Maternal control of early milk feeding: The role of attitudes, intention and experience.

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Summary

A controlling maternal feeding style can have negative consequences for child weight and eating style (Ventura & Birch, 2008). Mothers who breastfeed during the first year exert lower levels of control over child feeding (Farrow & Blissett, 2008). Explanations for this relationship speculate that experience of breastfeeding reduces control as breastfeeding requires an infant-led approach (Taveras et al. 2004) or alternatively that maternal attitudes predict both initiation of breastfeeding and later maternal control (Farrow & Blissett, 2006a). The nature of this relationship is explored in this thesis. Mothers reported their intended and actual feeding style during milk feeds when pregnant and at six months postpartum using a modified version of the Child Feeding Questionnaire (Birch, Fisher, Grimm-Thomas, Markey, Sawyer, & Johnson. 2001). Maternal use of control in the form of scheduling and encouraging milk feeds was evident. A high level of control was associated with a shorter breastfeeding duration ($p < 0.001$). Control beliefs were present prenatally with intended breastfeeding duration inversely associated with intended control. Furthermore, attitudes towards the infant-led nature of breastfeeding were associated with both breastfeeding duration and control. Breastfed infants need to be fed to infant demand and amount consumed is immeasurable whilst formula feeding is open to maternal manipulation. A belief that breastfeeding was inconvenient was associated with scheduling feeds whilst concerns over milk intake and low confidence were associated with encouraging feeds. Whilst scheduling feeds was a stable behaviour predictive from prenatal intention, encouraging feeds was fluid and related to maternal experience. Concerns about infant size or feeding difficulties increased use of encouraging feeds. Maternal desire for control may therefore drive breastfeeding duration, explaining the association between breastfeeding and later feeding style. The findings have important implications for breastfeeding duration, early programming of appetite and bodyweight and later maternal feeding style.

Declarations and Statements

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed ..... (candidate)

Date .....

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Where correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s).

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

Signed ..... (candidate)

Date .....

STATEMENT 2

I give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

Signed ..... (candidate)

Date .....

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List of Tables

Abbreviations

AAP.....American Academy of Pediatrics

BF.....Breastfed

BMI.....Body Mass Index

CFQ.....Child Feeding Questionnaire

DH.....UK Department of Health

FF.....Formula-fed

IMD.....Index of Multiple Deprivation

WHO.....World Health Organisation

Chapter 1

Literature Review

This literature review begins by examining the growing problem of childhood obesity in the United Kingdom (UK) and its long term consequences (Lobstein, Baur & Uauy, 2004). It explores potential influences upon child weight before focusing on the role of parents in determining child eating behaviour and weight (Ventura & Birch, 2008). Specifically, the emerging evidence that breastfeeding during the first year is associated with lower subsequent levels of maternal control is examined (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher, Birch, Smicklas-Wright & Picciano, 2000; Taveras, Scanlon, Birch, Rifas– Shiman, Rich – Edwards & Gillman, 2004). Here, potential explanations for the association are explored, focusing on comparisons between the infant-led feeding style of breastfeeding and formula feeding which is open to greater maternal control. Maternal attitudes surrounding this are examined. Finally the aims and justification for this thesis are presented.

1.1 Childhood obesity and overweight in the UK

Obesity in the UK is a growing problem with 30,000 related deaths each year (Haslam, Sataar & Lean, 2006). It is a strong casual factor in major chronic illnesses such as diabetes, hypertension and heart disease (Haslam & James, 2005). Through associated medical costs and days taken off for sickness each year, the obesity epidemic is directly costing the NHS £4.2 billion pounds a year with a wider health economy impact of £16 billion annually (Department of Health, 2008). Obesity is predicted to take over smoking as the leading preventable cause of death both in the UK (Haslam et al. 2006) and worldwide (World Health Organisation, 2002). By 2050 it has been predicted that 60% of men and 50% of women in the UK could be clinically obese (Foresight, 2007).

Levels of childhood obesity are also increasing worldwide with the United States and Europe leading the statistics (Lobstein et al. 2004; Wang & Beydoun, 2007). Worldwide, at least 20 million children under the age of five are overweight (WHO, 2006). The impact of obesity during childhood is multifaceted. In the short term, children can suffer with a range of obesity-induced issues including hormonal, orthopaedic, gastrointestinal, respiratory, metabolic, neurological and immunological disorders (Dietz, 1998; Luder, Melnik & DiMaio, 1998). Incidences of obesity related conditions such as type 2 diabetes, hypertension and elevated serum lipid and insulin concentrations are now being seen in children, when these were once considered adult conditions (Decklebaum & Williams, 2001; Freedman, Dietz, Srinivasan & Berenson, 1999). Probability of future obesity is also increased together with its associated health implications (Baker, Olsen & Sorensen, 2007; Singhal, Mulder, Twisk, can Mechelen & Chinapaw, 2008; Viner & Cole, 2006). Childhood obesity remains a strong predictor for adult cardiovascular disease, atherosclerosis and colorectal cancer even after controlling for adult obesity and smoking (Must, Jacques, Dallall, Bajema & Dietz, 1992). Moreover, it can impact on other areas of a child's wellbeing in terms of social, emotional and even long-term socioeconomic wellbeing (Gortmaker, Must, Perrin, Sobol & Dietz, 1993; Warschburger, 2005).

Trends for obesity are familial and parental obesity predicts childhood obesity (Danielzik, Langnase, Mast, Spethmann & Muller, 2002; Safer, Agras, Bryson, & Hammer, 2001). This relationship however is sometimes not evident until later childhood (Whitaker, Deeks, Baughcum & Specker, 2000). Moreover, overweight children growing up in a household with an overweight parent are more likely to remain overweight into adulthood than those with average weight parents (Magarey, Daniels, Boulton & Cockington, 2003). Risk is further increased where both parents are overweight (Francis, Ventura, Marini & Birch, 2007). Early influences are strong. Maternal prepregnant BMI is associated with infant birth weight and weight gain during the first year postpartum (Baker, Michaelson, Rasmussen & Sorenson, 2004) and into childhood and adolescence (Salsberry & Reagan, 2007).

