variables previously used by Cooper et al., (2004) and Orrell-Valente et al., (2007). These incorporate whether the mother eats with the child, whether she eats the same food as child, whether the child is allowed input in food choice or portion size, whether the child eats with siblings, whether the father eats with the child, and whether distractions are used (e.g. watching television or toys). Input in food choice reflects whether parents allowed their child some autonomy in the type and amount of food selected onto their plates. For example a selection of food in the middle of the table where the child could choose what to eat, or parents asking how much they would like or which elements of the meal they would like eg ‘Would you like some peas with that?’ or ‘Would you like a yogurt or some fruit’.

2.6.2.3 Maternal feeding practices

The family mealtime coding system (FMCS; Haycraft & Blissett, 2008 – Appendix Q) was used to gain independent observations of maternal feeding practices. The FMCS has been used within similar samples (Blissett & Haycraft, 2011; Farrow, Blissett & Haycraft, 2011; Haycraft & Blissett, 2008) and shown to have good inter-rater reliability (Farrow, Blissett & Haycraft, 2011; Haycraft & Blissett, 2008). This coding system was chosen as it contains measures of control and rewards that map well to the CFPQ used to measure maternally reported feeding practices. Three subscales from the FMCS were used to measure the frequency of mothers’ pressuring their child to consume more food, physically prompting their child to consume more food, and using incentives such as conditions or rewards to get their child to eat. Restriction of food intake was not measured within the observation as it was deemed that this largely covert behaviour was not directly observable within the mealtime and that overt restriction would be unlikely to be demonstrated during the mealtime.

Pressure to eat is defined as maternal verbal prompts for the child to consume more food, such as “eat a little bit more,” “have some peas,” or “eat three more mouthfuls.” Physical prompts were defined as maternal use of physical prompts to get the child to eat, usually by offering food to the child. This includes placing food on the spoon or fork and offering it to the child, or putting food on the cutlery ready for the
child to pick up and eat. Incentives/conditions were defined as verbal rewards and incentives or bargaining in an attempt to increase the child’s food consumption. For example, “Mummy will be so happy if you eat your beans,” or “eat this then you can have pudding”. A count was made every time each of the behaviours were displayed by mothers during the meal.

2.6.2.4 Maternal interaction at mealtimes.

Aspects from the Feeding Interaction Scale (FIS; Wolke, Summer, McDermott & Skuse, 1987 – Appendix R) and two adapted scales from the Family Mealtime Coding System (FMCS; Haycraft, 2007; Haycraft & Blissett, 2008 – Appendix J) were used to measure maternal interaction and communication at mealtimes. Various observational measures were chosen to allow all of the interactional variables highlighted within the literature that may be associated with food avoidance to be explored. The FIS has previously been used to assess maternal-child feeding interactions and to diagnose feeding problems, and has been found to have good validity and inter-rated reliability (Lindberg et al., 1996; Wolke & Skuse, 1992). Four subscales from the FIS were used to rate the amount/frequency of expressed positive emotion and expressed negative emotion, maternal feeding sensitivity and interactional conflict during the meal (Wolke et al., 1987). Amount/frequency of expressed positive emotion refers to verbally expressed statements and explicit non-verbal expressions such as hugs and kisses. Any expression of endearment is scored, but less weight is given to smiles and laughter. Amount/frequency of expressed negative emotion refers to negative verbal statements and non-verbal cues such as criticisms, threats, irritability, sharpness and negative tone. Expressed positive and negative emotion were rated separately on a 5 point likert scale, ranging from 1 (none, no expressions seen) to 5 very much (emotions expressed frequently) after the mealtime was complete. Feeding sensitivity refers to comments and feedback on child behaviour, hunger and eating, cue sensitivity, timing of offered food and termination of mealtime. Sensitivity was rated on a 9 point likert scale from 1 (highly insensitive; not responsive to child signals, meal entirely governed by mothers’ needs) to 9 (highly sensitive; attuned to the child and responsive to needs). Interactional conflict refers to the general atmosphere of the dyadic interaction, how positive or conflictual the mealtime was for mother and child and was rated on a 9 point likert scale from 1 (very much discord and conflict) to 9...
(very harmonious; agreeable, harmonious, peaceful, no conflict or negative feelings expressed).

Scales adapted from the FMCS (Haycraft, 2007) were used to assess the positive and negative comments made by the mother in relation to food. The FMCS measures generic positive and negative comments made to the child during the meal, whereas positive and negative comments specific to food were coded for within this thesis. Positive vocalisations about food were coded when the mother made any positive, enthusiastic comments about food or the mealtime such as “Mmm this is delicious”; “I like carrots”; “I have eaten it all up because it’s yummy”, “I love vegetables”. Negative vocalisations about food were coded when the mother made any negative comments about food or the mealtime, such as “I don’t like vegetables”, “this doesn’t taste that nice”. Every time the mother made a positive or negative comment about food during the meal a vocalisation was coded by the researcher.

2.6.2.5 Inter-rater reliability.

For the coding system implemented an independent second observer, who was trained on each coding method, coded a random sample of 20% of the observations. Inter-rater reliability was then calculated for all of the variables within each coding measure, using intra-class correlation coefficients. Details of these coefficients are reported in each of the empirical chapters within this thesis that used observational measures.

2.6.2.6 Height and weight.

Both mothers and the children were weighed and measured by the researcher during the visit to compute accurate BMI (kg/m²) and BMI Z-scores for mother and child respectively. Mothers were classed as overweight if they had a BMI > 25 or obese with BMI > 30 (World Health Organization, 1998). BMI Z scores were calculated for children using the Child Growth Foundation’s growth references which adjust for age and gender (Child Growth Foundation, 1996). Cole, Bellizzi, Flegal & Dietz (2000) standard definitions for overweight and obesity corrected for age and gender were also used to identify children at risk of overweight or obesity.
2.7 General data analysis strategy

Preliminary analysis of the data using Shapiro-Wilk tests and visual inspection of plots/graphs indicated the data was largely non-normally distributed throughout all sections of data collection, consequently where possible non-parametric statistics were used. Throughout all of the chapters descriptive statistics were used to evaluate the nature of the sample and the data were screened to assess the influence of demographic variables upon maternal and child variables measured. For all chapters two-tailed tests were employed and due to the large number of variables measured and the relatively small sample sizes, alpha levels of .01 have been adopted throughout to reduce the risk of Type 1 errors.

Within Chapters 3 and 5 correlation analyses have been used initially to ascertain the concurrent and prospective relationships between maternal reports of child eating behaviour with child temperament, maternal feeding practices and maternal psychopathology. Within Chapters 4 and 6 correlation analyses have been used initially to ascertain the concurrent and prospective relationships between independent observations of child eating behaviour with maternal feeding practices and interactional behaviour. Partial correlations were used in Chapters 5 & 6 due to the prospective design, so that initial levels of child eating behaviour could be controlled for. These analyses were also performed in Chapters 3, 5 & 6 to select variables for hierarchical regressions, a method which is common place in studies with a large number of independent variables (Stopa, Thorne, Waters & Preston, 2001).

In Chapter 3, hierarchical multiple regressions were performed to evaluate the contribution of maternal feeding practices to predict child eating behaviour after controlling for child temperament and maternal psychopathology. Hierarchical regressions are commonly used when investigating the contribution of hypothesised variables over and above the variance explained by other variables established as influential to the dependent variable. In Chapters 5 & 6 hierarchical multiple regressions were used in order to identify the longitudinal predictors of observed and maternally reported child food avoidance eating behaviour. The use of multiple regressions and partial correlations were deemed satisfactory as inspections of the residuals demonstrated normal distributions, linearity, independence, homoscedasticity (Field, 2005), and no multicollinearity (Bowerman & O’Connell, 1990; Myers, 1990).

In Chapter 4 correlation analyses were performed to assess whether maternal reports of child eating behavior would be validated by independent observations. In
Chapters 4 & 6 Mann-Whitney U tests were also used to explore differences between observed eating behaviour dependent on observed mealtime structure and organisation. Chapter 7 assesses the consistency and stability of both maternally reported and independently observed child eating behaviours and maternal feeding practices in children 3-4 years old. Using Cote and Bornstein’s (2003) paradigm, adjusted to account for non-normal data, correlation analyses were used to assess the stability of variables from 3 to 4 years of age and Wilcoxon signed rank tests were used to assess consistency between 3 and 4 years.
CHAPTER 3

Cross-sectional correlates of food avoidance eating behaviour during early childhood; the contribution of child temperament, maternal psychopathology and maternal feeding practices

As discussed within the literature review one of the primary aims of this thesis is to establish the relative importance of child temperament, maternal psychopathology and maternal feeding practices in the prediction of food avoidant eating behaviour in young children. Previous research has suggested the role of these factors in the development of child eating behaviour; however no research to date has assessed the unique contribution of maternal feeding practices over and above the contribution of the other child and parent factors. Such an investigation is essential as whilst intrinsic child characteristics such as temperament and parental psychopathology are largely stable and enduring, feeding practices represent an area that is potentially modifiable. In addition, the majority of studies within the feeding practices literature have focused on maternal control and have failed to explore the broad range of measurable strategies used by parents during mealtimes. Another limitation within the literature is that many studies fail to explore the predictors of eating behaviour early enough in childhood. Given that eating behaviours and food preferences develop very early in childhood and have been found to persist into later childhood and adulthood, it is imperative to conduct research in younger samples or children under 5 years of age, before eating behaviours have become embedded and engrained. Addressing the shortcomings of previous research, this Chapter will expand previous work by exploring the unique contribution of a broader range of maternal feeding practices than examined previously, in predicting food avoidance eating behaviour in a sample of children aged 2-4 years of age.

Cross-sectional correlates of food avoidance eating behaviour during early childhood; the contribution of child temperament, maternal psychopathology and maternal feeding practices

Abstract
The aim of this study was to examine the contribution of a broad range of maternal feeding practices in predicting parental reports of food avoidant eating behaviours in young children, after controlling for child temperament, and maternal symptoms of eating psychopathology, anxiety and depression, which have previously been associated with feeding problems. Two hundred and eighty four mothers of children aged between 2 and 4 years completed self-report measures of their child’s eating behaviour and temperament, maternal psychopathology and feeding practices. Maternal reports of food avoidant eating behaviours were associated with a more emotional child temperament and symptoms of maternal anxiety, depression and eating psychopathology. Maternal feeding practices, predominantly having fewer healthy foods available in the home and not involving their child in food planning and preparation and lower levels of restriction for weight reasons uniquely predicted child food avoidant eating behaviours after controlling for child emotionality and maternal psychopathology. Contrary to predictions, maternal pressure to eat did not significantly predict food avoidant eating behaviour. The significant contribution of maternal feeding practices, which are potentially modifiable behaviours, suggests that the feeding interactions of parents and their children should be targeted for intervention and the prevention of feeding difficulties during early childhood. Future research should continue to explore how a broader range of feeding practices might influence child eating behaviour, particular those that may be more adaptive, rather than focusing on control which was found to be less important with the present study.
Cross-sectional correlates of food avoidance eating behaviour during early childhood; the contribution of child temperament, maternal psychopathology and maternal feeding practices

Introduction

The dietary habits and eating behaviours of young children are a top priority amongst governing bodies, healthcare professionals, researchers and parents alike. Many children are not consuming healthy and varied diets, particularly the recommended five a day of fruits and vegetables (Yngve et al., 2005) and parents frequently report struggling with child feeding issues (Coulthard & Harris, 2003; Lindberg, Bohlin & Hagekull, 1991; Carruth, Zeigler, Gordon & Barr 2004; Jacobi, Atras, Bryson & Hammer, 2008; Mascola, Bryson & Agras, 2010). Whilst these problems can range from transient, relatively minor difficulties at mealtimes (e.g., disruptive mealtime behaviour, fussy tendencies) they can lead to life-threatening food refusal (Luiselli, 1989) and they represent an important health concern known to have adverse consequences for both children and their caregivers (Hagekull & Dahl, 1987; Marchi & Cohen, 1990; Harris & Booth, 1992). These include poor dietary variety (Golloway, Fiorito, Lee & Birch, 2005), essential nutrient deficiency (Falciglia, Couch, Gribble, Pabst & Farank, 2004) and low weight gain (Marchi & Cohen, 1990; Wright & Birks, 2000). In addition, both fussy eating and feeding problems can demonstrate consistency from early childhood into mid-adolescence and adulthood (McDermott, Mamun, Najman, Williiams, O’Callaghan & Bor, 2010; Mikkila, Rasanen, Raitakari, Pietinen & Viikari, 2004; Kotler, Cohen, Davies, Pine & Walsh, 2001; Marchi & Cohen, 1990) highlighting the need for a thorough understanding of the early risk factors and how to modify them. Whilst there is a growing body of literature investigating clinical feeding problems (e.g., Chatoor, 2002; Manikam & Perman, 2000; Nicholls, Chater & Lask, 2000), less is known about the predictors of the broad range of problems experienced in non-clinical community samples of children during early childhood. Further elucidation of this group would provide a better insight into how to prevent feeding problems and improve the diet and eating behaviour of young children.

Research has explored the contribution of both the caregiver and the child in the evolution of feeding difficulties and the development of eating behaviours (e.g., Coulthard & Harris 2003; Farrow & Bliaset, 2006). In recent years, the influence that
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parents can have on their children's dietary behaviour through food-related parenting practices has received particular attention (e.g., Kremers, Brug, de Vries & Engles, 2003). Research has tended to focus on controlling feeding practices; pressure to eat and restriction of food intake and examined their relationship with dietary intake and weight status. Coercive strategies, such as pressuring the child to eat are commonly reported in mother-child dyads with feeding problems (Sanders, Patel, Le Grice & Sheppard, 1993; Lindberg, Bohlin, Hagekull & Palmerus, 1996) and have been associated with lower child weight status in both cross-sectional and prospective studies of children during infancy and the pre-school years (Farrow & Blissett, 2008; Keller, Pietrobelli, Johnson & Faith, 2007; Powers, Chamberlin, van Schaick, Sherman, & Whitaker, 2006). Despite continued debate as to whether controlling feeding practices are a cause or a consequence of children’s emerging eating behaviours, overall the research evidence suggests they may negatively contribute to the development, reinforcement and exacerbation of child feeding problems and avoidant eating behaviours (Manikam & Perman, 2000; Davies & Pine, 2001; Harris & Booth, 1992).

Whilst the focus within the literature has been primarily on these two concepts of control; pressure to eat and restriction of food intake, there is evidence that there are several other measurable aspects of feeding that may be related to child intake such as using food as a reward and feeding for emotion regulation (e.g., Orrell-Valente, Hill, Brechwald, Dodge, Pettit & Bates, 2007; Musher-Eizenman & Holub, 2007, Kroller & Warschburge, 2008). Such feeding practices could be problematic; for example, rewarding a child for eating a disliked food can lead to a decline in the preference for that food, instead increasing the preference for the reward food (Newman & Taylor, 1992; Birch, Marlin & Rotter, 1984) which could exacerbate fussy eating behaviour and feeding problems by further decreasing children’s preference and intake of a healthy and varied diet. In addition, despite parental concerns about their children’s eating patterns being commonplace (Jacobi et al., 2003; McDermott et al., 2008) parents receive little positive advice on how to deal with challenging mealtimes and to actively decrease food refusal and fussy eating (American Dietetic Association, 2010; Van der Horst, 2012; Murashima, Hoerr, Hughes & Kaplowitz, 2011). However, research is beginning to move away from a focus on the negative implications of coercive feeding practices and has pointed to the importance of other behaviours. These include increasing children’s exposure to a variety of foods (e.g., Batsell, Brown, Ansfield & Paschall, 2002), making more healthy foods available in the home (Ventura & Birch,
2008) and child participation in food related activities such as food preparation (Heim, Bauer, Stang & Ireland, 2011; Marshall, Golley & Hendrie, 2011). It seems that behaviours such as encouraging balanced and varied food intake, providing a healthy food-related home environment and involving children in food preparation could play a crucial role in reducing picky eating and feeding problems (Musher-Eizenman & Holub, 2007). Further elucidation of this, particularly in young non-clinical samples, is essential, as it could provide a better understanding of how to promote more successful feeding interactions and prevent negative feeding outcomes.

Research exploring the impact of the care-giving environment on child feeding has also shown that maternal psychopathology, such as anxiety, depression and eating disorders are often associated with the presence and persistence of feeding problems in childhood (Ammaniti, Ambuzzi, Lucarelli, Cimino & D’Olimpio, 2004; Stein, Woolley & McPherson 1999; Blisset, Meyer & Haycraft, 2007). Whilst eating psychopathology has been most readily documented in relation to feeding problems (Ammaniti et al., 2004; Coulthard, Blissett & Harris, 2004; Blissett, Meyer & Haycraft, 2007) findings within this area are often equivocal and the evidence for associations, particularly between anxiety and depression with feeding problems, can be contradictory (e.g. Farrow & Blissett, 2005; Coulthard & Harris, 2003; Whelan & Cooper, 2000). Further research is needed, particularly exploring the relations between a range of affective symptoms in non-clinical groups of mothers with a broader range of eating behaviours displayed by their children.

In addition, whilst parents represent an essential influence on children’s eating behaviours, children also significantly contribute to the feeding interaction (Cabanac, 1987; Carnell & Wardle, 2008). Research has highlighted the influence that child temperament may have on eating behaviour and feeding problems (e.g., Farrow & Blissett, 2006; Pulkki-Raback, Elovaini, Kivimaki & Raitakari, 2005) and there is evidence that temperamental characteristics in combination with other risk factors may increase later vulnerability to eating problems (Martin, Wertheim, Prior, Smart, Sanson & Oberklaid, 2000). Two dimensions of temperament often documented to be associated with child feeding problems are difficult and demanding (Lindberg, Bohlin Hagekull & Thunstrom, 1994; Hagekull Bohlin & Rydell, 1997), and shy and unsociable temperaments (Pliner & Loewen,1997). More recently, research has begun to explore other dimensions of temperament such as emotionality, and Haycraft et al. (2011) found that children aged 3- 8 with more emotional temperaments were more
likely to demonstrate food avoidant eating behaviours. The evident contribution of both the caregiver and child in the evolution of feeding difficulties and the development of eating behaviours (e.g., Coulthard & Harris 2003; Farrow & Blisset, 2006), highlights a need for research studies to account for factors such as maternal psychopathology and child temperament when assessing the contribution of other risk factors, including parental feeding practices.

In summary, given the negative outcomes associated with fussy eating and feeding problems (e.g., Galloway et al., 2005; Wright & Birks, 2000), and evidence that they can persist across childhood and into adulthood (e.g., Kotler et al., 2001; Marchi & Cohen, 1990; McDermott et al., 2010) more research in non-clinical samples during early childhood is essential. Understanding the risk factors during this critical period, before the onset of more serious feeding problems, provides opportunities for prevention and intervention. Previous research has begun to highlight the importance of both child temperament (e.g., Farrow & Blissett, 2006) and parental psychopathology (e.g., Coulthard et al., 2003; Blissett et al., 2007; Farrow & Blisset, 2005) in predicting feeding problems, however despite growing evidence that parental feeding practices are highly influential (Fisher, Mitchell, Smiciklas-Wright & Birch, 2002; Spruijt-Metz, et al., 2006; Wardle, Carnell & Cooke, 2005) no research to date has investigated how a comprehensive and broad range of feeding practices may predict child food avoidance over and above the contribution of other child and parent factors. Such investigation is essential as whilst intrinsic child characteristics such as temperament and parental psychopathology are largely stable and enduring, feeding practices represent an area that is potentially modifiable.

Aims and Hypotheses

The first aim of the present study was to explore the associations between child food avoidance eating behaviours with a range of child and parent factors, specifically: child temperament, maternal anxiety, depression and eating-related psychopathology and maternal feeding practices. Secondly, this study aims to examine the contribution of a broader range of maternal feeding practices than have been previously explored, in predicting parental reports of food avoidant eating behaviours in young children, after controlling for the effects of child temperament and maternal psychopathology.

Extending previous research, it was hypothesised that more emotional and shy children, with mothers who reported higher symptoms of anxiety, depression and
eating-related psychopathology, would report higher levels of child food avoidant eating behaviours. It was also hypothesised that maternal use of controlling feeding practices and using food to modify or regulate behaviour, would be positively correlated with reports of food avoidance, whereas potentially more adaptive practices (such as having healthy foods available in the home, promoting well-balanced and varied food intake and child involvement in meal planning and preparation) would be negatively correlated with reports of food avoidance. Finally, it was hypothesised that parental feeding practices would uniquely predict reports of child food avoidant eating behaviours after controlling for the contribution of inherent child characteristics and maternal psychopathology.

Method

Participants

Two hundred and eighty four mothers (mean age 33.63 years; range = 20.33-47.42, SD=5.24) of children aged between 2 to 4 years (mean age 3.45 years; range = 2.00-4.83, SD = 1.00) completed a set of standardised questionnaires. There were 142 mothers of boys and 142 mothers of girls. Mothers were asked how many years of education they had after the age of 16 years, the mean was 4.19 years (range = 0.00-11.00 years, SD = 2.35) and 97% of the mothers in this sample described themselves as White British. However, analysis of occupational status revealed that participants were from a wide range of social backgrounds: ranging from 1 (managers and senior officials) to 9 (elementary occupations) using Standard Occupational Classification 2000 (Office for National Statistics, 2000) with a modal occupation level of 4 (administrative and secretarial occupations). Family income also ranged from < £15,000 to > £75,000 per annum with a modal annual family income of £30,000-£45,000.

Measures

Following ethical approval, mothers of children aged between 2-4 years old were recruited via various methods. Firstly, questionnaire packs were distributed to mothers via pre-schools and nurseries, or given directly to mothers by the researcher at sure-start centres and mother and toddler groups in Hertfordshire, Bedfordshire, Leicestershire and Nottinghamshire. In addition data were also collected using an online questionnaire hosted using SurveyMonkey.com (http://surveymonkey.com) with adverts placed on internet and social networking sites (e.g., Netmums) aimed at mothers
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with children aged 2-4. Importantly, exploration of the demographics and test variables, using Krusall-Wallis tests, revealed no significant differences between those participants recruited through the internet, through letters sent home, or through face-to-face recruitment at p<.01 level. For further details on recruitment please refer to Chapter 2 section 2.3.

Participants provided background information about their age, height, weight, education and occupation, as well as their child’s gender, date of birth, height and weight. Mothers then completed the following self-report measures (all described in further detail in Chapter 2 & Appendices I-N):

**The Child Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson & Rapoport, 2001).** Mothers completed the four subscales of the CEBQ; a parent-report questionnaire designed to assess their child’s eating styles; food fussiness, slowness in eating, satiety responsiveness and lack of enjoyment of food. Analysis of reliability within the present sample revealed good Cronbach’s $\alpha$ for the scales ranging from .68 to .89.

**Comprehensive Feeding Practices Questionnaire (CFPQ; Musheri-Eizenman & Holub, 2007).** Mothers completed 9 subscales of the CFPQ; pressure to eat, restriction for health, restriction for weight control, monitoring, emotion regulation, food as a reward, balance and variety, environment and involvement. Analysis of reliability within the present sample revealed good Cronbach’s $\alpha$ for the scales ranging from .62 to .81.

**The Child Temperament Questionnaire (EAS; Buss & Plomin 1984).** Mothers completed the parent rated EAS Temperament Survey for Children (Buss & Plomin, 1984) to measure four dimensions of child temperament; emotionality, shyness, activity, and sociability. Analysis of reliability within the present sample revealed good Cronbach's $\alpha$ for the scales ranging from .59 to .78.

**The Eating Disorder Examination Questionnaire (EDE-Q 22; Fairburn & Beglin, 1994).** Mothers completed the EDE-Q to measure four dimensions of eating disorder attitudes; dietary restraint, eating concerns, shape concerns, and weight
concerns. Analysis of reliability within the present sample revealed good Cronbach’s $\alpha$ for the scales ranging from .65 to .81.

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). Mothers completed the HADS, a brief self-report measure containing two 7 item subscales assessing levels of anxiety and depression. Analysis of reliability within the present sample revealed good Cronbach’s $\alpha$ for the scales ranging from .72 to .76.

Data Analysis

Preliminary analysis of the data using Shapiro-Wilk tests and visual inspection of plots/graphs indicated the data was largely non-normally distributed, consequently where possible non-parametric statistics were used. Descriptive statistics were first used to evaluate the nature of the sample. Previous research has found that variables such as child BMI, age, child gender, birth order, experience of breast feeding and mothers’ age, socioeconomic status, education and BMI are related to child feeding problems, so the data was analysed to establish whether these demographic variables were related to child food avoidant eating behaviours using Spearman’s rho correlations and Mann-Whitney tests. There were no significant relationships or differences on any of these variables with child food avoidance (all $p<.01$), therefore these demographic variables were not controlled for in any further analyses. In addition despite previous evidence of the association between food avoidance and lower BMI (e.g., Viana, Sinde & Saxton, 2008; Webber, Hill, Saxton, Van Jaarsveld & Wardle, 2009) there were also no significant relations between child BMI and food avoidance eating behaviours, therefore this was not analysed further.

Next, two-tailed Spearman’s rho correlations were used to explore the relationships between child eating behavior with child temperament, parental feeding practices, and maternal psychopathology; maternal anxiety, depression and eating-related psychopathology. Finally, hierarchical multiple regressions were performed to evaluate the contribution of maternal feeding practices to predict child eating behaviour after controlling for child temperament and maternal psychopathology. Only the significant correlates identified in the correlation matrices were entered into the regression analyses. Due to the number of correlations being performed alpha levels of .01 were adopted to reduce the risk of type I errors. The use of multiple regressions was deemed satisfactory for this non-parametric sample as inspections of the residuals
demonstrated normal distributions and homoscedasticity (Field, 2005) and no multicollinearity (Bowerman & O'Connell, 1990; Myers, 1990).

**Results**

*Descriptive statistics*

Two hundred and seventy four mothers self-reported their height and weight (10 mothers did not disclose this information) and maternal mean BMI was 25.64 (SD=5.20). Thirty-six percent of mothers were overweight (BMI > 25) or obese (BMI > 30, World Health Organization, 1998), suggesting that this sample is representative of the UK average BMI for women (Health Survey for England, 2010). Two hundred and forty four mothers provided details of their child’s height and weight (missing data for 30 children) and BMI Z scores for the children were calculated using the Child Growth Foundation's (1996) growth references which adjust for age and gender. The mean BMI Z-score was .44 (range = -3.09 – 3.31, SD = 2.03), close to 0 reflecting the average standardised BMI. Using Cole et al’s standard definitions for overweight and obesity corrected for age and gender (Cole, Bellizzi, Flegal & Dietz, 2000), 77.8% of the sample who provided child BMI data had children who were of a healthy weight with 15.2% at risk of overweight or obesity, suggesting this sample is in line with UK norms (Health Survey for England, 2010).

Descriptive statistics for the questionnaires completed by mothers are shown in Table 3.1. For the child variables, mean scores for eating behaviour and temperament are similar to other published data in similar samples in terms of age and demographics (e.g., Mathieus & Tambs, 1999; Wardle et al., 2001). For the maternal variables, mean scores for feeding practices and eating psychopathology are similar to other published data in similar samples (e.g., Mond, Hay, Rodgers, Owen & Beaumont, 2004; Musher-Eizenman & Holub, 2007). Anxiety and depression scores are similar to normative data for non-clinical samples terms of age and demographics (Crawford, Henry, Crombie & Taylor, 2001), with the mean anxiety score falling just above average, suggesting on average a mild level of maternal anxiety (Snaith & Zigmond, 1994).
## Table 3.1: Descriptive statistics for child and maternal variables

<table>
<thead>
<tr>
<th></th>
<th>Mean (N = 285)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child Eating Behaviour</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CEBQ) Food Fussiness</td>
<td>2.77</td>
<td>.90</td>
</tr>
<tr>
<td>Slowness in Eating</td>
<td>3.14</td>
<td>.77</td>
</tr>
<tr>
<td>Satiety Responsiveness</td>
<td>3.14</td>
<td>.65</td>
</tr>
<tr>
<td>Enjoyment of food</td>
<td>3.76</td>
<td>.77</td>
</tr>
<tr>
<td><strong>Child Temperament</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(EAS) Emotionality</td>
<td>2.26</td>
<td>.97</td>
</tr>
<tr>
<td>Activity</td>
<td>3.12</td>
<td>.49</td>
</tr>
<tr>
<td>Shyness</td>
<td>3.13</td>
<td>.44</td>
</tr>
<tr>
<td>Sociability</td>
<td>2.93</td>
<td>.53</td>
</tr>
<tr>
<td><strong>Maternal Feeding Practices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CFPQ) Pressure</td>
<td>3.40</td>
<td>.68</td>
</tr>
<tr>
<td>Restriction for Weight</td>
<td>2.44</td>
<td>.65</td>
</tr>
<tr>
<td>Restriction for Health</td>
<td>3.03</td>
<td>.83</td>
</tr>
<tr>
<td>Monitoring</td>
<td>4.36</td>
<td>.70</td>
</tr>
<tr>
<td>Emotional Regulation</td>
<td>1.90</td>
<td>.63</td>
</tr>
<tr>
<td>Food Reward</td>
<td>2.50</td>
<td>.98</td>
</tr>
<tr>
<td>Balance &amp; Variety</td>
<td>4.06</td>
<td>.51</td>
</tr>
<tr>
<td>Healthy Environment</td>
<td>3.95</td>
<td>.73</td>
</tr>
<tr>
<td>Involvement</td>
<td>3.36</td>
<td>.96</td>
</tr>
<tr>
<td><strong>Psychopathology (HADS)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>7.19</td>
<td>3.91</td>
</tr>
<tr>
<td>HADS Depression</td>
<td>5.62</td>
<td>3.53</td>
</tr>
<tr>
<td><strong>Eating Psychopathology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(EDEQ) Restraint</td>
<td>1.35</td>
<td>1.43</td>
</tr>
<tr>
<td>Eating Concern</td>
<td>.90</td>
<td>1.18</td>
</tr>
<tr>
<td>Shape Concern</td>
<td>2.50</td>
<td>1.70</td>
</tr>
<tr>
<td>Weight Concern</td>
<td>1.96</td>
<td>1.53</td>
</tr>
</tbody>
</table>

CEBQ = Child Eating Behaviour Questionnaire; EAS = Child Temperament Questionnaire; CFPQ = Comprehensive Feeding Practices Questionnaire; HADS = Hospital Anxiety and Depression Scale; EDEQ = Eating Disorder Examination Questionnaire.
Correlation Analyses; Relationship between maternal reports of child temperament, maternal psychopathology and maternal feeding practices with child food avoidant eating behaviours.

Child temperament and child food avoidant eating behaviour

Two-tailed Spearman’s rho correlations were used to assess which aspects of child temperament were significantly correlated with child food avoidant eating behaviour. As Table 3.2 indicates, mothers’ who reported that their child had an emotional temperament reported that they were fussier eaters, who were slower to eat, more satiety responsive, and enjoyed food less. Shyness, sociability and activity were not significantly correlated with any food avoidant eating behaviours.

Table 3.2: Two-tailed correlations between child temperament with child food avoidant eating behaviours

<table>
<thead>
<tr>
<th>Temperament</th>
<th>Child Eating</th>
<th>Food Fussiness</th>
<th>Slowness in Eating</th>
<th>Satiety responsiveness</th>
<th>Enjoyment of food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotionality</td>
<td></td>
<td>.35**</td>
<td>.18**</td>
<td>.17*</td>
<td>-.23**</td>
</tr>
<tr>
<td>Activity</td>
<td></td>
<td>.06</td>
<td>-.04</td>
<td>.05</td>
<td>.03</td>
</tr>
<tr>
<td>Shyness</td>
<td></td>
<td>.02</td>
<td>-.02</td>
<td>.11</td>
<td>.08</td>
</tr>
<tr>
<td>Sociability</td>
<td></td>
<td>.06</td>
<td>-.04</td>
<td>.05</td>
<td>.06</td>
</tr>
</tbody>
</table>

*p<.01, **p<.001

Maternal Psychopathology and child food avoidant eating behaviour

Two-tailed Spearman’s rho correlations were used to assess which aspects of maternal psychopathology were correlated with child food avoidance. As Table 3.3 indicates, mothers’ who reported more child food fussiness reported higher symptoms of anxiety. Mothers’ who reported more child slowness in eating reported higher symptoms of depression and concern about their body shape. Mothers’ who reported more child satiety responsiveness reported higher levels of concern about their eating, shape and weight. Finally, mothers’ who reported more child enjoyment of food reported lower symptoms of depression.
Table 3.3: Two-tailed correlations between maternal psychopathology and with child food avoidance eating behaviours

<table>
<thead>
<tr>
<th>Psychopathology</th>
<th>Anxiety</th>
<th>Depression</th>
<th>Eating Restraint</th>
<th>Eating Concern</th>
<th>Shape Concern</th>
<th>Weight Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.20**</td>
<td>.13</td>
<td>.01</td>
<td>.08</td>
<td>.08</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Fussiness</td>
<td>.12</td>
<td>.18*</td>
<td>.10</td>
<td>.17*</td>
<td>.23**</td>
<td>.20**</td>
</tr>
<tr>
<td>Slowness in Eating</td>
<td>.12</td>
<td></td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satiety Responsiveness</td>
<td>.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enjoyment of Food</td>
<td>-.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.01, **p<.001

Maternal feeding practices and child food avoidant eating behaviour

Two-tailed Spearman’s rho correlations were used to assess which maternal feeding practices were significantly correlated with child food avoidance. As Table 3.4 indicates, mothers’ who reported that their child was a fussier eater reported higher levels of restriction of food intake for health reasons but reported having fewer healthy foods available in the home and less child involvement in meal planning and preparation. Mothers who reported their child to be a slower eater also reported having fewer healthy foods available in the home. Mothers who reported that their child showed higher levels of satiety responsiveness reported using lower restriction of food intake for weight reasons and less monitoring of the child’s intake of less healthy foods. Mothers who reported that their child enjoyed food more reported greater restriction of food for weight reasons, having a greater amount of healthy foods available in the home and involving their child more in meal planning and preparation.
Table 3.4: Two-tailed correlations between maternal feeding practices with child food avoidant eating behaviours

<table>
<thead>
<tr>
<th></th>
<th>Child Eating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food Fussiness</td>
</tr>
<tr>
<td>Parental Pressure</td>
<td>-.02</td>
</tr>
<tr>
<td>Feeding Restriction for Weight</td>
<td>-.14</td>
</tr>
<tr>
<td>Parental Pressure</td>
<td>.16*</td>
</tr>
<tr>
<td>Monitoring</td>
<td>-.13</td>
</tr>
<tr>
<td>Emotional Regulation</td>
<td>.09</td>
</tr>
<tr>
<td>Food Reward</td>
<td>.05</td>
</tr>
<tr>
<td>Balance &amp; Variety</td>
<td>.01</td>
</tr>
<tr>
<td>Healthy Environment</td>
<td>-.25**</td>
</tr>
<tr>
<td>Involvement</td>
<td>-.20**</td>
</tr>
</tbody>
</table>

*p<.01, **p<.001

Predictors of child food avoidant eating behaviours

Four hierarchical multiple regressions were performed to evaluate the contribution of parental feeding practices to predict child eating behaviour after controlling for child temperament and maternal psychopathology where significantly related to the dependent variable of interest. Child temperament was entered in step 1, maternal psychopathology (anxiety, depression, eating psychopathology) were entered in step 2 and maternal feeding practices were entered in step 3. Only significant correlates were used in the analyses. Detailed results of the predictors for each of the food avoidance outcome variables are presented in Tables 3.5-3.8.

Predictors of maternal reports of child food fussiness. Table 3.5 shows that in the final regression model the child and maternal variables collectively predicted child food fussiness, accounting for 19% of the variance (Adjusted $r^2$). In step 1, child emotionality significantly predicted maternal reports of child slowness in eating and in step 2, whilst maternal anxiety significantly added to the regression (Adjusted $R^2 = .12$, $F(2,264)= 19.41$; $R^2$ change = .01, $p < .001$), it only explained an additional 1% of the variance. In the final regression model, significant individual predictors were the child having a more emotional temperament and mothers’ having fewer healthy foods available in the home and less child involvement in meal planning and preparation.
Maternal feeding practices alone added a significant increase of 7% of additional variance ($F(5,261) = 8.78; \ R^2$ change = .07, $p<.001$) after controlling for child temperament and maternal psychopathology.