However, as one might expect, these relationships could represent both genetic and environmental influences (Cullen, Lara & de Moor, 2002; Parsons, Power, Logan & Summerbell, 1999; Patrick & Nicklaus, 2005; Whitaker, Wright, Pepe, Seidel &

Dietz, 1997). Genetic factors have been attributed to 50 – 90% of the variation in Body Mass Index (BMI) (Maes, Neale & Eaves, 1997), and adopted children have BMI's in line with their biological rather than adoptive parents (Stunkard, et al. 1986). Genetic influences have been noted for eating in the absence of hunger (Kral & Faith, 2008), food preferences (Falciglia & Norton, 1994), taste sensitivity (Mennella, Pepino & Reed, 2005), meal patterns (Keshi-Rahkonen, Viken, Kaprio, Rissanen & Rose, 2004) and energy intake (de Castro, 1993).

However, although genetics do have an important influence upon weight gain and obesity, the recent rapid rise in obesity worldwide cannot be explained simply by genetic evolution (Guillaume & Lissau, 2002). Most explanations stem from a complex combination of behavioural and environmental factors that, in short, encourage greater intake of calories combined with reduced energy expenditure (Esposito, Fisher, Mennella, Hoelscher & Huang, 2009; Maziak, Ward & Stockton, 2007). Abundance of food, technology and the built environment has created an 'obisogenic environment' (Egger & Swinburn, 1997).

1.1.1. Childhood Nutrition and obesity risk

Childhood nutrition is a major risk factor for overweight (Rennie, Johnson & Jebb, 2005). Risk for obesity begins during gestation with in utero exposure to nutrients affecting foetal growth and development (Oken & Gillman, 2003). Maternal obesity during pregnancy increases risk of infant macrosomia (Salsberry & Raegen, 2007) whilst malnutrition, particularly protein restrictions are associated with low birth weight (Godfrey, Robinson, Barker & Osmond, 1996). Maternal diabetes has also been associated with infant birth weight and later growth. It is thought that the altered glucose-insulin metabolism of the mother may impact on infant production of and sensitivity to insulin throughout life (Yajnik, 2002). Notably low birth weight actually increases infant risk of overweight and later cardiovascular problems (Hales & Ozanne, 2003). Infants born a low birth weight appear to gain weight at a faster rate than normal during infancy which places them at risk of increased overweight (Dunger & Ong, 2005) [*see section 1.6.3*].

Infant nutrition also impacts upon later weight gain. Breastfeeding is associated with a lower risk of overweight (Gillman, Rifas-Shiman & Camargo, 2001) [*see section*

1.5.1] whilst early introduction of complementary foods places the infant at greater risk of later overweight (Kalies et al. 2005). Diet into toddlerhood and the preschool years impacts upon both later weight and eating patterns. Many toddlers are exposed to fatty foods, sweet beverages and salty snacks which increase their risk of overweight (Fox, Pac, Devaney & Jankowski, 2004; Savage, Fisher & Birch, 2007; Ziegler, Briefel, Clusen & Devaney, 2006). Early food preferences and choices also show long term stability (Lien, Lytle & Klepp, 2001; Mikkila, Rasanen, Raitakari, Pietinen & Viikari, 2005). Conversely, a diet high in fruit and vegetables reduces the risk of obesity (Cullen, Baranowski, Klesges, Watson, Sherwood & Story, 2004). However, the majority of children are not meeting the government recommended intake of five or more servings of fruit and vegetables a day, with some consuming none at all (Cockcroft, Durkin, Masding & Cade, 2005). Instead, low-cost and palatable, high energy dense convenience foods are commonplace (Stanton, 2006). Furthermore, a greater proportion of meals are eaten outside the home, where portion sizes are likely to be larger and contain increased levels of calories and fat (Young & Nestle, 2002). Fast-food consumption has increased with a typical meal containing a day's worth of energy (Brownell, 2004). Sugary drinks are commonplace, leading to high levels of sugar and calories being consumed – often without realisation or compensation (Ludwig, Peterson & Gortmaker, 2001). As food habits often become established during childhood and extend into adulthood, this is a worrying trend (Rozin, 1990).

1.1.2.Children's level of physical activity and obesity risk

In addition to a rise in calorie dense and nutrient poor diets, children today are also exercising considerably less than previous generations, and reducing energy expenditure (Andersen, Crespo, Bartlett, Cheskin & Pratt, 1998; Reilly, 2006). This is partly related to the spread of urban built-up environments where car use is frequent and walks short and easy (Saelens, Sallis & Frank, 2003). Children are also spending more time in the home watching television and playing video games rather than playing outside (McCool, 2005). Increased parental anxiety over assumed danger of outdoor play (Hull, 2007), despite chances of accident or abduction being lower than in previous years (Gill 2004), is also contributing to inactivity. When given the chance to play outside, play is restricted due to high traffic areas and a decrease in safe play areas (Ellaway, Kirk, Macintyre & Mutrie, 2007).

1.1.3. Impact of Socioeconomic status upon childhood obesity

Historically, children from low income families have been regarded as being at high risk for under nutrition (Miller & Korenman, 1994). However, over the past years concern has turned to their risk for overweight (Mei, Scanlon, Grummer-Strawn, Freedman, Yip & Trowbridge, 1998). Socio-economic status is now one of the most significant predictors of overweight in the Developed World, with those on the lowest incomes at increased risk (Molarius, Seidell, Sans, Tuomilehto & Kuulasmaa, 2000; Strauss & Pollock, 2001). This disparity has been attributed to a tendency to eat a less healthy diet (WHO, 2003), distorted perceptions of overweight (Wardle & Griffith, 2001), lack of nutritional knowledge (Baughcum, Burklow, Deeks, Powers & Whitaker, 1998) and inactivity (Crespo, Ainsworth, Keteyian, Heath & Smitt, 1999). For example, those on a lower income are significantly more likely to spend less money on food, choosing cheaper products with a lower nutritional value (Senauer, Asp & Kinsey, 1998), consume less fruits and vegetables (Krebs-Smith & Kantor, 2001), consume fewer fresh foods (Drewnowski, Darmon & Briend, 2004) and eat a diet of high energy dense foods (Drewnowski et al. 2004). Lack of access to supermarkets and thus a wider range of cheaper and fresher foods, lack of cooking facilities and multiple stressors play a role in determining poor diet of inexpensive, less nutritious food (Jetter & Cassady, 2006).

1.1.4. Parental obesity and childhood obesity risk

An increasing number of studies have highlighted the influence of parental behaviour over child diet and thus overweight. Indeed, the home environment may be one of the greatest influences upon child eating patterns and overweight (Rosenkranz & Dsewaltowski, 2008). Numerous studies have shown that children often model maternal eating habits with both increased maternal fruit consumption and fat consumption mirrored by the child (Cooke, Wardle, Gibson, Sapochnik, Sheiham & Lawson, 2004; Galloway, Fiorito, Lee & Birch, 2005). Moreover, a growing body of evidence depicts an association between not only choice of food but feeding style, particularly controlling feeding practices and childhood overeating and overweight (Ventura & Birch, 2008).

1.2. Parental feeding style and childhood risk of overweight

Parental feeding style has been associated with child weight and eating style (Birch & Davison, 2001; Benton, 2004; Ventura & Birch, 2008). A particular focus has been the level of control a mother exerts over her child's eating pattern in terms of amount consumed and type of nutrients eaten. The Child Feeding Questionnaire (CFQ) designed and validated by Birch, Fisher, Grimm-Thomas, Markey, Sawyer & Johnson (2001) evaluates parental beliefs, attitudes and practices towards children's diet. It was designed to be completed by parents whose child is consuming solid foods and with a suggested age range of two to eleven years. The CFQ aims to assess the level of primary carer involvement and control over the child's diet, and targets behaviours including perceived responsibility, concerns about child weight, restriction, pressure to eat, using food as a reward and monitoring, alongside perceptions of both parental and child weight. Most research in this area considers maternal feeding style, typically the mother has primary responsibility in this area (Wardle, Carnell & Cooke, 2005). A limited set of studies have considered paternal influence on child eating style (Haycraft & Blissett, 2008). However, even when paternal attitude is considered, mothers usually report significantly greater perceived responsibility (Francis, Hofer & Birch, 2001) and monitoring of their children's intake of food (Blissett, Myer & Haycraft, 2006).

1.2.1. Infant ability to self regulate intake of food

Infants have an innate ability to self regulate intake of food (Fomon, Filmer, Thomas, Anderson & Nelson, 1975); an ability which appears to be evident until early childhood (Birch & Deysher, 1985). Pre-school children are able to compensate for covert energy given in a preload by reducing subsequent intake (Birch & Deysher, 1986; Birch, Johnson, Jones & Peters, 1993). However, this natural ability appears to wane and variation occurs between children, especially once those children reach school age. Eating in the absence of hunger is a another notable behaviour (Faith, berkowitz, Stallings, Kerns, Storey & Stunkard, 2006; Hill, Llewellyn, Saxton, Weber, Semmler, Carnell et al. 2009). For example children aged 9 – 10 failed to account for a preload, eating a similar-sized lunch regardless (Anderson, Saravis, Schacter, Zlotkin & Leiter, 1989). As children grow older and into adulthood, the ability to self regulate further dissipates (Johnson &

Taylor- Holloway, 2006; Rolls, Row & Meengs, 2006). Moreover, children who are heavier show lower ability to self regulate, for example failing to adjust for a preload (Johnson & Birch, 1994).

A moderate level of maternal control over child diet may help foster healthy eating patterns (Ogden, Reynolds & Smith, 2006), however other forms can have a negative impact (Ventura & Birch, 2008). For example, monitoring children's intake of unhealthy snacks and providing access to plenty of nutrient dense foods are sensible approaches to influencing child diet and are associated with a lower risk of overweight and increased intake of healthier foods (Brown & Ogden, 2004). However, it is hypothesised that a high level of maternal control in other forms may contribute to a break down of the natural ability to self regulate intake of food or so called decline in satiety responsiveness. Instead of responding to internal cues of fullness and satiety, children may learn to eat for other reasons such as food still being present on their plate or a parent insisting they finish a meal (Benton, 2004). Indeed, a wide body of research has suggested that a high level of maternal control can lead to issues with child eating style, food preferences and possible weight gain (Faith, Francis, Sherry, Scanlon, & Birch, 2004; Ventura & Birch, 2008).

1.2.2 Maternal use of restriction

One form of maternal control is restriction of either certain foods or placing limits on the overall amount a child eats. This behaviour can stem from concerns about the child being overweight or becoming overweight. Items on the CFQ which tap into this behaviour include '*I have to make sure my child does not eat too much of her favourite foods*' and '*I intentionally keep some foods out of my child's reac*h. .

Many parents believe that they have to restrict their children's intake of high energy foods in order for them to maintain a healthy weight (Benton, 2004). Moreover, 40% of parents believe that restricting their child's access to palatable foods would decrease their child's preference for these foods (Casey & Rozin, 1989). Indeed, some use of restriction can have a positive impact upon children's diet. Ogden et al. (2006) for example raise the idea of overt and covert restriction. Overt restriction is direct and obvious to the child, for example telling them they cannot eat a certain snack, whereas covert control is subtle, for example only

bringing healthy foods into the house. It appears that covert restriction can be a positive step to encouraging a healthy diet in young children. Overt control however can have negative consequences. Rather than discouraging intake, children whose parents report a higher level of restriction of palatable foods actually report an increase in liking of such foods (Liem, Mars & De Graaf, 2004). Moreover, restriction appears to increase eating in the absence of hunger (Fisher & Birch, 1999a; Carper, Orlet Fisher & Birch, 2000; Birch, Fisher & Davison, 2003), uninhibited eating (Joyce & Zimmer-Gembeck, 2009) and increased consumption of restricted foods when allowed free access to them (Birch & Fisher, 2000; Lee, Mitchell, Smiciklas-Wright & Birch, 2001). Awareness of such restriction by the child further increases such consumption (Fisher & Birch, 1999b). Overeating of restricted foods when allowed free access in experimental settings also increases further if the mother is not present compared to if she is (Fisher et al. 2000).