Table 3.5: Significant predictors of child food fussiness using a hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>32.75(1,265)**</td>
<td>.11</td>
<td>.11</td>
<td>.33</td>
<td>5.72**</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>19.41(2,264)**</td>
<td>.13</td>
<td>.12</td>
<td>.30</td>
<td>5.03**</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
<td></td>
<td></td>
<td>.14</td>
<td>2.35*</td>
</tr>
<tr>
<td>3.</td>
<td>8.78(5,261)**</td>
<td>.21</td>
<td>.19</td>
<td>.29</td>
<td>5.12**</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
<td></td>
<td></td>
<td>.10</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td>Restriction Health</td>
<td></td>
<td></td>
<td>.04</td>
<td>.66</td>
</tr>
<tr>
<td></td>
<td>Healthy Environment</td>
<td></td>
<td></td>
<td>-.21</td>
<td>-3.65**</td>
</tr>
<tr>
<td></td>
<td>Involvement</td>
<td></td>
<td></td>
<td>-.14</td>
<td>-2.52*</td>
</tr>
</tbody>
</table>

*p<.01, **p<.001

Predictors of maternal reports of child slowness in eating. Table 3.6 shows that in the final regression model the child and maternal variables collectively predicted child slowness in eating, accounting for 9% of the variance (Adjusted $R^2$). In step 1, child emotionality significantly predicted maternal reports of child slowness in eating and in step 2, whilst maternal depression and shape concern significantly added to the regression (Adjusted $R^2 = .06, F(3,268)= 6.62; \ R^2$ change = .02, $p <.001$), they only explained an additional 2% of the variance. In the final regression model significant individual predictors were the child having a more emotional temperament and mothers’ having fewer healthy foods available in the home.
Table 3.6: Significant predictors of child slowness in eating using a hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>12.34(1,270)**</td>
<td>.04</td>
<td>.04</td>
<td>.21</td>
<td>3.51**</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>6.62(3, 268)**</td>
<td>.07</td>
<td>.06</td>
<td>.17</td>
<td>2.78*</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td></td>
<td></td>
<td>.10</td>
<td>1.57</td>
</tr>
<tr>
<td></td>
<td>Shape Concern</td>
<td></td>
<td></td>
<td>.11</td>
<td>1.70</td>
</tr>
<tr>
<td>3.</td>
<td>7.13(4,267)**</td>
<td>.10</td>
<td>.09</td>
<td>.16</td>
<td>2.68*</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td></td>
<td></td>
<td>.02</td>
<td>.26</td>
</tr>
<tr>
<td></td>
<td>Shape Concern</td>
<td></td>
<td></td>
<td>.05</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td>Healthy Environment</td>
<td></td>
<td></td>
<td>-.17</td>
<td>-2.86*</td>
</tr>
</tbody>
</table>

*p <.01, ** p<.001

Predictors of maternal reports of child satiety responsiveness. Table 3.7 shows that in the final regression model the child and maternal variables collectively predicted child satiety responsiveness accounting for 13% of the variance (Adjusted r²). In step 1, emotionality did not significantly predict maternal reports of child satiety responsiveness; however in step 2, maternal eating, weight and shape concern significantly added to the regression (Adjusted R² = .06, F(4,272)= 5.54; R² change = .04, p <.001), explaining an additional 4% of the variance. In the final regression model, significant individual predictors were mothers’ reporting higher levels of shape concern themselves but using lower restriction of their child’s food intake with the purpose of decreasing or maintaining the child’s weight. Maternal feeding practices alone added a significant increase of 7% of additional variance (F(6,270) = 7.88; R² change = .09, p<.001) after controlling for child temperament and maternal psychopathology.
Table 3.7: Significant predictors of child satiety responsiveness using a hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>5.14(1,275)</td>
<td>.02</td>
<td>.02</td>
<td>.14</td>
<td>2.27</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>5.54(4,272)**</td>
<td>.08</td>
<td>.06</td>
<td>.09</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eating Concern</td>
<td>-.03</td>
<td>-.34</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Shape Concern</td>
<td>.43</td>
<td>2.84*</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Weight Concern</td>
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<td>-1.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>7.88(6,270)**</td>
<td>.15</td>
<td>.13</td>
<td>.09</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eating Concern</td>
<td>-.01</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shape Concern</td>
<td>.44</td>
<td>2.95*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight Concern</td>
<td>-.17</td>
<td>-1.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Restriction Weight</td>
<td>-.27</td>
<td>-4.54**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td>-.04</td>
<td>-.62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.01, **p<.001

Predictors of maternal reports of child enjoyment of food. Table 3.8 shows that in the final regression model the child and maternal variables collectively predicted child enjoyment of food accounting for 23% of the variance (Adjusted r²). In step 1, a more emotional child temperament significantly predicted maternal reports of low child enjoyment of food and in step 2, maternal depression symptoms significantly added to the regression. In the final regression model, significant individual predictors of a lack of food enjoyment were a more emotional child temperament, higher symptoms of maternal depression, having fewer healthy foods available in the home and not involving the child more in meal planning and preparation, as well as lower levels of restriction for weight reasons. Maternal feeding practices alone added a significant increase of 14% of additional variance (F(5,265)=16.83; R² change = .14, p<.001) after controlling for child temperament and maternal psychopathology.
Table 3.8: Significant predictors of child enjoyment of food using a hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>19.93(1,269)**</td>
<td>.07</td>
<td>.07</td>
<td>-.26</td>
<td>-4.47**</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>14.61(2,268)**</td>
<td>.10</td>
<td>.09</td>
<td>-.21</td>
<td>-3.76**</td>
</tr>
<tr>
<td></td>
<td>Child Emotionality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td></td>
<td></td>
<td>-.18</td>
<td>-2.95*</td>
</tr>
<tr>
<td>3.</td>
<td>16.83(5,265)**</td>
<td>.24</td>
<td>.23</td>
<td>-.21</td>
<td>-3.82**</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td></td>
<td></td>
<td>-.14</td>
<td>-2.38*</td>
</tr>
<tr>
<td></td>
<td>Restriction Weight</td>
<td></td>
<td></td>
<td>.19</td>
<td>3.53**</td>
</tr>
<tr>
<td></td>
<td>Healthy Environment</td>
<td></td>
<td></td>
<td>.26</td>
<td>4.76**</td>
</tr>
<tr>
<td></td>
<td>Involvement</td>
<td></td>
<td></td>
<td>.14</td>
<td>2.56**</td>
</tr>
</tbody>
</table>

*p < .01, ** p < .001

Discussion

The aim of this study was to examine the contribution of a broad range of maternal feeding practices in predicting parental reports of food avoidance eating behaviours in young children, after controlling for child temperament, and maternal psychopathology. Overall the results suggest that having a child with an emotional temperament and mothers having fewer healthy foods available in the home and not involving their child in food planning and preparation predicted food avoidant eating behaviour. However contrary to predictions, maternal pressure to eat did not significantly predict food avoidant eating behaviours and aspects of maternal psychopathology were only found to predict satiety responsiveness and food enjoyment. In the final regression models mothers having fewer healthy foods available in the home and not involving their child in food planning and preparation and lower levels of restriction for weight reasons uniquely predicted child food avoidant eating behaviours after controlling for child emotionality and maternal psychopathology.

Contrary to previous research linking parental pressure to eat with feeding problems and negative mealtime experiences (e.g., Harris & Booth, 1992; Sanders et al., 1993), maternal reports of pressuring their child to consume more food at mealtimes
was not associated with food avoidant eating behaviours. This is somewhat surprising, as despite uncertainty over directionality, evidence has suggested a link between pressuring feeding strategies and feeding problems (e.g., Farrow & Blissett, 2008; Farrow et al., 2009; Galloway et al., 2005). However, results from this study suggest that, in non-clinical community samples, pressuring strategies may in fact be less important in the development of avoidant eating behaviours, and that instead risk factors or preventative strategies may lie more within the food related home environment.

Whilst pressure to eat did not predict food avoidant eating behaviours, mothers’ restriction of food intake for health reasons was associated with higher food fussiness and mothers’ restriction of food intake food intake for weight reasons was associated with and uniquely predicted lower satiety responsiveness and greater food enjoyment. Fussy eating has been defined as consuming an inadequate variety of foods (e.g., Dovey, Staples, Gibson & Halford, 2008; Galloway, Lee & Birch, 2003; Smith, Roux, Naidoo & Venter, 2005), therefore it is perhaps not surprising that parents of fussy eaters may restrict the child’s preferred foods in an attempt to promote more varied and healthy dietary intake. However, research suggests this strategy often has the opposite effect with high levels of control being associated with a greater preference for restricted food (Fisher & Birch, 1999) and lower fruit and vegetable intake over time (Galloway et al., 2005), suggesting that such strategies could in fact further exacerbate fussy and avoidant eating behaviours in the child. In addition, previous research has found parental restriction to be associated with child overweight and obesogenic eating behaviours, such as eating in the absence of hunger (e.g., Birch & Fisher, 2000; Fisher & Birch, 1996; Faith, Berkowitz, Stallings, Kerns, Storey & Stunkard, 2004; Fisher, Birch, Smiciklas-Wright, & Picciano, 2000; Fisher et al., 2000). Similarly this study found restriction for weight reasons to be associated with lower satiety responsiveness. However, as the cross-sectional nature of this study prevents inference of cause and effect, it is important to consider that parental restriction of food intake may also be in response to the child’s eating behaviour. In the present study restriction for weight reasons was also associated with greater food enjoyment, therefore it may be that mothers of children who really enjoy food and appear to eat beyond satiety and consume large amounts of food may feel the need to restrict their children’s food intake to maintain a healthy weight status.
An important aim of the current study was to explore a broader range of feeding practices than typically explored, and their associations with food avoidant eating behaviours. Supporting the hypotheses, having healthy foods available in the home and involving the child in cooking planning and preparation were associated with less food fussiness and slowness in eating, and with greater food enjoyment. Previous research on exposure has found that parents who fail to expose their children to a wide variety of foods and textures, or do not allow adequate exposures, are likely to encounter rejection of food (Birch, 1999; Carruth et al., 2004). In contrast, high exposure to foods may be an effective feeding practice which fosters increased liking and higher consumption of exposed foods (Wardle et al., 2003). Similarly, this research has found that parents who provide healthy and varied foods within the home reported having children that were less fussy and less slow to eat their food during meals and had greater food enjoyment.

In addition this study highlights the importance of involving children in food planning and preparation, which predicted lower food fussiness and greater food enjoyment. This supports and extends recent research using older children, suggesting the importance of co-participation in food-related activities in the development of healthy and adaptive eating behaviours (Heim et al., 2011; Marshall et al., 2011; van der Horst, 2012). For instance, a garden-based nutrition education programme in children aged 8-11 years, following a ‘seed to table’ approach involving fruit and vegetable food preparation and taste tests over a 12 week period, reported significant increases in fruit and vegetable intake and preference post invention (Heim et al., 2011). Similarly Van der Horst (2012) found a link between cooking enjoyment and both picky eating and eating enjoyment in 6-12 year olds and suggests that ‘the effects of food exposure may be evaluated based on the context in which they are experienced’ (pp. 6). It is likely that hands on activities like cooking and food preparation give children positive feelings such as ownership and pride (Heim et al, 2011) and lead to a positive evaluation of the food experience increasing liking of foods and willingness to them (Van der Horst, 2012). However, it is important to consider due to the socioeconomic status of the mothers used within this sample (eg., well educated, moderate/high income) that these findings may not reflect the general population. Mothers within the present sample reported relatively high use of involvement in food planning and food preparation, yet an important follow up for this study would be to explore how much this practice is used and its association with child eating behaviour, amongst other socio-demographic groups.
This study provides preliminary evidence of how more adaptive parental feeding practices could be important in preventing feeding problems and food fussiness and promoting more successful feeding interactions and outcomes. Future studies should continue to explore the effect of these feeding practices and the home environment and how they may interact to influence the development of eating behaviour during early childhood. Mealtimes can be very difficult for many families; future research must strive to offer parents more comprehensive advice on dealing the normal developmental stages of neophobia, food fussiness and food refusal to prevent the onset of future, more serious feeding difficulties and to promote healthy and balanced food intake amongst children.

Contrary to the hypotheses, the use of food for behaviour regulation, which incorporates the use food to regulate child emotional states and to reward behaviour, was not associated with food avoidant eating behaviour. It may be that use of food for emotion regulation is more important in relation to over-consumption rather than fussy and avoidant eating; with recent research finding that parental use of food for emotion regulation to be implicated in emotional overeating (Blissett, Haycraft & Farrow, 2010). Amongst the literature the effectiveness of rewards remains uncertain, with previous studies finding both positive (e.g., Cooke, Chambers, Añez, Croker, Boniface, Yeomans & Wardle, 2011; Coe et al., 1997; Kern & Marder, 1996; Lowe, Horne, Tapper, Bowdery & Egerton, 2004) and negative (Newman & Taylor, 1992; Birch, Marlin & Rotter, 1984; Vereecken, Keukelier & Maes, 2004; Kroller & Warschburger, 2008) outcomes in relation to child eating behaviour. These conflicting, equivocal findings may help to explain the lack of associations between rewards and food avoidance within the present study. Prospective research, beginning in early childhood is needed to explore rewards in more depth.

Supporting previous research (Farrow & Blisset, 2006; Hagekull et al., 1997; Haycraft et al., 2011; Lindberg, Bohlin, Hagekull & Palmerus, 1996) this study also demonstrated the contribution of inherent child characteristics such temperament in predicting reports of child food avoidant eating behaviours. Having a child with an emotional temperament was found to be associated with all 4 food avoidant eating behaviours and predicted food fussiness, slowness in eating and low food enjoyment. This supports and extends evidence from Haycraft et al., (2011) that an emotional temperament in particular may be an important child characteristic implicated in food avoidant eating in early childhood. As temperament refers to individual differences in a
person’s emotional reactivity and regulation (Goldsmith, Buss, Plomin, Rothbart, Thomas & Chess, 1987) it is possible that a more emotional child may show heightened emotional reactivity within feeding interactions and thus be more difficult within feeding interactions and more demanding in their food preferences. Given that early temperament characteristics have been found to be a risk factor for vulnerability to later eating problems (e.g., Martin, Wertheim, Prior, Smart, Sanson & Oberklaid, 2000) identifying associations between temperamental traits and feeding disturbances at an early age marks a potentially useful tool for parents and healthcare professionals. Future research should explore an interactive model between child eating behaviour with child temperament and parental feeding practices and behaviours, to provide further understanding of the complex bi-directional relationship between maternal and child characteristics in the development of children’s eating behaviours.

Finally the role of maternal psychopathology was explored and whilst maternal anxiety symptoms were associated with greater food fussiness, they did not uniquely predict food fussiness once maternal feeding practices were added into the regression model. Similarly maternal depression symptoms were associated with greater child slowness in eating and lower food enjoyment but only predicted lower food enjoyment. This suggests that whilst maternal anxiety and depression symptoms may be implicated, they are less key than maternal feeding practices. Maternal eating-related psychopathology was associated with child satiety responsiveness and slowness in eating, however only mothers’ worries about their shape and others’ perceptions of it predicted child satiety responsiveness after the contribution of parental feeding practices were accounted for. Similarly this suggests that whilst maternal eating behaviour may be important, child emotionality and maternal feeding practices may explain a greater amount of the variance in child food avoidance. This is in line with previous research has suggested that the contribution of maternal eating behaviour and psychopathology can be explained through their influence on maternal feeding practices, particularly through the association with elevated levels of control over the child’s eating (Francis & Birch, 2005; Blissett, Meyer & Haycraft, 2006).

There are a number of limitations to this study. The sample consisted of predominantly White, well educated, healthy weight mothers’ which will affect the generalisability of findings to other socio-economic groups and may not reflect relationships in other populations. The study also relied on maternal report of all constructs, however, several studies have demonstrated that maternal reports of feeding
difficulties are reliable and accurately reflect independent observations (Cooper et al., 2004; Farrow & Blissett, 2005), and psychometric instruments allow for the measurement of a wider range of feeding practices than might be observed in single mealtimes. The cross-sectional nature of the study also prevents conclusions about cause and effect, and future work would benefit from longitudinal designs incorporating observations of feeding interactions to validate parental reports. In addition, whilst this study offers an insight into the predictors of a number of avoidant eating behaviours experienced within family mealtimes, rather than focusing purely on food fussiness, future research could benefit from looking at how maternal reports of food avoidance eating behaviours and food fussiness relate to actual food intake, possibly through the use of food diaries or food consumption in an experimental setting.

In summary, the findings of this study suggest that whilst an emotional child temperament and maternal psychopathology are associated with food avoidance eating behaviours in young children, maternal feeding practices, predominantly having more healthy foods available in the home and involving their child in food planning and preparation, contribute over and above these other variables. The evident role of an emotional child temperament, which emerged as a predictor across all four of the behaviours measured, highlights an inherent child characteristic that may represent a risk factor for feeding difficulties and measures of child temperament should be incorporated into future research within this area. However, the additional unique variance explained by maternal feeding practices, which represent an area that is potentially modifiable, highlights how the mealtime interactions of parents and their children could be targeted for intervention and the prevention of feeding difficulties during early childhood. In particular, this study highlights the need for future research to focus on the benefits of adaptive feeding practices, and changes parents can make with the home environment, rather than focusing on the negative outcomes associated with coercive strategies. Further investigation of non-clinical groups during early childhood may not only provide insight into the factors implicated in the aetiology and maintenance of feeding problems, but may also help to prevent the development of these problems that can persist through childhood into mid-adolescence (McDermott et al., 2010; Kotler et al., 2001; Marchi & Cohen, 1990).
CHAPTER 4

Cross-sectional correlates of food avoidance during early childhood; observed associations with maternal feeding practices and mealtime behaviours

The previous Chapter demonstrated the child temperamental, maternal psychopathological and maternal feeding practice correlates of child food avoidant eating behaviours in a sample of children aged 2-4. Specifically it reported that food avoidance was associated with a more emotional child temperament, symptoms of maternal anxiety, depression and eating psychopathology, lower maternal restriction of food intake, mothers providing a less healthy food related home environment and not involving children in food planning and preparation. The previous Chapter also established the unique contribution of a broader range of feeding practices than examined previously, in predicting food avoidance, over and above the contribution of child temperament and maternal psychopathology.

Given the unique contribution of these potentially modifiable maternal feeding practices, this Chapter utilises observational measures to explore parent-child interactions at mealtimes in more depth. This Chapter aims to extend the previous one by exploring the relationship between independent observations of child food avoidance with maternal interactional behaviour during mealtimes, mealtime structure, and observed maternal feeding practices. In addition to observing maternal control during feeding; maternal sensitivity, conflict and expressed emotion will be evaluated. Due to discrepancies within the literature regarding the accuracy of maternal-reports, this Chapter also evaluates the validity of maternal descriptions of child eating and feeding practices with independent observations of these constructs.

An edited version of this chapter will be submitted for publication as: Powell, F. C. Farrow, C., & Meyer, C. (2012). The impact of mealtime structure, mealtime behaviours and feeding practices on food avoidance during early childhood: an observational study.
Cross-sectional correlates of food avoidance during early childhood; observed associations with maternal feeding practices and mealtime behaviours

Abstract
The aims of this study were to establish whether maternal reports of child eating behaviour and feeding practices are validated by independent observations of these constructs, and also to explore the relations between observations of children’s eating behaviour with mealtime structure and observed maternal feeding practices and behaviours. Seventy-five mothers of children aged between 2 and 4 years completed self-report measures of their own feeding practices, of their child’s eating behaviour, and were observed during a typical mealtime at home. Maternal reports of their child’s eating behaviours were validated by independent observations, however maternally reported feeding practices were not validated by observations of these behaviours. Mealtime structure emerged as an important factor which significantly distinguished dyads with higher compared to lower levels of food avoidance. In addition, independent observations of mothers verbally pressuring and physically prompting their child to consume more food and expressing negative emotion and comments during the mealtime were associated with greater food avoidance. Whereas observations of low interactional conflict, higher maternal sensitivity, positive expressed emotion and positive vocalisations were associated with observations of less child food avoidance. The findings of this study highlight maternal mealtime behaviours that may be associated with lower food avoidance in young children. Further longitudinal research is essential to ascertain the temporal precedence of these variables, so that the prospective risk and protective factors for food avoidance can be better understood.
Cross-sectional correlates of food avoidance during early childhood; observed associations with maternal feeding practices and mealtime behaviours

Introduction

As highlighted within the general literature review, many studies investigating child eating behaviour are limited by their reliance purely on maternal self-report measures (e.g. Galloway, Lee & Birch, 2005; Viana, Sinde, & Saxton, 2008; Webber, Hill, Saxton, Van Jaarsveld & Wardle, 2009). Such methods, despite being useful, may be subject to bias. For instance, whilst some studies suggest that mothers are reasonably accurate in their reports of mealtime interactions (Cooper, Whelan, Woolgar, Morrell & Murray, 2004; Farrow & Blissett, 2005) others have found that maternal reports are not validated by independent observations (Haycraft & Blissett, 2008) or that the accuracy of maternal report depends on child weight (Farrow, Blissett & Haycraft, 2011). Observational measures allow researchers to explore subtle behaviours that caregivers may not be aware of, are unwilling to report, or that are not assessed by questionnaires. For instance whilst self-report measures can offer an insight into the relations between parental feeding practices and child eating behaviour, independent observations of mealtimes allow a greater insight into social interactions at mealtimes and allow for an exploration of a broader range of variables that are involved in the interactions between mother-child dyads. These include, the structure and organisation of the family mealtime (who is present, whether parents/siblings eat with the child, or eat the same food), independent ratings of feeding practices (e.g., pressure, physical prompts, conditions and rewards to eat) and the interactional dynamic at mealtimes, such as the warmth, sensitivity, interpersonal involvement and positivity displayed by mothers. This Chapter utilises observations of maternal-child interactions during feeding to both validate maternal-reports of feeding practices and child eating behaviour, as well as to further explore the interactions between mother-child dyads during mealtimes.

The family is the primary social institution influencing young children, thus, it is likely that there are many modifiable risk factors for feeding problems with substantial roots within the family context (Ventura & Birch, 2008). Research exploring the family environmental influences on child eating behaviour has often focused on maternal
feeding practices such as pressure to eat, restriction of food intake, the use of rewards and monitoring of food intake. Coercive strategies, such as pressuring the child to eat are commonly reported in mother-child dyads with feeding problems (Lindberg, Bohlin, Hagekull & Palmerus, 1996) and pressure to eat has been associated with increased picky eating, lower fruit and vegetable intake, longer mealtime duration and lower child weight status during infancy and the pre-school years (Farrow & Blissett, 2008; Fisher, Mitchell, Smiciklas-Wright & Birch, 2002; Galloway, Fiorito, Lee & Birch, 2005; Klesges et al., 1983). Observational studies are less common, but research in clinical samples, has identified more coercive strategies in mothers of toddlers with feeding problems compared those without (Sanders, Patel, LeGrice & Sheppard, 1993). Further observational studies amongst non-clinical groups are needed to validate maternal reports and continue to explore the relationship between such strategies and food avoidance during early childhood.

Whilst research has tended to focus on behavioural feeding strategies used by parents to modify children’s dietary intake, researchers have also explored maternal interactional behaviour at mealtimes in more depth, examining the feeding dynamic and affective nature of dyadic interactions at mealtimes (e.g., Chatoor, Egan, Getson, Menvielle & O’Donnell, 1988; Hagekull, Bohlin & Rydell, 1997; Robertson, Puckering, Parkinson, Corlett & Wright, 2011). Preliminary cross-sectional maternal report studies have pointed to the importance of factors such as parental warmth, sensitivity & interpersonal involvement, modelling, praise, positivity and enthusiastic comments during mealtimes as effective means of encouraging healthy and adaptive eating behaviour and food consumption (e.g., Hagekull, Bohlin & Rydell, 1997; Moens, Braet & Soetens, 2007; Patrick, Nicklas, Hughes & Morales, 2005). Observational studies in clinical groups have identified greater conflict, negativity and insensitivity during mealtimes, when comparing the feeding interactions of mother of children with and without feeding problems (e.g., Chatoor et al., 1988; Robertson et al., 2011). However, observational studies exploring these variables amongst non-clinical groups are rare (Hagekull et al., 1997) and no research to date has evaluated the associations between a broad range of observed maternal interactional behaviours at mealtimes and food avoidant eating behaviours in early childhood.

Another aspect that may be important when considering parents’ socialisation of their children’s eating is their mealtime environment, including its organisation and structure (Orrell-Valente et al., 2007; Cooper, Whelan, Woolgar, Morrell & Murray,
Food avoidance in children

2004). For instance, several cross-sectional studies have found positive associations between the frequency of family meals and child eating behaviour, such as the consumption of healthier foods (e.g., Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2004). However, whilst the frequency of family meals seems to be important, many studies rely on retrospective self-report and few studies have looked at additional mealtime structure variables. Orrell-Valante et al. (2007) noted the frequency of several mealtime structure variables (e.g. whether parents are present, where mealtime took place, the use of distractors to feed) in high and low socioeconomic status families but failed to explore the association of these variables with child eating behaviour or feeding problems. Another observational study comparing children with and without feeding problems, found that mealtime disorganisation (not eating with parents, eating in the living room, using distractions at meals) was related to the presence of child feeding problems (Cooper et al., 2004). Exploration of mealtime structure and the social context of mealtimes, rather than just the frequency of family meals, may shed light on the modifiable risk and protective factors for food avoidance.

In summary, observational studies of the home mealtime environment, particularly in non-clinical groups, are rare, often only involve small samples (e.g., Klesges et al., 1983) and focus predominantly on feeding practices such as pressure to eat (e.g., Farrow, Blissett & Haycraft, 2011; Haycraft & Blissett, 2008; Sanders et al., 1993). These studies fail to evaluate the broad range of behaviours displayed by parents during mealtimes, or consider variation in the feeding dynamic and the affective nature of mealtime interactions. Preliminary cross-sectional psychometric studies have pointed to the importance of potentially positive behaviours displayed during mealtimes such as warmth, sensitivity, interpersonal involvement, modelling and positivity (e.g., Hagekull et al., 1997; Moens, Braet & Soetens, 2007; Patrick et al., 2005). Further research exploring these behaviours is essential, as despite parental concerns about their children’s eating patterns being common (Jacobi, Agras, Bryson & Hammer, 2003; McDermott, Mamum, Najman, Williams, O’Callaghan & Bor, 2008) parents receive little positive advice on how to deal with challenging mealtimes and to actively decrease food refusal and fussy eating (American Dietetic Association, 2010; Van der Horst, 2012, Murashima, Hoerr, Hughes & Kaplowitz, 2011). Utilising observational methods in particular will counter issues with the validity of parent report and offer a greater insight into parent-child interaction at mealtimes. No research to date has investigated how a comprehensive and broad range of feeding practices and maternal
mealtime behaviours are associated with validated reports of food avoidance during early childhood. Further elucidation of this, particularly in young non-clinical samples is essential, as it could provide a better understanding of how to promote more successful feeding interactions and prevent negative feeding outcomes.

**Aims and hypotheses**

The first aim of the present study was to validate maternal reports of child eating behaviour and maternal feeding practices with independent observations of these behaviours. The second aim was to explore whether there were any significant differences between observations of children’s eating behaviour dependent on the mealtime structure and organisations. Finally this study aimed to explore the relationships between independent observations of child food avoidant eating behaviours with observations of maternal feeding practices (pressure, physical prompts, incentives to eat) and mealtime behaviour (sensitivity, vocalisations and expressed emotion during the mealtime).

It was hypothesised that maternal reports of child eating behaviour and maternal feeding practices would correlate with independent observations of these constructs. It was hypothesised that independent observations of child eating behaviours would differ dependent on the mealtime structure, with greater food avoidance being seen in children whose mothers do not eat with them, who do not allow the child input into food choice or portion size, or use a distractor during the meal. It was also hypothesised that independent observations of more avoidant child eating behaviour (a slower eating rate, more food refusals, more negative comments during meal) would be associated with greater use of coercive feeding practices, increased pressure to eat, physical prompts, and use of incentives to eat. Observations of more child food avoidance were also hypothesised to be associated with lower sensitivity to the child’s needs, less positive expressed maternal emotion and fewer positive and more negative maternal comments about food.

**Method**

**Participants**

Seventy-five mothers completed a set of standardised questionnaires about themselves and their child and were observed with their child during a typical mealtime in their home. Families were recruited through nurseries, pre-schools, children’s centers
and online parenting sites; mothers of children aged 2-4 years were invited to take part (see Chapter 2 for further details on the sample). The mean age of the mothers was 35.94 years (Range = 27.42-46.92, SD= 4.19) and the mean age of the children was 3.31 years (Range = 2.00-4.75, SD = 1.17). If parents had more than one child within the age range, the child whose name fell first alphabetically participated in the study. There were 37 boys and 38 girls.

Mothers were asked how many years of education they had after the age of 16 years, the mean was 5.17 years (Range = 1.00-10.00, SD=1.71) and 97% of the mothers in this sample described themselves as White British. Analysis of occupational status revealed that participants were from a wide range of social backgrounds: ranging from 1 (managers and senior officials) to 6 (personal service occupations) using the Standard Occupational Classification 2000 (Office for National Statistics, 2000) with a modal occupation level of 3 (associate professional and technical occupations). Annual family income ranged from 1 (under £15,000) to 6 (over £75,000), with a modal annual income of 4; £45,000-£60,000.

**Measures and procedure**

Following recruitment and consent, questionnaire packs were distributed to parents to complete prior to the mealtime visit. Participants provided background information about their age, height, weight, education and occupation, as well as their child’s gender, date of birth, height and weight. Mothers then completed the following measures (all described in detail in Chapter 2 & Appendices A-K):

**The Child Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson & Rapoport, 2001).** Mothers completed 4 subscales of the CEBQ; food fussiness, slowness in eating, satiety responsiveness and enjoyment of food. Analysis of reliability within the present sample revealed good Cronbach's $\alpha$ for the subscales ranging from .77-.89.

**Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007).** Mothers completed 2 subscales of the CFPQ; pressure to eat and food as a reward. Analysis of reliability within the present sample revealed a good Cronbach's $\alpha$ for the subscales ranging from .65-.79.
Mealtime observation

Mother-child dyads were also observed during a typical lunch or evening meal at the family’s home using a video camera. The researcher analysed the mealtimes using the coding schemes outlined below, in order to gain independent measures of mealtime structure, maternal feeding practices and behaviours and child eating behaviour. For full details of the mealtime protocol used and the observational measures please see Chapter 2 (Appendices O-R) and for information disclosed to parents about study aims see Appendices E-G:

Mealtime structure and environment (Cooper, Wheelan, Woolgar, Morrel & Murray, 2004; Orrell-Valente, Hill, Brechwald, Dodge, Pettit & Bates, 2007). The mealtimes were firstly coded with 6 items relating to the environment, structure and management of the child’s mealtime, using a combination of variables previously used by Cooper et al. (2004) and Orrell-Valente et al. (2007) in order to assess the specific dimension of mealtime structure. This incorporates whether the mother eats with the child, eats the same food as child, or allows the child input in food choice or portion size, whether the father or siblings are eating with the child and whether distractions are used (e.g. watching television or play with toys).

Maternal feeding practices and mealtime behaviour. The family mealt ime coding system (FMCS; Haycraft & Blissett, 2008) was used to measure the frequency of mothers’ pressuring their child to consume more food, physically prompting the child to consume more food, using incentives such as conditions or rewards to get their child to eat, and the frequency of positive and negative comments by the mother to the child in relation to food. The frequency of times mothers praised their child for eating was also measured; a count was made for each time the mother displayed each of these behaviours over the course of the meal. Four subscales from The Feeding Interaction Scale (FIS; Wolke, Summer, McDermott & Skuse, 1987) were also used to rate maternal behaviour during the meal; interactional conflict, feeding sensitivity (rated on a 9 point likert scale) and amount/frequency of both expressed positive and negative emotion (rated on a 5 point likert scale).

Child eating behaviour. The Child Mealtime Coding System CMCS; Haycraft & Blissett, 2008) and Behavioural Coding Inventory (BCI; Young & Drewett, 2000)
were used to gain independent observations of child eating behaviour during mealtime interactions. Variables measured were child speed of eating, food refusals, difficulty to feed and positive and negative vocalisations about food.

**Inter-rater reliability.** For the coding system implemented an independent second observer, who was trained on each coding method, coded a random sample of 20% of the observations. Inter-rater reliability was then calculated for all of the variables within each coding measure using intra-class correlation co-efficients. Mean inter-rater reliability was .84 (range .79-.94) and the mean level of significance was p<.001, indicating that the coding of this measure achieved good reliability.

**Mother and child BMI.** Where parents and children consented, objective measures of height and weight were obtained by the researcher (for 70 of the children and 31 of the mothers). BMI Z scores for the children were calculated using the Child Growth Foundation's (1996) growth references which adjusts for child age and gender.

**Data analysis**

Preliminary analysis of the data using Shapiro-Wilk tests and visual inspection of plots/graphs indicated the data was largely non-normally distributed, consequently where possible non-parametric statistics were used. After descriptive statistics were performed to evaluate the nature of the sample, the data was screened to assess any relationships between demographic factors and both the observed and self-reported parent and child behaviours. A series of Spearman’s two-tailed correlations revealed no significant associations between observed and self-reported child eating behaviour and maternal feeding practices and behaviours with parent age, parent and child BMI, child birth weight, maternal occupation or education level and family income (all p<.01). Child age was unrelated to maternal reports of child eating behaviour or mothers observed or self-reported feeding practices, however younger children were observed to refuse more foods (r = -.42, p<.01), were rated as more difficult to feed (r = .37, p < .01). Therefore child age was controlled for within the correlation analyses exploring the association between observed food avoidance with observed maternal feeding practices. Mann-Whitney tests indicated that there were no significant differences in observed child eating behaviour or feeding practices dependent on whether children were male or female, whether they were White or non-White, whether they were
observed at lunch (n=39) or evening meal (n = 36), and whether the father or siblings were present.

Next, a series of two-tailed Spearman’s rho correlations, were performed to assess whether maternal reports of child eating behavior and maternal reports of their feeding practices were validated by independent observations of these constructs. Mann-Whitney U tests were conducted to evaluate whether there were significant differences in child eating behaviour dependent on the mealtime structure and environment. Two-tailed partial correlations, controlling for child age were then used to explore the relationships between observed child eating behavior with observed maternal feeding practices and interactional behaviour during mealtimes.

**Results**

**Descriptive Statistics.**

Sixty-five mothers self-reported their height and weight, and maternal mean BMI was 23.83 (Range = 16.80-33.25, SD= 3.32). Most mothers reported a healthy body weight (BMI < 25: World Health Organization, 1998), and 21.1% of mothers gave a BMI which indicated they were either overweight (BMI >25) or obese (BMI > 30: WHO 1998) which corresponds to approximately the national averages (Health Survey for England, 2010). Out of the 65 mothers who reported their height and weight, objective measures of height and weight were also obtained during the visit by the researcher for 31 mothers. Interclass correlations revealed a correlation coefficient of .80 at p<.001, suggesting that mothers were broadly accurate in reporting their height and weight. Sixty mothers reported their child’s height and weight and BMI Z scores for the children were calculated using the Child Growth Foundation’s (1996) growth references which adjust for age and gender. The mean reported BMI Z-score was .12 (Range = -3.12 – 3.01, SD = .98), indicating a healthy BMI. Objective measures of height and weight were obtained by the researcher, after the mealtime was complete, for 70 of the children (5 parents or their child did not give consent). Mean BMI Z-score (based on actual height & weight) was .55 (Range = -2.46 – 2.21, SD = .86), also indicating a healthy BMI. Using Cole et al’s standard definitions for overweight and obesity corrected for age and gender (Cole, Bellizzi, Flegal & Dietz, 2000) 91.4 % of the sample were healthy weight, 2.9% were underweight and 5.7% were overweight or obese. Interclass correlations revealed a correlation coefficient of .54 at p<.05, suggesting that mothers were only moderately accurate in reporting their child’s BMI.
Descriptive statistics for maternal self-report and independent observations of child eating behaviour and maternal feeding practices and mealtime behaviour are presented in Table 4.1. Mean scores for the CEBQ, CFPQ, CMCS, FMCS and FIS are similar to other published data in similar samples in terms of demographics (Farrow; 2005; Haycraft, 2007; Haycraft & Blissett, 2008; Musher-Eizenman & Holub, 2007; Wardle et al., 2001). The mean length of the mealtimes was 23.31 minutes and mealtimes ranged from 7.49 minutes to 51.58 minutes.

Table 4.1: Descriptive statistics for maternal reports and independent observations of child eating behaviour and maternal feeding practices and mealtime behaviour

<table>
<thead>
<tr>
<th></th>
<th>Mean (N=75)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent report</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Child eating behaviour</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food fussiness</td>
<td>2.86</td>
<td>.64</td>
</tr>
<tr>
<td>Slowness in eating</td>
<td>3.06</td>
<td>.82</td>
</tr>
<tr>
<td>Satiety responsiveness</td>
<td>3.25</td>
<td>.64</td>
</tr>
<tr>
<td>Enjoyment food</td>
<td>3.68</td>
<td>.72</td>
</tr>
<tr>
<td><strong>Maternal feeding practices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>3.11</td>
<td>.89</td>
</tr>
<tr>
<td>Food as a reward</td>
<td>2.73</td>
<td>1.20</td>
</tr>
<tr>
<td><strong>Independent Observations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Child eating Behaviour</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed (mouthfuls per minute)</td>
<td>3.02</td>
<td>1.55</td>
</tr>
<tr>
<td>Food refusals</td>
<td>4.71</td>
<td>6.55</td>
</tr>
<tr>
<td>Difficult to feed</td>
<td>2.36</td>
<td>1.01</td>
</tr>
<tr>
<td>Positive vocalisations about food</td>
<td>3.47</td>
<td>3.29</td>
</tr>
<tr>
<td>Negative vocalisations about food</td>
<td>1.51</td>
<td>2.81</td>
</tr>
<tr>
<td><strong>Maternal feeding practices &amp; behaviours</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>3.86</td>
<td>4.45</td>
</tr>
<tr>
<td>Physical prompts</td>
<td>4.75</td>
<td>10.20</td>
</tr>
<tr>
<td>Incentives &amp; rewards</td>
<td>1.65</td>
<td>2.30</td>
</tr>
<tr>
<td>Feeding sensitivity</td>
<td>6.50</td>
<td>1.62</td>
</tr>
<tr>
<td>Interactional conflict</td>
<td>4.81</td>
<td>2.41</td>
</tr>
<tr>
<td>Expressed positive emotion</td>
<td>3.81</td>
<td>.88</td>
</tr>
<tr>
<td>Expressed negative emotion</td>
<td>1.21</td>
<td>.64</td>
</tr>
<tr>
<td>Positive vocalisations about food</td>
<td>6.19</td>
<td>3.92</td>
</tr>
<tr>
<td>Negative vocalisations about food</td>
<td>.33</td>
<td>2.43</td>
</tr>
</tbody>
</table>

SD = Standard Deviation  
\(c\) = counts – frequency of occurrence across mealtime  
\(r\) = ratings – objective rating based on mealtime – higher score reflect higher rating

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Frequency Statistics

Table 4.2 displays frequency statistics for the observed family mealtimes in relation to the mealtime structure and environment. In addition, 39 mother-child dyads were observed at lunchtime and 36 were observed in the evening.

Table 4.2 Descriptive and frequency statistics for the observed mealtime structure

<table>
<thead>
<tr>
<th>Mealtime Environment</th>
<th>Yes</th>
<th>No</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother present</td>
<td>70</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Father present</td>
<td>19</td>
<td>56</td>
<td>75</td>
</tr>
<tr>
<td>Sibling/s present</td>
<td>40</td>
<td>30</td>
<td>75</td>
</tr>
<tr>
<td>Whole family present</td>
<td>19</td>
<td>56</td>
<td>75</td>
</tr>
<tr>
<td>Mother eating with child</td>
<td>46</td>
<td>29</td>
<td>75</td>
</tr>
<tr>
<td>Mother eating same as child</td>
<td>43</td>
<td>32</td>
<td>75</td>
</tr>
<tr>
<td>Child allowed input in food choice</td>
<td>39</td>
<td>36</td>
<td>75</td>
</tr>
<tr>
<td>Distraction used</td>
<td>10</td>
<td>65</td>
<td>75</td>
</tr>
</tbody>
</table>

Validity of maternal reports of child food avoidant eating behaviour

To assess the hypothesis that maternal reports of child eating behavior would be validated by independent observations, two-tailed Spearman’s rho correlations were performed. As Table 4.3 indicates, maternal reports of children’s eating behavior were significantly correlated with a number of independent observations. Maternal reports of their child being a fussier eater with lower food enjoyment were correlated with independent observations of the child refusing a greater number of foods, being more difficult to feed, being slower to eat and making fewer positive vocalisations about food. Lower reported food enjoyment was also correlated with observations of children making more negative comments about food. Children who were reported to eat more slowly were observed to eat more slowly, refused more mouthfuls of food and made more negative vocalisations about food. Children who were reported to have high satiety responsiveness where observed to eat more slowly, made more negative vocalisations, and less positive vocalisations about food.
Table 4.3: Two-tailed Spearman’s rho correlations between maternal reports and independent observations of child eating behaviour

<table>
<thead>
<tr>
<th>Maternal Report of Child Eating</th>
<th>Food Fussiness</th>
<th>Slowness in Eating</th>
<th>Satiety responsiveness</th>
<th>Enjoyment of food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Speed</td>
<td>-.336*</td>
<td>-.379**</td>
<td>-.314*</td>
<td>.380**</td>
</tr>
<tr>
<td>Food refusals</td>
<td>.394**</td>
<td>.295*</td>
<td>.214</td>
<td>-.447**</td>
</tr>
<tr>
<td>Difficult to feed</td>
<td>.426**</td>
<td>.291</td>
<td>.234</td>
<td>-.446**</td>
</tr>
<tr>
<td>Positive vocalisations food</td>
<td>-.440**</td>
<td>-.034</td>
<td>-.306*</td>
<td>.322*</td>
</tr>
<tr>
<td>Negative vocalisations food</td>
<td>.256</td>
<td>.366*</td>
<td>.326*</td>
<td>-.434**</td>
</tr>
</tbody>
</table>

*p < .01, **p < .001

Validity of maternal reports of feeding practices

Two-tailed Spearman’s rho correlations were again used to assess the hypothesis that maternal reports of their own feeding practices would be validated by independent observations. As Table 4.4 indicates, maternal reports of their own feeding practices were not significantly correlated with independent observations of their feeding practices.