In the short-term, maternal restriction of palatable foods may appear to be successful. Farrow & Blissett (2008) found that maternal restriction measured at one year old did reduce child weight at two years old. This finding was echoed by Grubbels, Kremers, Stafleu, Dagnelie, Goldbohm, de Vries & Thijs (2008) who found that maternal restriction was associated with reduced consumption of the restricted item amongst two year olds. However, at this young age it is likely that parents have a high level of control over the types of food and frequency that their child accesses and eats them (Birch, 1991). Therefore in these cases, restriction reduces child weight because the child is unable to access the restricted food. Parents could interpret this restriction as successful, and therefore continue with this technique believing they will continue to have a positive impact upon child weight and eating style. Research confirms the notion that, if given free access to a restricted food, a child will consume a greater amount (Fisher & Birch, 1999a). This lower inhibitory control can be associated with greater weight gain (Anzman & Birch, 2009) . By restricting a certain food, the salience and desire for that food is increased, inadvertently leading the child to seek out the food by whatever means once given access. In short, a toddler who has had restricted access to certain foods may seek them out and overeat when given the opportunity to choose their own food in later childhood (Benton, 2004).

There is some suggestion that high use of maternal restriction is associated with child overweight (Farrow & Blissett, 2006b; Fisher & Birch, 1999a; Francis et al. 2001; Ogden, Reynolds & Smith, 2006), although certainly not every study is conclusive (Haycraft & Blissett, 2008). The relationship does appear to be bidirectional however. On the one hand, mothers who are concerned about their child's weight may attempt to restrict foods (Francis, Hofer & Birch, 2001; Musher-Eizenman, Holub, Hauser & Young, 2007; Tiggemann & Lowes, 2002). However, because restricting foods leads to higher consumption when given free access, it appears that restricting palatable foods may actually lead to increased weight gain (Clark, Goyder, Bissell, Blank & Peters, 2007). Longitudinal work for example indicates that maternal restriction measured at five years old predicts child weight at seven, independently of initial child weight (Faith, et al. 2004). Manipulation of control in experimental settings also suggests that restriction can affect child eating behaviour directly and, in turn, potential weight gain. Fisher & Birch (1999) presented children with two similar snack foods but restricted access to one. Preference for seeking out of the restricted snack food increased relatively to the unrestricted snack food. Children whose behaviour was most affected by the manipulation were heavier and had parents who used the greatest amount of restriction.

Evidence suggests that restriction could be a general maternal approach to child feeding. Studies have shown that there are no differences in maternal use of restriction between siblings who may be of different weights and have different eating patterns (Keller et al. 2006). Similarly, Wardle, Sanderson, Guthrie, Rapoport, & Plomin (2002) found no differences between level of maternal restriction for monozygotic and dizygotic twins, suggesting that the tendency to restrict may be a maternal characteristic. This also applies for sibling pairs where one child is obese and the other average weight (Saelens, Ernst & Epstein, 2000).

One limitation of the restriction literature is that the majority of studies evaluating maternal restriction use self-report, because restriction is difficult to observe in a natural setting. Attempts to relate reported use of restriction with observed restriction during meal times often do not produce significant (or strong) results (Farrow & Blissett, 2006; Haycraft & Blissett, 2008). However, this may be due to

the nature of the control behaviour. Whilst parents may encourage their child to eat during a mealtime, they are unlikely to try and restrict intake of food that they have placed before the child (Orrell-Valente et al. 2007). Restriction instead may take place over the course of the day, and this is difficult to observe naturalistically during the course of a meal.

In summary, restricting access to certain foods can increase risk of weight gain, but mothers can also react to weight gain by attempting to further restrict food.

1.2.3 Maternal use of Pressure to eat

Pressure to eat usually occurs in a meal-time situation and often for nutrient dense foods such as fruit and vegetables. Alternatively, the child may be encouraged to eat more of a meal. Items in the CFQ identifying this include '*If I did not guide or regulate my child's eating she would eat less than she should*' and '*My child should always eat all the food on the plate*' (Birch et al. 2001). Many parents believe that using pressure to get their child to eat has a positive effect in increasing nutrient intake (Casey & Rozin, 1989) or believe that a heavier child is healthier (Wardle, 2002). Evidence suggests, however, that instead of increasing children's intake and liking of these foods, maternal pressure to eat is associated with decreased liking of the target food, reduced intake of food and lower child weight (Faith et al. 2004; Montgomery, Jackson, Kelly & Reilly, 2006). Moreover, pressure to eat can decrease a child's appetite responsiveness, because they learn to eat according to others' directions rather than internal cues of hunger and satiety (Benton, 2004; Birch, McPhee, Shoba, Steinberg & Krehbiel, 1987; Costanzo & Woody, 1985;).

Maternal pressure to eat is associated with increased perceived pickiness or fussiness of the child (Carruth, Skinner, Houck, Moran, Coletta & Ott, 1998; Farrow, Galloway & Fraser, 2008) and a decreased intake of nutrient rich foods such as fruit and vegetables (Fisher, Mitchell, Smiciklas-Wright & Birch, 2002; Galloway, Lee & Birch, 2003). In experimental settings, pressure to eat was associated with decreased liking and consumption of a soup (Galloway et al. 2006) and whilst giving a reward for consumption of a target food increased consumption, it decreased liking (Birch et al. 1987). Retrospective associations have also been seen between adult pickiness and recall of maternal pressure to eat

as a child (Batsell, Brown, Ansfield & Paschall, 2002; Brunstrom, Mitchell & Baguley, 2005). However, few studies establish the causal direction of maternal and child behaviour. One hypothesis is that high maternal pressure to eat increases unwillingness to eat fruit and vegetables due to negative associations or sheer stubbornness (Benton, 2004). Alternatively, children who refuse to eat such foods may lead their parents to use higher levels of pressure to eat in order to encourage food intake (Ventura & Birch, 2008).

Some studies suggest that use of pressure to eat is negatively associated with child weight although the relationship is not always strong (Brann & Skinner, 2005; Francis, Hofer & Birch, 2001; Kroller & Warschburger, 2008). Generally, the greater the use of maternal pressure to eat, the lower the weight of the child. Again, causality needs to be considered. It is possible that increased pressure to eat disliked foods decreases liking and thus consumption and increases picky eating, leading to a decrease in weight. Alternatively, mothers who are concerned about their child's low weight may try to encourage them to eat more. A number of studies have supported this idea, suggesting that concern over child low weight is associated with increased use of pressure to eat (Brann & Skinner, 2005; Francis, Hofer & Birch, 2001; Galloway, Lee & Birch, 2003). Farrow & Blissett (2008) for example found that pressure to eat measured when the infant was one year old was negatively correlated with birth weight, suggesting parents are reacting to infant size. However, pressure to eat at one year was also associated with lower weight at two years independently of weight at one year suggesting that pressuring a child can lead to decreased weight (Farrow & Blissett, 2008). This finding echoed longitudinal work by Faith et al. (2004) who showed that pressure to eat at age five negatively predicted child weight at age seven, independently of initial weight. These findings are consistent with the view that the relationship between maternal behaviour and child-feeding is bi directional.

Unlike maternal use of restriction which appears stable across siblings regardless of weight (Keller et al. 2006; Wardle et al. 2002), variations between children have been noted for maternal use of encouragement to eat. Within families mothers have been shown to use lower levels of pressure to eat with overweight compared to

average weight siblings (Brann & Skinner, 2005; Francis, Hofer & Birch, 2001; Keller et al. 2006).

In summary, a child who is underweight or a fussy eater could encourage use of pressure to eat in the mother. Pressure to eat, however, can lead to further refusal or dislike of the target food.

1.2.4 Maternal control and child weight

A key question within the area of maternal control and subsequent child weight and eating style is causality. Does maternal control affect child behaviour or does child behaviour modify maternal control? From the evidence, the association between high control over child feeding and child weight and eating behaviour appears to be bi-directional (Faith & Kerns, 2005) although some studies do fail to find any link between maternal or parternal control and child weight at all (Haycraft & Blissett, 2008; Wardle et al. 2002). High maternal control can impact negatively upon the child, but a child who is over or underweight or displays picky eating habits can lead to an increase in maternal control (Davison & Birch, 2001; Ventura & Birch, 2008).

Moreover, these two associations can be additive. Indeed, Faith et al. (2004) noted that for children who were at risk of obesity (according to high maternal pre pregnant weight), maternal restriction was associated with increased weight gain. However, the same pattern did not apply for children who were low-risk for obesity. Restriction and concern were more evident in families with heavier children at age five, and restriction at age five predicted heavier child weight at age seven. Furthermore, a high level of monitoring in low-risk families predicted reduced weight at seven, suggesting a protective effect. Faith et al. (2004) therefore proposed a bi-directional relationship between control of child-feeding and child weight; controlling strategies are adopted because of concerns about weight, but a high level of control may intensify the child-weight problem further. Young children have been shown to regulate their weight gain naturally if left to control their own intake of food. Farrow & Blissett (2006) observed mothers feeding their infants at six months old. Where maternal control was low, infants who had had slow weight-gain during the first six months gained significantly

more weight during the next six months and vice versa, thus balancing their weight gain. Conversely, when mothers showed high levels of controlling feeding practices, infants who had had slow weightgain continued to gain weight at a slower rate, and those with initial heavier weight-gain further increased theirs. It appears that maternal control during child feeding has a potentially important influence upon child eating style and weight.

1.3. Maternal characteristics and feeding style

In addition to the evidence illustrating the association between maternal use of control and child weight and eating style, maternal individual differences may further affect use of control. In particular, socioeconomic status, maternal weight and body image concerns, and overall parenting style appear to influence maternal feeding style.

1.3.1 Influence of socioeconomic status

Although considerable research has examined the relationship between maternal feeding style and childhood eating style and weight, many of the key studies have been conducted amongst American, white and middle class samples for example Faith et al. (2004). There is evidence to suggest however that child feeding style may be associated with socioeconomic status; maternal use of restriction and pressure to eat may be driven by different factors according to socioeconomic influences. In particular, food insecurity; a lack of reliable access to nutritionally adequate food (Adams, Grummer-Strawn & Chavez, 2003); has been associated with overweight (Okasha, McCarron. McEwen, Durnin & Davey – Smith, 2003; Melgar – Quinonez & Kaiser, 2004).

Mothers from lower socioeconomic backgrounds are significantly less likely to recognise that their child is overweight (Baughcum, Chamberlain, Deeks, Powers & Whitaker, 2000). Moreover, mothers from a lower income background are more likely to perceive a heavier child as healthier and an indicator of good parenting (Baughcum et al. 1998) compared to mothers from more affluent backgrounds. Amongst mothers who perceive their child to be overweight, understanding of the mechanisms involved is poor. Beliefs are strong that genetics lead to child

overweight and that little can be done nutritionally to modify child weight (Jain, Sherman, Chamberlain, Carter, Powers & Whitaker, 2001).

Food insecurity is associated with concern that the child is not receiving enough food despite a tendency for child overweight (Baughchum et al. 1998). One suggestion is that fear or anxiety about not being able to buy food may lead to overeating in the absence of hunger (Dietz, 1995). However, a number of studies show no significant association between food insecurity (Matheson, Robinson, Varady & Killen, 2006), low SES (Orrell-Valente et al. 2007) or maternal education (Saxton, Carnell, Cornelia, Jaarsveld & Wadle, 2009) and maternal pressure to eat. Although mothers from food insecure households were more likely to report pressure to eat, this did not remain significant once child weight had been controlled for (Feinberg, Kavanagh, Young & Prudent, 2008).