Table 4.4: Two-tailed Spearman’s rho correlations between maternal reports and independent observations of maternal feeding practices

<table>
<thead>
<tr>
<th>Maternal report</th>
<th>Pressure to eat</th>
<th>Food as a reward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Pressure</td>
<td>.19</td>
<td>.12</td>
</tr>
<tr>
<td>Physical Prompt</td>
<td>.06</td>
<td>-.01</td>
</tr>
<tr>
<td>Conditions &amp; incentives</td>
<td>.06</td>
<td>.02</td>
</tr>
</tbody>
</table>

*p < .01, **p < .001

Effects of mealtime structure and environment on observed child eating behaviour

Two-tailed Mann-Whitney U tests were used to explore whether there were any significant differences between observations of children’s eating and mealtime behaviour dependent on mealtime structure. Children whose mothers ate with them refused fewer foods during the meal (U = 381.00, z = -3.32, p < .001) and were observed as being easier to feed (U = 4.26.50, z = -2.75, p<.01) compared to those
children whose mothers did not. In addition children whose mothers ate the same food as them during the meal refused fewer foods ($U = 1070.50$, $z = -4.18$, $p < .001$), made less negative vocalisations about food ($U = 920.50$, $z = -2.84$, $p < .01$), and had children who were easier to feed ($U=953.00$, $z = -3.21$, $p < .01$) compared to those mothers who ate something different to their child or didn’t eat with them. However, there were no significant differences between the eating behaviour of children if their father or another sibling was present.

Children who were allowed some input in food choice refused fewer foods during the meal ($U= 959.00$, $z = -3.63$, $p < .001$), made less negative ($U =959.00$, $z = -4.07$, $p < .001$), and more positive vocalisations about food during the meal ($U = 420.50$, $z = 2.56$, $p = .01$), had a faster eating rate ($U = 332$, $z = 3.52$, $p < .001$), and were observed as being easier to feed ($U=387.50$, $z = -3.04$, $p < .005$). Children who had a distraction present during the meal (e.g., TV, radio, books, magazines, toys) refused more foods ($U = 160.50$, $z = 2.61$, $p < .01$), and made more negative vocalisations about food ($U = 176.00$, $z = 2.66$, $p < .01$) than those who were not distracted during the meal.

**Correlation Analyses; Relationships between observed child eating behaviour with maternal feeding practices and interactional behaviour**

Two-tailed partial correlations, controlling for child age were used to assess whether observed maternal feeding practices and mealtime behaviour were significantly correlated with observed child eating behaviour. As Table 4.5 indicates independent observations of maternal pressure to eat were associated with slower eating speed, refusing more food, making more negative vocalisations about food and being more difficult to feed. Mothers’ physically prompting their children to consume food were associated with the child refusing more food, making more negative vocalisations during the meal and the child being more difficult to feed. Mothers’ use of incentives, conditions and rewards during the mealtime was associated with a slower eating speed, refusing a greater number of foods, making more negative vocalisations about food and being more difficult to feed.

Mothers’ observed to be sensitive to the child’s needs during the meal had children who refused fewer foods, had a faster eating rate, were easier to feed and made fewer negative vocalisations about food during the meal. Mothers’ who displayed high levels of positive emotion during the meal were observed to have children who were
easier to feed whereas mothers who displayed high levels of negative emotion were observed to have children who ate more slowly. Mothers who made positive vocalisations about food during the meal were observed to have children who also made more positive vocalisations about food. Mothers who made more negative vocalisations about food were observed to have children who ate slower, refused more food and were more difficult to feed. Greater observed interactional conflict between mother and child was associated with slower eating rate, refusing more food, being more difficult to feed and making less positive vocalisations about food.

Table 4.5: Two-tailed partial correlations, controlling for child age, between observed maternal feeding practices and mealtime behaviours with observed child eating behaviour

<table>
<thead>
<tr>
<th>Observed child eating behaviour</th>
<th>Speed</th>
<th>Refusals</th>
<th>Difficult to feed</th>
<th>Positive vocalisation food</th>
<th>Negative vocalisation food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal feeding practices and behaviours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>-.50**</td>
<td>.57**</td>
<td>.34*</td>
<td>-.15</td>
<td>.47**</td>
</tr>
<tr>
<td>Physical Prompt</td>
<td>-.24</td>
<td>.73**</td>
<td>.34*</td>
<td>-.19</td>
<td>.41**</td>
</tr>
<tr>
<td>Conditions &amp; Incentives</td>
<td>-.47**</td>
<td>.61**</td>
<td>.36*</td>
<td>-.05</td>
<td>.47**</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>.38**</td>
<td>-.43**</td>
<td>-.43**</td>
<td>.22</td>
<td>-.36*</td>
</tr>
<tr>
<td>Interactional Conflict</td>
<td>-.30*</td>
<td>.55**</td>
<td>.49**</td>
<td>-.32*</td>
<td>.21</td>
</tr>
<tr>
<td>Positive Emotion</td>
<td>.03</td>
<td>-.24</td>
<td>-.33*</td>
<td>.17</td>
<td>.05</td>
</tr>
<tr>
<td>Negative emotion</td>
<td>-.45**</td>
<td>.28</td>
<td>.19</td>
<td>-.20</td>
<td>-.06</td>
</tr>
<tr>
<td>Positive vocalisation food</td>
<td>.06</td>
<td>-.21</td>
<td>-.08</td>
<td>.41**</td>
<td>-.24</td>
</tr>
<tr>
<td>Negative vocalisation food</td>
<td>-.46**</td>
<td>.66**</td>
<td>.45**</td>
<td>-.06</td>
<td>-.06</td>
</tr>
</tbody>
</table>

*p < .01; ** p < .001

Discussion

The present study aimed to evaluate the validity of maternal reports of child eating behaviour and feeding practices with independent observations of these constructs and explore the associations between observations of children’s eating behaviour with observed maternal feeding practices and interactional behaviour. In addition this study explored whether there were any significant differences between
observations of children’s eating behaviour dependent on the mealtime structure. Maternal reports of their child’s eating behaviour were validated by independent observations, however, contrary to predictions, maternally reported feeding practices were not validated by independent observations. Supporting the hypotheses, results indicate that structured mealtimes, and positive interactions characterised by high sensitivity, low conflict and positive expressed emotion rather than using coercive strategies, such as pressure to eat and physical prompting, are associated with less avoidant eating behaviours and thus may help to promote more adaptive eating behaviours in young children.

Previous research exploring the validity of maternal self-report measures has often been contradictory and equivocal. Self-report is often subject to bias, however, several researchers have demonstrated that maternal reports of feeding difficulties are reliable and accurately reflect independent observations (Cooper et al., 2004; Farrow & Blissett, 2005). The results of the present study interestingly suggest that whilst mothers may be able to accurately report their children’s eating behaviour, self-reports of their own feeding practices were not validated by independent observations. The validation of maternally reported child feeding problems supports previous evidence (Chatoor et al., 1988; Sanders et al., 1993) and suggests that mothers are in tune with the feeding problems and eating behaviours of their child. This may be because mothers are often the primary caregiver and thus are likely to engage in daily interactions with their children around food particularly in this younger age group. However, the poor correspondence between observed and reported maternal feeding practices highlights the importance of utilising observational measures, as mothers reports of their own feeding practices may not always be accurate reflections of maternal behaviour. It is possible that mothers may underestimate the use of the coercive strategies or may act differently because they are being observed. However, it is also important to note that this study only explored the validity of maternal reports of pressure to eat and the use of rewards. Future research should seek to find methods to observe a wider range of feeding practices and mealtime behaviours using experimental methods which may make observations of constructs such as restriction more feasible.

As predicted, mealtime structure emerged as an important factor which significantly distinguished dyads with high, compared to lower levels of food avoidance. Supporting and extending research in older samples highlighting the importance of family mealtimes in the development of healthy and adaptive eating (e.g.,
Boutelle, Lytle, Murray, Birnbaum & Story, 2001; Burgess-Champoux, Larson, Neumark-Sztainer, Hannan & Story, 2009; Gillman et al., 2000; Neumark-Sztainer et al., 2004), children whose mothers not only ate with them but also ate the same food as them, refused fewer foods and were easier to feed compared to children whose mothers did not. Regular family meals provide an opportunity for the role modelling of healthy eating and social interactions among family members and have been found to have a ‘protective effect’ against disordered eating in older samples (Neumark-Sztainer et al., 2004; Neumark-Sztainer, Wall, Haines, Story, Sherwood & van den Berg, 2007; Neumark-Sztainer, Eisenberg, Fulkerson, Story, & Larson, 2008). The results of this study suggest that a similar relationship may be present in the development of early food avoidant eating behaviour and supports research within a lab-setting where 2-5 year olds were found to accept a novel food more quickly and ingest more of that food when an adult was eating a similar food of the same colour rather than just sitting together but not eating (Addessi et al., 2005). Future research should continue to explore the socialisation of family mealtimes within this age group as this represents a critical period where eating behaviours are becoming established and embedded (Kelder et al., 1994). Interestingly, within the present sample there were no significant differences in children’s eating behaviour according to whether their father or siblings were present, future studies would benefit from further exploring the role of additional family members during mealtime interactions. In addition, it is important to consider that fathers were present in only 19 of the 75 mealtimes and this sample may be underpowered to detect significant differences according to paternal presence. Similarly, the use of distraction was only evident in 10 of the 75 mealtimes observed. Due to the very unequal group sizes for this variable, caution should be taken in interpretation of the finding that distraction during meals may be associated with greater food avoidance and replication with more equal group sizes is needed.

Less avoidant eating behaviour was also observed in children whose mother allowed them some autonomy in food choice. Previous research has shown that over time, given autonomy, young children tend to eat a variety of food and achieve a nutritionally adequate diet (e.g., Rolls, 1986). Similarly these findings suggest that allowing children some autonomy in food choice may foster less avoidant eating behaviour. However, it is possible that the degree to which mothers allow autonomy is actually dependent on the child’s eating behaviour; mothers of avoidant eaters may feel the need to direct and stipulate what their child eats, in an attempt to counter their fussy,
restrictive eating behaviours and improve their child’s dietary variety and intake. Longitudinal studies are essential in order to infer causal relationships between mealtime structure and food avoidant eating behaviours in children.

Supporting the hypotheses and extending previous research linking parental pressure to eat with feeding problems and negative mealtime experiences (e.g., Harris & Booth, 1992; Sanders et al, 1993) independent observations of mothers verbally pressuring and physically prompting their child to consume more food during the mealtime were associated greater food refusal, more negative child comments about food, and the child being more difficult to feed. Observations of pressure to eat were also associated with having a slower eating speed. Whilst the cross-sectional nature of the study prevents inferences of cause and effect, in line with previous research (Oralle-Valente, 2007) it seems many parents feel the need to encourage their children to consumer more food at meal times. This could be both in response to their childs’ avoidant eating behaviour (Farrow et al., 2009) and due to concerns about children not eating enough or not having a healthy balanced diet (Galloway et al., 2005). Yet pressuring strategies could also be causally linked and implicated in the development and persistence of these problems (Farrow & Blissett, 2008; Harris & Booth, 1992; Skuse, 1993; Blissett et al., 2000). Longitudinal studies, utilising observational measures, are needed to better understand the complex bi-directional nature of feeding interactions to provide better clarity on the role of pressure in the development, maintenance and management of avoidant eating behaviours during early childhood.

Observations of mothers using conditions and incentives during the meal in a bid to get their child to consume more food were associated with observations of a slow child eating speed, more food refusals, the child being more difficult to feed and making more negative comments about food during the mealtime. Previous research exploring the association between rewards with child eating behaviour and food intake has been somewhat contradictory, with evidence for both positive (e.g., Cooke, Chambers, Añez, Croker, Boniface, Yeomans & Wardle, 2011; Kern & Marder, 1996; Lowe, Horne, Tapper, Bowdery & Egerton, 2004) and negative (Newman & Taylor, 1992; Birch, Marlin & Rotter, 1984; Vereecken, Keukelier & Maes, 2004; Kroller & Warschburger, 2008) outcomes in relation to child eating behaviour. Supporting and extending finding from Kroller & Warschburger (2008) where parental use of food as a reward was associated with lower intake of fruit and vegetables in a sample of 2–6 year old children, the results of the present study identify maternal use of incentives and
conditions as a cross-sectional correlate of food avoidance. However, again, parental use of rewards may be in response to avoidant eating behaviour in their child and further research is needed to evaluate the role of rewards in the development of avoidant eating behaviours in young children.

An important aim of the current study was also to explore the affective nature and dynamic of feeding interactions and potentially more adaptive mealtime behaviours. Supporting the hypotheses, independent observations of low interactional conflict between dyads and mothers being more sensitive to the child’s needs during feeding, frequently expressing positive emotion and making positive vocalisations, were associated with observations of less avoidant eating behaviour. This provides preliminary observational evidence to support previous research highlighting the benefits of authoritative parenting (Tinsley, Markey, Ericksen, Ortiz & Kwasman, 2002; Kremers, et al., 2003; Patrick, Nikolas, Hughes & Morales, 2005), parental warmth and sensitivity during mealtimes (e.g., Patterson et al., 1992; Moens, Braet & Soetens, 2007; Patrik et al., 2007) and enthusiastic comments, as an effective means of encouraging healthy food consumption (e.g., Birch, 1980; Harper & Sanders, 1975; Hendy & Raudenbush, 2000). The findings of the present study support suggestions that parental modelling when combined with positive comments and social affect towards food could be an effective means for caregivers to promote healthy eating behaviours among children (Rhee, 2008).

The evident role of interactional conflict and maternal sensitivity which emerged as cross-sectional correlated of 4 of the 5 observed avoidant eating behaviours, highlight potential maternal risk factors for avoidant eating. Results support previous findings amongst clinical groups, where conflict and negativity at mealtimes have been commonly reported in mother child-dyads where children have clinical feeding problems (Boddy & Skuse, 1994; Harris & Booth, 1992; Robertson et al., 2001). Robertson et al. (2011), in an observational study of children aged between 1 and 2 years, found that mothers of children with growth faltering displayed less positive, sensitive interactions with their infants (low awareness of child autonomy, less responsiveness and warmth, low co-operation with the child) compared to controls. However, as with the present study it is not clear whether the association represents a causal relationship or an adaptive response to the child’s eating behaviour. One prospective study amongst a non-clinical population has found that feeding problems at age 2 years were prospectively predicted by the interaction between infant temperament
and lower maternal sensitivity (Hagekull, Bohlin & Rydell, 1997), suggesting that a causal relationship may be present. Overall, results of the present study suggest that the feeding dynamic during mealtimes in terms of the degree of sensitivity, warmth and harmony in mother-child dyads may be an important factor in the development of avoidant eating behaviour and highlights a need for further prospective research within this area.

Caution must be taken when generalising the findings of this research given that the sample consisted of predominantly White, well educated, healthy weight mothers, and replication in wider socio-economic and ethnical groups is recommended. Another potential issue is that of demand characteristics. Certain variables such as maternal positive vocalisations about food were relatively frequent (mean of 6.19 over the course of meal) whereas negative vocalisations about food were very infrequent (mean of <1 per meal). It is possible that this may not reflect ‘typical’ maternal behaviour, but demand characteristics due to being observed. Similarly it is unclear whether observed behaviours such as allowing the child input in food choice, reflects typical familiar behaviours or mealtime specific behaviours or demand characteristics. In the present study it was not possible to validate these observed measures against maternal report or across numerous observations to assess stability. Findings from Young and Drewett (2000) suggest that measures taken from a single mealtime observation may not reliably summarise children's feeding characteristics and that more than 1 observation is needed. This may also be the case for maternal behaviours and mealtime structure, thus it is acknowledged that completing more than 1 observation would improve this study and its reliability further.

Whilst it could be argued that the sample size was relatively small given the number of variables measured (Tabacknick & Fidell, 2007) this study has improved on previous observational studies by the nature of its larger sample size (e.g., Klesges et al., 1983; Haycraft & Blissett, 2008). The cross sectional nature of the study prevents conclusions about cause and effect, and future work would benefit from longitudinal designs to elucidate the temporal precedence amongst variables. This study provided an important insight into the structure and environment of mealtimes, but perhaps future studies could incorporate information on the type of food offered and consumed at the mealtime. For instance whether children were given solid versus semi-solid food and whether they were self fed versus fed by mother, which may influence factors such as eating speed and mother and child behaviour at mealtimes (Parkinson & Drewett, 2001;
Food avoidance in children Parkinson, Wright & Drewett, 2004). In addition, there is previous evidence that eating speed has a substantial heritable component (Llewellyn et al., 2008), and is associated with intrinsic factors such as temperament and eating enjoyment (Carnell & Wardle, 2007; Faith & Hittner, 2010) so perhaps such future research could benefit by focusing on the interaction of genetic, intrinsic and environmental factors to in relation to eating speed and child eating behaviour. Another limitation of the present study was the use of the CMCS (Haycraft, 2007) to measure and code some aspects of child eating behaviour, such as difficulty to feed and positive and negative vocalisations about food. These measures have no published psychometric properties, yet within the present study they were shown to have good test retest reliability and showed good correspondence with parent-report (see Table 4.3).

In summary, this study demonstrated several significant and novel cross-sectional associations between independent observations of child food avoidant eating behaviours with maternal feeding practices, interactional behaviour and mealtime structure variables. Specifically it found that mealtime structure was an important factor which significantly distinguished dyads with higher compared to lower levels of food avoidance, and it identified observed verbal pressure to eat, physical prompts, interactional conflict, low sensitivity, high expressed negative and low positive expressed emotion and vocalisations as cross-sectional correlates of observed child food avoidance. The results of this study indicate that not just mothers eating with their children, but also consuming the same or similar foods, whilst being sensitive to their child’s preferences and needs, and engaging in positive verbal interactions rather than using coercive strategies, such as pressure to eat and physical prompting, may help to promote more adaptive eating behaviours in young children. This is particularly important as this age group represents a critical period where eating behaviours are becoming established and embedded (Kelder, Perry, Klepp & Lyte, 1994) and where preventative strategies could be most effectively implemented. Future research should continue to assess both the risk factors and protective effects amongst non-clinical groups during early childhood before the onset of more serious feeding problems. Many children are not consuming healthy and varied diets, particularly the recommended five a day of fruits and vegetables (Yngve et al., 2005) and parents frequently report struggling with child feeding issues (Colthard & Harris, 2003; Carruth et al, 2004). This study provides a holistic overview of the influence of mealtime socialisation on eating behaviour, however further research is needed to better understand how these variables
interact to influence eating behaviour. Due to the complex bi-directional nature of feeding interactions, longitudinal research in particular will be essential to highlight temporal precedence of these variables.
CHAPTER 5

Longitudinal predictors of food avoidant eating behaviour during early childhood; the contribution of child temperament, maternal psychopathology and maternal feeding practices

The current chapter represents the first of two chapters exploring the longitudinal predictors of child food avoidance eating behaviours. The preceding chapters have identified cross-sectional correlates of child food avoidant eating behaviour; such as an emotional child temperament, symptoms of maternal depression, anxiety and eating psychopathology and maternal feeding practices and behaviours. However due to the cross-sectional nature of these studies, it is not possible to draw conclusions about potential causal relationships, as cross-sectional correlates do not establish temporal precedence. Therefore the current Chapter aims to replicate and extend Chapter 3 by using a longitudinal design to explore the prospective predictors of child food avoidant eating behaviours during early childhood. Longitudinal research within this field is rare, results often mixed and equivocal, and studies tend to follow children later in childhood. Addressing the shortcomings of previous research, this Chapter aims to explore the contribution of child temperamental, maternal psychopathological and maternal feeding practice variables at 3 years of age, in predicting child food avoidant eating behaviours at 4 years of age.

An edited version of this chapter will be submitted for publication as: Powell, F. C. Farrow, C., & Meyer, C. (2012). Longitudinal predictors of food avoidant eating behaviour during early childhood; the contribution of child temperament, maternal psychopathology and maternal feeding practices
Longitudinal predictors of food avoidant eating behaviour during early childhood; the contribution of child temperament, maternal psychopathology and maternal feeding practices

Abstract
The primary aim of the present 1 year prospective study was to establish whether child temperament, maternal symptoms of eating psychopathology, anxiety and depression, and maternal feeding practices at age 3 predict food avoidant eating behaviour at age 4. This study also aimed to establish whether parental feeding practices add to the predictive variance in later eating behaviour accounted for by these other variables. Sixty-six mothers completed self-report measures of their child’s eating behaviour and temperament, and of their own psychopathology and feeding practices at child age 3 and again at age 4. More food avoidant eating behaviour at 4 years of age was associated with a more emotional child temperament, higher symptoms of maternal anxiety, depression and eating psychopathology at age 3. In addition, greater maternal pressure to eat, greater restriction of food intake, lower involvement in food preparation, a less healthy food environment and less encouragement of a balanced and varied diet at age 3 were associated with greater child food avoidance at age 4. Mothers pressuring their child to consume food at mealtimes and not encouraging balanced and varied food intake at 3 years uniquely predicted child food avoidant eating behaviours at 4 years after accounting for the contribution of other variables. The additional unique variance explained by maternal feeding practices begins to elucidate how the mealtime interactions of families could be targeted for intervention and the prevention of feeding difficulties during early childhood. In particular this study highlights the need for future research to utilise longitudinal designs to further explore the modifiable risk factors and potential protective factors against avoidant child eating behaviour.
**Longitudinal predictors of food avoidant eating behaviour during early childhood; the contribution of child temperament, maternal psychopathology and maternal feeding practices**

**Introduction**

Early childhood marks a critical period in development where eating behaviours are becoming established and embedded (Kelder et al., 1994; Jacobi, Agras, Bryson & Hammer, 2003). Feeding problems during this period are common (Coulthard & Harris, 2003; Ramsay, Gisel, McCusker & Bellavance, 2003), often enduring (McDermott, Mamunm Najman, Williams, O’Callaghan & Bor, 2010) and known to have adverse consequences for both children and their caregivers (Hagekull & Dahl, 1987; Chatoor, Egan, Geston, Menveille, & O’Donnell, 1988; Wright & Birks, 2000). Therefore research beginning early in childhood exploring the prospective predictors of feeding problems before they become too deeply embedded is essential.

As the preceding chapters have highlighted, cross-sectional studies have identified many parent and child correlates of feeding problems and avoidant eating behaviours (e.g., Coulthard & Harris 2003; Farrow & Blisset, 2006; Powell, Farrow & Meyer, 2011). For instance, there is evidence for the role of inherent child characteristics such a gender and temperament (Haycraft, Farrow, Meyer, Powell & Blissett, 2011; Powell et al., 2011) and family-environmental factors such as mealtime structure, maternal feeding practices and maternal psychopathology (e.g., Blissett, Meyer & Haycraft, 2007; Hendy & Raudenbush, 2000; Kremers, Brug, de Vries & Engels, 2003; Savage, Fisher & Birch, 2007). However due to the cross-sectional nature of these studies, it is not possible to draw conclusions about potential causal relationships and there is a paucity amongst the literature, particular amongst this age range, exploring the longitudinal predictors of these behaviours. A better understanding of the factors that may precede and predict these problems would have important implications for prevention and intervention.

Some prospective studies have explored the characteristics, prevalence and stability of fussy eating and feeding problems across early childhood (e.g., Jacobi et al., 2003; Mascola, Bryson & Agras, 2011) but few have explored the longitudinal predictors and precursors of picky or avoidant eating behaviour. For example, cross-sectionally pressure to eat has been readily documented to be associated with lower
child weight status, lower fruit and vegetable intake and higher levels of feeding problems and avoidant eating behaviour such as fussy eating (e.g., Fisher et al., 2002; Lindberg, Bohlin, Hagekull & Palmerus, 1996; Sanders, Patel, Le Grice & Shepard, 1993; Wardle, Carnell & Cooke, 2005). However, whilst pressure to eat has been found to prospectively predict lower weight status in 1-2 year olds (Farrow & Blissett, 2008), 5-7 years olds (Faith, Berkowitz, Stallings, Kerns, Storey & Stunkard, 2004a) and 7-9 year olds (Galloway, Fiorito, Lee & Birch, 2005), few longitudinal studies have examined associations between pressure to eat and eating across early childhood and results have been inconsistent and equivocal. For example, Gregory, Paxton & Brozovic (2011) found that maternal use of pressure to eat at 1 year predicted lower child frequency of fruit consumption at 2 years, yet in another 1 year prospective study with pre-school children, the same authors failed to find a prospective relationship between pressure to eat and food fussiness (Gregory et al., 2010).

In addition, whilst there is limited longitudinal evidence of a causal link between parental feeding practices such as pressure to eat, and child eating behaviour and weight status (Farrow & Blissett, 2008; Galloway et al., 2005; Gregory et al., 2011), there is also evidence that parental feeding practices may be employed in response to the child’s eating behaviour and weight status (Birch & Fisher, 2000; Chatoor, Egan, Geston, Menveille & O’Donnel, 1988; Drucker, Hammer, Agras & Bryson, 1999; Faith et al., 2004a; Farrow, Galloway & Fraser, 2009; Iannotti, Brien & Spillman, 1994; McKenzie et al., 1991). For instance, a recent sibling study, with a mean child age of 5 years, found that parents used different feeding practices for children in the same family in response to their eating behaviour, reporting higher levels of pressure to eat with children who were fussier, emotionally under-ate and were more responsive to internal satiety cues (Farrow, Galloway & Fraser, 2009). Similarly, parents have also been found to be more likely to pressure a child to eat if they perceive the child to be underweight (Francis, Hofer & Birch, 2001) and are more likely to use restriction of food with girls who are overweight (Birch & Fisher, 2000). Further prospective studies are essential to better understand the complex bi-directional nature of feeding interactions and the role of maternal control in the development of child eating behaviour. Feeding practices are potentially modifiable, and continued research in this area is essential to provide guidance to parents on appropriate ways to interact with their children at mealtimes to improve children’s eating behaviour and dietary intake.
Whilst much of the focus within the literature has been on coercive feeding strategies, research has also explored the role of availability, modelling and parental food intake on child eating (Coulthard, Harris & Emmet, 2011; Gregory et al., 2011; Powell et al., 2011). Gregory (2010) found that modelling of healthy eating with 3 year old children predicted lower food fussiness and food responsiveness and higher interest in food at 4 years old. Providing a healthy food related home environment may also be important; the frequency of providing home-cooked fruit and vegetables at 6 months of child age has been found to predict consumption of fruit and vegetables at 7 years (Coulthard, Harris & Emmet, 2011). Cross-sectionally the provision of a healthy food-related home environment has also been associated with lower food fussiness in 2-5 year olds (Powell et al., 2011), however there is no research to date exploring these variables longitudinally within this age range. There is also a lack of prospective research exploring other adaptive feeding practices such as encouraging balanced and varied food intake and involving children in food planning and preparation, despite evidence that these may be related to child eating behaviour (e.g., Orrell-Valente et al. 2007; Musher-Eizenman & Holub, 2007, Kroller & Warschburge, 2008). For instance, co-participation in food related activities has been associated with lower food fussiness, greater food enjoyment and increased fruit and vegetable intake (Heim, Bauer, Stang & Ireland, 2011; Marshall, Golley & Hendrie, 2011; Van der Horst, 2012). Future prospective studies beginning in early childhood are essential to further understand how we can utilise such feeding practices to prevent the onset of feeding problems and food fussiness and promote more successful feeding interactions and outcomes.

Research exploring the impact of the care-giving environment on child feeding has also pointed to the role of maternal psychopathology (Ammaniti, Lucarelli, Cimino & D’Olimpio, 2004; Stein, Wolley & McPherson, 1999; Blissett, Meyer & Haycraft, 2007). However, findings within this area are often equivocal and the evidence for associations, particularly between anxiety and depression with feeding problems can be contradictory (e.g., Farrow & Blissett, 2005; Coulthard & Harris, 2003; McDermott et al., 2009; Meyer & Haycraft, 2007; Whelan & Cooper, 2000). Research exploring the prospective predictors of eating disturbances in the first 5 years of life has highlighted the role of maternal eating behaviour and psychopathology, suggesting that covert modelling of eating problems could foster the development of similar behaviours in the child (Stice, Agras & Hammer, 1999). However, other studies such as Jacobi et al., (2003) who explored parental precursors to picky eating in a sample of children
followed from 3.5-5.5 years, found no associations between maternal eating behaviour, body dissatisfaction or BMI with child picky eating. Similarly, one study exploring the longitudinal correlates of irregular and fussy eating, found maternal anxiety during the child’s early years (6 months-5 years), predicted the persistence of eating problems at 14 years (McDermott et al., 2009) yet others have found no differences in anxiety and depression levels between mothers of children with or without feeding problems (Whelan & Cooper, 2000). Further longitudinal research is needed, particularly exploring the relations between a range of affective symptoms in non-clinical groups of mothers with a broader range of eating behaviours displayed by their children across early childhood.

When assessing inherent child influences, child temperament has been identified as a cross-sectional correlate of child food avoidance (Haycraft et al., 2011; Powell et al., 2011) and has been found to be a risk factor for vulnerability to later eating problems (e.g., Martin et al., 2000). An emotional temperament in particular may be important (Haycraft et al., 2011; Powell et al., 2011), yet whilst this temperament profile has been identified as a risk factor for overweight in a prospective study from birth to 9.5 years (Agras et al., 2004), no studies as yet have explored whether emotionality prospectively predicts food avoidant eating behaviour.

In summary, given the negative outcomes associated with fussy eating and feeding problems (e.g., Chatoor et al., 1988; Galloway et al., 2005; Wright & Birks, 2000), and evidence that they can persist across childhood and into adulthood (e.g., Kotler et al., 2001; Marchi & Cohen, 1990; McDermott et al., 2010) more research in non-clinical samples during early childhood is essential. Although many of the preceding correlates of feeding problems have been replicated, studies have invariably adopted cross-sectional designs and failed to specifically explore food avoidant eating behaviours, amongst non-clinical populations. Understanding the risk factors during this critical period before the onset of more serious feeding problems provides opportunities for prevention and intervention. Longitudinal designs are needed to establish temporal precedence in order to ascertain whether these factors are a result of child eating behaviour or whether they actually play a role their development so that the complex bi-directional nature of feeding interactions can be better understood. In addition, no research to date has investigated how a comprehensive and broad range of feeding practices may longitudinally predict child food avoidance over and above the contribution of other child and parent factors. Such investigation is essential as whilst
intrinsic child characteristics such as temperament and parental psychopathology are largely stable and enduring, feeding practices represent an area that is potentially modifiable.

**Aims and Hypotheses**

The primary aim of this study is to establish whether child temperament, maternal psychopathology and maternal feeding practices at 3 years of age predict food avoidant eating behaviours at 4 years. This study also aims to establish whether parental feeding practices add to the predictive variance in later eating behaviour accounted for by child temperament and maternal psychopathology. It was hypothesised that maternal reports of child food avoidant eating behaviours at 4 years would be positively correlated with an emotional child temperament, higher levels of maternal anxiety, depression and eating-related psychopathology and the use of controlling feeding practices at age 3. Whereas more adaptive practices, such as having healthy foods available in the home, promoting well-balanced and varied food intake and child involvement in meal planning and preparation at age 3 would be negatively correlated with reports of food avoidance at 4 years, after controlling for baseline eating behaviour at age 3. Finally, it was hypothesised that parental feeding practices at 3 years would uniquely predict reports of child food avoidance at 4 years, after controlling for eating behaviour at age 3 and the contribution of inherent child characteristics and maternal psychopathology.

**Method**

**Participants**

Seventy-five mothers of children aged between 2-4 years were recruited through nurseries, pre-schools and children’s centers to take part in the longitudinal element of this study. These participants completed a set of standardised questionnaires (as described in Chapter 3) and took part in a home meal time observation, at age 3 (Time point 1: TP 1: Chapter’s 3 & 4), 66 of these mothers took part in the 12 month follow up at 4 years (Time Point 2: TP2: present study).

For a description of the sample at TP 1 see Chapter 3. The mean age of the mothers at the 12 month follow up was 36.89 years (Range = 28.42-47.92, SD= 4.24) and the mean age of the children was 4.46 years (Range = 3.10-5.62, SD = 1.18). There were 33 mothers of boys and 33 mothers of girls. Mothers were asked how many years of education they had after the age of 16, the mean was 5.15 years (Range = 1.00-10.00
years, SD = 1.77) and 97% of the mothers in this sample described themselves as White British. Analysis of occupational status revealed that participants were from a wide range of social backgrounds: ranging from 1 (managers and senior officials) to 8 (elementary occupations) using Standard Occupational Classification 2000 (Office for National Statistics, 2000) with a modal occupation level of 4 (administrative and secretarial occupations). Family income also ranged from < £15,000 to > £75,000 per annum with a modal annual family income of £45,000-£60,000.

Measures

Standardised questionnaire packs were completed by mothers at both TP1 and TP 2. TP 2 questionnaire packs were either posted to mothers or given to them at the follow-up home mealtime observation, approximately 12 months after initial participation. Participants again provided background information about their current height, weight, occupation and family income as well as their child’s height and weight and completed the following self-report measures (all measures are described in detail in Chapter 2 and Appendices I-N):

*The Child Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson & Rapoport, 2001).* Mothers completed 4 subscales of the CEBQ; a parent-report questionnaire designed to assess their child’s eating styles; food fussiness, slowness in eating; satiety responsiveness and enjoyment of food. Analysis of reliability within the present sample revealed good Cronbach’s $\alpha$ for the subscales ranging from .68-.81.

*Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007).* Mothers completed 9 subscales of the CFPQ; pressure to eat, restriction for health, restriction for weight, monitoring, emotion regulation, food as a reward, balance and variety, healthy environment and involvement. Analysis of reliability within the present sample revealed good Cronbach's $\alpha$ for the subscales ranging from .61-.85.

*The Child Temperament Questionnaire (EAS; Buss & Plomin 1984).* Mothers completed the parent rated EAS Temperament Survey for Children (Buss & Plomin, 1984) to measure four dimensions of child temperament; emotionality, shyness,
activity, and sociability. Analysis of reliability within the present sample revealed good Cronbach's $\alpha$ for the subscales ranging from .68-.73.

**The Eating Disorder Examination Questionnaire (EDE-Q 22; Fairburn & Beglin, 1994).** Mothers completed the EDE-Q to measure 4 dimensions of eating disorder attitudes; dietary restraint, eating concerns, shape concerns, and weight concerns. Analysis of reliability within the present sample revealed good Cronbach's $\alpha$ for the subscales ranging from .56-.79.

**The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983).** Mothers completed the HADS, a brief self-report measure containing two 7 item subscales assessing levels of anxiety and depression. Analysis of reliability within the present sample revealed good Cronbach's $\alpha$ for the subscales ranging from .59-.77.

**Data analysis**

First, attrition analyses were conducted to identify whether there were systematic differences between those who were retained in the study at follow-up and those who dropped out of the study after baseline assessment. Seventy-five participants completed baseline questionnaire and observational assessments, 66 of which were retained at follow-up, giving a retention rate of 88%. There were a number of diverse reasons for discontinuation, including lack of time, disinterest and moving home without a forwarding address. Mann-Whitney U tests revealed no significant differences ($p<.01$) between those who dropped and those that were retained in terms of maternal BMI, occupation, income, psychopathology and feeding practices or on child age, BMI, temperament or eating behaviour at 3 years.

Preliminary analysis of the data using Shapiro-Wilk tests and visual inspection of plots/graphs indicated the data was largely non-normally distributed, consequently where possible non-parametric statistics were used. After descriptive statistics were performed to evaluate the nature of the sample, the data was screened to explore any significant relationships between demographic factors and child eating behaviours at TP2. A series of Spearman’s two-tailed correlations revealed no significant relationships between TP 2 child eating behaviour and the demographic variables of maternal age, maternal BMI, maternal income, occupation classification, education level, child age or child BMI Z score (all $p<.01$). Mann-Whitney U tests also indicated
that there were no statistically significant differences between male and female children in their eating behaviours at TP 2 therefore the sample was analysed as a whole.

Next, a series of two-tailed partial correlations, controlling for baseline eating behaviours, were used to explore the longitudinal relationships between TP2 (mean age 4 years) eating behavior with TP1 (mean age 3 years) child temperament, maternal psychopathology and feeding practices. These analyses were performed to select variables for hierarchical regressions, a method which is common place in studies with a large number of independent variables (Stopa et al., 2001). Alpha levels of .01 were adopted throughout the analyses to reduce the risk of type I errors.

To identify the longitudinal predictors of child food avoidant eating behaviours a series of two-tailed hierarchical multiple regressions were performed with the outcome variables being each of the TP2 eating behaviours (food fussiness, slowness in eating, satiety responsiveness, enjoyment of food). Significantly correlated aspects of TP 1 child temperament and maternal psychopathology were entered in step 1 and significantly correlated TP 1 maternal feeding practices were entered in step 2. Hierarchical regressions are commonly used when investigating the contribution of hypothesised variables over and above the variance explained by other variables established as influential to the dependent variable. Therefore this method was used to determine whether maternal feeding practices add to the predictive variance in TP2 child eating behavior, after controlling for child temperament and maternal psychopathology. The use of multiple regressions and partial correlations were deemed satisfactory as inspections of the residuals demonstrated normal distributions and homoscedasticity (Field, 2005) and no multicollinearity (Bowerman & O’Connell, 1990; Myers, 1990).

Results

Descriptive statistics

For a description of sample at TP 1 see Chapter 3. At TP2 56 mothers self-reported their height and weight, and maternal mean BMI was 23.82 (SD= 3.38), suggesting that mothers were on average of healthy body weight (BMI < 25: World Health Organization, 1998). Twenty-six percent of mothers gave a BMI which indicated they were either overweight (BMI >25) or obese (BMI > 30: WHO 1998) which corresponds to approximately the national averages (Health Survey for England, 2010). Mean child BMI Z-score (based on actual height & weight) was .62 (Range = -
2.62 – 2.87, SD = .89), indicating a healthy BMI. Using Cole et al’s standard definitions for overweight and obesity corrected for age and gender (Cole, Bellizzi, Flegal & Dietz, 2000) 86.7% of the sample were healthy weight, 5% were underweight and 8.3% were overweight.

Descriptive statistics for the questionnaires completed by mothers at TP’s 1 and 2 are shown in Table 5.1. Mean scores for all the child and maternal variables measured are similar to other published data in samples similar in terms of age and ethnicity (e.g., Crawford, Henry, Crombie & Taylor, 2001; Mond, Hay, Rodgers, Owen & Beaumont, 2004; Mathieus & Tambs, 1999; Musher-Eizenman & Holub, 2007; Snaith & Zigmond, 1994, Wardle et al., 2001).
## Table 5.1: Descriptive statistics for child and maternal variables

<table>
<thead>
<tr>
<th></th>
<th>Time point 1 (N=75)</th>
<th>Time point 2 (N=66)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td><strong>Child Eating Behaviour (CEBQ)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Fussiness</td>
<td>2.77 (.90)</td>
<td>2.88 (1.07)</td>
</tr>
<tr>
<td>Slowness in Eating</td>
<td>3.14 (.77)</td>
<td>2.91 (.81)</td>
</tr>
<tr>
<td>Satiety Responsiveness</td>
<td>3.14 (.65)</td>
<td>3.10 (.70)</td>
</tr>
<tr>
<td>Enjoyment of food</td>
<td>3.76 (.77)</td>
<td>3.69 (.93)</td>
</tr>
<tr>
<td><strong>Child Temperament (EAS)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotionality</td>
<td>2.26 (.97)</td>
<td>2.19 (.95)</td>
</tr>
<tr>
<td>Activity</td>
<td>3.12 (.49)</td>
<td>3.22 (.43)</td>
</tr>
<tr>
<td>Shyness</td>
<td>3.13 (.44)</td>
<td>3.33 (.35)</td>
</tr>
<tr>
<td>Sociability</td>
<td>2.93 (.53)</td>
<td>3.17 (.46)</td>
</tr>
<tr>
<td><strong>Maternal Feeding Practices (CFPQ)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>3.40 (.68)</td>
<td>3.23 (.93)</td>
</tr>
<tr>
<td>Restriction for Weight</td>
<td>2.44 (.65)</td>
<td>1.77 (.58)</td>
</tr>
<tr>
<td>Restriction for Health</td>
<td>3.03 (.83)</td>
<td>3.17 (1.00)</td>
</tr>
<tr>
<td>Monitoring</td>
<td>4.36 (.70)</td>
<td>4.30 (.67)</td>
</tr>
<tr>
<td>Emotional Regulation</td>
<td>1.90 (.63)</td>
<td>1.86 (.48)</td>
</tr>
<tr>
<td>Food Reward</td>
<td>2.50 (.98)</td>
<td>2.75 (1.03)</td>
</tr>
<tr>
<td>Balance &amp; Variety</td>
<td>4.06 (.51)</td>
<td>4.45 (.49)</td>
</tr>
<tr>
<td>Healthy Environment</td>
<td>3.95 (.73)</td>
<td>3.94 (.82)</td>
</tr>
<tr>
<td>Involvement</td>
<td>3.36 (.96)</td>
<td>3.68 (.74)</td>
</tr>
<tr>
<td><strong>Psychopathology (HADS)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>7.19 (3.91)</td>
<td>6.34 (2.95)</td>
</tr>
<tr>
<td>HADS Depression</td>
<td>5.62 (3.53)</td>
<td>4.34 (3.07)</td>
</tr>
<tr>
<td><strong>Eating Psychopathology (EDEQ)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restraint</td>
<td>1.35 (1.43)</td>
<td>1.25 (1.01)</td>
</tr>
<tr>
<td>Eating Concern</td>
<td>.90 (1.18)</td>
<td>.72 (.73)</td>
</tr>
<tr>
<td>Shape Concern</td>
<td>2.50 (1.70)</td>
<td>2.02 (1.49)</td>
</tr>
<tr>
<td>Weight Concern</td>
<td>1.96 (1.53)</td>
<td>1.57 (1.23)</td>
</tr>
</tbody>
</table>

CEBQ = Child Eating Behaviour Questionnaire, EAS = Child Temperament Questionnaire, CFPQ = Comprehensive Feeding Practices Questionnaire, HADS = Hospital Anxiety & Depression Scale, EDEQ = Eating Disorders Examination Questionnaire
Correlation Analyses; Longitudinal relationship between maternal reports of child temperament, maternal psychopathology and feeding practices at age 3 with child food avoidant eating behaviour at age 4, controlling for child eating behaviour at age 3.

A series of partial correlations were used to assess which aspects of child temperament, maternal psychopathology and feeding practices at TP 1 were significantly correlated with each of the child food avoidant eating behaviours at TP 2 after controlling for baseline eating behaviour. As Table 5.2 indicates, after controlling for baseline child food fussiness at age 3, maternal reports of a more emotional child temperament at TP 1 were associated with greater child food fussiness at TP 2. Mothers who reported higher symptoms of anxiety at TP 1 reported greater child food fussiness, slowness in eating and satiety responsiveness at TP 2 and higher maternal depression symptoms were associated with greater child food fussiness. Higher levels of maternal restraint, eating and shape concern at TP 1 were associated with greater child satiety responsiveness at TP 2, whilst eating concern was also associated greater child slowness in eating at TP 2.

Maternal reports of pressuring their child to eat at TP 1 were associated with reports of greater child food fussiness and slowness in eating and lower food enjoyment at TP 2. Maternal restriction for health reasons was associated with greater food fussiness at TP 2. Mothers who reported encouraging balanced and varied food intake and providing a healthy home food environment at TP 1 reported less child food fussiness, slowness in eating, and satiety responsive and greater enjoyment of food at TP2. In addition, involving the child in meal planning and preparation at TP 1 was also associated with greater enjoyment of food at TP 2. There were no other significant correlates.
Food avoidance in children

Table 5.2: Two-tailed partial correlations, controlling for child eating behaviour at age 3, between child temperament, maternal psychopathology and maternal feeding practices at age 3 with child eating behaviour at age 4.

<table>
<thead>
<tr>
<th>Child eating behavior at TP 2</th>
<th>Food Fussiness</th>
<th>Slowness in Eating</th>
<th>Satiety responsiveness</th>
<th>Enjoyment of food</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TP 1 EAS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotionality</td>
<td>.34*</td>
<td>.16</td>
<td>.17</td>
<td>-.25</td>
</tr>
<tr>
<td>Activity</td>
<td>-.01</td>
<td>.05</td>
<td>.14</td>
<td>-.01</td>
</tr>
<tr>
<td>Shyness</td>
<td>.11</td>
<td>-.06</td>
<td>-.17</td>
<td>-.08</td>
</tr>
<tr>
<td>Sociability</td>
<td>-.11</td>
<td>-.19</td>
<td>-.05</td>
<td>.12</td>
</tr>
<tr>
<td><strong>HADS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>.44**</td>
<td>.46**</td>
<td>.31*</td>
<td>-.25</td>
</tr>
<tr>
<td>HADS Depression</td>
<td>.28*</td>
<td>.09</td>
<td>.26</td>
<td>-.15</td>
</tr>
<tr>
<td><strong>EDEQ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restraint</td>
<td>.27</td>
<td>.19</td>
<td>.36*</td>
<td>-.22</td>
</tr>
<tr>
<td>Eating Concern</td>
<td>.30</td>
<td>.34*</td>
<td>.31*</td>
<td>-.23</td>
</tr>
<tr>
<td>Shape Concern</td>
<td>.25</td>
<td>.21</td>
<td>.33*</td>
<td>-.20</td>
</tr>
<tr>
<td>Weight Concern</td>
<td>.25</td>
<td>.19</td>
<td>.27</td>
<td>-.15</td>
</tr>
<tr>
<td><strong>CFPQ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>.49**</td>
<td>.56**</td>
<td>.19</td>
<td>-.39**</td>
</tr>
<tr>
<td>Restriction for Weight</td>
<td>.29</td>
<td>.21</td>
<td>.17</td>
<td>-.15</td>
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<tr>
<td>Restriction for Health</td>
<td>.32*</td>
<td>.23</td>
<td>.01</td>
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<tr>
<td>Monitoring</td>
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<td>.12</td>
<td>.05</td>
<td>.11</td>
</tr>
<tr>
<td>Emotional Regulation</td>
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<td>.05</td>
<td>.08</td>
<td>-.16</td>
</tr>
<tr>
<td>Food Reward</td>
<td>.11</td>
<td>.28</td>
<td>-.02</td>
<td>-.23</td>
</tr>
<tr>
<td>Balance &amp; Variety</td>
<td>-.49**</td>
<td>-.35*</td>
<td>-.44**</td>
<td>.53**</td>
</tr>
<tr>
<td>Healthy Environment</td>
<td>-.42**</td>
<td>-.33*</td>
<td>-.27*</td>
<td>.47**</td>
</tr>
<tr>
<td>Involvement</td>
<td>-.30</td>
<td>-.19</td>
<td>-.18</td>
<td>.37*</td>
</tr>
</tbody>
</table>

*p < .01 **p < .001; TP 1 = Time-point 1, TP 2 = Time-point 2; CEBQ = Child Eating Behaviour Questionnaire, EAS = Child Temperament Questionnaire, CFPQ = Comprehensive Feeding Practices Questionnaire, HADS = Hospital Anxiety & Depression Scale, EDEQ = Eating Disorders Examination Questionnaire
Predictors of maternal reports of child food fussiness. Table 5.3 shows that in the final regression model the variables collectively predicted child food fussiness, accounting for 48% of the variance (Adjusted r²). Step 1 was significant F(2,63) = 5.39, p<.01, with child emotionality and maternal anxiety as significant individual predictors. In the final model, maternal feeding practices added a significant increase of 31% of additional variance; F(7,58) = 9.44, R² change = .31, p<.001 after controlling for child temperament and maternal psychopathology. However, only mothers’ not encouraging balanced and varied food intake was a significant individual predictor of food fussiness at TP2.

Table 5.3: Significant predictors of child food fussiness at TP 2 using a hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>5.39(2,63)*</td>
<td>.21</td>
<td>.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Emotionality</td>
<td>.27</td>
<td>2.37*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Anxiety</td>
<td>.36</td>
<td>2.85*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Depression</td>
<td>-.06</td>
<td>-.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>9.44(7,58)**</td>
<td>.53</td>
<td>.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Emotionality</td>
<td>.04</td>
<td>.39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Anxiety</td>
<td>.19</td>
<td>1.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Depression</td>
<td>-.16</td>
<td>-1.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure to Eat</td>
<td>.15</td>
<td>1.43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restriction for Health</td>
<td>-.08</td>
<td>-.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy Environment</td>
<td>-.25</td>
<td>-2.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance and Variety</td>
<td>-.43</td>
<td>-3.39**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.01 **p<.001; TP 2 = Time point 2

Predictors of maternal reports of child slowness in eating. Table 5.4 shows that in the final regression model the variables collectively predicted child slowness in eating, accounting for 35% of the variance (Adjusted r²). Step 1 was significant F(2,63) = 7.84, p<.001, with maternal anxiety as significant individual predictor. In the final model, maternal feeding practices added a significant increase of 18% of additional variance; F(5,60) = 7.88, R² change = .18, p<.001 after controlling for maternal
psychopathology; Maternal anxiety and mothers pressuring their child to eat were significant individual predictors of greater slowness in eating at TP 2.

Table 5.4: Significant predictors of child slowness in eating at TP 2 using a hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>7.84(2,63)**</td>
<td>.20</td>
<td>.17</td>
<td>.46</td>
<td>3.71**</td>
</tr>
<tr>
<td></td>
<td>Maternal Anxiety</td>
<td></td>
<td></td>
<td>.31</td>
<td>2.65*</td>
</tr>
<tr>
<td></td>
<td>Maternal Eating Concern</td>
<td></td>
<td></td>
<td>-.03</td>
<td>-.23</td>
</tr>
<tr>
<td>2.</td>
<td>7.88(5,60)**</td>
<td>.40</td>
<td>.35</td>
<td>.31</td>
<td>2.65*</td>
</tr>
<tr>
<td></td>
<td>Maternal Anxiety</td>
<td></td>
<td></td>
<td>.31</td>
<td>2.65*</td>
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<tr>
<td></td>
<td>Maternal Eating Concern</td>
<td></td>
<td></td>
<td>-1.1</td>
<td>.27</td>
</tr>
<tr>
<td></td>
<td>Pressure to eat</td>
<td></td>
<td></td>
<td>.40</td>
<td>3.42**</td>
</tr>
<tr>
<td></td>
<td>Healthy Environment</td>
<td></td>
<td></td>
<td>-.09</td>
<td>-.67</td>
</tr>
<tr>
<td></td>
<td>Balance and Variety</td>
<td></td>
<td></td>
<td>-.11</td>
<td>-.87</td>
</tr>
</tbody>
</table>

*p<.01  **p<.001; TP 2 = Time point 2

Predictors of maternal reports of child satiety responsiveness. Table 5.5 shows that in the final regression model the variables collectively predicted child satiety responsiveness, accounting for 27% of the variance (Adjusted r²). Step 1 was significant F(4,61) = 4.24, p<.01, however there were no significant individual predictors. In the final model, maternal feeding practices added a significant increase of 10% of additional variance; F(6,59) = 4.82, R² change = .10, p<.001 after controlling for maternal psychopathology. However, only mothers’ not encouraging balanced and varied food intake was a significant individual predictor of satiety responsiveness at TP 2.
Table 5.5: Significant predictors of child satiety responsiveness at TP 2 using a hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4.24(4,61)*</td>
<td>.22</td>
<td>.17</td>
<td>0.31</td>
<td>2.33</td>
</tr>
<tr>
<td></td>
<td>Maternal Anxiety</td>
<td></td>
<td></td>
<td>.19</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>Maternal Restrained Eating</td>
<td></td>
<td></td>
<td>.01</td>
<td>.07</td>
</tr>
<tr>
<td></td>
<td>Maternal Eating Concern</td>
<td></td>
<td></td>
<td>.14</td>
<td>.90</td>
</tr>
<tr>
<td>2.</td>
<td>4.82 (6,59)**</td>
<td>.31</td>
<td>.27</td>
<td>0.21</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td>Maternal Anxiety</td>
<td></td>
<td></td>
<td>.07</td>
<td>.58</td>
</tr>
<tr>
<td></td>
<td>Maternal Restrained Eating</td>
<td></td>
<td></td>
<td>.09</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td>Maternal Eating Concern</td>
<td></td>
<td></td>
<td>.07</td>
<td>.48</td>
</tr>
<tr>
<td></td>
<td>Maternal Shape Concern</td>
<td></td>
<td></td>
<td>-.11</td>
<td>-.80</td>
</tr>
<tr>
<td></td>
<td>Healthy Environment</td>
<td></td>
<td></td>
<td>-.27</td>
<td>-2.84*</td>
</tr>
<tr>
<td></td>
<td>Balance and Variety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.01  **p<.001; TP 2 = Time point 2

Predictors of maternal reports of child enjoyment of food. Table 5.6 shows that in the final regression model the variables collectively predicted child enjoyment of food, accounting for 49% of the variance (Adjusted r²); F(4,61)=16.31, p<.001. In the final model, mothers’ having healthy foods available in the home and encouraging a balanced and varied food intake were significant predictors of greater food enjoyment at TP 2.

Table 5.6: Significant predictors of child enjoyment of food at TP2 using a hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>16.31(4,61)**</td>
<td>.52</td>
<td>.49</td>
<td>-.19</td>
<td>-1.97</td>
</tr>
<tr>
<td></td>
<td>Pressure to Eat</td>
<td></td>
<td></td>
<td>.29</td>
<td>2.65*</td>
</tr>
<tr>
<td></td>
<td>Healthy Environment</td>
<td></td>
<td></td>
<td>.32</td>
<td>2.75*</td>
</tr>
<tr>
<td></td>
<td>Balance and Variety</td>
<td></td>
<td></td>
<td>.19</td>
<td>2.00</td>
</tr>
</tbody>
</table>

*p<.01  **p<.001; TP 2 = Time point 2
Discussion

The primary aim of this study was to establish the contribution of child temperament, maternal psychopathology and feeding practices in predicting child food avoidance, in a one year prospective investigation among a sample of young children. The study also aimed to establish whether parental feeding practices add to the predictive variance in eating behaviour over time, accounted for by child temperament and maternal psychopathology. Supporting the hypotheses, higher food avoidant eating behaviours at 4 years of age were associated with a more emotional child temperament, higher symptoms of maternal anxiety, depression, and eating psychopathology when children were aged 3. Child food avoidance at age 4 was also associated with greater maternal use of pressure to eat, restriction of food intake for health reasons, low involvement in food preparation, and not encouraging balanced and varied food intake or providing a healthy food-related home environment at age 3. Predictors varied amongst each of the food avoidant eating behaviours; In the final regression models mothers pressuring their child to consume food at mealtimes and not encouraging balanced and varied food intake, and not having a healthy food-related home environment at 3 years uniquely predicted child food avoidance at 4 years after accounting for the contribution of child emotionality and maternal psychopathology.

Supporting the hypotheses and extending previous research linking parental pressure to eat with feeding problems and food avoidant eating behaviours (e.g., Harris & Booth, 1992; Powell et al., 2011; Sanders et al, 1993; Gregory et al., 2011; Galloway et al., 2005) maternal reports of pressuring their child to consume more food at meals at age 3 was significantly associated with greater child food fussiness, greater slowness in eating and lower food enjoyment at age 4, after controlling for baseline eating behaviours. In addition, maternal pressure to eat at age 3, uniquely predicted child slowness in eating at age 4, after controlling for the contribution of child temperament and maternal psychopathology. Interestingly, these findings do not replicate those of chapter 3 where cross-sectionally pressure to eat was not associated with food avoidance. However, they provide some support for previous longitudinal evidence of a causal link between pressure to eat and child eating behaviour (Farrow & Blissett, 2008; Galloway et al., 2005, Gregory et al., 2011) and suggest that maternal pressure to eat at mealtimes could be a risk factor for children becoming slower eaters over time. Previous research has found that parental behaviour at mealtimes during early feeding problems may be implicated in the development of further feeding problems (Harris &
Booth, 1992), with the strategies used by parents in an attempt to increase their child’s intake ultimately exacerbating the child’s feeding problems and making mealtimes more negative for both parent and child (Harris & Booth, 1992; Skuse, 1993; Blissett et al., 2000). This may help to explain why the association between pressure to eat and food avoidant behaviours emerges longitudinally but not cross-sectionally. However, results were not clear cut, as pressure to eat only emerged as a significant predictor for 1 of 4 of the food avoidance eating behaviours, it is likely that other child and maternal factors may interact with maternal control to influence child eating behaviour, and a complex bi-directional relationship is likely.

Whilst pressure to eat was associated with all four food avoidant eating behaviours, mothers’ restriction of their child’s food intake with the purpose of limiting less healthy foods was only associated with food fussiness. This is unsurprising given that the use of restriction has primarily been associated with overweight, overconsumption and obesogenic eating behaviours (Faith, Scanlon, Birch, Francis & Sherry, 2004b; Fisher, Birch, Smicklas-Wright & Picciano, 2000) rather than feeding problems. However, as fussy eating has been defined as consuming an inadequate variety of foods (Dovey, Staples, Gibson & Haldorf; 2008; Galloway, Lee & Birch, 2003; Smith, Roux, Naidoo & Venter, 2005), it is possible that parents of fussy eaters may restrict the child’s preferred foods in an attempt to promote more varied and healthy dietary intake. However, research suggests this strategy often has the opposite effect with high levels of control being associated with a greater preference for restricted food (Fisher & Birch, 1999) and lower fruit and vegetable intake over time (Galloway et al., 2005), suggesting that such strategies could in fact further exacerbate fussy and avoidant eating behaviours in the child. Yet, within the present study, whilst an association was found, restriction did not uniquely prospectively predict child food fussiness. Mothers’ not encouraging balanced and varied food intake was the only significant individual predictor, suggesting that over time, this may be more important in the development of food fussiness.

Replicating and extending previous findings (Heim et al., 2011; Marshall et al., 2011; Van der Horst, 2012; Powell et al., 2011), the results provide evidence that some feeding practices may have a protective effect against the development of food avoidance and instead foster enjoyment of food. Encouraging balanced and varied food intake and providing a healthy food related home environment at age 3 were associated with lower levels of food fussiness, slowness in eating and satiety responsiveness and
greater food enjoyment at age 4 after controlling for baseline eating behaviours. In addition, balance and variety uniquely predicted lower food fussiness and satiety responsiveness and greater food enjoyment, and healthy environment uniquely predicted enjoyment of food, after controlling for child temperament and maternal psychopathology. These findings extend previous cross-sectional (e.g., Powell et al., 2011; Wardle et al., 2003) and longitudinal research (Coulthard et al., 2011) and suggest that exposing children to a healthy food-related home environment and encouraging them to eat a wide variety of balanced foods during early childhood may help to reduce future food fussiness and increase future food enjoyment.

Involving children in food planning and preparation was also positively correlated with food enjoyment, extending previous research highlighting the importance of co-participation in food related activities (Heim et al., 2011; Marshall et al., 2011; Van der Horst, 2012). It has been suggested that hands on activities like cooking and food preparation give children positive feelings such as ownership and pride (Heim et al., 2011) and lead to a positive evaluation of the food experience increasing liking of foods and willingness to try them (Van der Horst, 2012). The results of the present study also suggest that it is likely to not merely be exposure to a healthy environment that is important but also, receiving positive encouragement from parents and being allowed to be involved in food related activities such as food preparation that influences the development of food enjoyment and a reduction in food fussiness. Whilst encouraging balanced and varied food intake and providing a healthy food-related environment were the only feeding practices to uniquely predict future food avoidant eating behaviour after controlling for child temperament and maternal psychopathology, it is likely that these feeding practices interact, and collectively they explained a significant increase in variance across all four eating behaviours. Further research is needed to continue to explore these feeding practices during early childhood in order to better understand how they impact on the development of eating behaviour.

Contrary to the hypotheses and previous research identifying child temperament as a correlate of eating behaviour (Farrow & Blisset, 2006; Hagekull, Bohlin & Rydell, 1997; Haycraft et al., 2011; Powell et al., 2011), child emotionally at age 3 was only associated with greater child food fussiness at age 4, and whilst it also significantly predicted food fussiness, this association was not significant after accounting for the influence of maternal feeding practices. This suggests that whilst an emotional temperament may be an important child characteristic implicated in child food
avoidance (Haycraft et al., 2011; Powell et al., 2011), prospectively maternal feeding practices explain a greater amount of the variance in child food avoidance and may be more important in the development of eating behaviour over time. This is particularly important as intrinsic child characteristics such as temperament are largely stable and enduring, whereas feeding practices represent an area that is potentially modifiable and could therefore be targeted for intervention and the prevention of feeding difficulties during early childhood.

Finally supporting the hypotheses and previous research (Ammaniti et al., 2004; Blissett et al., 2007; Stice et al., 1999) symptoms of maternal anxiety at age 3 were associated with greater food fussiness and slowness in eating and lower food enjoyment at age 4 after controlling for baseline eating behaviour. Maternal anxiety symptoms also significantly predicted food fussiness and slowness in eating, however anxiety did not uniquely predict food fussiness once maternal feeding practices were added into the regression models. Similarly, symptoms of maternal depression and aspects of maternal eating psychopathology were also associated with future eating behaviour, yet they did not emerge as significant predictors of food avoidance after accounting for the variance explained by maternal feeding practices. Collectively these findings suggest that whilst symptoms of maternal psychopathology are likely to be implicated in the development of child food avoidance they are less key than maternal feeding practices.

Whilst the age range of participants were chosen as this period has been identified as a critical period in the development of eating behaviour (Birch & Fisher, 1998; Cashdan, 1994; Illingworth & Lister, 1964) there is evidence to suggest that the explored predictors may begin to impact on child eating from birth, through weaning and the early years (e.g., Farrow & Blissett, 2006; Farrow & Blissett, 2008). Future prospective studies should aim to recruit participants during pregnancy or earlier in life in order to identify true risk factors and protective factors for the development of food avoidance eating behaviours. In addition, little is known about the early trajectory of child food avoidance eating behaviour, and despite recent research suggesting that child eating behaviour may show consistency and stability from as young as 2 years old (Farrow & Blissett, 2012) further exploration of the consistency and stability of food avoidant eating behaviours across early in childhood is essential. A limitation of the present study was the use of the CMCS (Haycraft, 2007) to measure and code some aspects of child eating behaviour, such as difficulty to feed and positive and negative vocalisations about food. These measures have no published psychometric properties,
yet within the present study they were shown to have good test retest reliability and showed good correspondence with parent-report (see Chapter 4; Table 4.3).

The results of the present study have demonstrated the specificity of predictors of child food avoidant eating behaviours over time. Whilst longitudinal support was found for many of the preceding correlates of food avoidance, the results found that, after controlling for initial levels of eating behaviour maternal pressure to eat, not providing a healthy food-related home environment and not encouraging balanced and varied food intake were the only maternal factors which uniquely predicted increased child food avoidant eating behaviour over time. The findings suggest that after controlling for baseline levels of eating behaviour there was minimal predictive ability of the hypothesised child temperamental and maternal psychopathological factors on subsequent food avoidant eating behaviour. This suggests that risk factors for future food avoidance may be less about inherent psychological characteristics and instead be more about family environmental factors such as feeding practices. This has important practical implications for parents, clinicians and health professionals working with children with feeding problems as it highlights the mealtime interactions as a modifiable area to target for the intervention and the prevention of feeding difficulties during early childhood. In addition this study highlights the need for future research to utilise longitudinal designs and explore the long term benefits of adaptive feeding practices. Further investigation of non-clinical groups during early childhood may not only provide insight into the risk factors implicated in the aetiology and maintenance of feeding problems, but may also help to prevent the development of these problems that can persist throughout childhood and into adolescence (McDermott et al., 2010; Kotler et al., 2001; Marchi & Cohen, 1990).
CHAPTER 6

Longitudinal predictors of food avoidant eating behaviour during early childhood; observed associations with maternal feeding practices and mealtime behaviours

The current chapter represents the second of two chapters exploring the longitudinal predictors of child food avoidance eating behaviours. Chapter 5 utilised self-report measures to demonstrate the child temperamental, maternal psychopathological and maternal feeding practice predictors of child food avoidance eating behaviour over time. Specifically it reported that food avoidance eating behaviours at age 4 were prospectively predicted by an emotional child temperament, symptoms of maternal anxiety, mothers pressuring their child to consume food at mealtimes and not encouraging balanced and varied food intake, and not having a healthy food-related home environment at age 3.

Chapter 4 utilised observational measures to explore parent-child interactions at mealtimes in more depth and demonstrated several significant and novel cross-sectional associations between independent observations of child food avoidant eating behaviours with maternal feeding practices, interactional behaviour and mealtime structure variables. Specifically it found that mealtime structure was an important factor which significantly distinguished dyads with higher compared to lower levels of food avoidance, and it identified observed verbal pressure to eat, physical prompts, expressed negative emotion, interactional conflict, low sensitivity, low positive expressed emotion and vocalisations as cross-sectional correlates of observed child food avoidance. This Chapter extends these findings by exploring the contribution of these variables at age 3 to predict child food avoidance longitudinally one year later at age 4. Observational studies utilising longitudinal designs are rare, yet they are essential to establish temporal precedence and draw conclusions about potential causal relationships.

An edited version of this chapter will be submitted as: Powell, F. C. Farrow, C., & Meyer, C. (2012). The influence of maternal feeding practices and mealtime behaviours on child food avoidant eating behaviour: a longitudinal and observational study in early childhood
Longitudinal predictors of food avoidant eating behaviour during early childhood; observed associations with maternal feeding practices and mealtime behaviours

Abstract
The principal aim of this study was to evaluate the contribution of independently observed maternal feeding practices and mealtime interaction variables at age 3 in predicting observed child food avoidance at age 4. This study also aimed to establish whether there were any significant differences between observations of children’s eating behaviour at 4 years of age according to observed mealtime structure at 3 years. Sixty five mothers were observed with their child during a typical mealtime in their home when their children were aged approximately 3 years old, and again 1 year subsequently. Mealtime structure, specifically; mothers eating with child, eating the same food as their child, allowing the child autonomy in food choice and not using distractions at age 3, distinguished dyads with lower compared to higher levels of food avoidance at age 4. Independent observations of more avoidant child eating behaviour at age 4 were associated with greater maternal use of pressure to eat and physical prompts, more interactional conflict, more negative and less positive maternal expressed emotion, and lower maternal feeding sensitivity during observations at age 3. Unique significant predictors of food avoidance at age 4, after controlling for baseline eating behaviour at age 3, were pressure and physical prompts to eat, interactional conflict and a lack of expressed positive emotion. Overall results suggest a protective effect of structured family meals, and a positive feeding dynamic characterised by warmth and sensitivity and low conflict or coercion. These findings extend our knowledge concerning the preventative advice that can be offered to parents who are concerned about their children developing fussy or fussier eating habits.
Longitudinal predictors of food avoidance eating behaviour during early childhood; observed associations with maternal feeding practices and mealtime behaviours

Introduction

Feeding problems and struggles with food are common concern (Murashima, Hoerr, Hughes & Kaplowitz, 2011; Colthard & Harris, 2003; Lindberg, Bohlin, Hagekull, 1991), with many children not consuming healthy and varied diets (Yngve et al., 2005) and displaying avoidant eating behaviours (Sanders, Patel, Le Grice & Sheppard, 1993). These behaviours are an important health concern (Chatoor et al., 1988; Hagekull & Dahl, 1987; Marchi & Cohen; Wright & Birks, 2000) and thus an understanding of the predictors and precursors of these behaviours is a top priority for researchers, healthcare professionals and parents alike. At the forefront of much of the current research on the development of children’s eating behaviour are family-environmental influences. The family is the primary social institution influencing young children, thus, the development of child eating behaviour is likely to have substantial roots within the family context (Ventura & Birch, 2008). Research in this area has tended to largely focus on maternal feeding practices, such as the use of pressure to eat, restriction of food, the use of rewards for eating and monitoring food intake and their association with child eating behaviour and weight. However, despite extensive cross-sectional evidence, longitudinal studies remain rare and results often equivocal. For example, whilst there is limited longitudinal evidence of a causal link between parental feeding practices such as pressure to eat, and child eating behaviour and weight status (Farrow & Blissett, 2008; Galloway, Fiorito, Lee & Birch, 2005; Gregory, Paxton & Brozovic, 2011) it has also been shown that parental feeding practices may be employed in response to the child’s eating behaviour and weight status (Birch & Fisher, 2000; Chatoor, Egen, Geston, Menveille & O’Donnell, 1988; Drucker, Hammer, Agras & Bryson, 1999; Farrow, Galloway & Fraser, 2009; Iannotti, O’Brien & Spillman, 1994; McKenzie et al., 1991). Longitudinal observational studies, particularly in non-clinical samples are very rare and often limited by small sample sizes. Further prospective studies, using observational measures to validate parent report, are needed to elucidate the role of maternal control in the development of child eating behaviour.
Research exploring family-environmental influences on child eating behaviour is beginning to explore the wider socialisation of family mealtimes, including their frequency, structure (e.g. whether parents are present, where mealtime took place, the use of distractors to feed) and the interactional dynamic between mother-child dyads (e.g. interpersonal involvement, the affective nature of mealtimes and conflict/harmony of interactions). The frequency of family mealtimes have been increasingly explored (e.g., Chan & Sobal, 2011; Gable, Chung & Krull, 2007; Hammons & Fiese, 2011) and cross-sectionally frequency has been associated with healthier child weight (e.g., Sen, 2006), more adaptive child eating behaviour (Gillman et al., 2000; Boutelle, Lytle, Murray, Birnbaum & Story, 2001), and the consumption of healthier foods (e.g., Videon & Manning, 2003). Longitudinally, frequent family meals, a positive atmosphere at family meals, and a more structured family meal environment during adolescence have been associated with a decreased risk of adolescent disordered eating (Neumark-Sztainer, Eisenberg, Fulkerson, Story & Larson, 2008; Neumark-Sztainer, Wall, Haines, Story, Sherwood & van den Berg, 2007). However, the majority of these studies have been carried out amongst older child and adolescent samples, and studies in early childhood using longitudinal designs are rare. In addition, studies have largely focused on frequency of family mealtimes and have not explored other measurable aspects of mealtime structure such as, such as whether siblings are present, whether the mother eats the same food as the child and whether distractors are used (Orrell-valante et al., 2007). Cooper et al. (2004) reported higher levels of mealtime disorganisation (not eating with parents, eating in the living room, using distractions at meals) in children with feeding problems compared to controls. Similarly, Chapter 4 found significant differences in food avoidant eating behaviour dependent on whether mothers ate with, and ate the same food as their child, allowed them autonomy in food choice and used a distractor, or not. However to date no research has explored these behaviours longitudinally in a sample of children during early childhood.

Researchers have also begun to explore parent-child interactions within mealtimes, rather than just feeding practices per say, in more depth (e.g., Cjaza, 2011). It is generally accepted that maternal child interaction is of high importance to child development (Chatoor, 2000; Robertson, Puckering, Parkinson, Corlett & Wright, 2011) and several studies emphasise the importance of parental warmth, support, sensitivity, responsiveness and involvement for the well-being of children and adolescents (e.g., Ainsworth, Blehar, Water & Wall, 1978; Baumrind, 1993; Maccoby
and Martin, 1983; Patterson et al., 1992). Similar features are likely to be important within feeding interactions (Chatooor, 2000; Rhee, Lumeng, Appugliese, Kaciroti & Bradley, 2006; Kremers, et al., 2003; Patrick, Nikolas, Hughes & Morales, 2005) and preliminary cross-sectional maternal report studies have pointed to the importance of potentially positive behaviours displayed during mealtimes such as warmth, sensitivity, interpersonal involvement, modelling, praise, positivity and enthusiastic comments (e.g., Patterson et al., 1992; Moens, Braet & Soetens, 2007; Patrik et al., 2005; Robertson, 2011) as effective means of encouraging healthy food consumption.

Whilst studies that rely purely on parent-report measures can offer an insight into the aspects of maternal-child interactions during mealtimes and their influence on eating behaviour, independent observations of mealtimes allow researchers to examine these factors in greater depth. Robertson et al. (2011) in an observational study of children aged between 1 and 2 years, found difference in parent–child meal time interaction between children with growth faltering and healthy controls. Mothers of children with growth faltering displayed less positive, sensitive interactions with their infants (low awareness of child autonomy, less responsiveness and warmth, low cooperation with the child) compared to controls. However due to the cross-sectional nature of the study it was not clear whether this is a causal relationship or an adaptive response to the child’s eating behaviour. There has been limited research amongst non-clinical groups; however one prospective study found that feeding problems at age 2 years were predicted by the interaction between infant temperament and lower maternal sensitivity (Hagekull et al., 1997). Chapter 4 explored mealtime behaviours such as sensitivity, positive emotion and positive comments as cross-sectional correlates of lower food avoidance in children aged 2-4, however, no research to date has explored these relationships over time.

Given the negative outcomes associated with fussy eating and feeding problems (e.g., Chatooor et al., 1988; Galloway et al., 2005; Wright & Birks, 2000), and evidence that they can persist across childhood and into adulthood (e.g., Kotler et al., 2001; Marchi & Cohen, 1990; McDermott et al., 2010) prospective research beginning in early childhood is essential. Although some of the preceding associations of feeding problems have been replicated, studies have invariably adopted cross-sectional designs, not used observational measures, or have failed to follow children from early enough. In addition previous research has often focused on feeding practices alone and failed to explore the complex dynamics of parent-child interaction at mealtimes amongst non-
Food avoidance in children

clinical populations. Understanding the risk factors during this critical period before the onset of more serious feeding problems provides opportunities for prevention and intervention. Longitudinal designs are needed to establish temporal precedence in order to ascertain whether these factors are a result of child eating behaviour or whether they actually play a role in their development so that the complex bi-directional nature of feeding interactions can be better understood.

Aims and Hypotheses

The first aim of the present study was to explore whether there were any significant differences between observations of children’s eating behaviour at 4 years of age according to observed mealtime structure at 3 years. The study also aims to establish whether observed maternal feeding practices (pressure to eat, physical prompts, use of incentives) and mealtime interactional behaviours (expressed emotions, vocalisations, sensitivity, interactional conflict) at 3 years of age predict observed child avoidant eating behaviour at 4 years.

It was hypothesised that independent observations of child eating behaviours at age 4 would differ dependent on the mealtime structure at age 3, with children displaying less food avoidance at age 4 (lower food refusal, faster eating rate, more positive vocalisations about food) if their mothers ate with them, ate the same food as them, allowed the child input into food choice and did not use a distractor such as the TV or toys during the meal at 3 years. It was also hypothesised that independent observations of more avoidant child eating behaviour at 4 years would be associated with greater use of observed coercive feeding strategies; pressure to eat, physical prompts to eat, the use of incentives, and lower sensitivity to the child’s needs at 3 years. Finally it was hypothesised that independent observations of more avoidant child eating behaviour at age 4 would be associated with previous observations of less positive expressed emotion, fewer positive comments and praise, and more interactional conflict, negative comments and negative expressed emotion by the mother during meals at 3 years.

Method

Participants

Seventy-five mothers of children aged 2-5 years were recruited through nurseries, pre-schools and children’s centers, to take part in the longitudinal element of
this study. These participants completed a set of standardised questionnaires and took part in a home mealtime observation at age 3 (TP 1: Chapter’s 3 & 4), and 65 took part in the mealtime observation at a 12 month follow up at 4 years (TP2: present study).

For a description of the sample at TP 1 see Chapter 4. The mean age of the mothers at the 12 month follow up was 37.03 years (Range = 28.42-47.92, SD= 4.25) and the mean age of the children was 4.40 years (Range = 3.10-5.62, SD = 1.13). There were 32 mothers of boys and 33 mothers of girls. Mean maternal years of education post-16 years of age was 5.02 (Range = 1.00-9.00 years, SD = 1.76) and 97% of the mothers in this sample described themselves as White British. Participants reported a wide range of occupations: ranging from 1 (managers and senior officials) to 8 (elementary occupations), using the Standard Occupational Classification 2000 (Office for National Statistics, 2000) with a modal occupation level of 4 (administrative and secretarial occupations). Family income ranged from < £15,000 to > £75,000 per annum with a modal annual family income of £45,000-£60,000.

**Measures and Procedure**

Mothers and their children were visited, approximately 12 months after initial participation (range 11.10-12.90 months) for a follow-up home mealtime observation. Mother-child dyads were observed during a typical lunch or evening meal at the family’s home using a video camera. For full details of the protocol used see Chapter 2. After the meal, the mother was asked to rate the typicality of both the mealtime in general and specifically in relation to the target child’s behaviour on a scale from “1” (very untypical meal/behaviour) to “5” (very typical meal/behaviour). Exclusion from the study was planned if any parents gave a score of less than 3, but this was not necessary as no parents scored <3.