In terms of restriction, food insecurity is naturally associated with lower access to foods. However many studies show that mothers from food insecure families usually restrict their own intake of food before their children are affected (Coates, Frongillo, Rogers, Webb, Wilde & Houser , 2006). Moreover, there is some evidence to suggest that mothers high in SES are more likely to restrict food than those lower in SES (Orrell- Valente et al. 2007). This is possibly associated with lower recognition amongst lower SES families of child overweight (Molarius et al. 2000). Other studies however have found an inverse association between maternal education and use of restriction (Blissett & Haycraft, 2008).

Differences in observations of parental behaviour during mealtimes have been examined. There is emerging evidence to suggest that parents high in SES are more likely to use reasoning, praise and food rewards during mealtimes than those lower in SES (Orrell-Valente et al. 2007). Lower SES families are however often focused on avoiding conflict during meal times (Baugcum, et al. 2001).

In terms of monitoring, levels are often lower amongst low SES families (Clark et sl. 2007. Snacking in between meals and taking food from the fridge is common in lower SES families (Jain et al. 2001; Melgar–Quinonez & Kaiser, 2004) whereas higher maternal education is associated with greater use of positive monitoring

(Saxton et al. 2009). Moreover, use of food in non nutritional ways is high amongst mothers in lower socioeconomic groups. Food is used to control behaviour, for bribery and as an affordable treat (Baughcum, et al. 1998; Chamberlain, Sherman, Jain, Powers & Whitaker, 2002).Conversely, mothers with a higher level of education use lower levels of emotional feeding (Saxton et al. 2009).

Although some studies are inconclusive (Gray, Byrd, Jeralynn, Cossman, Chromiak, Cheek & Jackson, 2007), socioeconomic status may therefore have a potential influence upon maternal use of control and should be considered in further research.

1.3.2. Maternal weight and eating concerns

A number of associations have been identified between maternal weight and eating style and maternal feeding style. Thus maternal weight and eating concerns can impact upon child eating style and weight. Indirectly, mothers who are overweight may model their unhealthy eating styles to their children and many similarities have been seen between maternal and child diet (Birch, Fisher & Davison, 2003; Fisher et al. 2002). Similarities in negative eating styles such as emotional eating have also been seen between maternal and child dyads (Jahnke & Warchsburger, 2008).

In addition, maternal weight is associated with maternal feeding style, although the evidence is in places contradictory. Firstly, mothers who are overweight have higher weight concerns about their daughters (Johannsen, Johannsen & Specker, 2006), independently of their daughters actual weight (Francis, Hofer & Birch, 2001). However other studies have shown that obese mothers show less control over their child's diet (Orrell-Valente et al. 2007; Robinson, Kiernan, Matheson & Haydal, 2001) allowing an increased number of snack foods (Fisher & Birch, 1999a). Moreover, associations have been found between higher maternal BMI and increased reported (but not observed) use of restriction and observed (but not reported) use of pressure to eat (Haycraft & Blissett, 2008) and eating in the absence of hunger (Fisher, Rolls & Birch, 2003). Specifically, overweight mothers use a higher level of pressure to eat if their daughter is thinner and they are worried about future weight problems suggesting their own weight concerns are affecting their use of control (Francis, Hofer & Birch, 2001). Conversely, other studies show no association between maternal BMI and maternal control. Wardle et al. (2002) for example found

no difference in encouragement to eat between obese and normal weight mothers. However, children of obese mothers are more compliant with prompts to eat than children of non-obese mothers (Lumeng & Burke, 2006).

In terms of maternal body-image and own eating style, concerns appear to relate to maternal use of restriction. Mothers who themselves had higher personal weight- and eating concerns were more likely to try and restrict their children's intake of food (Francis et al. 2001). Moreover, a parental history of eating disorders or general body dissatisfaction predicts restriction (Duke, Bryson, Hammer & Agras, 2004). Eating styles also impact on feeding styles. Although associations are found between father and daughter dyads for eating style (Francis et al. 2007), the relationship between maternal and daughter eating styles are often stronger (Cutting, Fisher, Grimm-Thomas & Birch, 1999; Jacobi, Agras & Hammer, 2001). Maternal restrained eating is associated with maternal restriction of access to snack foods (Fisher & Birch, 1999a) and mothers high of restraint monitor daughters intake of food more (Tiggeman & Lowes, 2002). Similarly, mothers who are symptomatic of eating disorders are higher in restriction. For example, mothers who scored highly on symptoms of drive for thinness and bulimia expressed higher levels of restriction (Farrow & Blissett, 2009). Conversely, high levels of maternal disinhibition has been associated with overweight in girls in one study (Cuting et al. 1999) and boys but not girls in another study (Whitaker et al. 2000). Overall it appears that parents who have dysfunctional attitudes towards their own body-image and eating style can pass these onto their children deliberately or inadvertently. A mother with poor body-image and a restrictive eating style may have high concerns that her child will become overweight. Through restricting their intake of food she may believe she is doing the best for her child but in fact may possibly be placing the child at risk of overweight.

1.3.2 Parenting style and maternal control

There is also emerging evidence that maternal use of control is associated with general parenting style. A tendency to want to have high levels of control over the child's behaviour and lifestyle in general perhaps may lead to controlling child feeding practices and vice versa. Maccoby & Martin (1983) identified three main styles of parenting; authoritative, authoritarian, and permissive/indulgent. In

general terms, authoritative parenting styles are the most positive (Weiss & Schwartz, 1996). Authoritative parents are assertive with clear standards for behaviour, but respectful and responsive. Authoritarian and permissive parenting styles conversely are associated with more negative outcomes for the child (Weiss & Schwartz, 1996). Authoritarian parenting styles are controlling, unresponsive and cool whilst permissive or indulgent parenting styles are inconsistent, often inappropriate for age, unresponsive and uninvolved.