**Observational Measures**

Due to a lack of a widely accepted comprehensive tool for use of observing family mealtimes in either clinical or non-clinical groups, aspects from various assessment measures were used when coding the mealtimes to address all of the variables of interest. See Chapter 2 (Appendices O-R) for a full description of these measures.
**Mealtime structure and environment** (Cooper, Wheelan, Woolgar, Morrel & Murray, 2004; Orrell-Valente, Hill, Brechwald, Dodge, Pettit & Bates, 2007). The mealtimes were firstly coded with 6 items relating to the environment, structure and organisation of the child’s mealt ime, using a combination of variables previously used by Cooper et al. (2004) and Orrell-Valente et al. (2007). These incorporate whether the mother eats with the child, whether she eats the same food as child, whether the child is allowed input in food choice or portion size, whether the child eats with siblings, whether the father eats with the child, and whether distractions are used (e.g. watching television or toys).

**Child eating behaviour.** The Child Mealtime Coding System (CMCS; Haycraft & Blissett, 2008) and an adapted scale from the Behavioural Coding Inventory (BCI; Young & Drewett, 2000) were used to code observations of child eating behaviour. Variables measured were speed of eating, food refusals, difficulty to feed and positive and negative vocalisations about food.

**Maternal feeding practices and mealtime behaviour.** The Family Mealt ime Coding System (FMCS; Haycraft & Blissett, 2008) was used to measure the frequency of mothers’ pressuring their child to consume more food, physically prompting the child to consume more food, using incentives such as conditions or rewards to get their child to eat, and the frequency of positive and negative comments by the mother in relation to food. A count was made for each time the mother displayed each of these behaviours over the course of the meal. Four subscales from The Feeding Interaction Scale (FIS; Wolke, Summer, McDermott & Skuse, 1987) were also used to rate maternal behaviour during the meal; interactional conflict, feeding sensitivity (both rated on a 9 point likert scale) and the amount/frequency of both expressed positive and negative emotion (rated on a 5 point likert scale).

**Inter-rater reliability.** For the coding system implemented an independent second observer, who was trained on each coding method, coded a random sample of 20% of the observations. Inter-rater reliability was then calculated for all of the variables within each coding measure using intra-class correlation co-efficients. The mean intraclass co-efficient was .88 (range .83-.96) and the mean level of significance was p<.001, indicating that the coding of this measure achieved good reliability.
Mother and child BMI. Where parents and children consented, objective measures of height and weight were obtained by the researcher (for 58 of the children and 29 of the mothers at TP 2). BMI Z scores for the children were calculated using the Child Growth Foundation’s (1996) growth references which adjusts for child age and gender.

Data Analyses

Preliminary analysis of the data using Shapiro-Wilk tests and visual inspection of plots/graphs indicated the data was largely non-normally distributed, consequently where possible non-parametric statistics were used. To screen the data for potential confounding variables, a series of Spearman’s two-tailed correlation analyses were used and revealed no significant associations between observed child eating behaviour and maternal feeding practices with the demographic variables of parent age, parent and child BMI, child birth weight, parent and maternal occupation and education level and family income (all p<.01). Child age was unrelated to observed maternal feeding practices, however younger children were observed to refuse more foods (r= -.39, p<.01), make more negative vocalisations about food (r= -.38, p <.01) and were slower to eat their meals (r = .36, p<.01). Mann-Whitney tests indicated that there were no statistically significant differences between White or non-White mothers and children or between male and female children, in observed child eating behaviour or observed maternal feeding practices. There were also no significant differences in observed child eating behaviour, dependent on whether families were observed at lunch (n=33) or at the evening meal (n = 32), and whether the father or siblings were present. Therefore the sample was analysed as a whole but where significantly related, child age was controlled for in relevant analyses.

Mann-Whitney U tests were conducted to evaluate whether there were significant differences in child eating behaviour at 4 years of age dependent on the mealtime structure and environment at age 3. Following this, a series of two-tailed partial correlations, controlling for baseline eating behaviour and child age (where significantly related), were used to explore the longitudinal relationships between observed child eating behavior at 4 years with observed maternal feeding practices and interactional behaviour during the mealtime at 3 years. These analyses were performed to select variables for hierarchical regressions, a method which is common place in
studies with a large number of independent variables (Stopa et al., 2001). Alpha levels of .01 were adopted throughout the analyses to reduce the risk of type I errors.

To identify the longitudinal predictors of child food avoidance eating behaviour a series of two-tailed hierarchical multiple regressions were performed with the outcome variables being each of the TP2 eating behaviours (slowness in eating, food refusal, difficulty to feed, positive/negative comments about food). Where significant, child age was entered in Step 1 and then significantly correlated maternal feeding practices and behaviours were entered in Step 2. Hierarchical regressions are commonly used when investigating the contribution of hypothesised variables over and above the variance explained by other variables established as influential to the dependent variable. Therefore this method was used to determine whether maternal feeding practices and behaviours add to the predictive variance in child eating behavior at 4 years, after controlling for child age (where relevant). The use of multiple regressions and partial correlations were deemed satisfactory as inspections of the residuals demonstrated normal distributions and homoscedasticity (Field, 2005) and no multicollinearity (Bowerman & O’connell, 1990; Myers, 1990).

**Results**

**Descriptive Statistics**

For a description of the sample at TP 1 see Chapter 4. Fifty-six mothers self-reported their height and weight, and maternal mean BMI was 23.02 (SD= 3.23), suggesting that mothers were on average of healthy body weight (BMI < 25: World Health Organization, 1998). Twenty-three percent of mothers gave a BMI which indicated they were either overweight (BMI >25) or obese (BMI > 30: WHO 1998) which corresponds to approximately the national averages. Out of the 56 mothers who reported their height and weight, objective measures of height and weight were also obtained during the visit by the researcher for 29 mothers. Interclass correlations revealed a correlation coefficient of .73 at p<.01, suggesting that mothers were broadly accurate in reporting their height and weight.

Fifty-four mothers reported their child’s height and weight and BMI Z scores for the children were calculated using the Child Growth Foundation’s (1996) growth references which adjust for age and gender. The mean reported BMI Z-score was -.02 (Range = -3.24 – 2.87, SD = .91), indicating a healthy BMI. Objective measures of height and weight were obtained by the researcher, after the mealtime was complete, for
60 of the children (5 parents or their child did not give consent). Mean BMI Z-score (based on actual height & weight) was .62 (Range = -2.62 – 2.87, SD = .89), indicating a higher but also healthy BMI. Using Cole et al’s standard definitions for overweight and obesity corrected for age and gender (Cole, Bellizzi, Flegal & Dietz, 2000) 86.7 % of the sample were healthy weight, 5 % were underweight and 8.3 % were overweight or obese. Interclass correlations revealed a correlation coefficient of .48 at p<.05, suggesting that mothers were only moderately accurate in reporting their child’s BMI. Table 6.1 shows mean change scores for child BMI Z scores between TP 1 and TP 2 and results from Wilcoxon matched signed rank tests which suggest consistency in child BMI over time. Figure 6.1 shows mean BMI Z-score change on a graph.

Table 6.1: Descriptive statistics and Wilcoxon signed rank tests for child BMI Z score

<table>
<thead>
<tr>
<th>Variable</th>
<th>3 years mean (SD) N = 75</th>
<th>4 years mean (SD) N = 65</th>
<th>Mean change 3-4 years (SD) N = 65</th>
<th>Wilcoxon Z score</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI Z Score</td>
<td>.55 (.86)</td>
<td>.62 (.89)</td>
<td>.07 (.61)</td>
<td>.42</td>
</tr>
</tbody>
</table>
Descriptive statistics for independent observations of child eating behaviour and maternal feeding practices and mealtime behaviour are presented in Table 6.2. Mean scores for the CMCS, FMCS and FIS are similar to other published data in similar samples in terms of demographics (Haycraft, 2007; Haycraft & Blissett, 2008; Farrow; 2005). The mean length of the mealtime was 21.66 minutes and mealtimes ranged from 10.20 to 45.00 minutes.

Table 6.2: Descriptive statistics for independent observations of child eating behaviour and maternal feeding practices and mealtime behaviours.
### Food avoidance in children

<table>
<thead>
<tr>
<th>Child eating</th>
<th>Time point 1 (N = 75)</th>
<th>Time point 2 (N = 65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (mouthfuls per minute)</td>
<td>3.14 (1.57)</td>
<td>3.07 (1.32)</td>
</tr>
<tr>
<td>Behaviour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food refusals&lt;sup&gt;c&lt;/sup&gt;</td>
<td>4.50 (5.94)</td>
<td>4.12 (7.18)</td>
</tr>
<tr>
<td>Difficult to feed&lt;sup&gt;r&lt;/sup&gt;</td>
<td>2.39 (1.08)</td>
<td>2.08 (0.83)</td>
</tr>
<tr>
<td>Positive vocalisations about food&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.57 (3.34)</td>
<td>3.15 (2.90)</td>
</tr>
<tr>
<td>Negative vocalisations about food&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.55 (2.95)</td>
<td>1.45 (2.77)</td>
</tr>
<tr>
<td>Maternal feeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat&lt;sup&gt;c&lt;/sup&gt;</td>
<td>4.05 (5.03)</td>
<td>2.63 (4.24)</td>
</tr>
<tr>
<td>Mealtime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical prompts&lt;sup&gt;c&lt;/sup&gt;</td>
<td>5.14 (10.82)</td>
<td>3.60 (7.60)</td>
</tr>
<tr>
<td>Mealtime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeding Sensitivity&lt;sup&gt;r&lt;/sup&gt;</td>
<td>6.60 (1.64)</td>
<td>6.86 (1.86)</td>
</tr>
<tr>
<td>Interactional Conflict&lt;sup&gt;r&lt;/sup&gt;</td>
<td>3.05 (1.82)</td>
<td>2.97 (2.16)</td>
</tr>
<tr>
<td>Expressed positive emotion&lt;sup&gt;r&lt;/sup&gt;</td>
<td>3.98 (.87)</td>
<td>4.05 (.82)</td>
</tr>
<tr>
<td>Expressed negative emotion&lt;sup&gt;r&lt;/sup&gt;</td>
<td>1.38 (.80)</td>
<td>1.45 (.71)</td>
</tr>
<tr>
<td>Positive vocalisations about food&lt;sup&gt;c&lt;/sup&gt;</td>
<td>6.19 (3.96)</td>
<td>3.95 (2.77)</td>
</tr>
<tr>
<td>Negative vocalisations about food&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.35 (2.61)</td>
<td>.11 (4.44)</td>
</tr>
<tr>
<td>Mealtime</td>
<td>Length of mealtime (minutes)</td>
<td>23.31 (7.60)</td>
</tr>
</tbody>
</table>

SD = Standard deviation; <sup>c</sup> = counts – frequency of occurrence across mealtime; <sup>r</sup> = ratings – objective rating based on mealtime – higher score reflect higher rating

**Frequency Statistics**

Table 6.3 displays frequency statistics for the observed family mealtimes in relation to the mealtime structure and environment. In addition, 32 mother-child dyads were observed at lunchtime and 33 were observed in the evening.

---

**Table 6.3. Descriptive and frequency statistics for the observed mealtime environment**
### Mealtime Environment

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother present</td>
<td>65</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Father present</td>
<td>18</td>
<td>47</td>
<td>65</td>
</tr>
<tr>
<td>Sibling/s present</td>
<td>46</td>
<td>19</td>
<td>65</td>
</tr>
<tr>
<td>Whole family present</td>
<td>18</td>
<td>47</td>
<td>65</td>
</tr>
<tr>
<td>Mother eating with child</td>
<td>40</td>
<td>25</td>
<td>65</td>
</tr>
<tr>
<td>Mother eating same as child</td>
<td>37</td>
<td>28</td>
<td>65</td>
</tr>
<tr>
<td>Child allowed input in food choice</td>
<td>34</td>
<td>22</td>
<td>65</td>
</tr>
<tr>
<td>Distraction used</td>
<td>12</td>
<td>53</td>
<td>65</td>
</tr>
</tbody>
</table>

**Effects of mealtime structure and environment at 3 years on observed child eating behaviour at 4 years**

Two-tailed Mann-Whitney U tests were used to explore whether there were any significant differences in observations of childrens’ eating and mealtime behaviour at age 4 dependent on mealtime structure and environment at age 3. Children whose mothers ate with them at 3 years were observed at 4 years to refuse fewer foods ($U = 758.500, z = 3.67, p < .001$), to make fewer negative comments ($U = 238.00, z = -3.64, p < .001$) and more positive comments about food ($U = 742.00, z = 3.47, p < .001$) and were observed as being easier to feed at age 4 ($U = 334.50, z = -2.53, p < .01$) than those whose mothers did not. In addition children whose mothers ate the same food as them during the observed meal at 3 years were observed at 4 years to refuse fewer foods ($U = 742.50, z = -3.33, p = .001$), to make less negative vocalisations about food ($U = 750.00, z = -3.48, p < .001$), and more positive vocalisations about food at 4 years ($U = 293.00, z = 2.96, p < .01$) than those whose mothers did not. However, there were no significant differences between the eating behaviour of children at 4 years if their father or another sibling was eating with them at 3 years of age.

Children who were allowed some input in food choice at 3 years, were observed at 4 years to refuse fewer foods during the meal ($U = 112.50, z = -2.51, p = .01$), made less negative vocalisations about food during the meal ($U = 745.00, z = -4.22, p < .001$), had a faster eating rate ($U = 237.00, z = 3.38, p = .001$), and were observed as being easier to feed ($U = 305.50, z = -2.63, p < .01$) than those children had no choice in the
amount or type served to them. Children who had a distraction (e.g., TV, radio, books, magazines, toys) present during the meal at 3 years were observed at 4 years to refuse more foods ($U = 160.50, z = 2.61, p < .01$), and to make more negative vocalisations about food ($U = 45.50, z = 4.02, p < .001$), less positive vocalisations about food ($U = 398.50, z = -3.44, p = .001$), and to have a slower eating rate at age 4 ($U = 385.50, z = -3.15, p < .01$) compared to those who had no distractions during the meal at age 3.

**Correlation Analyses; longitudinal relationship between observed maternal feeding practices and mealtime behaviours at 3 years with observed child eating behaviour at 4 years, controlling for baseline child eating behaviour.**

A series of partial correlations were used to assess which maternal feeding practices and behaviours at 3 years were significantly correlated with observed child food avoidance at age 4 after controlling for baseline eating behaviour (and child age where relevant). As Table 6.4 indicates, after controlling for child age and baseline child eating speed at age 3, observations of maternal pressure to eat and physical prompts at age 3 where associated with child slowness in eating at age 4. Observations of greater food refusals at age 4 were associated with higher maternal pressure to eat and physical prompts to get the child to eat, greater interaction conflict at mealtimes and lower positive expressed emotion and sensitivity during mealtimes at age 3. Observed ratings of the child being more difficult to feed at age 4 were associated with observation of greater interactional conflict and greater maternal expressed negative emotion at age 3.

After controlling for baseline eating behaviour at age 3, children observed to make more positive vocalisations about food at age 4 were observed to have mothers who had expressed more positive and less negative emotion, used less pressure to eat and less physical prompts, used fewer incentives and conditions and had lower interactional conflict at mealtimes at age 3. Observations of more negative vocalisations about food at 4 years were associated with previous observations of more maternal pressure to eat, physical prompts, more negative expressed emotion and interactional conflict, along with lower feeding sensitivity and expressed positive emotion at 3 years old.
Table 6.4: Two-tailed partial correlations, controlling for child eating behaviour at age 3 (and child age where relevant), between observed maternal feeding practices and mealtime behaviours with observed child eating behaviour

<table>
<thead>
<tr>
<th>Observed child eating behaviour at TP2</th>
<th>Eating speed^</th>
<th>Food refusals</th>
<th>Difficult to feed^</th>
<th>Positive vocalisation food</th>
<th>Negative vocalisation food^</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal feeding practices and behaviours at TP 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>-.40**</td>
<td>.62**</td>
<td>.31</td>
<td>-.48**</td>
<td>.61**</td>
</tr>
<tr>
<td>Physical prompt</td>
<td>-.36*</td>
<td>.52**</td>
<td>.20</td>
<td>-.35*</td>
<td>.43**</td>
</tr>
<tr>
<td>Conditions &amp; rewards</td>
<td>-.12</td>
<td>.33</td>
<td>.19</td>
<td>-.36*</td>
<td>.32</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>.27</td>
<td>-.37*</td>
<td>-.32</td>
<td>.29</td>
<td>-.49**</td>
</tr>
<tr>
<td>Interactional conflict</td>
<td>-.30</td>
<td>.40**</td>
<td>.52**</td>
<td>-.45**</td>
<td>.57**</td>
</tr>
<tr>
<td>Positive emotion</td>
<td>.31</td>
<td>-.36*</td>
<td>-.25</td>
<td>.37*</td>
<td>-.48**</td>
</tr>
<tr>
<td>Negative emotion</td>
<td>-.23</td>
<td>.30</td>
<td>.44**</td>
<td>-.38*</td>
<td>.56**</td>
</tr>
<tr>
<td>Positive vocalisation food</td>
<td>-.17</td>
<td>-.03</td>
<td>.44**</td>
<td>-.38*</td>
<td>.07</td>
</tr>
<tr>
<td>Negative vocalisation food</td>
<td>-.03</td>
<td>-.02</td>
<td>.10</td>
<td>.02</td>
<td>-.01</td>
</tr>
</tbody>
</table>

*p < .01; ** p < .00; ^ = Controlling for baseline eating behaviour and child age; TP1 = Time point 1; TP 2 = Time point 2

Predictors of child eating behaviours

Five hierarchical multiple regressions were performed to evaluate the contribution of observed parental feeding practices and mealtime behaviours at 3 years of age to predict observed child eating behaviour at age 4, after controlling for child age (where significant). Child age (where significantly related) was entered in step 1 and observed maternal feeding practices and mealtime behaviours at age 3 were entered in step 2 to predict observed child eating behaviour at age 4. Only significant correlates were used in these analyses. Detailed results of the predictors for each of the food avoidance outcome variables are presented in Tables 6.5-6.9.
Predictors of observed child eating speed. Table 6.5 shows that in the final regression model the variables significantly collectively predicted child eating speed, accounting for 39% of the variance (Adjusted $r^2$). Step 1 was not significant; $F(1,64) = 5.42$, adjusted $R^2 = .40$, $p<.001$. In the final model, after controlling for child age, maternal feeding practices and behaviours significantly added to the regression, accounting for an additional 32% of the variance in eating speed at age 4; $F(3,62)=14.33$, $R^2$ change = .32, $p<.001$. However the only significant unique predictor was mothers’ pressuring their child to eat at age 3.

Table 6.5. Significant predictors of child eating speed at TP 2 using hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>Beta</th>
<th>$T$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>5.42(1,64)</td>
<td>.08</td>
<td>.07</td>
<td>.29</td>
<td>2.33</td>
</tr>
<tr>
<td></td>
<td>Child age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>14.33(3,62)**</td>
<td>.42</td>
<td>.39</td>
<td>-.50</td>
<td>-4.24**</td>
</tr>
<tr>
<td></td>
<td>Child age</td>
<td></td>
<td></td>
<td>.09</td>
<td>.83</td>
</tr>
<tr>
<td></td>
<td>Pressure to eat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical prompt to eat</td>
<td></td>
<td></td>
<td>-.17</td>
<td>-1.47</td>
</tr>
</tbody>
</table>

*p<.01 **p<.001; TP 2 = Time point 2

Predictors of observed child food refusal. Table 6.6 shows that in the final regression model the variables collectively predicted child food refusal at age 4, accounting for 51% of the variance (adjusted $r^2$). Step 1 was significant; $F(1,64) = 8.16$, adjusted $R^2 = .10$, $p<.01$, and child age significantly predicted food refusal at age 4 ($\beta = -.34$, $t = 2.90$, $p <.01$). After controlling child age, maternal feeding practices and behaviours significantly added to the regression, accounting for an additional 41% of the variance; $F(6,59) = 32.47$, $R^2$ change = .41, $p<.001$. In the final model, mothers pressuring and physically prompting the child to eat, and interactional conflict at mealtimes at age 3 were significant unique predictors of greater food refusal at age 4.
Table 6.6: Significant predictors of TP 2 food refusal using hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>8.16(1,64)*</td>
<td>.12</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child age</td>
<td></td>
<td></td>
<td></td>
<td>-.34</td>
<td>-2.90*</td>
</tr>
<tr>
<td>2.</td>
<td>32.47(6,59)**</td>
<td>.53</td>
<td>.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child age</td>
<td></td>
<td></td>
<td></td>
<td>-.09</td>
<td>-1.26</td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>.35</td>
<td>3.09**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical prompt to eat</td>
<td>.31</td>
<td>3.26*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>.14</td>
<td>1.47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactional conflict</td>
<td>.28</td>
<td>2.71*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive emotion</td>
<td>.04</td>
<td>-.68</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.01 **p<.001; TP 2 = Time point 2

Predictors of observed difficulty to feed. Table 6.7 shows that in the final regression model the variables collectively predicted child difficulty to feed to age 4, accounting for 36% of the variance (adjusted r²); F(63,2) = 21.15, adjusted R² = .36, p<.001). Interactional conflict at mealtimes at age 3 was the only significant unique predictor of greater difficulty to feed at age 4.

Table 6.7: Significant predictors of TP 2 difficulty to feed using hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>21.15(63,2)**</td>
<td>.38</td>
<td>.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactional conflict</td>
<td></td>
<td></td>
<td></td>
<td>48</td>
<td>4.60**</td>
</tr>
<tr>
<td>Negative emotion</td>
<td>.14</td>
<td>1.10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.01 **p<.001; TP1 = Time point 1; TP 2 = Time point 2
Predictors of observed child positive vocalisations about food. Table 6.8 shows that in the final regression model the variables collectively predicted child positive vocalisations about food at age 4, accounting for 22% of the variance (adjusted $r^2$); F(6,59) = 4.07, adjusted $R^2 = .22$, $p<.01$. However, there were no significant unique predictors of child positive vocalisations about food at age 4.

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4.07(6,59)*</td>
<td>.30</td>
<td>.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>-.11</td>
<td>-.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical prompt to eat</td>
<td>-.14</td>
<td>-.96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditions &amp; rewards</td>
<td>-.10</td>
<td>-.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactional conflict</td>
<td>-.02</td>
<td>-.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive emotion</td>
<td>.20</td>
<td>1.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative emotion</td>
<td>-.17</td>
<td>-.89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.01 **p<.001; TP 2 = Time point 2

Predictors of observed child negative vocalisations about food. Table 6.9 shows that in the final regression model the variables collectively predicted negative vocalisations about food by the child, accounting for 80% of the variance (adjusted $r^2$). Step 1 was significant; F(60,2) = 19.25, adjusted $R^2 = .37$, $p<.001$), and negative vocalisations at age 3 significantly predicted negative vocalisations at age 4 ($\beta = .59$, $t = 5.73$, $p <.001$). In step 2, after controlling for baseline negative vocalisations at age 3 and child age, maternal feeding practices and interactional behaviours significantly added to the regression, accounting for an additional 43% of the variance; F(54,8) = 27.83, $R^2$ change = .43, $p<.001$. In the final model, significant unique predictors of child negative vocalisations about food at age 4 were previous negative vocalisations about food, maternal pressure and physical prompts to get the child to eat and less positive expressed emotion at age 3.
Table 6.9: Significant predictors of TP 2 negative vocalisations about food using hierarchical multiple regression

<table>
<thead>
<tr>
<th>Model</th>
<th>F(df)</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Beta</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>7.70(1,64)*</td>
<td>.11</td>
<td>.10</td>
<td>-.34</td>
<td>-2.77*</td>
</tr>
<tr>
<td>Child age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>19.54(7,58)**</td>
<td>.49</td>
<td>.46</td>
<td>.02</td>
<td>.28</td>
</tr>
<tr>
<td>Child age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure to eat</td>
<td>.46</td>
<td>3.30*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical prompt to eat</td>
<td>.35</td>
<td>4.22**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sensitivity</td>
<td>.14</td>
<td>1.70</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Interactional conflict</td>
<td>.16</td>
<td>1.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive emotion</td>
<td>-.24</td>
<td>-2.89*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negative emotion</td>
<td>.15</td>
<td>1.42</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.01 **p<.001

Discussion

The principal aim of this study was to establish the contribution of independently observed maternal feeding practices and maternal mealtime interactional behaviours at age 3, in predicting observed child food avoidance at age 4, in a one year prospective study. The study also aimed to explore whether there were any significant differences between observations of children’s eating behaviour at 4 years of age dependent on the observed mealtime structure and organisation at age 3. As predicted, mealtime structure at age 3 significantly distinguished dyads with high, compared to lower levels of food avoidance at age 4. Supporting and extending previous research in older child samples (e.g., Neumark-Sztainer et al., 2003; Gillman et al., 2000; Burgess et al., 2009), children whose mothers ate with them and ate the same food during the observed meal at 3 years, refused fewer foods, made fewer negative comments and more positive comments about food at 4 years, compared to those children whose mothers did not. It was notable that it was not just eating together but also eating the same food which was important, supporting lab-based research where 2-5 year olds accepted a novel food more quickly and ingested more of that food when an adult was eating a similar same-coloured food compared to not eating anything (Addessi et al., 2005).
Previous longitudinal research in adolescent samples has found that frequent family meals, and a more structured family meal environment are associated with a decreased risk of adolescent disordered eating (Neumark-Sztainer et al., 2008; Neumark-Sztainer, et al., 2007). The results of this study extend findings in younger children and suggest that structured mealtimes, where mothers eat together with their child, eat the same food, and don’t have a distraction on during the meal, represent a protective factor against child food avoidance. Although this study did not measure the frequency of family mealtimes, participants were asked to carry out the observed mealtime as they usually would, and the thus the structure of the mealtime observed hopefully reflects a ‘typical’ mealtime within the family. It has been suggested that family meals provide an opportunity for the role modelling of healthy eating patterns and social interactions among family members (Brown & Ogden, 2004; Neumark-Sztainer et al., 2004; Neumark-Sztainer et al., 2007) which could explain the positive associations found. However, whilst, significant differences were found if the mother was eating with the child, there were no significant differences in children’s eating behaviour according to whether the father or siblings were eating with the child. However, fathers were present in only 18 of the 65 mealtimes and this sample may be underpowered to detect significant differences according to paternal presence. Therefore it is recommended that future studies explore the role of the father in family mealtime interactions in more depth. Similarly, the use of distraction was only evident in 12 of the 65 mealtimes observed. Due to the very unequal group sizes for this variable, caution should be taken in interpretation of the findings that the use of a distraction at mealtimes may be associated with greater food avoidance and replication with more equal group sizes is needed.

Children also displayed less avoidant eating behaviour at age 4 if their mother allowed them some autonomy in food choice at age 3. Satter (1990) suggests that during feeding, effective parents provide opportunities for infants and young children to explore but also provide structure and limits. Thus, as the present study and the preceding Chapters have highlighted, it might be that providing a healthy home food-related environment and structured mealtimes, but allowing children some autonomy and choice about what and how much they eat may help to foster healthy and adaptive child eating behaviour. In line with this idea, previous research has shown that over time, given autonomy, young children tend to eat a variety of food and achieve a nutritionally adequate diet (e.g., Rolls, 1986).
Supporting the hypotheses, independent observations of more avoidant child eating behaviour at age 4 were associated with greater maternal use of pressure to eat and physical prompts to get the child to eat, more interactional conflict and negative expressed emotion by the mother and lower positive expressed emotion and feeding sensitivity during feeding at age 3. However, observed child food avoidance was not related to mothers’ positive or negative comments about food, and the use of conditions and incentives were only associated less positive vocalisations about food made by the child at age 4. Predictors varied amongst each of the food avoidance eating behaviours at 4 years; In the final regression models mothers pressuring and physical prompting their child to consume food at mealtimes, not expressing positive emotion and higher levels of interaction conflict between mother-child dyads at 3 years uniquely predicted child food avoidance at 4 years. However, there were no significant unique predictors for positive vocalisations about food at age 4.

Supporting the hypotheses and extending previous research linking parental pressure to eat with feeding problems and negative mealtime experiences (e.g., Harris & Booth, 1992; Sanders et al, 1993) independent observations of mothers verbally pressuring and physically prompting their child to consume more food during the mealtime at 3 years were associated with the child refusing more foods, making more negative comments and fewer positive comments about food and having a slower eating speed at 4 years old. Pressure and physical prompts also uniquely predicted observed food refusal and more negative comments about food made by the child during the meal at age 4, with pressure to eat also uniquely predicting eating speed. These findings support previous longitudinal evidence of a causal link between pressure to eat and child eating behaviour (Farrow & Blissett, 2008; Galloway et al., 2005, Gregory et al., 2011) and suggest that maternal control during mealtimes could be a risk factor for child food refusal and a lack of eating enjoyment. However, due to the complex bi-directional nature of feeding interactions, longitudinal research beginning postpartum and following children across childhood would shed more light on the causal relationships.

Previous research has found that parental behaviour and responses during early feeding problems may be implicated in maintenance of feeding problems (Harris & Booth, 1992; Piazza et al., 2003), with the strategies used by parents in an attempt to increase their child’s intake ultimately exacerbating the child’s feeding problems and making mealtimes more negative for both parent and child (Harris & Booth, 1992;
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Skuse, 1993; Blissett et al., 2000). Whilst this highlights the importance of pressure in the development of food avoidance, it highlights a need for future research to explore alternative, more adapted strategies that parents can use when attempting to cope with normal developmental stages of neophobia, food fussiness and food refusal to ensure that these problems are transient and do not become exacerbated.

Greater interactional conflict during mealtimes at 3 years was associated with all observed avoidant eating behaviours other than a slow eating rate at age 4, and interactional conflict uniquely predicted food refusal and child difficulty to feed at 4 years old. Conflict and negativity at mealtimes have been commonly reported in mother child-dyads where children have feeding problems (Boddy & Skuse, 1994; Harris & Booth, 1992; Robertson et al., 2001) whereas warmth and positive interpersonal involvement have been associated with more positive feeding outcomes (e.g., Fiese et al., 2012; Moens, Braet & Soetens, 2007; Patterson et al., 1992; Patrick et al., 2007; Robertson et al., 2011). Given reports from a Canadian study, using a representative, population-based cohort of children aged 3-4, that for one sixth of the population, family meals are unpleasant and regularly involve arguments between parents, among children, or between parents and children (Burnier, Dubois & Girard, 2011), the role of conflict at mealtimes warrants further investigation. Where previous studies have been unable to decipher causal relationships (e.g., Robertson et al., 2011) the results of the present study provide preliminary evidence that discord and conflict at mealtimes may be causally implicated in the development of food avoidant eating behaviours during early childhood. Practitioners and health care professionals should consider the importance of positive feeding dynamics within the home, and within primary care interventions for children with feeding problems when offering preventative advice to parents.

Supporting previous evidence of the role of parental warmth and sensitivity during mealtimes (e.g., Moens, Braet & Soetens, 2007; Patterson et al., 1992; Patrick et al., 2007; Robertson et al., 2011) mothers who were observed to express more positive emotion and to be more sensitive towards their child during feeding at 3 years, were observed to have children who refused fewer foods and made fewer negative comments at 4 years. This provides preliminary longitudinal observational evidence to support previous research suggesting the benefits of authoritative parenting (Tinsley, Markey, Ericksen, Ortiz & Kwasman, 2002; Kremers, et al., 2003; Patrick, Nikolas, Hughes & Morales, 2005) and parental warmth and sensitivity during mealtimes (e.g., Hagekull et
al., 1997; Moens, Braet & Soetens, 2007; Patterson et al., 1992; Patrick et al., 2007). However, feeding sensitivity, and negative expressed emotion did not emerge as unique predictors of any of the avoidant eating behaviours and positive expressed emotion was only found to uniquely predict less negative comments about food made by the child at 4 years. Nevertheless these maternal behaviours significantly added to the regression models and collectively maternal feeding practices and mealtime interactions explained a large increased in the variance explained. This suggests that positive interactions and sensitivity may be important factors but these variables may co-exist with other maternal factors, with shared variance likely amongst the variables measured.

Finally, previous research has suggested that enthusiastic comments may be an effective means of encouraging healthy food consumption (e.g., Birch, 1980; Harper & Sanders, 1975; Hendy & Raudenbush, 2000), however positive vocalisations about food made by mothers at 3 years were unrelated to child avoidant eating behaviour 1 year on. Descriptive statistics showed that many parents do make positive comments about food during meals, but perhaps these are strategies used by parents both with fussy avoidant eaters in an attempt encourage them to eat more, and by less fussy avoidant eaters as interactions will be less conducive to conflict and generally more positive for both the parent and the child.

Caution must be taken when generalising the findings of this research given the homogenous nature of the sample which consisted of mainly White, well educated, healthy weight mothers. It is also important to note that these findings were conducted with a non-clinical sample, and thus, although results displayed a range in levels of avoidant eating behaviour (e.g., no. Refusals ranged from 0 to 30 refusals), demonstrating potentially problematic eating behaviour in a some children within the sample, overall mean scores for observed avoidant eating behaviours were relatively low. For instance whilst the maximum number of refusals observed over the course of a meal was 30, the mean number across the whole sample was 4 refusals over the course of a meal. Similarly on average children within the sample were rated as moderately easy to feed (‘sometimes eats nicely and without difficulty, but sometimes refuses foods, is fussy or slow, or requires prompts or encouragements’) and mean BMI Z scores were within healthy range. Arguably, this suggests that, on the whole, the level of children with significant ‘feeding problems’ may be low, and in terms of BMI the sample are of healthy weight. Perhaps future studies could aim to recruit a sample demonstrating a broader spectrum in levels of avoidant eating, or employ measures
where categorising children into groups (such as high/low feeding problems) is possible, rather than analysing them on a continuum. The final sample size was also relatively small given the number of predictor variables entered (Tabachnick & Fidell, 2007) and the results require replication in larger samples.

Despite these limitations the results highlight the importance of several mealtime factors that may be important preventing the development of avoidant eating over time; for example, mothers eating with their children, eating the same food, not using distractions, and allowing children some autonomy in food choice were all linked to less avoidant eating behavior over time. Perhaps future studies could incorporate information on the type of food offered and consumed at the mealtimes, such as whether children were given solid versus semi-solid food and whether they were self fed versus fed by mother, as these may influence factors such as eating speed and mother and child behaviour at mealtimes. Observed coercive strategies, such as pressure to eat and physical prompts emerged as the most prominent unique predictors of food avoidance over time and represent potential risk factors. This study also provided evidence of the role of low conflict and greater positive emotion at mealtimes, which may help to promote more adaptive eating behaviours in young children. Overall results suggest a protective effect of structured family meals, and a positive feeding dynamic characterised by warmth and sensitivity and low conflict and low use coercive feeding strategies. Future research must continue to assess both the risk and protective factors against the development of child feeding problems early in childhood before the onset of more serious difficulties. This is particularly important as this age group represents a critical period where eating behaviours are becoming established and embedded (Kelder et al., 1994) and where preventative strategies could be most effectively implemented. These findings extend our knowledge concerning the preventative advice that can be offered to parents who are concerned about their children developing fussy or fussier eating habits and have important practical implications for clinicians and health professionals working with children with feeding problems as these findings could be utilised to develop treatment protocols and preventative interventions.
CHAPTER 7

The consistency and stability of maternally reported and independently observed child eating behaviours and maternal feeding practices from 3 to 4 years of age

Despite evidence that eating behaviours and food preferences can develop very early in childhood and may relate to later eating attitudes, food preferences, food intake and BMI, little is known about the early developmental trajectory of child eating behaviour. Evaluating the consistency and stability of behaviours provides insight into both the general course of a behaviour’s development as well as individual variation in that behaviour over time which can aid understanding of a behaviour’s origin, nature and projection. Thus a better understanding of the developmental trajectory of avoidant eating behaviour early in childhood would be very helpful to researchers, parents and practitioners alike. Recent research has suggested that maternal reports of child eating behaviour may be stable across childhood but results regarding consistency have been mixed and equivocal. Furthermore, despite evidence that maternal reports can be subject to bias, no research to date has explored the consistency of independent observations of child food avoidant eating behaviours, which is necessary to validate associations found using maternal report.

The previous chapters have highlighted important family environmental factors that may predict differences in children’s eating behaviour during early childhood, yet little is known about the stability and consistency of these maternal influences. Again, the limited research evidence has reported mixed results and has largely focused on maternal reports of controlling feeding practices, despite evidence that many other measurable maternal feeding practices and behaviours are related to child eating behaviour. Addressing the shortcomings of previous research, this Chapter will expand previous work by exploring the consistency and stability of both maternally reported and independently observed child eating behaviour and maternal feeding practices and behaviours across early childhood.

This chapter will be submitted as Powell, F. C., Farrow, C. V., & Meyer, C. (2012). The consistency and stability of maternally reported and independently observed child eating behaviours and maternal feeding practices from 3 to 4 years of age.
The consistency and stability of maternally reported and independently observed child eating behaviours and maternal feeding practices from 3 to 4 years of age

Abstract
The aim of this study was to explore the consistency and stability of both maternally reported and independently observed child food avoidant eating behaviours and maternal feeding practices in a 1 year prospective study during early childhood. Sixty five mothers completed measures of child eating behaviour and parental feeding practice 12 months apart at approximately 3 and 4 years of age. Mother-child dyads were also observed during a mealtime at ages 3 and 4, where measures of child eating behaviour and maternal feeding practices and behaviours were independently coded. Objective measures of child height and weight were also obtained by the researcher at 3 and 4 years. Maternally reported and independently observed child eating behaviours and parental feeding practices remained stable between 3 and 4 years of age. There was also predominantly good consistency in measures of child eating behaviour and maternal feeding practices over time, with the exception of independent observations of maternal pressure to eat, maternal positive vocalisations about food, and child difficulty to feed which were found to significantly decrease between 3 and 4 years of age. These findings suggest that validated reports of children’s eating behaviours are largely stable and continuous in the year prior to age 4. Further research is necessary to replicate these findings and continue to explore the consistency and stability of the broad range of maternal feeding practices and mealtime behaviours which may influence the development of these eating behaviours.
Consistency and stability of maternally reported and independently observed child eating behaviours and maternal feeding practices from 3 to 4 years of age

Introduction

In recent years there has been growing interest in the developmental trajectory of BMI, adiposity, dietary intake and eating behaviour. Adiposity and BMI have generally been found to be relatively stable across childhood and track into adolescence and adulthood (Deshmukh-Taskar, Nicklas, Morales, Yang, Zakeri, & Berenson, 2006; Herman, Craig, Gauvin, & Katzmarzyk, 2008; Hesketh Wake, Waters, Carlin, & Crawford, 2004). Limited research has also found moderate stability in dietary intake and food preferences during childhood, adolescence and into adulthood (Bertheke Post, de Vente, Kemper, & Twisk, 2001; Rajeshwari, Nicklas, Yang, & Berenson, 2004; Skinner, Carruth, Wendy & Ziegler, 2002; Moore et al., 2005; Zive, Berry, Sallis, Frank & Nader, 2002). For example, Moore et al. (2005) found strong correlations between fruit, vegetable and dairy intake in children from 3 to 12 years. Given that eating behaviours and food preferences can develop very early in childhood (Birch & Fisher, 1998) and may relate to later eating attitudes, food preferences, food intake and BMI (Braet & Van Strien, 1997; Jansen et al., 2003; Savage, Fisher, & Birch, 2007; Wardle, 2006; Wardle, 2007), it is imperative to explore the early trajectory of a broad range of eating behaviours. Yet, whilst studies tracking the development of obesogenic eating behaviours are rising (e.g., Farrow & Blissett, 2012), less is known about the stability and consistency of a broad range of avoidant eating behaviours, despite feeding problems being a common concern for parents and practitioners alike (Coulthard & Harris, 2003; Lindberg, Bohlin & Hagekull, 1991; Murashima et al., 2011).

In order to appropriately explore the developmental trajectory of eating behaviours over time, it is important to consider both consistency within a group and stability in individuals; two theoretically and statistically independent concepts (Bornstein, Brown & Slater, 1996; McCall, 1981; Cote & Bornstein, 2003; Farrow & Blissett 2012). Consistency reflects consistency in the mean group levels of behaviour over time, whereas stability reflects consistency in individual ranks on behaviours in a group over time (Cote & Bornstein, 2003). Evaluating both consistency and stability in behaviour allows insight into both the general course of a behaviours development as well as individual variation in that behaviour over time which can aid understanding of a behaviours origin, nature and projection (Cote & Bornstein, 2003).
Recent research has begun to explore the stability and consistency of eating behaviours during childhood using psychometric measures. A 1 year longitudinal study in 2-4 year old children demonstrated significant correlations for food responsiveness, food fussiness and interest in food over time (Gregory, Paxton & Brozovic, 2010). Similarly, Ashcroft et al., (2008) found good stability in eating behaviour between 4 to 11 years of age (high correlations between CEBQ scores at 4 and 11 years), however they found that food avoidant eating behaviours significantly decreased over time, whereas more obesogenic eating behaviours significantly increased across time in children aged 4-11 years. Farrow & Blissett (2012) also report stability in parentally reported eating behaviours between 2-5 years, using the CEBQ, for all eating behaviours other than desire to drink. McDermott et al. (2010) explored the stability of parent-perceived child irregular eating, in a large sample of children, from 6 months to 14 years of age and found that approximately 40% of irregular eaters at age 5 were still irregular eaters at age 14. They also report that the rate of eating problems at age 5 and 14 years was very similar (28.06% and 27.08% respectively) and that the persistence of eating problems at age 5 and 14 years was significantly related to feeding problems at 6 months of age.

Whilst overall evidence seems to suggest that parent’s descriptions of child food avoidant eating behaviours may show individual stability across childhood, it still remains unclear whether there is consistency in mean group levels across childhood. Ashcroft et al. (2008) report decreases in avoidant eating behaviour over time in 4-11 year olds, whereas Farrow and Blissett (2012) suggest good consistency in mean levels of food avoidant eating behaviours between 2-5 years of age. However, whilst not all studies have explored the trajectory of behaviours using the Cote and Bornstein (2003) paradigm, there is evidence that feeding problems can also demonstrate consistency from early childhood into mid-adolescence and adulthood (McDermott et al., 2010; Mikkila, Rasanen, Raitakari, Pietinen & Viikari, 2004), and early feeding problems and food avoidance have been associated with the both the later development of eating disorders (Kotler, Cohen, Davies, Pine & Walsh, 2001; Marchi & Cohen, 1990) and continued fussy eating and poor dietary variety in adolescence and adulthood (McDernott et al., 2010; Boggio, Chabanet & Issanchou, 2005). Further research in younger populations is necessary, in order to understand the early development of these behaviours before they become embedded.
In addition, to our knowledge no studies yet exist exploring the stability and consistency of independently observed child eating behaviour over time. Jacobi et al. (2003) used psychometric and behavioural measures to investigate 135 ‘picky eaters’ at 3½ and 5½ years old and whilst they found that picky eaters persisted with food avoidance and strong food dislikes over time, their study was primarily aimed at behavioural validation of parent reports of picky eating and did not explore consistency and stability in food avoidance in any depth. They did report the stability of parentally reported pickiness between ages 3 and 5, but this was based on just one question “Is your child a picky eater?”. To address these gaps, the current study aims to explore the consistency and stability of both maternally reported and independently observed child food avoidant eating behaviour across early childhood.

It is also important to explore the stability and consistency of the predictors and precursors of these eating behaviours, in order for researchers to understand the best ways to promote healthy food intake and prevent the development of feeding problems during childhood and into adolescence. As the previous Chapters have highlighted, family-environmental factors appear to play a key role in the development and prevention of feeding problems, yet there is little research exploring whether factors such as parental feeding practices and behaviours are also stable and continuous over time. Controlling feeding practices (e.g., pressure to eat, restriction of food, and monitoring) have been the focus of most research in this area. Previous studies have indicated that such strategies are stable from 1 to 2 years of age (Blissett & Farrow, 2007), from 2 to 5 years of age (Farrow & Blissett, 2012), between 3 and 4 years of age (Gregory et al., 2010) and between 5 and 7 years of age (Faith et al., 2004). But evidence for consistency is less clear cut and rare in samples of young children. Webber et al., (2010) report that parents describe using significantly less pressure to eat, monitoring and restriction with their children between 7 and 10 years of age. Similarly, another study found that parents report allowing the child more independence across middle childhood, between 4, 7 and 9 years (Rhee et al., 2009). However, despite early childhood being identified as a critical period in the development of eating behaviours and food preferences (Birch & Fisher, 1998) only one study to date has explored the consistency of these practices in children aged 2-5 years old. This study found that whilst there was good consistency in mean levels of parental restriction and monitoring over time, levels of maternal pressure to eat significantly increased over time (Farrow & Blissett, 2012). Results are therefore somewhat equivocal and require further
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investigation, particularly in the critical period when eating behaviours are becoming established and embedded.

In addition, despite evidence that many other measurable maternal feeding practices and behaviours are related to child eating behaviour (see Chapter 1 for review, Chapters 3-6 for empirical evidence), research on consistency and stability has been largely limited to controlling feeding practices (e.g., Farrow & Blissett, 2012). No research to date has looked at the early trajectory of maternal reports of feeding practices such as using food as a reward or for emotion regulation, involvement in food preparation or encouraging balance and varied intake, over time. The utilisation of observational measures could shed light of the trajectory of other potentially positive behaviours displayed by mothers during mealtimes, such as warmth and sensitivity (e.g., Patterson et al., 1992; Moens, Braet & Soetens, 2007; Patrik et al., 2007), and enthusiastic comments and praise (e.g., Birch, 1980; Harper & Sanders, 1975; Hendy & Raudenbush, 2000). Prospective studies beginning early in childhood, and tracking feeding practices over time are therefore essential.

**Aims & Hypotheses**

The first aim of the present study was to explore the consistency and stability of both maternally reported and independently observed avoidant eating behaviours in children in a 1 year prospective study during early childhood. The second aim was to explore the consistency and stability of both maternally reported and independently observed maternal feeding practices across this time. Supporting previous findings (e.g., Ashcroft et al. 2008; Farrow & Blissett, 2012), it was hypothesised that parental reports of children’s eating behaviours would be significantly correlated over time, showing good stability between 3 and 4 years of age. In addition, given evidence that maternal reports are validated by independent observations (Blissett, 1998; Farrow & Blissett, 2012; Whelan & Cooper, 2000, Chapter 3), it was also hypothesised that there would be stability in observed child eating behaviour over time. It was also hypothesised that there would be good consistency in mean levels of observed and maternally reported children’s eating behaviours over time. In line with evidence for stability in parental feeding practices (e.g., Blissett & Farrow, 2007; Faith et al., 2004; Farrow & Blissett, 2012; Gregory et al., 2010) it was also hypothesised that both maternal reports and observations of these behaviours would be significantly correlated over time. It was hypothesised that feeding practices would be predominantly stable over time but that
maternal controlling feeding practices may change over time. This hypothesis was not
directional as control has previously been found to both increase and decrease over time
(e.g., Farrow & Blissett, 2012; Webber et al., 2010).

Method

Participants

Seventy-five mothers of children aged between 2-4 years were recruited through
nurseries, pre-schools and children’s centers, to take part in this study. These
participants completed a set of standardised questionnaires about themself and their
child and were observed with their child during a normal mealtime in their home (TP1;
mean age 3 years). Sixty-five of these participants remained in the study for the second
stage of data collection when their children were aged 3-5 years (TP2; mean age 4
years). At the 12 month follow up, these 65 participants again completed the same
standardised questionnaires and took part in a second home mealtime observation.
Reasons for discontinuing participation were varied and including moving home
without providing a forwarding address, lack of time and illness. Mann-Whitney U
tests indicated that there were no significant differences between participants who were
retained in the study at follow-up and those who dropped out of the study after baseline
assessment in terms of their demographics (age, education, income, occupation code,
BMI) or maternal reports and independent observations of child eating behavior and
maternal feeding practices at 3 years of age.

The mean age of the mothers at TP 1 was 35.94 years (Range = 27.42-46.92,
SD= 4.19) and the mean age of the children was 3.31 years (Range = 2.00-4.75, SD =
1.17) and there were 37 male and 38 female children. For a detailed description of the
sample at TP 1 see Chapter 4. The mean age of the mothers at the 12 month follow up
was 37.03 years (Range = 28.42-47.92, SD= 4.25) and the mean age of the children was
4.40 years (Range = 3.10-5.62, SD = 1.13). There were 32 mothers of boys and 33
mothers of girls. Mean maternal years of education post-16 years of age was 5.02
(Range = 1.00-9.00 years, SD = 1.76) and 97% of the mothers in this sample described
themselves as White British. Participants reported a wide range of occupations: ranging
from 1 (managers and senior officials) to 8 (elementary occupations), using the
Standard Occupational Classification 2000 (Office for National Statistics, 2000) with a
modal occupation level of 4 (administrative and secretarial occupations). Family
income ranged from < £15,000 to > £75,000 per annum with a modal annual family income of £45,000-£60,000.

**Measures and Procedure**

Standardised questionnaire packs were completed by mothers at TP1 and TP 2. TP 2 questionnaire packs were either posted to parents to complete prior to the mealtime visit or given to them at the follow-up home mealtime observation, approximately 12 months after initial participation (range 11.10-12.90 months). At both time points participants provided background and demographic information, children were weighed and measured, and mothers completed the following self-report measures (all measures are described in detail in Chapter 2 & Appendices A- J). As described in Chapter’s 3 and 5, cronbach's alphas indicated good reliability for this population for and all maternal report measures at TP1 and TP 2.

**The Child Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001).** Mothers completed 4 subscales of the CEBQ; food fussiness, slowness in eating, satiety responsiveness and enjoyment of food.

**Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007).** Mothers completed 9 subscales of the CFPQ; pressure to eat, restriction for health, restriction for weight control, monitoring, emotion regulation, food as a reward, balance and variety, environment and involvement

**Mealtime Observation.** Mother-child dyads were observed during a typical lunch or evening meal at the family’s home using a video camera at 3 and 4 years old. Independent observations of the variables outlined below were then coded for (full details of the observation protocol and measures coded are described in Chapter 2). As described in Chapter’s 4 and 6 intra-class correlation co-efficient’s indicated good inter-rater reliability for these measures at TP1 and TP 2.

**Child Eating Behaviour.** The Child Mealtime Coding System CMCS; Haycraft, 2007) and an adapted scale from the Behavioural Coding Inventory (BCI; Young & Drewett, 2000) were used to code independent observations of child eating behaviour.
Food avoidance in children during mealtime interactions. Variables measured were speed of eating, food refusals, difficulty to feed and positive and negative vocalisations about food.

**Maternal feeding practices and mealtime behaviour.** The Family Mealtime Coding System (FMCS; Haycraft & Blissett, 2008) was used to measure the frequency of mothers’ pressuring their child to consume more food, physically prompting the child to consume more food, using incentives such as conditions or rewards to get their child to eat, and the frequency of positive and negative comments by the mother to the child in relation to food. A count was made for each time the mother displayed each of these behaviours over the course of the meal. Four subscales from The Feeding Interaction Scale (FIS; Wolke, Summer, McDermott & Skuse, 1987) were used to rate maternal behaviour during the meal; interactional conflict, feeding sensitivity (rated on a 9 point likert scale) and amount/frequency of both expressed positive and negative emotion (rated on a 5 point likert scale).

**Child BMI.** Where parents and children consented, objective measures of height and weight were obtained by the researcher (65 of the children at TP 1 and 58 of the children at TP 2). BMI Z scores for the children were calculated using the Child Growth Foundation's growth references which adjusts for child age and gender (Child Growth Foundation, 1996).

**Data analysis**

Preliminary analysis of the data using Shapiro-Wilk tests and visual inspection of plots/graphs indicated the data was largely non-normally distributed, consequently where possible non-parametric statistics were used to analyse the data. Following descriptive statistics, difference scores were calculated between 3 and 4 years of age by subtracting scores at age 3 from scores at age 4. Mean change scores were then calculated, with positive scores indicating an increase in the variable over time, and negative scores indicating a decrease in the variable. Spearman’s two-tailed correlations indicated that maternal age, occupation code, income and child age were not significantly correlated with the degree of change in maternally reported or independently observed child eating behaviour, BMI Z score or maternal feeding practices and behaviours. Mann-Whitney U tests showed that there were no significant differences between male and female children in the degree of change on these
variables between 3 and 4 years of age. Therefore these demographic variables were not analysed further and the sample was analysed as a whole.

Cote and Bornstein’s (2003) paradigm, adjusted to account for non-normal data, was followed to evaluate the stability and consistency of the variables. Two-tailed Spearman’s correlations were used to assess the stability of variables from 3 to 4 years of age and Wilcoxon signed rank tests were used to assess consistency between 3 and 4 years. Where variables did not show consistency across the measured time period (as indicated by significant differences on Wilcoxon matched pairs test), effect sizes (ES) were calculated by dividing the mean change score for the variable by the standard deviation of the mean score for the variable at the first time point (Cohen, 1992).

Results

Characteristics of the sample. Descriptive statistics for maternal self-report of child eating behaviour and maternal feeding practices at 3 and 4 years of age are presented in Table 7.1. Mean scores for the CEBQ and CFPQ are similar to other published data in similar samples (Musher-Eizenman & Holub, 2007; Wardle et al., 2001). Table 7.2 displays the mean and standard deviation scores for independent observations of child eating and parental feeding practices and behaviours at 3 and 4 years of age. Mean scores for the CMCS, FMCS and FIS are similar to other published data in similar samples (Farrow, 2005; Haycraft, 2007; Haycraft & Blissett, 2008).
Table 7.1: Descriptive statistics and Wilcoxon signed rank tests for maternally reported child eating behaviour and maternal feeding practices over time

<table>
<thead>
<tr>
<th>Variable</th>
<th>3 years mean (SD)</th>
<th>4 years mean (SD)</th>
<th>Mean change 3-4 years (SD)</th>
<th>Wilcoxon Z score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 75</td>
<td>N = 65</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Child eating behaviour (CEBQ)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food fussiness</td>
<td>2.89 (.92)</td>
<td>2.88 (.92)</td>
<td>-.01</td>
<td>-.07</td>
</tr>
<tr>
<td>Slowness in eating</td>
<td>3.00 (.79)</td>
<td>2.91 (.81)</td>
<td>-.09</td>
<td>-1.40</td>
</tr>
<tr>
<td>Satiety responsiveness</td>
<td>3.18 (.67)</td>
<td>3.09 (.70)</td>
<td>-.09</td>
<td>-1.76</td>
</tr>
<tr>
<td>Enjoyment of food</td>
<td>3.68 (.73)</td>
<td>3.69 (.88)</td>
<td>.01</td>
<td>.03</td>
</tr>
<tr>
<td><strong>Maternal feeding Practices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CFPQ)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>3.15 (.85)</td>
<td>3.04 (.89)</td>
<td>-.11 (.69)</td>
<td>-1.20</td>
</tr>
<tr>
<td>Restriction for weight</td>
<td>1.91 (.65)</td>
<td>1.78 (.59)</td>
<td>-.13 (.50)</td>
<td>-2.26</td>
</tr>
<tr>
<td>Restriction for health</td>
<td>3.19 (.87)</td>
<td>3.21 (.92)</td>
<td>.02 (83)</td>
<td>.47</td>
</tr>
<tr>
<td>Monitoring</td>
<td>4.21 (.70)</td>
<td>4.28 (.65)</td>
<td>.05 (42)</td>
<td>1.04</td>
</tr>
<tr>
<td>Emotional regulation</td>
<td>1.91 (.59)</td>
<td>1.85 (.46)</td>
<td>-.06 (.49)</td>
<td>-1.15</td>
</tr>
<tr>
<td>Food as a reward</td>
<td>2.24 (.78)</td>
<td>2.40 (.76)</td>
<td>.16 (.74)</td>
<td>1.10</td>
</tr>
<tr>
<td>Balance &amp; variety</td>
<td>4.27 (.61)</td>
<td>4.37 (.53)</td>
<td>.10 (.57)</td>
<td>.88</td>
</tr>
<tr>
<td>Healthy environment</td>
<td>3.97 (.79)</td>
<td>4.03 (.80)</td>
<td>.06 (.65)</td>
<td>1.12</td>
</tr>
<tr>
<td>Involvement</td>
<td>3.54 (.45)</td>
<td>3.62 (.51)</td>
<td>.08 (.49)</td>
<td>.92</td>
</tr>
</tbody>
</table>

No change scores were significant at p<.01 or p<.001; CEBQ = Child Eating Behaviour Questionnaire; CFPQ = Comprehensive Feeding Practices Questionnaire

Consistency of child eating behaviours and parental feeding practices between 3 and 4 years of age. Tables 7.1 and 7.2 also present the mean change scores for maternally reported and observed variables between 3 and 4 years of age, as well as the results from Wilcoxon matched signed rank tests to explore consistency. As Table 7.1 indicates there was significant consistency in maternal reports of both child eating behaviours and maternal feeding practices between 3 and 4 years of age. As Table 7.2 indicates there was also consistency in many of the observed child eating behaviours and maternal feeding practices and behaviours. However, independent observations of child difficulty to feed, maternal pressure to eat and positive vocalisations about food significantly decreased between 3 and 4 years. The ES of these changes indicate...
relatively small decrease in pressure to eat (ES = .28) and child difficulty to feed (ES = .30) and a moderate decrease in maternal positive vocalisations about food (ES = .57).

Table 7.2: Descriptive statistics and Wilcoxon signed rank tests for observed child eating behaviour and maternal feeding practices and behaviours over time

<table>
<thead>
<tr>
<th>Variable</th>
<th>3 years mean (SD) N = 75</th>
<th>4 years mean (SD) N = 65</th>
<th>Mean change 3-4 years (SD) N = 65</th>
<th>Wilcoxon Z score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child eating behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed (mouthfuls per minute)</td>
<td>3.14 (1.57)</td>
<td>3.07 (1.32)</td>
<td>-.07 (1.91)</td>
<td>-.20</td>
</tr>
<tr>
<td>Food refusals</td>
<td>4.50 (5.94)</td>
<td>4.12 (7.18)</td>
<td>-.38 (3.64)</td>
<td>-.74</td>
</tr>
<tr>
<td>Difficult to feed</td>
<td>2.39 (1.08)</td>
<td>2.08 (.83)</td>
<td>-.31 (.93)</td>
<td>-2.67*</td>
</tr>
<tr>
<td>Positive vocalisations about food c</td>
<td>3.57 (3.34)</td>
<td>3.15 (2.90)</td>
<td>-.42 (3.70)</td>
<td>-2.42</td>
</tr>
<tr>
<td>Negative vocalisations about food c</td>
<td>1.55 (2.95)</td>
<td>1.45 (2.77)</td>
<td>-.10 (2.12)</td>
<td>-2.8</td>
</tr>
<tr>
<td>Maternal mealtime behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat c</td>
<td>4.05 (5.03)</td>
<td>2.63 (4.24)</td>
<td>-1.42 (2.92)</td>
<td>-3.65**</td>
</tr>
<tr>
<td>Physical prompts c</td>
<td>5.14 (10.82)</td>
<td>3.60 (7.60)</td>
<td>-1.54 (8.46)</td>
<td>-1.25</td>
</tr>
<tr>
<td>Incentives &amp; rewards c</td>
<td>2.02 (3.08)</td>
<td>1.83 (3.05)</td>
<td>-.19 (2.35)</td>
<td>-.93</td>
</tr>
<tr>
<td>Feeding sensitivity r*</td>
<td>6.60 (1.64)</td>
<td>6.86 (1.86)</td>
<td>.26 (1.44)</td>
<td>1.54</td>
</tr>
<tr>
<td>Interactional conflict r*</td>
<td>3.05 (1.82)</td>
<td>2.97 (2.16)</td>
<td>-.08 (1.55)</td>
<td>-3.93</td>
</tr>
<tr>
<td>Expressed positive emotion r</td>
<td>3.98 (.87)</td>
<td>4.05 (.82)</td>
<td>.07 (.85)</td>
<td>.62</td>
</tr>
<tr>
<td>Expressed negative emotion r</td>
<td>1.38 (.80)</td>
<td>1.45 (.71)</td>
<td>.07 (2.12)</td>
<td>.79</td>
</tr>
<tr>
<td>Positive vocalisations about food c</td>
<td>6.19 (3.96)</td>
<td>3.95 (2.77)</td>
<td>-2.24 (4.23)</td>
<td>-4.91**</td>
</tr>
<tr>
<td>Negative vocalisations about food c</td>
<td>.35 (2.61)</td>
<td>.11 (.44)</td>
<td>-.24 (2.66)</td>
<td>-.44</td>
</tr>
</tbody>
</table>

*p<.01 **p<.001
c = counts – frequency of occurrence across mealtime
r = ratings – objective rating based on mealtime (1-5) – higher score reflect higher rating
r* = rating – objective rating based on mealtime (1-9) – higher score reflect higher rating

Stability of child eating behaviours and parental feeding practices and behaviours between 3 and 4 years of age. The correlations over time for maternal reports of child eating behaviour and parental feeding practices at 3 and 4 years are presented in Table 7.3. All variables were significantly correlated over time suggesting good stability in measures of child eating and parental feeding in early childhood. Significant correlations ranged from .48 (balance and variety) to .81 (food fussiness) suggesting good stability in these variables in children of this age (Ashcroft et al., 2008).
Table 7.3: Two-tailed Spearman’s correlations for maternal reports of child eating behaviour and maternal feeding practices at 3 and 4 years of age

<table>
<thead>
<tr>
<th>Variable</th>
<th>r 3-4 years (N = 65)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child eating behaviour</strong></td>
<td></td>
</tr>
<tr>
<td>Food fussiness</td>
<td>.81**</td>
</tr>
<tr>
<td>Slowness in eating</td>
<td>.67**</td>
</tr>
<tr>
<td>Satiety responsiveness</td>
<td>.63**</td>
</tr>
<tr>
<td>Enjoyment of food</td>
<td>.73**</td>
</tr>
<tr>
<td><strong>Maternal feeding practices</strong></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>.66**</td>
</tr>
<tr>
<td>Restriction for weight</td>
<td>.75**</td>
</tr>
<tr>
<td>Restriction for health</td>
<td>.58*</td>
</tr>
<tr>
<td>Monitoring</td>
<td>.72**</td>
</tr>
<tr>
<td>Emotional regulation</td>
<td>.62**</td>
</tr>
<tr>
<td>Food as a reward</td>
<td>.51*</td>
</tr>
<tr>
<td>Balance &amp; variety</td>
<td>.48**</td>
</tr>
<tr>
<td>Healthy environment</td>
<td>.59**</td>
</tr>
<tr>
<td>Involvement</td>
<td>.52**</td>
</tr>
</tbody>
</table>

*p<.01  **p<.001

The correlations over time for independent observations of child eating behaviour and parental feeding practices and behaviours at 3 and 4 years are presented in Table 4. All child eating behaviour variables were significantly correlated over time suggesting good stability in observed measures of eating during early childhood. Maternal negative vocalisations about food were not correlated, and decreased over time, however all other maternal feeding practices and behaviours were correlated over time. Significant correlations ranged from .36 (maternal positive vocalisations about food) to .68 (child speed of eating) suggesting good stability in these variables in children of this age (Ashcroft et al., 2008).
### Table 7.4: Two-tailed Spearman’s correlations for observed child eating behaviour and maternal feeding practices and behaviours at 3 and 4 years of age

<table>
<thead>
<tr>
<th>Variable</th>
<th>r 3-4 years N = 65</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child eating behaviour</strong></td>
<td></td>
</tr>
<tr>
<td>Speed (mouthfuls per minute)</td>
<td>.68**</td>
</tr>
<tr>
<td>Food refusals</td>
<td>.65**</td>
</tr>
<tr>
<td>Difficult to feed</td>
<td>.56**</td>
</tr>
<tr>
<td>Positive vocalisations about food</td>
<td>.43**</td>
</tr>
<tr>
<td>Negative vocalisations about food</td>
<td>.46**</td>
</tr>
<tr>
<td><strong>Maternal mealtime behaviour</strong></td>
<td></td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>.63**</td>
</tr>
<tr>
<td>Physical prompts</td>
<td>.57**</td>
</tr>
<tr>
<td>Incentives &amp; rewards</td>
<td>.57**</td>
</tr>
<tr>
<td>Feeding sensitivity</td>
<td>.62**</td>
</tr>
<tr>
<td>Interactional conflict</td>
<td>.61**</td>
</tr>
<tr>
<td>Expressed positive emotion</td>
<td>.50**</td>
</tr>
<tr>
<td>Expressed negative emotion</td>
<td>.60**</td>
</tr>
<tr>
<td>Positive vocalisations about food</td>
<td>.36*</td>
</tr>
<tr>
<td>Negative vocalisations about food</td>
<td>-.06</td>
</tr>
</tbody>
</table>

*p<.01 **p<.001

### Discussion

The aims of the present study were to assess the consistency and stability of both maternally reported and independently observed child eating behaviours and maternal feeding practices in children aged 3-4 years old. In terms of stability, the results suggest good stability in individual ranks of maternally reported and observed child eating behaviours and maternal feeding practices between 3 and 4 years. Significant correlations, ranging from .43 to .81 were found, suggesting, for example, that children who scored highly on food fussiness or food refusal at 3 years still had relatively high scores at 4 years. The only exception to this was observations of mothers’ negative vocalisations about food which were not stable between 3 and 4 years of age. The results of this study also demonstrate good consistency in mean group levels of both maternal reports and independent observations of children’s eating behaviours and maternal feeding practices over time with the exceptions of difficulty to feed, pressure to eat and maternal positive vocalisations which significantly decreased over time. Supporting the hypotheses and extending previous findings (e.g., Ashcroft et
Food avoidance in children

al. 2008; Farrow & Blissett, 2012), results suggest that both parental reports and independent observations of children’s food avoidant eating behaviours are stable across early childhood. This supports evidence that eating behaviours develop very early in childhood (Birch & Fisher, 1998; Farrow & Blissett, 2012), even as early as 2 or 3 years, and validates maternal reports that these behaviours are stable between 3 and 4 years of age. Correlation coefficients were particularly high for food fussiness (r = .81) providing strong support for previous evidence of the persistence of picky, fussy or irregular eating across early childhood (Jacobi et al., 2003; Mc Dermot et al., 2010; Mikkila et al., 2004). This is particularly important given that early feeding problems and avoidant eating behaviours have been associated with both the later development of eating disorders (Kotler et al., 2001; Marchi & Cohen, 1990) and continued fussy eating and poor dietary variety in adolescence and adulthood (McDernott et al., 2010; Nicklaus et al., 2005). Exploring these behaviours in early childhood, before they become embedded is essential, and future prospective longitudinal research would benefit from following children from birth through weaning and early mealtime interactions to shed additional light on the origin, nature and projection of these behaviours.

The results of this study also demonstrate good stability in individual ranks of maternally reported and observed feeding practices between 3 and 4 years of age. This supports previous evidence (e.g., Blissett & Farrow, 2007; Faith et al., 2004; Farrow & Blissett, 2012; Gregory et al., 2010), adds to the reliability of the Comprehensive Feeding Practices Questionnaire as a measure of parental feeding practices over time, and extends findings by demonstrating stability in observed behaviours between 3 and 4 years of age. Observed negative vocalisations about food made by the mothers during the meal was the only variable that did not significant correlate at age 3 and 4. Very few parents made negative comments during the observed meals (mean TP1 = .35, mean TP2 =.11) and these results suggest they were used sporadically and not consistently by mothers at 3 and 4 years of age. Negative comments about food could also reflect state like maternal mood rather than a stable trait or behaviour shown across mealtimes.

Consistency in maternal reports of child food avoidant eating behaviours during early childhood supports recent research by Farrow & Blisset (2012) who also demonstrated consistency in parentally reported food fussiness, slowness in eating, satiety responsiveness and enjoyment in food over time in children aged 2-5 years. However these results are contrary to findings in older samples. For example, Ashcroft et al., (2008) found that Satiety responsiveness, slowness in eating and food fussiness
significantly decreased over time, whereas enjoyment of food significantly increased over time in children aged 4-11 years old. This was the first study to date to explore consistency in observed child eating behaviour, and whilst results were largely parallel to maternal report, there was one exception; similarly to findings from Ashcroft et al. (2008), mean levels of observed child difficulty to feed reduced over time. Given that children become more autonomous eaters across early childhood and various factors, associated with increased feeding difficulties, such as food neophobia decline (Koivisto-Hursti & Sjoden, 1997; Addessi, Galloway, Visalberghi & Birch, 2005; Mc Farlane & Pliner, 1997) this result is not unexpected. As the incidence of feeding problems is often elevated when reported by caregivers compared to healthcare professionals (Ramsay & Veroff, 1995), it could be that independent observations provide a more accurate indication of feeding difficulties than self-report measures. Chapter 4 found that maternal reports of child eating behaviour were not validated by independent reports which may explain the differences found in stability of child eating behaviour between independent observations and maternal reports. It is essential that future research utilises observational measures so that the early trajectory of child eating behaviour can be better understood.

Despite mixed and often equivocal evidence from previous studies (Farrow & Blissett, 2012; Webber et al., 2012) this study found consistency in mean group levels over time for all of the maternally reported feeding practices and the majority of independently observed mealtime behaviours with the exception of maternal pressure to get the child to eat and positive vocalisations made to the child about food during the meal, which were both found to significantly decrease over time. This supports reports that parents describe using significantly less pressure to eat with their children between 7 and 10 years of age (Webber et al., 2010) yet contradicts recent findings from Farrow & Blissett (2012) who found self-report measures of maternal pressure to eat were significantly higher at 5 years compared to at age 2 years of age. Due to the bi-directional nature of feeding interactions, it is unsurprising that parallels are evident with decreases in both observations of child difficulty and observed pressure to eat over time. There is evidence of a causal link between pressure to eat and feeding problems (Farrow & Blissett, 2008) yet there is also evidence that parental feeding practices may be employed in response to the childs’ eating behaviour and weight status (Birch & Fisher, 2000; Chatoor et al., 1988; Drucker et al., 1999; Faith et al., 2005; Farrow, Galloway & Fraser, 2009; Iannotti et al., 1994; McKenzie et al., 1991). It is possible
that within the present study relative changes in difficulty to feed and pressure to eat are linked, yet the direction of this relationship is unclear and conclusions are speculative.

The findings of this research build upon current knowledge concerning the stability and consistency of eating behaviours and feeding practices during early childhood. It is the first to date to explore their developmental trajectory using both parent-report and observational measures, and to incorporate the broad range of measurable parental feeding practices and behaviours associated with child eating behaviour. Whilst the generalisability of the findings is limited by the small sample size, studies utilising both observational measures and longitudinal designs are rare and often use samples much lower than those achieved within the present study. Thus this study provides novel and interesting findings, and it is a great starting point for future replication within bigger samples. Another strength is the high participant retention rate and that attrition analysis revealed no systematic differences in those participants who dropped out or were retained. An important consideration when interpreting these findings is the age range of the children who were recruited aged between 2-4 years old and followed up 12 months later at 3-5 years old. One might expect there to be variability in eating behaviour and feeding practices dependent on child age, affecting the validity of measures of consistency and stability amongst this sample. However, data screening revealed that child age was not significantly correlated with the degree of change in maternally reported or independently observed child eating behaviour or maternal feeding practices, suggesting that changes did not significantly differ dependent on child age. Despite this it is recommended that future research exploring the developmental trajectory of child eating aims to recruit children within a narrower age range.

In summary in this small community sample maternal reports and independent observations of both child eating behaviour and maternal feeding practices remained predominantly stable and continuous between the ages of 3 and 4 years. By utilising observational measures the results of the present study provide novel evidence that validated reports of child eating behaviour are stable and continuous over time. Given that early childhood has being identified as a critical period in the development of eating behaviours and food preferences (Birch & Fisher, 1998) which may relate to later eating attitudes, food preferences, food intake and BMI (Braet & Van Strien, 1997; Jansen et al., 2003; Savage, Fisher, & Birch, 2007; Wardle, 2006; Wardle, 2007), the evident consistency and stability during early childhood highlights a need to continue to
explore the developmental trajectory from as early in life as possible; tracking eating behaviour from infancy and weaning through the first few years of life. In addition, given findings from Ashcroft et al., (2010) future studies continue to follow children later into childhood, to ascertain whether avoidant eating behaviours, whilst stable and continuous across early childhood, do in fact decrease through into middle childhood. Results from the present study also provide evidence of the stability and consistency of many other measurable maternal feeding practices and mealtime behaviours that had not been explored previously. Prospective studies beginning early in childhood, and tracking a broad range of feeding practices over time are essential; feeding practices are potential modifiable and could be targeted for the prevention of, and intervention for, feeding problems and food fussiness to promote more successful feeding interactions and outcomes. Further research is necessary to replicate these findings in larger and more diverse samples and to explore the factors that predict changes in eating behaviour and maternal feeding practices over time.
CHAPTER 8

General Discussion

8.1 Introduction to general discussion

This Chapter provides an overview of the results of this thesis and a discussion of the findings. The original aims and hypotheses of this thesis will be summarised and the overall results will be outlined. Firstly, the maternally reported, cross-sectional correlates and longitudinal predictors of child food avoidant eating behaviours will be explored; evaluating the relative importance of child temperament, maternal psychopathology and maternal feeding practices. Secondly, the independently observed, cross-sectional correlates and longitudinal predictors of child food avoidant eating behaviours will be discussed; evaluating the relative importance of mealtime structure, maternal feeding practices and maternal interactional behaviour. Thirdly the validity of maternal reports of child eating behaviour and maternal feeding practices will be described. Following that, the longitudinal consistency and stability of child eating behaviours and maternal feeding practices will be appraised. The limitations of the research will then be reviewed and directions for future research will be made. Finally the overall findings of this thesis and their implications for research and clinical practice will be concluded.

8.2 Aims and hypotheses of the thesis

The overall aim of this thesis is to establish the relative importance of maternal feeding practices, interactional behaviour, mealtime structure, child temperament and maternal psychopathology in the prediction of validated maternal reports of child food avoidant eating behaviour, in a one year prospective study with children aged 2-5. This thesis aimed to explore the cross-sectional correlates and longitudinal predictors of food avoidance, using both maternal report (Chapters 3 & 5) and independent observations (Chapters 4 & 6). This thesis also aimed to evaluate the validity of maternal reports of child eating behaviours and feeding practices with independent observations of these constructs (Chapter 4). Lastly, this thesis aimed to assess the consistency and stability of independent observations and maternal reports of child eating behaviours and maternal feeding practices across early childhood (Chapter 7).
It was hypothesised that maternal reports of child food avoidant eating behaviours at ages 3 and 4 would be positively correlated with an emotional child temperament, higher maternal psychopathological symptoms and greater use of controlling feeding practices at age 3. Whereas more adaptive practices, such as having healthy foods available in the home, promoting well-balanced and varied food intake and child involvement in meal planning and preparation would be negatively correlated with reports of food avoidant eating behaviours. It was also hypothesised that parental feeding practices at age 3 would uniquely predict reports of child food avoidant eating behaviour at age 3, and also longitudinally at age 4, after controlling for previous child eating behaviour and the contribution of inherent child characteristics and maternal psychopathology. It was hypothesised that independent observations of more avoidant eating behaviours at ages 3 and 4 would be associated with greater use of coercive feeding strategies and less positive interaction by mothers’ during mealtimes at 3 years. It was also hypothesised that independent observations of child eating behaviours at 3 and 4 years of age, would differ dependent on the mealtime organisation at 3 years. It was hypothesised that maternal reports of child eating behaviour and maternal feeding practices would correlate with independent observations of these constructs. Finally it was hypothesised that maternal reports and independent observations of children’s eating behaviours and maternal feeding practices and behaviours would show good stability and consistency between 3 and 4 years of age.

8.3 Summary of results
8.3.1 Maternal Report; Child temperament, maternal psychopathology and maternal feeding practices as cross-sectional correlates and longitudinal predictors of food avoidance

Chapter 3 investigated the child temperamental, maternal psychopathological and maternal feeding practice correlates of food avoidance (food fussiness, slowness in eating, satiety responsiveness, low food enjoyment), using maternal report. Chapter 5 advanced these cross-sectional findings by extending this study using a longitudinal design to identify the prospective predictors of food avoidant eating behaviours in early childhood.
8.3.1.1 Child Temperament

Supporting previous research (e.g. Farrow & Blisset, 2006; Hagekull et al., 1997; Haycraft et al., 2011) child temperament was associated with child food avoidance at both 3 and 4 years of age. It was an emotional child temperament in particular that emerged as a significant correlate, and contrary to the hypotheses, shyness, sociability and activity were unrelated to food avoidance. Cross-sectionally maternal reports of an emotional child temperament were associated with higher levels of all four food avoidance eating behaviours at age 3. Moreover, an emotional child temperament uniquely predicted food fussiness, slowness in eating and low food enjoyment at 3 years, even after the contribution of maternal psychopathology and feeding practices had been accounted for. The significance of an emotional temperament suggests that a more emotional child may show heightened emotional reactivity within feeding interactions and thus could be more difficult to feed and more demanding in terms of their food preferences.

Early temperament characteristics have previously been found to be a risk factor for vulnerability to later eating problems (e.g., Martin et al., 2000), however, within this thesis, prospectively child emotionally at age 3 was only associated with greater child food fussiness at age 4, and whilst it also significantly predicted food fussiness, this association was not significant after accounting for the influence of maternal feeding practices. This suggests that whilst an emotional temperament is an important child characteristic implicated in child food avoidance, other factors, such as maternal feeding practices which uniquely predicted eating behaviour over time, may represent more significant risk factors. In addition, given that maternal reports of food avoidance were found to be relatively stable and continuous between 3-4 years of age (Chapter’s 5 & 7), coupled with the greater number of temperamental correlates identified in the cross-sectional study (Study 3), it is possible that a causal relationship is present between child emotionality and food avoidance eating behaviour, but that this association occurred prior to the baseline assessments, i.e. before the age of 3 years. It is possible that temperament is implicated in development of eating behaviours earlier in childhood, and thus a recommendation for future research is to recruit participants during pregnancy or earlier in life in order for the role of child temperament in the development of eating behaviour to be more clearly defined.
8.3.1.2 Maternal Psychopathology

Chapter 3 explored the cross-sectional associations between child food avoidant eating behaviour with maternal symptoms of anxiety, depression and eating-related psychopathology. In this study maternal anxiety symptoms were significantly associated with and predicted greater food fussiness, however maternal anxiety did not uniquely predict food fussiness once maternal feeding practices were added into the regression model. Similarly, in Chapter 3, maternal depression symptoms were associated with greater child slowness in eating and lower food enjoyment but only uniquely predicted lower food enjoyment. Maternal eating-related psychopathology was also significantly associated cross-sectionally with child satiety responsiveness and slowness in eating, however only mothers’ worries about their shape and others’ perceptions of it predicted child satiety responsiveness after the contribution of parental feeding practices were accounted for. Collectively these findings suggest that whilst symptoms of maternal psychopathology are associated with child food avoidance, other maternal factors such as feeding practices may represent more influential risk factors for feeding problems.