Different parenting styles have been associated with variations in child feeding style and eating behaviour. Authoritative parenting is associated with higher levels of monitoring of unhealthy snack foods and increased responsiveness to child appetie, but decreased control in terms of restriction and pressure to eat (Hughes et al. 2005; Hubbs-Tait, Kennedy, Page, Topham & Harrist, 2008). Meanwhile, a number of studies have shown an association between authoritarian parenting and increased restriction (Birch et al. 2001; Hubbs-Tait et al. 2008) and pressure to eat (Duke et al. 2004; Hubb-Tait et al. 2008). Finally, permissive parenting has been linked to low monitoring of intake of snacks (Blissett & Haycraft, 2008; Cullen, et al. 2000)

Parental psychosocial wellbeing has also been associated with maternal feeding style. Mothers who are high in anxiety are significantly more likely to report higher levels of restriction whilst parental satisfaction (feeling competent) was associated with lower levels of both restriction and pressure to eat (Mitchell, Brennan, Hayes & Miles, 2009). Moreover, maternal wellbeing has been associated with maternal feeding style during the first year. Amongst infants receiving only milk or complementary foods, maternal restriction was associated with maternal anxiety whereas a forceful feeding style was associated with maternal stress, depression and anxiety (Hurley, Black, Papas & Caufield, 2008). Similarly, higher levels of maternal anxiety during pregnancy and at 6 and 12 months postnatally were significantly associated with higher use of maternal restriction at one year (Farrow & Blissett, 2005).

Parenting style, therefore, has a possible impact on child diet and weight although some studies are inconclusive (Vereecken, Legiest, De Bourdeaudhuij & Maes,

2009). An authoritative parenting style is associated with an increased consumption of fruit and vegetables (Patrick, Nicklas, Hughes & Morales, 2005). Moreover indulgent/permissive or authoritarian feeding styles are associated with childhood overweight (Hughes, Power, Orlet-Fisher, Mueller & Nicklas, 2005; Moens, Braet & Soetens, 2007; Rhee, Lumeng, Appugliese, Kaciroti & Bradley, 2006). Other studies however fail to find such a link (Agras, Hammer, McNicholas & Kraemer, 2004; Brann & Skinner, 2005; Wake, Nicholson, Hardy & Smith, 2007). Furthermore, other general indicators of parenting style correlate with maternal feeding style. For example, mothers high in restriction are significantly more likely to restrict the amount of time children spend watching television or playing on the computer suggesting perhaps an overall controlling parenting style (Van Strien, van Niekerk & Ouwens, 2009).

Parenting style is also associated with maternal SES. Mothers higher in SES are significantly more likely to display more positive discipline and greater organisation than mothers lower in SES (Grant, Compas, Stulmacher, Thurm, McMahon & Halpert, 2003). Related to this, there is some evidence that the meal time environment can affect child eating style. During observations of a typical mealtime, mealtime negativity as measured by the Child Feeding Assessment Questionnaire (Harris & Booth, 1992) was associated with greater use of maternal pressure to eat. Moreover, parents who reported meal time behaviours that scored highly on chaos (lack of structure) or coerciveness (parents irritability, overactivity, controlling during meal times) had children who showed higher levels of disinhibited eating (Joyce & Zimmer-Gembeck, 2009).

It appears that parents who have a general tendency to be over-controlling in their parenting style may therefore also exert high levels of control over their child's diet. Conversely parents who are inattentive generally are more permissive in controlling intake of unhealthy foods. Parents who give their children autonomy and respect on the other hand appear to have the healthiest approach to child feeding. However, it is also possible that parenting style (and thus associated feeding style) could be born out of reaction to individual child differences. Perhaps children who display difficult behaviour in general, including over eating and an

unhealthy diet, foster a controlling parenting style (Hubbs-Tait et al. 2008). Further research is needed to ascertain causality.

1.4. Maternal Control and breastfeeding

Recent studies in both the USA and UK have highlighted an association between breastfeeding during the first year of life and later maternal control when feeding the child solid foods. Specifically, mothers who breastfeed during the first year appear to exert lower levels over later child diet in comparison to women who formula feed. For example, Fisher, Birch, Smicklas-Wright & Picciano (2000) found lower levels of maternal control when children were 18 months amongst mothers who breastfed during the first year of life compared to those who formula fed. Taveras et al. (2004) showed that the longer mothers breastfed their infants, the lower their levels of restriction at one year, although no effect was seen for breastfeeding duration upon maternal pressure to eat or monitoring. In 2006 Farrow & Blissett noted that breastfeeding was associated with lower levels of pressure to eat and more positive meal time interactions during mealtime observations at one year. In support of this, a shorter breastfeeding duration was associated with greater use of pressure to eat at one year and greater restriction at two years (Blissett & Farrow, 2007) and that mothers who breastfed used lower levels of pressure to eat when their children were twelve months old. No relationship was seen between breastfeeding and monitoring or restricting behaviours however (Farrow & Blissett, 2008).

These studies highlight an association between breastfeeding and a lower level of later control over child feeding, however there is no evidence to support why this relationship may occur. One speculation explains the link through the differential natures of breast and formula feeding; whilst formula feeding is open to maternal control and manipulation, breastfeeding is infant-led. It is suggested that breastfeeding both allows the child to learn to self regulate intake of food and that experience of breastfeeding encourages the mother to develop a feeding style low in control (Taveras et al. 2004). These early experiences may then follow through to later feeding. Alternatively, perhaps maternal individual differences or disposition explain both choice to breast or formula feed and later control (Farrow & Blissett, 2006a). However, no research has been conducted to examine levels of

maternal control during breastfeeding and how these levels may apply to later solid feeding.

1.5. The benefits of breastfeeding

In addition to the association of breastfeeding and lower later levels of maternal control, breastfeeding has numerous benefits for both infant and maternal health. Indeed the World Health Organisation (2002) recommends that mothers should breastfeed exclusively for the first six months of age and then continue to do so alongside complementary foods for the first two years and beyond. This recommendation is reinforced by both the American Academy of Pediatrics (2005) and the UK Department of Health (DH, 2007) who advise breastfeeding to be continued for at least the first year of life and beyond as desired by mother and child. Breast milk alone supplies adequate nutrients for the first six months postpartum (Fleisher, Weaver, Bramca et al. 2000) including iron (Dewey, Cohen, Landa-Rivera & Brown, 1998) and zinc (Brown, Peerson, Rovera & Allen, 2002).