Chapter 5 replicated Chapter 3 however it used a longitudinal design to explore the relative importance of maternal psychopathology in prospectively predicting food avoidance across early childhood. Supporting the hypotheses and previous research (Ammaniti et al., 2004; Blissett et al., 2007; Stice et al., 1999) maternal anxiety at age 3 was associated with greater food fussiness and slowness in eating and lower food enjoyment at age 4, after controlling for baseline eating behaviour. Maternal anxiety symptoms also significantly predicted food fussiness and slowness in eating, however anxiety did not uniquely predict these variables once maternal feeding practices were added into the regression model. prospectively, symptoms of maternal depression at age 3 were also associated with greater food fussiness at age 4, yet depression did not emerge as significant predictor of food fussiness after controlling for baseline eating behaviour and accounting for the variance explained by maternal feeding practices. Higher levels of maternal restraint, eating and shape concern at age 3 were associated with greater child satiety responsiveness at age 4, whilst eating concern was also associated greater child slowness in eating. However, again these aspects of maternal eating psychopathology did not emerge as significant predictors of food avoidance after controlling for baseline eating behaviour and accounting for the variance explained by maternal feeding practices. This again supports the suggestion that whilst maternal
psychopathy may be important, child emotionality and maternal feeding practices
appear to explain a greater amount of the variance in child food avoidance. This is in
line with previous research which has suggested that the contribution of maternal eating
behaviour and psychopathology can be explained through their influence on maternal
feeding practices, particularly through the association with elevated levels of control
over the child’s eating (Francis & Birch, 2005; Blissett et al., 2006). An interesting
future direction would be to explore maternal anxiety specifically to mealtimes, and
evaluate how parenting stress and anxiety about mealtimes and concern’s about child
weight and eating, influence both how mothers interact with their children and also their
child’s developing eating habits.

8.3.1.3 Maternal Feeding Practices

Chapter’s 3 and 5 also investigated the cross-sectional and longitudinal
relationships respectively, between child food avoidance with maternal feeding
practices. Importantly, the unique contribution of a broad range of maternal feeding
practices were assessed in predicting parental reports of child food avoidance, after
controlling for the effects of child temperament and maternal psychopathology.

8.3.1.3.1 Control

Contrary to the hypotheses and previous research linking parental pressure to eat
with feeding problems and negative mealtime experiences (e.g., Harris & Booth, 1992;
Sanders et al., 1993), maternal reports of pressuring their child to consume more food at
mealtimes were not significantly associated cross-sectionally with food avoidant eating
behaviours. However, prospectively, results from Chapter 5 indicate that maternal
reports of pressuring their child to consume more food at meals at age 3 were
significantly associated with greater child food fussiness, slowness in eating and lower
food enjoyment at age 4, after controlling for previous child eating at age 3. In
addition, maternal pressure to eat at age 3, uniquely predicted child food fussiness and
slowness in eating at age 4, after controlling for the contribution of baseline eating,
child temperament and maternal psychopathology. These findings do not replicate those
of Chapter 3 but do support the hypotheses and previous longitudinal evidence of a
causal link between pressure to eat and child eating behaviour (Farrow & Blissett, 2008;
Galloway et al., 2005, Gregory et al., 2011) and suggest that maternal pressure to eat at
mealtimes could be a risk factor for children becoming slower and fussier eaters over
time. Previous research has found that parental mismanagement of mealtimes during early feeding problems may be implicated in the development of further feeding problems (Harris & Booth, 1992), with the strategies used by parents in an attempt to increase their child’s intake ultimately exacerbating the child’s feeding problems and making mealtimes more negative for both parent and child (Harris & Booth, 1992; Skuse, 1993; Blissett et al., 2000). This may help to explain why the association between pressure to eat and food avoidance emerges longitudinally but not cross-sectionally, with other maternal feeding practices having a greater influence on concurrent eating behaviours, yet in the longer term pressure to eat may exacerbate problems further. However, results were not clear cut, as pressure to eat only emerged as a significant unique longitudinal predictor for 2 of the 4 food avoidant behaviours. Therefore it is possible that other child and maternal factors may interact with maternal control to influence child eating behaviour, and a complex bi-directional relationship is likely.

Cross-sectionally, maternal reports of restriction of food intake for weight reasons were associated with and uniquely predicted lower satiety responsiveness and greater food enjoyment, yet prospectively, maternal restriction for weight reasons was unrelated to food avoidance. This highlight the importance of considering the bi-directional nature of feeding interactions as it may be that mothers restrict their child’s food intake for weight reasons, in response to high food enjoyment and poor satiety responsiveness, with the positive intention of limiting consumption of food intake, rather than restriction being causally implicated. Restriction for health reasons was associated with higher food fussiness, cross-sectionally and also longitudinally after controlling for baseline food fussiness. Thus whilst restriction did not uniquely predict food fussiness within the regression models, previous restriction was associated with increases in food fussiness over time. Fussy eating has been defined as consuming an inadequate variety of foods (Dovey et al., 2008; Galloway, Lee, & Birch, 2003; Smith, Roux, Naidoo & Venter, 2005) and thus it is possible that parents of fussy eaters may restrict the child’s preferred foods in an attempt to promote more varied and healthy dietary intake. However, previous research suggests that this strategy often has the opposite effect to its presumed intentions, with high levels of restriction previously being associated with a greater preference for restricted food (Fisher & Birch, 1999) lower fruit and vegetable intake over time (Galloway et al., 2005). The results of this thesis support these findings and suggest that restrictive
feeding strategies could in fact further exacerbate fussy and avoidant child eating behaviours over time.

8.3.1.3.2 Environment

Supporting the hypothesis and previous findings (Heim et al., 2011; Marshall et al., 2011; Van der Horst, 2012; Powell et al., 2011), the results of this thesis provide evidence that some feeding practices may have a protective effect against the development of food avoidance and instead foster greater child enjoyment of food. Maternal reports of providing a healthy home food-related environment were cross-sectionally associated with and uniquely predicted less food fussiness, less slowness in eating and greater food enjoyment, after controlling for child emotionality and maternal psychopathology. Reports of mothers involving their child in food planning and preparation were also cross-sectionally associated with and uniquely predicted less food fussiness and greater food enjoyment. Prospectively provision a healthy food-related home environment at age 3 was associated with less avoidant eating behaviour and greater food enjoyment at age 4, after controlling for previous child eating behaviour. However, in the longitudinal hierarchical regressions a healthy environment at age 3 only uniquely predicted less slowness in eating at age 4 when other variables were included in the model. Involving the child in meal planning and preparation at age 3, was unrelated to food fussiness, slowness in eating and satiety responsiveness but was associated with greater enjoyment of food at age 4 after controlling for previous child enjoyment of food. Whilst maternal reports of encouraging balanced and varied food intake were not related to food avoidance cross-sectionally at 3 years old, balance and variety at age 3 was associated with less child food fussiness, less slowness in eating, and less satiety responsive and greater enjoyment of food at age 4 and uniquely predicted food fussiness and enjoyment of food at age 4 after controlling for baseline eating.

Replicating and extending previous findings (Heim, Bauer, Stang & Ireland, 2011; Marshall, Golley & Hendrie, 2011; Van der Horst, 2012; Powell et al., 2011), collectively these results provide evidence that the home food-related environment and co-participation in food related activities may have a protective effect against the development of food avoidance in children. Exposing children to a healthy food-related home environment and encouraging them to eat a wide variety of balanced foods during early childhood may help to reduce future food fussiness and increase food enjoyment;
whereas hands on activities like cooking and food preparation could lead to a positive evaluation of the food experience, thus increasing liking and willingness to try foods (Van der Horst, 2012). Whilst fewer unique predictors were identified in longitudinal hierarchical regressions, compared to the associations noted in the partial correlations, it is likely that these environmental feeding practices interact to influence eating behaviour, as collectively they explained a significant increase in variance across all four eating behaviours.

These findings provide preliminary evidence of possible causal relationships and highlight the need for future research to utilise longitudinal designs to explore the long term benefits of these home environmental feeding practices. Whilst these maternal report subscales offer some insight in the food related home environment, future research should continue to explore parental choices within the immediate home environment in more depth. For instance by exploring fruit and vegetable exposure/intake, access to highly palatable foods, and the amount of snacking between meals; behaviours which have been more frequently evaluated in relation to overconsumption and obesogenic eating behaviours (e.g., Wilson, 2000; Fisher & Birch, 2002; Jahns, Siega-Riz & Popkin, 2001; Neilson & Popkin, 2003). Further exploration of these factors in relation to fussy and avoidant eating would provide greater insight into the ways in which parents could adapt their immediate home environment to help promote healthy and varied food intake and reduce the likelihood of encountering feeding problems.

8.3.1.3.3 Behaviour Regulation

Contrary to the hypotheses, both cross-sectionally and prospectively, the use of food for behaviour regulation, which incorporates the use food to regulate child emotional states and to reward behaviour, was not associated with food avoidant eating behaviour. It may be that use of food for emotion regulation is more important in relation to over-consumption and overweight as opposed to food avoidance; with recent research findings suggesting that parental use of food for emotion regulation predicts emotional overeating (Blissett, Haycraft & Farrow, 2010). Another explanation may lie in the uncertainty amongst the literature as to the effectiveness of rewards, which have previously been associated with both positive (e.g., Cooke, Chambers, Añez, Croker, Boniface, Yeomans & Wardle, 2011; Coe et al., 1997; Kern & Marder, 1996; Lowe, Horne, Tapper, Bowdery, & Egerton, 2004) and negative (Newman & Taylor, 1992;
Birch, Marlin & Rotter, 1984; Vereecken, Keukelier & Maes, 2004; Kroller & Warschburger, 2008) outcomes in relation to child eating behaviour. It may be that over time, the use of rewards decrease food avoidance for some children yet increase food avoidance for others, thus explaining the lack of significant associations in either direction. Orrell-Valente and colleagues (2007) suggest the need to sub-categorise conditions and rewards and they distinguish using food as a reward from using non-food related items as rewards and categorise conditions into threats to withdraw desired foods and threats to withdraw non-food privileges. Such sub-categorisation may allow researchers to identify adaptive and unadaptive rewards, which may indeed be specific to each individual child. Further experimental and observational research is essential to adequately evaluate the role of rewards in the development of avoidant eating behaviour in young children.

8.3.1.4 Summary

Chapter’s 3 and 5 have utilised maternal-report measures to demonstrate the child temperamental, maternal psychopathological and maternal feeding practice cross-sectional correlates and longitudinal predictors of child food avoidance over time. In addition they established the unique contribution of a broader range of maternal feeding practices than examined previously, in predicting food avoidance, over and above the other factors. Specifically, food avoidant eating behaviours were associated with an emotional child temperament and symptoms of maternal anxiety, depression and eating psychopathology. Moreover, higher maternal pressure to eat, lower maternal restriction of food intake and mothers providing a less healthy food related home environment, not encouraging balanced and varied food intake and not involving children in food planning and preparation were associated with child food avoidance. Whilst longitudinally many of these correlates were associated with changes in eating behaviour over time, the results suggest that after controlling for initial levels of eating behaviour, maternal pressure to eat, not providing a healthy food-related home environment and not encouraging balanced and varied food intake were the only maternal factors which uniquely predicted increased child food avoidance over time. The findings suggest that after controlling for baseline levels of eating behaviour there was minimal predictive ability of the hypothesised child temperamental and maternal psychopathological factors on subsequent food avoidant eating behaviour. This indicates that risk factors for future food avoidance may be less about inherent
psychological characteristics and instead be more about family environmental factors such as feeding practices.

Maternal pressure to eat emerged as a risk factor for more avoidant eating behaviour over time whereas a healthy food related home environment represents a potential protective factor against future food avoidance. Caregivers receive little positive advice on how to deal with challenging mealtimes and how to actively decrease food refusal and fussy eating (American Dietetic Association, 2010; Van der Horst, 2012, Murashima, Hoerr, Hughes & Kaplowitz., 2011). These findings extend our knowledge concerning the preventative advice that can be offered to parents who are concerned about their children developing fussy or fussier eating habits and highlight the need for future research to utilise longitudinal designs and explore the long term benefits of adaptive feeding practices such as these. Further investigation of the modifiable predictors of food avoidance in non-clinical groups during early childhood may not only provide insight into the risk factors implicated in the aetiology and maintenance of feeding problems, but may also help to prevent the development of these problems that can persist throughout childhood and into adolescence (McDermott et al., 2010; Kotler et al., 2001; Marchi & Cohen, 1990).

8.3.2 Independent Observations; mealtime structure, maternal feeding practices and interactional behaviour as cross-sectional correlates and longitudinal predictors of food avoidance

Chapter 4 investigated whether there were any significant differences between observations of children’s eating behaviour dependent on mealtime structure and examined the maternal feeding practices and mealtime behavioural correlates of food avoidance (food refusal, slowness in eating, difficulty to feed, positive and negative vocalisations), using independent observations. Chapter 6 advanced these cross-sectional findings by extending this study using a longitudinal design and evaluated the relative importance of observed maternal feeding practices and mealtime behaviour in predicting observed child food avoidance over time.

8.3.2.1 Mealtime Structure

As predicted, mealtime structure emerged as an important factor which significantly distinguished dyads with high, compared to lower levels of food avoidance, both cross-sectionally and longitudinally. Supporting and extending research
in older samples highlighting the importance of family mealtimes in the development of healthy and adaptive eating (e.g., Neumark-Sztainer, et al., 2003; Gillman, et al., 2000; Boutelle et al., 2001; Burgess-Champoux et al., 2009), children whose mothers ate with them, ate the same food as them, and allowed their child input in food choice at age 3, were observed to display less avoidant eating behaviours at ages 3 and 4, compared to the children of mothers who did not. More avoidant eating behaviours at ages 3 and 4 was also observed during mealtimes where a distractor (such as TV, radio, toys) was used compared to when there were no distractions during the meal. Interestingly, within these studies no significant differences in eating behaviour where found according to whether the child’s father or siblings were present. However, whilst siblings were present in approximately 50% of the mealtimes, fathers were only present in 22% of observations and thus the data may be underpowered to detect significant differences according to paternal presence. Future studies would benefit from further exploring the role of additional family members during mealtime interactions.

Supporting previous lab-based research where 2-5 year olds accepted a novel food more quickly and ingested more of that food when an adult was eating a similar same-coloured food compared to not eating anything (Addessi et al., 2005), collectively, the results of these studies suggest the importance of mothers not only eating with their children but also trying to eat the same food. Children can learn about food by observing and modelling the eating behaviour of others (Savage, Fisher & Birch, 2007; Brown & Ogden, 2004; Neumark, 2004; Neumark 2007) which may explain why these mealtime organisation variables predicted a decrease in food avoidance over time.

Family meals provide an opportunity for the role modelling of healthy eating patterns (Brown & Ogden, 2004; Neumark-Sztainer et al., 2004; Neumark-Sztainer et al., 2007) and thus may help to foster balanced and varied food intake and less avoidant eating behaviours. However it is also possible that children can model less adaptive eating behaviours, and if mothers’ food choices for themselves and their child are limited and unhealthy, in the longer-term this could in fact exacerbate feeding problems and food avoidance. Within the present thesis, the sample was comprised of predominantly White, well educated, healthy weight mothers’ who described themselves as providing a healthy food environment and encouraging balanced and varied food intake (descriptive statistics Chapter’s 3 and 5). This may explain why positive outcomes were found with maternal presence and consuming the same foods.
These findings need to be explored in groups from lower socio-economic backgrounds where it may be more difficult to provide exposure to a healthy and varied diet, and also require replication in families from different cultural and ethnic backgrounds to explore whether similar results are found.

Interestingly results also highlighted the importance of allowing children some autonomy and involvement in food choice in the development of less avoidant eating behaviours over time. Satter (1990) suggests that during feeding, effective parents provide opportunities for infants and young children to explore but also provide structure and limits. Similarly results from this thesis suggest that providing a healthy home food-related environment and structured mealtimes, but allowing children some autonomy and choice about what and how much they eat may help to foster healthy and adaptive child eating behaviours. This also supports previous research which has shown that over time, given autonomy, young children tend to eat a variety of food and achieve a nutritionally adequate diet (e.g., Rolls, 1986).

**8.3.2.2 Observed Maternal Feeding Practices**

Chapter’s 4 and 6 also explored the cross-sectional and longitudinal associations between independent observations of child food avoidant eating behaviours with maternal feeding practices, specifically the observable aspects of control; pressure to eat, physical prompts to eat and the use of conditions and incentives to eat. In addition Chapter 6 evaluated whether these observed maternal feeding practices at 3 years of age uniquely predicted observed child eating behaviour at 4 years, after controlling for baseline levels.

Observed maternal pressure to eat and physical prompts to eat at age 3 were associated with more food avoidant eating behaviours both cross-sectionally at age 3, and longitudinally at age 4. Moreover, analysis of the longitudinal predictors of observed food avoidance indicate that pressure to eat and physical prompts to eat at age 3 uniquely predicted both food refusal and negative vocalisations about food at age 4, even after controlling for baseline eating behaviour. The fact that pressure to eat and physical prompts emerged as significant longitudinal predictors of child food avoidance supports previous longitudinal evidence of a causal link between pressure to eat and child eating behaviour (Farrow & Blissett, 2008; Galloway et al., 2005, Gregory et al., 2011) and suggests that maternal control during mealtimes could be a risk factor for child food refusal and negative mealtime experiences over time. Very few longitudinal
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studies have used observational measures, and the interpretation of findings has thus been limited by the potential bias of maternal report, therefore these results expand and enhance on previous research by providing evidence for a causal relationship between validated, independently observed measures of these constructs. Results support previous research suggesting that the strategies used by parents in an attempt to increase their child’s intake can unintentionally exacerbate the child’s feeding problems and make mealtimes more negative for both parent and child (Harris & Booth, 1992; Skuse, 1993; Blissett et al., 2000). This is particularly important given that another recent observational study reported that parents primary aim at mealtime is to get their child to eat more (Orrell-Valente et al., 2007), with mothers in the present study being observed to pressure or prompt their children to eat on average 4-5 times per meal. Orrell-Valente et al. (2007) suggest a need to differentiate amongst prompts in terms of variation in parents’ affective style or message content and the results of the present study also suggest a need to explore pressuring feeding practices in more depth. Researchers need to seek to identify more appropriate behaviours which parents can use to guide and encourage young children to consume a healthy and varied diet.

In contrast to maternal report findings from Chapter 3, cross-sectionally observed use of conditions and incentives to get the child to eat were associated with more food avoidant child eating behaviours. However, longitudinally conditions and incentives to eat at age 3 were only found to be significantly associated with, but not uniquely predict, less positive vocalisations about food made by the child at age 4. Despite previous evidence concerning the positive outcomes associated with the use of the rewards, such as increased fruit and vegetable consumption, and reduced food refusal (e.g., Cooke, Chambers, Añez, Croker, Boniface, Yeomans & Wardle, 2011; Coe et al., 1997; Kern & Marder, 1996; Lowe, Horne, Tapper, Bowdery, & Egerton, 2004), within the present study rewards did not predict changes in eating behaviour over time. The fact that an association was found cross-sectionally but not longitudinally suggests that rewards are more than likely used in response to children’s avoidant eating behaviour rather causally implicated in changes in food avoidance over time. The mixed results found within this thesis mirror those found in previous research on the association between rewards and eating behaviour. Whilst there is evidence that interventions within schools using rewards may be effective (Lowe, Horne, Tapper, Bowdery & Egerton, 2004; Hendy, Williams & Camise, 2005), future studies would benefit from continuing to explore parental use of rewards within the home across early
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childhood so that the role of rewards in the development or prevention of food avoidance can be more clearly defined.

8.3.2.3. Maternal Mealtime Interaction

Chapter’s 4 and 6 also explored the cross-sectional and longitudinal associations between independent observations of child food avoidant eating behaviours and independent observations of maternal interaction at mealtimes, specifically maternal feeding sensitivity, interactional conflict, expressed emotion and vocalisations. In addition Chapter 6 evaluated the relative contribution of these behaviours in predicting child food avoidance over time. Supporting the hypotheses, cross-sectionally observations of high maternal feeding sensitivity, low interactional conflict and mothers expressing positive emotion and making positive vocalisations about food during the meal were associated with observations of less child food avoidance, whereas negative expressed emotion and comments were associated with greater food avoidance. Longitudinally, findings were similar and maternal interactional behaviour at age 3 remained associated with food avoidance at age 4, but there were fewer significant relationships. Within the regression models, higher levels of interaction conflict between mother-child dyads and mothers not expressing positive emotion at 3 years uniquely predicted child food avoidance at 4 years after accounting for the contribution of previous eating behaviour. These findings provide preliminary observational evidence to support previous research highlighting the benefits of parental sensitivity, warmth and positive interpersonal involvement during mealtimes (e.g., Fiese et al., 2012; Moens, Braet & Soetens, 2007; Patterson et al., 1992; Patrik et al., 2007; Robertson et al., 2011), and reports of conflict and negativity at mealtimes in mother child-dyads where children have feeding problems (Boddy & Skuse, 1994; Harris & Booth, 1992; Robertson et al., 2011). Where previous studies have been unable to decipher causal relationships (e.g., Robertson et al., 2011) the results of the present study provide evidence that discord and conflict at mealtimes may be causally implicated in the development of food avoidance over time. Given reports from a Canadian study, using a representative, population-based cohort of children aged 3-4, that for one sixth of the population family meals are unpleasant and regularly involve arguments (Burnier et al., 2011), the role of conflict at mealtimes warrants further investigation.
Whilst feeding low sensitivity and negative expressed emotion at age 3 did not emerge as unique longitudinal predictors of any of the avoidant eating behaviours at age 4, these variables were associated with changes in food avoidance over time in the partial correlations and these maternal behaviours significantly added to the regression models. Collectively maternal feeding practices and mealtime interactions explained a large increased in the variance explained and thus negative interactions and low sensitivity may be implicated in the development of food avoidance but these variables may co-exist with other maternal factors, with shared variance likely amongst the variables measured. Finally, cross-sectionally mothers who made positive vocalisations about food during the meal were observed to have children who also made more positive vocalisations about food, whereas more maternal negative vocalisations about food were associated a slower eating rate, more food refusals and observations of the child being more difficult to feed. The association between negative comments and greater food avoidance supports findings from Hagekull and Dahl (1987) whereby more negative emotions were reported in a sample of mothers of clinic-referred infants with feeding problems compared to mothers of healthy children. However this research was cross-sectional and it may be that differences in maternal comments and emotions at mealtimes may be in response to variations in child eating behaviour rather than causal implicated. The results of this thesis support this premise as whilst some cross-sectional associations were found, child food avoidance was not associated prospectively with mothers’ positive or negative comments about food. Results suggest that mothers’ general positivity and emotional expression is more important than positive comments specific to food, in relations to promoting less avoidant eating behaviours in young children.

Overall the results with regard to maternal interactions at mealtimes point to the importance of a positive feeding dynamic characterised by low conflict, positive expressed emotion and high feeding sensitivity. Where previous cross-sectional studies have been unable to infer causal relationships (e.g., Robertson et al., 2011) the results of the present study provide preliminary evidence into potential protective and risk factors, within the interactional dynamic of mealtimes, that may implicated in the development of food avoidant eating behaviours over time. Practitioners and health care professionals should consider the importance of positive feeding dynamics within the home in primary care interventions for children with feeding problems and when offering preventative advice to parents.
8.3.2.4 Summary

Chapter’s 4 and 6 demonstrated maternal feeding practices and interactional behaviours as cross-sectional correlates and longitudinal predictors of food avoidance. Specifically, after controlling for initial levels of eating behaviour, maternal pressure and physical prompts to eat, greater interactional conflict and lower positive expressed emotion were identified as unique predictors of increased avoidant eating behaviour in children over time. Mealtime structure, which significantly distinguished dyads with high, compared to lower levels of food avoidance, both cross-sectionally and longitudinally, also highlights the importance of elements within family mealtime structure that may help to reduce food avoidance. Observed coercive strategies, such as pressure to eat and physical prompts which emerged as the most prominent unique predictors of food avoidance over time and represent potential risk factors. This study also provided evidence of the role of the low conflict and greater positive emotion at mealtimes, which may help to promote more adaptive eating behaviours in young children.

Overall the results suggest a protective effect of structured family meals, and a positive feeding dynamic characterised by warmth and sensitivity and low conflict and low use coercive feeding strategies. This is particularly important as the age group investigated represents a critical period where eating behaviours are becoming established and embedded (Kelder et al., 1994) and where preventative strategies could be most effectively implemented. These findings extend our knowledge concerning the preventative advice that can be offered to parents who are concerned about their children developing fussy or fussier eating habits. Future research should seek to evaluate not only parental feeding practices such as control, but the affective nature of feeding interactions and how these variables may interact to influence child eating behaviour.

8.3.3 Validation of maternal reports of feeding practices and child eating behaviour

One of the aims within Chapter 4 was to validate maternal reports of child eating behaviour and maternal feeding practices with independent observations of these behaviours. Maternal reports of child food avoidance were associated with independent observations; however maternal reports of their own feeding practices were not validated by independent observations. The validation of maternally reported child
feeding problems supports previous evidence that mothers are able to accurately report their children’s eating behaviour (Chatoor et al., 1988; Sanders et al., 1993), suggesting that mothers are in tune with the feeding problems and eating behaviours of their child. This may be because mothers are often the primary caregiver and thus are likely to engage in daily interactions with their children around food, especially in this group which were predominantly pre-school aged at time point 1. The poor correspondence between observed and reported maternal feeding practices could be explained in various ways. It could be that mother’s reports of their own feeding practices may not always be accurate as it is possible that mothers may underestimate their use of certain less socially desirable practices such as pressure to eat. However it is also plausible that mothers do not behave naturally when they are being observed, thus explaining the discrepancy between the two measures. Additionally it can be difficult to observe many maternal feeding practices, for example the present thesis did not explore the validity of maternal restriction as it is often a covert practice not easily observable in a standard mealtime. These finding highlight the importance of utilising both maternal report and observational measures.

8.3.4 The consistency and stability of maternally reported and independently observed child eating behaviours and maternal feeding practices from 3 to 4 years of age

Chapter 7 examined the consistency and stability of both maternally reported and independently observed maternal feeding practices and child food avoidant eating behaviours in a 1 year prospective study during early childhood. Results demonstrated good stability in individual ranks of maternally reported and observed child eating behaviours and maternal feeding practices between 3 and 4 years.

The stability of maternal feeding practices supports previous research (e.g., Blissett & Farrow, 2007; Faith et al., 2004; Farrow & Blissett, 2012; Gregory et al., 2010) and provides novel results by demonstrating stability in observed as well as self-reported behaviours. In addition findings add to the reliability of the Comprehensive Feeding Practices Questionnaire, and The Family Mealtime Coding System as measures of parental feeding practices over time. The documented stability of child eating behaviour supports evidence that eating behaviours develop very early in childhood (Birch & Fisher, 1998; Farrow & Blissett, 2012), even as early as 2 or 3 years old. Correlation coefficients were particularly high for food fussiness (r = .81) providing
strong support for previous evidence of the persistence of picky, fussy or irregular eating across early childhood (Jacobi et al., 2003; Mc Dermot et al., 2010; Mikkila et al., 2004). This is particularly important given that early feeding problems and avoidant eating behaviours have been associated with both the later development of eating disorders (Kotler, Cohen, Davies, Pine & Walsh, 2001; Marchi & Cohen, 1990) and continued fussy eating and poor dietary variety in adolescence and adulthood (McDernott et al., 2010; Nicklaus, Boggio, Chabanet & Issanchou, 2005). Good consistency in mean group levels of maternally reported and independently observed feeding practices and child eating behaviours were also reported with the exception of observed difficulty to feed, pressure to eat and positive vocalisations which significantly decreased over time.

These findings build upon current knowledge concerning the stability and consistency of eating behaviours and feeding practices during early childhood. This data is the first to date to explore the developmental trajectory of these behaviours using both parent-report and observational measures, and to incorporate the broad range of measurable parental feeding practices and behaviours associated with child eating behaviour. However, when interpreting these findings it is important to consider the age range of the children, who were recruited aged between 2-4 years old and followed up 12 months later at 3-5 years old. One might expect there to be variability in eating behaviour and feeding practices dependent on child age, affecting the validity of measures of consistency and stability amongst this sample. However, data screening revealed that child age was not significantly correlated with the degree of change in maternally reported or independently observed child eating behaviour or maternal feeding practices, suggesting that changes did not significantly differ dependent on child age within the sample. Despite this it is recommended that future research exploring the developmental trajectory of child eating aims to recruit children within a narrower age range.

Given that early childhood has being identified as a critical period in the development of eating behaviours and food preferences (Birch & Fisher, 1998) which may relate to later eating attitudes, food preferences, food intake and BMI (Braet & Van Strien, 1997; Jansen et al., 2003; Savage Fisher, & Birch, 2007; Wardle, 2006; Wardle, 2007), the evident consistency and stability during early childhood highlights a need to continue to explore the developmental trajectory from as early in life as possible; tracking eating behaviour from infancy and weaning through the first few years of life.
Further research is necessary to replicate these findings in larger and more diverse samples and to explore the factors that predict changes in eating behaviour and maternal feeding practices over time.

**8.4 BMI**

A notable finding, running throughout this thesis, was that BMI was unrelated to avoidant eating behaviour. Given that the present sample of children were, on average, of ‘healthy weight’ it could be argued that these avoidant eating behaviours were not impacting on growth and thus may not be problematic. We know that for some early feeding problems can be transient and resolve without intervention and clinical input (Morrell & Black, 2000). If these early avoidant behaviours also appear not impact on growth, perhaps concern about them is misplaced. Yet, whilst previously failure to thrive (FTT) has been used to signify significant feeding problems (e.g., Fosson & Wilson, 1987; Mathisen, Skuse, Wolke & Reilly, 1989), recently negative social, psychological and developmental outcomes have been recognised as important (e.g., Berlin, Davies, Lobato, & Silverman, 2009; Black, 1999; Ramsay & Veroff, 1998; Winters, 2003). Within the literature on picky or fussy eating, it has been found to be associated with both lower weight (e.g., Marchi & Cohen, 1990) yet also with elevated BMI in children (Carruth & Skinner, 2000) and the consumption of higher amounts of fat (Galloway et al., 2005) and more sweetened foods (Carruth et al., 2004). Thus it may be that BMI is not the best indicator of the impact of avoidant eating behaviour. Picky eaters have been found to eat a limited variety of foods (Carruth, Skinner, Houck, Moran, Coletta & Ott, 1998a; Mascola, Bryson & Agras, 2011), and especially be more likely to avoid fruits and vegetables (Gallloway et al., 2005; Jacobi et al., 2003). This reflects an important barrier to healthy eating, which may effect essential nutrient intake in children (Golloway, Fiorito, Lee & Birch, 2005) rather weight per say.

Given this, this study could be improved by including a measure of dietary or fruit and vegetable intake, perhaps in the form of a food diary. In addition, whilst no significant changes in BMI were identified over the 1 year period, it would be beneficial to continue to follow these children further across childhood to ascertain whether there was any impact on growth or weight over time. As data from a large population based cohort study (Gateshead Millennium Baby Study) found that whilst weight faltering is more common in children with eating problems, eating problems in the majority of toddlers are associated with normal growth (Wright, Parkinson, Shipton
Food avoidance in children

& Drewett, 2007). Further longitudinal studies following children across childhood, measuring a range of outcomes, are needed to better understand whether avoidant eating behaviours may be problematic. Similarly, in the present study avoidant eating behaviours were found to be relatively stable and continuous between 3 and 4 years of age, yet there is evidence that they significantly decrease between 4-11 years (Ashcroft et al., 2008) and thus may be relatively transient. Again it is unclear within the present sample whether a similar pattern would emerge later in childhood, limited the conclusions that can be drawn. It may be that is important for future research to also measure parental concern about child eating and weight and explore its association with actual eating behaviour and BMI. As if these behaviours are relatively transient with little impact on BMI and health, it may be that concerns of parents and researchers alike may be misplaced.

8.5 Limitations of the present thesis and directions for future research

There are a number of limitations to this study and points to be considered in the interpretation of the findings. As with many research studies, this study suffers from the bias caused by self selecting samples. Despite attempts to recruit mothers for the observational longitudinal study from various geographic and demographic areas across the south east and the midlands of the U.K., participation was optional and relied on convenience opportunity sampling therefore it is acknowledged that there may be some sampling bias. In addition, eligibility criteria included English being the primary spoken language within the home for those participating in the observational aspect of the study, in order for the home mealtimes to be coded and analysed by the researcher, which may have excluded some families from more diverse cultural and ethnic backgrounds taking part. For the initial cross-sectional sample for Chapter 3, the internet was used for recruitment and completion of questionnaires, a method which has been criticised for attracting biased samples, such as participants with above average education (Azar, 2000), however beneficially, it provides access to samples from a wide spread of geographic locations (Gosling et al., 2004), something that many other recruitment methods fail to achieve. Moreover, exploration of the present sample using Krusall-Wallis tests, revealed no significant differences in the demographic and test variables, between those participants recruited through the internet compared to those recruited through letters or face to face. Despite these attempts to reduce sampling bias,
the mothers’ within the thesis sample were predominantly White, well educated, and of healthy weight. This will affect the generalisability of findings to other groups and may not reflect wider views and perceptions of the general population.

This study could be criticised for recruiting children who were originally aged between 2-4 years old and followed up 12 months later at 3-5 years old. It could be argued that there would have already been large variability in eating behaviour within these groups dependent on child age. However, previous research has suggested that child food avoidance is both stable and continuous in children aged 2-5 years (Farrow et al., 2012) and the effects of age were screened before data analysis was conducted within each chapter. In Chapter’s 4 and 6, child age was in fact associated with observed child food avoidance, with younger children within the sample being observed to refuse more foods, make more negative vocalisations about food, and be slower to eat their meals. Therefore within these chapters the effect of child age was controlled for in both the correlations and regression models. No systematic differences in maternally reported food avoidance were found within the sample dependent on age. Importantly within chapter 7 there were no significant differences in changes in observed or maternally reported child eating behaviour over time dependent on child age. However, future research exploring the longitudinal predictors of child eating behaviour would benefit from recruiting children within a 1 year age bracket, ideally from soon after birth and following them yearly throughout childhood. There is evidence that family environmental factors, such as feeding practices, can influence children from very early in life, for instance through weaning and the first few years of life (e.g., Farrow & Blissett, 2006, also see review Hetherington, Cecil, Jackson & Schwartz, 2011). This coupled with evidence of stability and consistency in child eating behaviour from as young as 2 years old, highlights the need for future research to begin earlier than age 2, before food avoidant eating behaviours develop and become engrained.

This study could be criticised for the relatively small sample size in the longitudinal observational aspect of this study, given the number of variables explored. However, observational studies, due to their time and cost constraints, are rare and samples are often very small. Achieving a sample size of 75 participants and maintaining such a high retention rate at the 1 year follow-up are significant strengths of this study. Future research studies should continue to use mixed methods approach utilising observational measures to validate parental-report and allow for the
exploration of a broader range of variables then maternal report measures offer. Importantly this thesis presents many novel and exciting findings and highlights some potential risk factors and protective factors within the family environment for food avoidance over early childhood, but replication in larger samples and longitudinal studies following children earlier in life and over a greater number of years is recommended. Upon reflection, it would have been beneficial to have been able to follow up the families within this sample across 2 years, but due to time, financial and practical restraints this was not possible.

8.6 Conclusions

In summary, the present thesis presents evidence to support the contribution of family-environmental factors in the development of food avoidant eating behaviours during early childhood. Through use of maternal reports and observational measures, many different maternal environmental factors could be explored and their relative unique contribution evaluated. This is the first study to explore concurrently and prospectively, the contribution of a broad range of feeding practices over time after controlling for inherent child characteristics and maternal psychopathology. This is particularly valuable given that child temperament and maternal psychopathology are largely stable and enduring whereas maternal feeding practices and mealtime behaviours are potentially modifiable. The identification of pressure, physical prompts and interaction conflict as potential risk factors and positive emotions, feeding sensitivity, provision of a healthy food-related home environment, encouraging balanced food intake, and involving the child in food planning as potential protective factors against food avoidance highlights areas that health professionals, clinicians and parents can focus on to prevent food avoidance and promote healthy and varied food intake amongst children. The evident importance of several mealtime factors in preventing the development of avoidant eating over time, such as mothers eating with their children, eating the same food, not using distractions, and allowing children some autonomy in food choice highlight additional modifiable factors with the direct home environment that could be utilised to prevent feeding problems.

The results of this study suggest that maternal reports of child eating behaviour are accurate yet reports of their own feeding behaviours may not be, highlighting the need to consider the reliability of questionnaire measures within research in this field. Finally this study found that both maternally reported and independently observed child
eating behaviours and maternal feeding practices were predominantly stable and continuous across early childhood, highlighting a need for future studies to explore the developmental trajectory of these behaviours from weaning through the first few years of life. In addition, given contradictory evidence that these behaviours can be transient (e.g., Ashcroft et al., 2008; Morrell & Black, 2000) or persistent (McDermott et al., 2008; Nicklaus et al., 2005), more longitudinal studies following children later into childhood are also essential to evaluate the long-term implications of these early eating behaviours. Within the present thesis, child BMI was unrelated to avoidant eating behaviour and the sample of children were, on average, of ‘healthy weight’ therefore it could be argued that these avoidant eating behaviours are not be problematic. Measurement of a broader range of outcomes, such as fruit and vegetable consumption or nutrient intake values are needed to better understand whether avoidant eating behaviours may be problematic. Overall this thesis demonstrates many interesting and novel findings but primarily through the utilisation of observational and longitudinal data it demonstrates the important causal contribution of family-environmental factors in the development of food avoidant eating behaviours during early childhood.
REFERENCES


Farrow, C., & Blissett, J. (2012). Stability and consistency of parentally reported child eating behaviours and feeding practices from 2 to 5 years of age. *Appetite*, 58, 151–156


Food avoidance in children


Food avoidance in children


Appendix A

Internet advert for online questionnaire
Mothers and their 2-5-year-old children needed to take part in a new study

- Are you a mother of a child aged between 2-5?
- Would you like to be involved in new research at Loughborough University?
- If so, then you could be of great help!

Two hundred and fifty mothers and their 2 to 5 year-old children are required to partake in an study exploring the development of eating behaviours in young children. This research study explores the factors that influence children’s eating behaviour with a view to developing our knowledge and understanding of how to improve children’s eating in the future. If you would take part in this research please click on the link below to complete an online questionnaire about yourself and your child aged between 2-5 years old, which will take approximately 20 minutes to complete.

{Survey Monkey Link here}

All the information you provide will be made anonymous and confidential and participation in this study is completely voluntary and you are not under any obligation to take part. You are free to withdraw from this study at any time, and there is no penalty if you decide to do so. Further information about the study and a consent form can be found using the link provided. Alternatively should you wish to discuss this study further please contact me using the details below. Your input into this survey really would be appreciated.

Miss Faye Powell  - Email: f.c.powell@lboro.ac.uk  - Tel: 01509 228473  /  07921838900
Appendix B

Initial Contact Letter sent to nursery/pre-school managers for questionnaire study
Dear {HEAD TEACHER/MANAGER},

Child Eating Behaviour Research Project

My name is Faye Powell and I am a Ph.D. student currently conducting research into children’s feeding and eating behaviour at Loughborough University. I am writing to ask if you might be able to help me with an aspect of the project on which I am currently working by distributing some questionnaire packs to the parents of children aged 2 to 5 years. The proposed research would be exploring the factors that influence children’s eating behaviour and food choice with a view to developing our knowledge and understanding of how to improve children’s eating in the future.

If you are happy to help with this study it would involve distributing some questionnaire packs to parents which contain all of the information about the study and a pre-paid envelope for them to return the questionnaire to me in should they decide to take part. Taking part in the study is completely optional for parents and all data is confidential and made anonymous. This is clearly stated in the information pack for parents. I would be more than happy to share the anonymous findings of the study with the school after completion should you wish to use them to inform your healthy eating policy.

If you would be willing to distribute some sets of questionnaires, I would be really grateful to you. I can be contacted by email f.c.powell@lboro.ac.uk by telephone 07921838900 or 01509 228473, or at the address below. I would be happy to answer any questions you may have, send you a copy of the questionnaire to look at, or arrange a meeting to further discuss this with you.

Thank you very much for taking the time to read my letter and, in anticipation, for your help with my research. I do appreciate that it is not always convenient for schools to partake in research projects, but hope that you will be able to help on this occasion. I look forward to hearing from you.

Yours Sincerely,

Faye Powell
Appendix C

Information sheet for online questionnaire
CHILD EATING BEHAVIOUR STUDY
Faye Powell, Dr. Claire Farrow and Dr. Caroline Meyer
Department of Human Sciences, Loughborough University

Information Sheet

250 parents of children aged between 2 and 5 years are taking part in a study exploring the development of children’s eating behaviour. I would like to invite you to take part in this research by completing this online questionnaire, about yourself and your child aged between 2-5 years old, which will take approximately 20 minutes to complete.

Your role in the study: You will be asked to fill in a questionnaire about yourself and your child. The questionnaire asks about your attitudes towards food and eating as well as the practices that you use when feeding and parenting your child. It also asks about your child’s eating behaviours and temperament.

All the information you provide will be anonymous and confidential and all data will be kept securely at Loughborough University. Participation in this study is completely voluntary and you are not under any obligation to take part. You are free to withdraw from this study at any time, and there is no penalty if you decide to do so. However no information can be withdrawn from the study after the date of publication. If you are willing to take part in the questionnaire part of this study, please sign the consent form on the next page.

If you have any questions or should you wish to discuss this study further please do not hesitate to contact me using the details below.

Miss Faye Powell - Email: f.c.powell@lboro.ac.uk Tel: 01509 228473 / 07921838900

Please note if any of the questions in the questionnaire pack raise issues that you need to discuss further or if you have concerns about your eating, or your child’s eating, you may find the following of use:

- NHS Direct - Tel: 0845 46 47
- BEAT (for concerns about eating disorders) - Tel: 0845 634 1414
- Parentline Plus (a free national helpline for parents and step-parents) – Tel: 0808 800 2222
- Your GP

Yours sincerely,

Faye Powell
Appendix D

Information Sheet attached to questionnaires sent to schools and nurseries
Dear Parent,

I am a Ph.D. student at Loughborough University currently conducting research about the development of children’s feeding and eating behaviour. I am writing to ask if you might be able to help me with an aspect of the project on which I am currently working. My research study is exploring the factors that influence children’s eating behaviour with a view to developing our knowledge and understanding of how to improve children’s eating in the future. I would like to invite you to take part in this research by completing the enclosed questionnaire, about yourself and your child aged between 2-5 years old, which will take approximately 20 minutes to complete.

All the information you provide will be made anonymous and confidential and all data will be kept securely at Loughborough University. Participation in this study is completely voluntary and you are not under any obligation to take part. You are free to withdraw from this study at any time, and there is no penalty if you decide to do so. Should you wish to discuss this study further please contact me using the details below.

Your input into this survey really would be appreciated and if you would like to take part please read the following information and, complete the enclosed consent form and questionnaire and return them to me using the enclosed pre paid envelope or return them to your child’s school or nursery as soon as possible.

I am very grateful for your time. Thank you for your help.

Faye Powell  - f.c.powell@lboro.ac.uk – 07921838900 – 01509 228473

Please note if any of the questions raise issues that you need to discuss further or if you have concerns about your eating, or your child’s eating, you may find the following of use:

La Leche League 02072421278 (Child feeding support)
NHS Direct - Tel: 0845 46 47
Beat (formerly The Eating Disorders Association) - Tel: 0845 634 1414

This information sheet is for you to keep. Should you decide to take part but wish to withdraw at a later stage please contact Miss Faye Powell.
Appendix E

Advert for observational study
Mothers and their 2-5-year-old children needed to take part in a new study

- Are you a mother of a child aged between 2-5?
- Would you like to be involved in new research at Loughborough University?
- If so, then you could be of great help!

One hundred mothers and their 2 to 5 year-old children are required to partake in an observational study exploring parent-child interactions and the development of eating behaviours in young children. The study involves a visit by a researcher to your home either over a lunchtime or evening meal at a convenient date and time to suit you and your family and completion of a questionnaire. You and your child would be observed eating during lunchtime or evening meal in your home.

Your input into this research would be greatly appreciated. For more details, and to find out how you could help, please contact:

Miss Faye Powell – 07921838900 / 01509 228473 - f.c.powell@lboro.ac.uk

School of Sports, Exercise & Health Sciences; Loughborough University, Leicestershire LE11 3TU, UK
Appendix F

Pre-recruitment information sheet for observational study
**Information Sheet**

**What is the study about?**
This study is exploring parent-child interactions and the development of children’s eating behaviours.

**Who is taking part?**
100 parents and their children aged between 2 and 5 years.

**What will I have to do and how long will it take?**
The study will take about 1 hour over either a lunchtime or evening meal and can be arranged at a convenient date and time to suit you and your family. It can be during the week or at a weekend, whichever is preferable for you.

**Your role in the study:** You will be asked to fill in a questionnaire about yourself and your child. This will ask about your attitudes towards food and eating and the practices that you use when feeding and parenting your child. It will also ask about your child’s eating behaviours and temperament. You will also be asked if you and your child are willing to be observed and video recorded during a typical mealtime within your home, and if you are willing to be weighed and measured.

**Your child’s role in the study:** Your child will be observed or video recorded during a typical mealtime. You and your child will then be asked if you are both happy for your child to be weighed and measured.

**The Visit:** After a date for the observation has been organised, I will post out a questionnaire pack and consent form for you to fill out, for me to collect on arrival. On the day of the visit, I will arrive approximately 15 minutes before you plan to eat your meal, so that you and your child can familiarise yourselves with me and the camcorder. You will then be video recorded having a typical mealtime with your child. I would like this, ideally, to be as close to a ‘normal’ mealtime as possible, including things like whether your other children, or partner are normally present. Afterwards I will then weigh and measure you and your child.

**What happens to the information?**
All the information you and your child provide will be anonymous and confidential. All video recordings will be anonymous and kept in a securely locked cabinet. The data will be analysed and written up as a group so no individual can be identified and no-one will know who participated in the study.

**Do I have to participate?**
Your participation in this study is entirely voluntary and you are under no obligation to take part. You and your child are both free to withdraw from this study at any time, and there is no penalty if either or both of you decide to do so.
What do I do if I want to participate?
Your input into this study really would be appreciated. If you are willing to take part in this study please contact me via email or over the phone, with times and dates of when you expect to be available (e.g., Monday lunchtimes, Thursday evenings, November only). We can then arrange to book in the observation. Also, if you have any further questions, or should you wish to discuss this study further, please do not hesitate to contact me using the details below.
Miss Faye Powell - Email: f.c.powell@lboro.ac.uk Tel: 01509 228473 / 07921838900

I am very grateful for your time and consideration. Thank you so much for your help.
Appendix G

Post-recruitment information sheet for observational Study
CHILD EATING BEHAVIOUR STUDY
Faye Powell, Dr. Claire Farrow and Dr. Caroline Meyer
School of Sports, Exercise and Health Sciences, Loughborough University

Dear {PARENT},

Thank you so much for offering to take part in this study. I look forward to meeting you and {CHILD’S NAME} on {DAY/DATE OF VISIT}. Below is an information sheet for you to keep and attached is the questionnaire and consent form I would like you to complete. I will collect these when I come to visit.

Information Sheet
100 parents and their children aged between 2 and 5 years are taking part in a study exploring parent-child interactions and the development of children’s eating behaviours. The study will take about 1 hour over either a lunchtime or evening meal.

Your role in the study: You will be asked to fill in a questionnaire about yourself and your child. The questionnaire asks about your attitudes towards food and eating as well as the practices that you use when feeding and parenting your child. It also asks about your child’s eating behaviours and temperament. During the visit, you and your child will be observed during a typical family mealtime and you will be asked if you are both happy to be weighed and measured.

Your child’s role in the study: Your child will be observed and video recorded during a typical mealtime and you and your child will then be asked if you are both happy for your child to be weighed and measured.

All the information you and your child provide will be anonymous and confidential. The consent forms will be kept separately from the questionnaire and the video tapes. An identifier code will be used to link your questionnaire responses with the recordings from the observations. Only the researchers will have access to the anonymous questionnaires and video recordings, which will be stored in a locked cabinet at Loughborough University and destroyed after 6 years. The data will be analysed and written up as a group so no individual can be identified and no-one will know who participated in the study.

Your participation in this study is entirely voluntary and you are under no obligation to take part. You and your child are both free to withdraw from this study at any time, and there is no penalty if you decide to do so. However no information can be withdrawn from the study after the date of publication. If you are willing to take part in the questionnaire part of this study, please sign the attached consent form.

If you have any questions or should you wish to discuss this study further please do not hesitate to contact me using the details below.

Miss Faye Powell - Email: f.c.powell@lboro.ac.uk - Tel: 01509 228473 / 07921838900
Please note if any of the questions in the questionnaire pack raise issues that you need to discuss further or if you have concerns about your eating, or your child’s eating, you may find the following of use:

- NHS Direct - Tel: 0845 46 47
- BEAT (for concerns about eating disorders) - Tel: 0845 634 1414
- Parentline Plus (a free national helpline for parents and step-parents) – Tel: 0808 800 2222
- Your GP

Yours sincerely,

Faye Powell
Appendix H

Time-point 2 invitation letter and participation form
Dear {PARENT},

I hope that you and {CHILDS NAME} are well. I am writing to thank you for your help and support with my observational study looking at children’s eating and mealtime behaviours. This initial stage of the project was a great success, and it would not have been possible without your assistance. I received a fantastic response rate and managed to visit nearly 80 families in total. I am sincerely grateful to you and all of the families that kindly took part. I am currently in the process of finishing analysing all of the data and I will notify you of the key findings once the study is complete. I was particularly interested in the challenges faced by parents’ when feeding their children, particularly involving picky/fussy eating and consumption of a balanced diet, and I found the visits really eye-opening and enjoyable. I am hoping the write up the results of this first part of the study for publication, and to present at an international conference this summer. I also hope to try to disseminate some of the information to parents and nurseries/schools.

For the next stage of my project, I am hoping to carry out follow ups of the home observations, with as many of the 80 families as possible. I hope that this will provide an insight into how children’s’ eating behaviours change over time and the different factors that may influence this. You and {CHILDS NAME} are invited to take part in this new aspect of my project. Similarly to last year, it will involve observing and video-recording a typical mealtime and then there is a questionnaire for you to complete. The visit will again take about 1 hour over either a lunchtime or evening meal and can be arranged at a convenient date and time to suit you and your family, and the questionnaires take about 20 minutes to complete. It can be during the week or at a weekend, whichever is preferable for you.

Thank you very much for taking the time to read my letter and, in anticipation, for your help with my research. I really appreciate your help with the first stage of my research and I understand that it is not always convenient to partake in research projects, but hope that you will be able to help me with this element of my research. It would be great to see {CHILDS NAME} and no doubt how much they have changed. I will contact you by phone in one week’s time to discuss this further with you, but if you wish to contact me in the meantime, or if you have any questions, then please do not hesitate to contact me via phone or email using the contact details below. Alternatively you may complete the enclosed form and return it using the pre-paid envelope attached. I look forward to speaking to you.

Yours sincerely,

Faye Powell
Participation Form

□ I would like to take part in the follow-up visit for your study and I am happy for you contact me with further information, and to arrange a visit.

□ I am not interested in taking part in this aspect of your study

If you would like to take part please can you indicate any dates and times that you are or might typically be available (e.g., lunchtimes only, specific dates etc)

Dates/times…………………………………………………………

Preferred mode of contact & contact details
□ Phone …………………………………
□ Email …………………………………

Name:…………………………………………………………
Signed:…………………………………………………………
Date:…………………………
Appendix I

Demographic Information
BACKGROUND INFORMATION:

Please could you first provide some information about yourself and your child.

You:

What is your date of birth: ………………… Your gender: Male / Female

Your height:……………………………… Your weight:……………………………

Please describe your ethnicity (e.g., White/ Asian)…………………………

Occupation (at present or your occupation prior to parenthood):
……………………………………

How many years of full time education have you had since the age of 16?………………

Which of the following best describes your total annual family income?  □ Under £15,00

□ £15,000-£30,000 □ £30,000-£45,000 □ £45,000-£60,000 □ £60,000-£75,000 □ £75,000+

Your child: (NB: Please answer ALL questions based on the child that is taking part in this study.)

Your child’s date of birth: ………………… Child’s gender: Male / Female

Child’s height: …………………(approx.) Child’s weight…………………(approx.)

Please describe your child’s ethnicity:………………

How many children do you have? ………………… Is this your 1st/2nd/3rd etc. child?………

Has your child ever been hospitalised for a feeding related problem? Yes □ No □

If Yes please give details…………………………………………………………

What was your child’s birth weight?………………………………………………

Was your child ever breast fed? Yes □ No □

If yes, at what age did your child completely stop breast feeding?………………Months

At what age was your child first fed formula?……………Months

At what age did your child completely stop drinking formula?……………Months

At what age did your child first start eating solid foods daily?……………Months
Appendix J

Child Eating Behaviour Questionnaire (Wardle et al., 2001)
## Child EatingBehaviour Questionnaire (CEBQ)

Please read the following statements and tick the boxes most appropriate to your child’s eating behaviour.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>My child loves food</td>
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<tr>
<td>My child eats more when worried</td>
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<tr>
<td>My child has a big appetite</td>
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<tr>
<td>My child finishes his/her meal quickly</td>
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<tr>
<td>My child is interested in food</td>
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<tr>
<td>My child is always asking for a drink</td>
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<td>My child refuses new foods at first</td>
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<td>My child eats slowly</td>
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<td>My child eats less when angry</td>
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<td>My child enjoys tasting new foods</td>
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<td>My child eats more when s/he is tired</td>
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<tr>
<td>If allowed to, my child would eat too much</td>
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<td>My child eats more when anxious</td>
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<td>My child enjoys a wide variety of foods</td>
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<td>My child leaves food on his/her plate at the end of a meal</td>
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<tr>
<td>My child takes more than 30 minutes to finish a meal</td>
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<tr>
<td>Statement</td>
<td>Never</td>
<td>Rarely</td>
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</tr>
<tr>
<td>Given the choice, my child would eat most of the time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>My child looks forward to mealtime</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>My child gets full before his/her meal is finished</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>My child enjoys eating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>My child eats more when she is happy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>My child is difficult to please with meals</td>
<td></td>
<td></td>
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<td>24</td>
</tr>
<tr>
<td>My child eats less when upset</td>
<td></td>
<td></td>
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<td></td>
<td>25</td>
</tr>
<tr>
<td>My child gets full up easily</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>My child eats more when s/he has nothing else to do</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Even if my child is full up s/he finds room to eat his/her favourite food</td>
<td></td>
<td></td>
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<td>28</td>
</tr>
<tr>
<td>If given the chance, my child would drink continuously throughout the day</td>
<td></td>
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<td></td>
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<td>29</td>
</tr>
<tr>
<td>My child cannot eat a meal if s/he has had a snack just before</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>If given the chance, my child would always be having a drink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>My child is interested in tasting food s/he hasn’t tasted before</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>My child decides that s/he doesn’t like a food, even without tasting it</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33</td>
</tr>
<tr>
<td>If given the chance, my child would always have food in his/her mouth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>34</td>
</tr>
<tr>
<td>My child eats more and more slowly during the course of a meal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35</td>
</tr>
</tbody>
</table>
**Scoring of the CEBQ**

To obtain each subscale score, add up the total of the items for each subscale and divide by the number of items.

*Reversed items 3, 4, 10, 16 and 32

Food responsiveness  =  item mean FR-12,14,19,28,34
Emotional over-eating  =  item mean EOE -2,13,15,23, 27
Enjoyment of food  =  item mean EF – 1,5,20,22
Desire to drink  =  item mean DD-  6,29,31
Satiety responsiveness  =  item mean SR- 3*,17,21,26,30
Slowness in eating  =  item mean SE- 4*,8,18,35
Emotional under-eating  =  item mean EUE - 9,11,25
Food fussiness  =  item mean FF - 7,10*,16*,24,32*,33
Appendix K
Comprehensive Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007)
Comprehensive Feeding Practices Questionnaire

Parents take many different approaches to feeding their children and may have different concerns about feeding depending on their child. **Please answer the following questions as honestly as possible with this child in mind.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Mostly</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How much do you keep track of the sweet foods (e.g. sweets, chocolate, confectionary, ice cream, cake, biscuits) that your child eats?</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. How much do you keep track of the snack food (e.g. crisps, Doritos, cheese puffs) that your child eats?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3. How much do you keep track of the high-fat foods that your child eats?</td>
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<tr>
<td>4. How much do you keep track of the sugary drinks (e.g. fizzy drinks, sugary squashes) this child drinks?</td>
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<tr>
<td>5. Do you let your child eat whatever s/he wants?</td>
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<tr>
<td>6. At dinner, do you let this child choose the foods s/he wants from what is served?</td>
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<tr>
<td>7. When this child gets irritable, is giving him/her something to eat or drink the first thing you do?</td>
<td></td>
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<tr>
<td>8. Do you give this child something to eat or drink if s/he is bored even if you think s/he is not hungry?</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9. Do you give this child something to eat or drink if s/he is upset even if you think s/he is not hungry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. If this child does not like what is being served, do you make something else?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11. Do you allow this child to eat snacks whenever s/he wants?</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12. Do you allow this child to leave the table when s/he is full, even if your family is not done eating?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Do you encourage this child to eat healthy foods before unhealthy ones?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please answer the following questions as honestly as possible with your child in mind.

<table>
<thead>
<tr>
<th>Question</th>
<th>Disagree</th>
<th>Slightly disagree</th>
<th>Neutral</th>
<th>Slightly agree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Most of the food I keep in the house is healthy.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>15. I involve my child in planning family meals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. I keep a lot of snack food (e.g. crisps, Doritos, cheese puffs) in my house.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. My child should always eat all of the food on his/her plate.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. I have to be sure that my child does not eat too many high-fat foods.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. I offer my child his/her favourite foods in exchange for good behaviour.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Most of the food I keep in the house is healthy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. I allow my child to help prepare family meals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. If I did not guide or regulate my child’s eating, s/he would eat too much of his/her favourite foods.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. A variety of healthy foods are available to my child at each meal served at home.</td>
<td></td>
<td></td>
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<td>---</td>
</tr>
<tr>
<td>24.</td>
<td>I offer sweet foods (e.g. sweets, chocolate, confectionary, ice cream, cake, biscuits) to my child as a reward for good behaviour.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>25.</td>
<td>I encourage my child to try new foods.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>26.</td>
<td>I discuss with my child why it’s important to eat healthy foods.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>27.</td>
<td>I tell my child that healthy food tastes good.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>28.</td>
<td>I encourage my child to eat less so he/she won’t get fat.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>29.</td>
<td>If I did not guide or regulate my child’s eating, s/he would eat too many junk foods.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>30.</td>
<td>I give my child small helpings at meals to control his/her weight.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>31.</td>
<td>If my child says, “I’m not hungry,” I try to get him/her to eat anyway.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>32.</td>
<td>I discuss with my child the nutritional value of foods.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>33.</td>
<td>I encourage my child to participate in grocery shopping.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>34.</td>
<td>If my child eats more than usual at one meal, I try to restrict his/her eating at the next meal.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>35.</td>
<td>I restrict the food my child eats that might make him/her fat.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>36.</td>
<td>There are certain foods my child shouldn’t eat because they will make him/her fat.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>37.</td>
<td>I withhold sweets/dessert from my child in response to bad behaviour.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>38.</td>
<td>I keep a lot of sweet foods (e.g. sweets, chocolate, confectionary, ice cream, cake, biscuits) in my house.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>39.</td>
<td>I encourage my child to eat a variety of foods.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>40.</td>
<td>If my child eats only a small helping, I try to get him/her to eat more.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>41.</td>
<td>I have to be sure that my child does not eat too much of his/her favourite foods.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>42.</td>
<td>I don’t allow my child to eat between meals because I don’t want him/her to get fat.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>43.</td>
<td>I tell my child what to eat and what not to eat without explanation.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>44.</td>
<td>I have to be sure that my child does not eat too many sweet foods (e.g. sweets, chocolate, confectionary, ice cream, cake, biscuits).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>45.</td>
<td>I model healthy eating for my child by eating healthy foods myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>46.</td>
<td>I often put my child on a diet to control his/her weight.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>47.</td>
<td>I try to eat healthy foods in front of my child, even if they are not my favourite.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>48.</td>
<td>I try to show enthusiasm about eating healthy foods.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>49.</td>
<td>I show my child how much I enjoy eating healthy foods.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>50.</td>
<td>When he/she says he/she is finished eating, I try to get my child to eat one more (two more, etc.) bites of food.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Scoring of the Comprehensive Feeding Practices Questionnaire

For each subscale calculate means from the responses to the questions that comprise it. Any questions marked with *are reverse coded prior to scoring (Qs 16, 37).

Note:
- Items numbered 1–13 utilize a 5-point response scale “never, rarely, sometimes, mostly, always.”
- Items numbered 14–49 utilize a 5-point scale with different anchors, “disagree, slightly disagree, neutral, slightly agree, agree.”
- Items marked with an * are reverse coded.

Scoring:
Pressure – 17, 30, 39, 49
Restriction for Health – 21, 28, 40, 43
Restriction for weight control – 18, 27, 29, 33, 34, 35, 41, 45
Monitoring – 1, 2, 3, 4
Food as reward – 23, 36, 19
Emotion regulation – 7, 8, 9
Encourage balance and variety – 13, 26, 38
Healthy Environment – 14, 16*, 22, 37*
Involvement – 15, 20, 32
Appendix L
Eating Disorder Examination Questionnaire (EDE-Q 22; Fairburn & Beglin, 1994)
The following questions are concerned with your own eating behaviour over the PAST FOUR WEEKS ONLY (28 days). Please read each question carefully and circle the appropriate number on the right. Please answer all the questions.

<table>
<thead>
<tr>
<th>Question</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight?</td>
<td>No Days</td>
<td>1-5 days</td>
<td>6-12 days</td>
<td>13-15 days</td>
<td>16-22 Days</td>
<td>23-27 days</td>
<td>Every Day</td>
</tr>
<tr>
<td>2 Have you gone for long periods of time (8 hours or more) without eating anything in order to influence your shape or weight?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3 Have you tried to avoid eating any foods which you like in order to influence your shape or weight?</td>
<td></td>
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</tr>
<tr>
<td>4 Have you tried to follow definite rules regarding your eating in order to influence your shape or weight; for example, a calorie limit, a set amount of food, or rules about what or when you should eat?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5 Have you wanted your stomach to be empty?</td>
<td></td>
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<tr>
<td>6 Has thinking about food or its calorie content made it much more difficult to concentrate on things you are interested in; for example, read, watch TV, or follow a conversation?</td>
<td></td>
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<tr>
<td>7 Have you been afraid of losing control over eating?</td>
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<tr>
<td>8 Have you had episodes of binge eating?</td>
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<tr>
<td>9 Have you eaten in secret? (Do not count binges.)</td>
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<td></td>
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<tr>
<td>10 Have you definitely wanted your stomach to be flat?</td>
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<td></td>
</tr>
<tr>
<td>11 Has thinking about shape or weight made it more difficult to concentrate on things you are interested in; for example read, watch TV or follow a conversation?</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>12 Have you had a definite fear that you might gain weight or become fat?</td>
<td></td>
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<td></td>
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<tr>
<td>13 Have you felt fat?</td>
<td></td>
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<tr>
<td>14 Have you had a strong desire to lose weight?</td>
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</tr>
<tr>
<td>15 On what proportion of times that you have eaten have you felt guilty because of the effect on your shape or weight? (Do not count binges.)</td>
<td></td>
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</tbody>
</table>

(Circle the number which applies.)
<table>
<thead>
<tr>
<th></th>
<th>OVER THE PAST FOUR WEEKS (28 DAYS) (PLEASE CIRCLE THE NUMBER WHICH BEST DESCRIBES YOUR BEHAVIOUR.)</th>
<th>NOT AT ALL</th>
<th>SLIGHTLY</th>
<th>MODERATELY</th>
<th>MARKEDLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Has your weight influenced how you think about (judge) yourself as a person?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>30</td>
<td>Has your shape influenced how you think about (judge) yourself as a person?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>31</td>
<td>How much would it upset you if you had to weigh yourself once a week for the next four weeks?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>32</td>
<td>How dissatisfied have you felt about your weight?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>33</td>
<td>How dissatisfied have you felt about your shape?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>34</td>
<td>How concerned have you been about other people seeing you eat?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>35</td>
<td>How uncomfortable have you felt seeing your body; for example, in the mirror, in shop window reflections, while undressing or taking a bath or shower?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>36</td>
<td>How uncomfortable have you felt about others seeing your body: for example, in communal changing rooms, when swimming or wearing tight clothes?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Scoring of the EDE- Q 22

The EDE-Q 22 is a 22 item version of the 36 item EDEQ, with the diagnostic items removed (Qs 16-28 inclusive).

Each item is scored from 0 to 6 as indicated on the questionnaire.

The items comprising the 4 subscales are:

- RESTRAINT (5): 1, 2, 3, 4, 5
- EATING CONCERN (5): 6, 7, 9, 15, 34
- SHAPE CONCERN (8): 10, 11, 12, 13, 30, 33, 35, 36
- WEIGHT CONCERN (5): 11, 14, 29, 31, 32

To obtain each subscale score, add up the total of the items for each subscale and divide by the number of items.
Appendix M

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983)
### HADS

**Instructions:** tick only one box for each question that corresponds to how you feel

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel tense or ‘wound up’:</td>
<td>Most of the time...........</td>
</tr>
<tr>
<td></td>
<td>Nearly all the time.........</td>
</tr>
<tr>
<td>2. I still enjoy the things I used to enjoy:</td>
<td>Definitely as much..........</td>
</tr>
<tr>
<td></td>
<td>Occasionally................</td>
</tr>
<tr>
<td>3. I get a sort of frightened feeling as if something awful is about to happen:</td>
<td>Very definitely and quite badly......</td>
</tr>
<tr>
<td></td>
<td>Definitely ..................</td>
</tr>
<tr>
<td>4. I can laugh and see the funny side of things:</td>
<td>As much as I always could ....</td>
</tr>
<tr>
<td></td>
<td>Very much indeed ............</td>
</tr>
<tr>
<td>5. Worrying thoughts go through my mind:</td>
<td>A great deal of the time ..........</td>
</tr>
<tr>
<td></td>
<td>As much as ever I did ..........</td>
</tr>
<tr>
<td>6. I feel cheerful:</td>
<td>Not at all ...........</td>
</tr>
<tr>
<td></td>
<td>Very often indeed ............</td>
</tr>
<tr>
<td>7. I can sit at ease and feel relaxed:</td>
<td>Definitely ..................</td>
</tr>
<tr>
<td></td>
<td>Often .......................</td>
</tr>
<tr>
<td>8. I feel as if I am slowed down:</td>
<td>Nearly all the time.........</td>
</tr>
<tr>
<td>9. I get a sort of frightened feeling like ‘butterflies’ in the stomach:</td>
<td>Not at all...........</td>
</tr>
<tr>
<td>10. I have lost interest in my appearance:</td>
<td>Definitely ..................</td>
</tr>
<tr>
<td>11. I feel restless as if I have to be on the move:</td>
<td>Very much indeed ............</td>
</tr>
<tr>
<td>12. I look forward with enjoyment to things:</td>
<td>As much as ever I did ..........</td>
</tr>
<tr>
<td>13. I get sudden feelings of panic:</td>
<td>Very often indeed ............</td>
</tr>
<tr>
<td>14. I can enjoy a good book or radio or TV programme:</td>
<td>Often .......................</td>
</tr>
</tbody>
</table>
**Scoring of the HADS**
Each question is coded from 3-0 (decending). Items marked with a * are reverse coded. To obtain each subscale score, add up the total of the items for each subscale and divide by the number of items.

Anxiety – 1, 3, 5, 7*, 9*, 11, 13
Depression – 2*, 4*, 6, 8, 10, 12*, 14*

The norms below give you an idea of the level of anxiety and depression:
0 – 7  = Normal
8 – 10 = Mild
11 – 14 = Moderate
15 – 21 = Severe
Appendix N

EAS Child Temperament Questionnaire (EAS; Buss & Plomin 1984)
**Child Temperament Questionnaire**

**Instructions:** Using the scale below, please circle one number for each question which best corresponds to your answer. **Please answer these questions about your child who is in this study.**

<table>
<thead>
<tr>
<th></th>
<th>Not characteristic or typical of your child</th>
<th>Neutral</th>
<th>Very characteristic or typical of your child</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Child tends to be shy</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Child cries easily</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Child likes to be with people</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Child is always on the go</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Child prefers playing with others rather than alone</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Child tends to be somewhat emotional</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>When child moves about, s/he usually moves slowly</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Child makes friends easily</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Child is off and running as soon as s/he wakes in the morning</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Child finds people more stimulating than anything else</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Child often fusses and cries</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Child is very sociable</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Child is very energetic</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Child takes a long time to warm (up?) to strangers</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Child gets upset easily</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Child is something of a loner</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Child prefers quiet, inactive games to more active ones</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>When alone, child feels isolated</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Child reacts intensely when upset</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Child is very friendly with strangers</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
**Scoring of the EAS**

To obtain each subscale score, sum the item scores & divide by number of answers in each subscale to calculate a mean for each of the four subscales

Shyness = 1, 8, 12, 14, 20
Emotionality = 2, 6, 11, 15, 19
Sociability = 3, 5, 10, 16, 18
Activity = 4, 7, 9, 13, 17
Appendix O

Child Mealtime Coding System (FMCS; Haycraft, 2007)
Child Mealtime Coding System

Operational definitions for the items coded from the CMCS are described below (Haycraft, 2007).

<table>
<thead>
<tr>
<th>Variable coded</th>
<th>Recipient</th>
<th>Definition</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative comments – from target child</td>
<td>About food</td>
<td>Anything negative said about food or mealtime, such as “don’t like it”, “don’t want any more”, “I’m not eating it!”, “no more”, “I don’t like lamb”.</td>
<td>A count was made each time the child made a negative comment during the meal.</td>
</tr>
<tr>
<td>Positive comments – from target child</td>
<td>About food</td>
<td>Positive, enthusiastic comments about food or the mealtime. Examples include: “this food is yummy”; “more please!”; “I like carrots!”; “look Mummy I ate it all up”, “I love ice cream!”.</td>
<td>A count was made each time the child made a positive comment during the meal</td>
</tr>
</tbody>
</table>
| How difficult/easy target child is to feed | N/A           | 1 = easy – usually autonomous feeder, who eats what given, with little protest or conflict. May request more food. Usually uses correct implements, or eats well with fingers.  
2 and 4 used for when child falls within these guidelines - i.e. is more easy (=2) or more difficult (=4) than ‘moderate’ | 1-5 Rating |

• 1 = easy – usually autonomous feeder, who eats what given, with little protest or conflict. May request more food. Usually uses correct implements, or eats well with fingers.
• 3 = moderate – sometimes eats nicely and without difficulty, but sometimes refuses foods, is fussy or slow, or requires prompts or encouragements.
• 5 = difficult – much resistance to offers of food, refusal to eat. Disagreements regarding food consumed. Tantrums. Disliking or refusing foods given/offered.
Appendix P

Mealtime Structure (Cooper, Wheelan, Woolgar, Morrel & Murray, 2004; Orrell-Valente, Hill, Brechwald, Dodge, Pettit & Bates, 2007)
Mealtime Structure (Cooper et al., 2004; Orrell-Valente et al., 2007)

Six items relating to the environment, structure and organisation of the child’s mealtime, using a combination of variables previously used by Cooper et al., (2004) and Orrell-Valente et al., (2007). Each of these variables were coded separately, to allow each aspect of the mealtime structure to be examined independently.

<table>
<thead>
<tr>
<th>Variable coded</th>
<th>Definition</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother eating with the child</td>
<td>Whether mothers was eating with their child during the meal or not</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Mother eating same</td>
<td>Whether the mother ate the same food/meal as the child or ate something different/nothing at all</td>
<td>Yes/No</td>
</tr>
<tr>
<td></td>
<td>N.B – No was also coded if mothers ate nothing</td>
<td></td>
</tr>
<tr>
<td>Child allowed input in food</td>
<td>Whether child was allowed some autonomy in food choice</td>
<td>Yes/NO</td>
</tr>
<tr>
<td>choice</td>
<td>N.B – this includes what and/or how much the child ate</td>
<td></td>
</tr>
<tr>
<td>Eating with Siblings</td>
<td>Whether the child was eating with any siblings or not</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Eating with Father</td>
<td>Whether the child was eating with their father or not</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Distraction</td>
<td>Whether any distractions were used during the meal, including the TV, radio, playing with toys, books and magazines</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>
Appendix Q

Family Mealtime Coding System (FMCS; Haycraft, 2007)
Family Mealtime Coding System (FMCS; Haycraft, 2007).

Operational definitions for the items coded from the FMCS are described below (Haycraft, 2007).

<table>
<thead>
<tr>
<th>Variable coded</th>
<th>Recipient</th>
<th>Definition</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure to eat – from mother</td>
<td>Target child</td>
<td>Parental <strong>verbal</strong> encouragement to consume more food, such as: “eat a little bit more”, “have some peas” or “eat three more mouthfuls”. Includes gentle use of coercion, such as: “just eat the meat”, or “try a mouthful”.</td>
<td>A count made for each unit of speech made by mother</td>
</tr>
<tr>
<td>Prompt, physical – from mother</td>
<td>Target child</td>
<td>Parental use of <strong>physical</strong> encouragements to get child to eat, usually by offering food to the child. Includes placing food on the spoon/fork and offering it to the child, or putting food on the cutlery ready for the child to pick up and eat.</td>
<td>A count made for each unit of speech made by mother</td>
</tr>
<tr>
<td>Use of incentives/conditions – from either parent</td>
<td>Target child</td>
<td>Verbal use of incentives or bargaining in an attempt to increase children’s food consumption. For example, “Mummy will be so happy if you eat your beans”, or “eat this then you can have pudding”.</td>
<td>A count made for each unit of speech made by mother</td>
</tr>
</tbody>
</table>

Two further scales from the FMCS (Haycraft, 2007) were adapted to assess the positive and negative comments made by the mother in relation to food. The FMCS measures generic positive and negative comments made to the child during the meal, where as positive and negative comments specific to food were coded for within this thesis. Operational definitions of these variables are described below.
<table>
<thead>
<tr>
<th>Variable coded</th>
<th>Recipient</th>
<th>Definition</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative comments – from mother about food</td>
<td>About food</td>
<td>Anything negative said about food or mealtime, such as “don’t like vegetables”, “this doesn’t taste very nice”</td>
<td>A count made for each unit of speech made by mother</td>
</tr>
<tr>
<td>Positive comments – from mother about food</td>
<td>Positive, enthusiastic comments about food or the mealtime. Examples include: “Mmm this delicious”; “mummy loves these carrots!”; “I ate it all up because its yummy”</td>
<td>A count made for each unit of speech made by mother</td>
<td></td>
</tr>
</tbody>
</table>
Appendix R

The Feeding Interaction Scale (FIS; Wolke, Summer, McDermott & Skuse, 1987)
The Feeding Interaction Scale

Operational definitions for the items coded from the FIS are described below (Wolke et al., 1987).

<table>
<thead>
<tr>
<th>Variable coded</th>
<th>Definition</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>Sensitivity relating to: comments and feedback on child behaviour, hunger and eating stimulation, cue sensitivity, timing of offered food and termination of mealtime</td>
<td>1-9 Rating</td>
</tr>
<tr>
<td>Interactional Conflict</td>
<td>How harmonious or conflictual was the interaction between mother and child. 1 = Very much discord &amp; conflict 5 = Neutral; bland, atmosphere seems neither positive nor negative 9 = Very harmonious; agreeable, peaceful, no conflict or negative feelings expressed</td>
<td>1-9 Rating</td>
</tr>
<tr>
<td>Amount/ frequency of expressed positive emotion</td>
<td>Verbally expressed positive emotions and non-verbal expressions such as hugs or kisses, less weight given to smiles and laughs by itself. Any expression of endearment is scored 1 = Mum never expresses such emotion 2 = very little – mother seldom expresses such emotion 3 = Moderate – Mum sometimes expresses positive emotion 4 = Much – often expresses positive emotion 5 = Very much – frequently expresses positive emotion</td>
<td>1-5 Rating</td>
</tr>
<tr>
<td>Amount/ frequency of expressed negative emotion</td>
<td>Negative verbal statements and non-verbal cues, e.g., criticisms, threats, pushes, hits, irritability, sharpness, tone. 1 = Very much – frequently expresses negative emotion 2 = Much – often expresses negative emotion 3 = Moderate – Mum sometimes expresses emotion 4 = very little – mother seldom expresses such emotion 5 = Mum never expresses such emotion</td>
<td>Rating 1-5</td>
</tr>
</tbody>
</table>