Health benefits to the breastfed infant are plentiful. Formula-fed infant visit the doctors 50% more by the age of four months than breastfed infants (Wright, Parkinson & Scott, 2006). Infants who are breastfed have lower incidences of gastrointestinal infections (Howie, Forsyth, Ogston, Clark & Florey, 1990), respiratory problems (Kramer & Kramer, 2002) and otitis media (Duncan et al. 1993). Lower levels of allergies, asthma and eczema are found amongst breastfed infants (Fewtrell, 2004; Moore et al. 2004; Oddy & Peat, 2003). The greatest reduction in illness is seen in those infants exclusively breastfed, although partial breastfeeding is linked also to reduced illness occurrence (Scariati, Grummer-Strawn & Fein, 1997). Breastfeeding decreases the probability of sudden infant death syndrome (McVea, Turner & Peppler, 2000), childhood leukaemia (Kwan, Buffler, Abrams & Kiley, 2004), digestive disorders (Rigas et al. 1993) and diabetes (Gerstein, 1994). Infants who are breastfed show consistently higher IQ scores, but there is much debate here over confounding variables such as maternal education and socioeconomic status (Anderson et al. 1999). Recent evidence suggests that early feeding behaviour can also have long-term impact. Breastfeeding has a small but significant effect on lowering adult blood pressure, serum lipids and total cholesterol levels (Leon & Ronalds, 2009; Martin & Smith, 2009).

Breastfeeding also has a number of health benefits for the mother including a decreased risk of osteoporosis (Cumming & Klineberg, 1993), reproductive cancers (Beral, 2002; Yen, Yen, Bai & Lin, 2003) and cardiovascular disease (Schwarz, Ray, Stuebe et al. 2009). Women who breastfeed regain their pre-pregnant weight faster than those who formula feed (Dewey, Heinig & Nommsen, 1993). Breastfeeding also aids in recovery from childbirth including contraction of the uterus, and increases the likelihood of optimal child spacing through delayed ovulation (Kennedy & Visness, 1992). Furthermore, breastfeeding holds economic benefits both to the mother in terms of both formula cost (Tutler & Dewey, 1996), and reduced health-related absenteeism from work through reducing the risk of infant and maternal illness (Ball & Wright, 1999).

1.5.1 Breastfeeding and obesity risk

There is also growing evidence that breastfeeding may be an important factor in limiting the risk of overweight and obesity in childhood (Armstrong, Reily et al. 2002; Gillman, Rifas-Shiman & Camargo, 2001). A number of recent systematic reviews highlight the protective effect of breastfeeding against childhood overweight and obesity. Breastfeeding reduces chances of childhood overweight by around 15 – 30%, where a longer duration of breastfeeding and exclusive breastfeeding appear to offer the greatest potential reduction (Arenz, Ruckerl, Koletzko & von Kries, 2004; Dewey, 2003; Owen, Martin, Whincup, Smith & Cook, 2005). Similarly in a meta-analysis, Harder, Bergmann, Kallischnigg & Plagemann (2005) concluded that breastfeeding is associated with a 4% decrease in the risk of childhood obesity for each month of breastfeeding until nine months of age. Further studies have shown a decrease in obesity risk at nine to ten years old (Liese Hirsch, Mutius, von Keil, Leupold & Weiland. 2001), six to 14 years old (Toschke, Vignerova, Lhotska, Osancova, Koletzko & von Kries 2002), in adolescence (Shields, O'Callaghan, Williams, Najman & Bor, 2006; Tulldahl, Petterson, Andersson & Hulthen, 1999) and adulthood for those children who were breastfed (Victora, Barros, Lima, Horta, & Wells, 2003). However, some argue that the association in adulthood is explained by socioeconomic factors and not the direct experience of breastfeeding (Parsons et al. 2003). Other studies show no relation between breastfeeding and reduced risk of overweight and obesity (Poulton & Williams, 2001; Wadsworth, Marshall, Hardy & Paul, 1999). However, methodological difficulties do occur in some studies due to

problems defining the notion of breastfeeding and whether this determines only initiation, exclusivity or any duration (Dewey, 2003).

1.6. Explanations for the protective effect of breastfeeding upon childhood obesity

Reasons for the association between breastfeeding and reduced risk of overweight and obesity are unclear. A number of suggestions have been put forward to explain the protective effect of breastfeeding including differences in growth patterns of breast and formula fed infants, disparity in content of breast and formula milk and variation in feeding styles of breast and formula fed infants. Many explanation focus on the issue of rapid weight gain amongst formula fed infants and the implications of this early programming (Ong & Loos, 2006).

Before the possible explanations for the protective effect of breastfeeding upon childhood overweight and obesity are presented, a number of confounding variables in the relationship are examined. In particular, both maternal weight and socioeconomic status are associated with both infant weight gain and breastfeeding duration. Rather than breastfeeding having a direct effect, it may simply be associated with other factors that in turn explain risk of obesity and weight gain (Wadsworth et al. 1999). The evidence suggests however that breastfeeding duration and future risk of obesity are associated independently of these factors (Armstrong et al. 2002; Scholtens, Gehring, Brunekreef, Smit, Jongste, Kerkhof, Gerritsen & Wijga, 2007).

1.6.1 Maternal overweight and reduced duration of breastfeeding

Women who are obese or overweight before pregnancy are less likely to initiate breastfeeding (Kitsantas & Pawloski, 2009; Li, Jewell & Grummer-Strawn, 2003) or to breastfeed for a shorter duration (Donath & Amir, 2000; Hilson, Rasmussen & Kjolhede, 2004). Moreover, they are likely to introduce complementary foods at an earlier stage (Crocetti, Dudas & Krugman, 2004) than non obese women. Reasons for a reduced breastfeeding duration amongst mothers who are overweight are both biological and psychosocial. Mothers who are overweight can experience delayed lactogenesis (Hillson, Rasmussen & Kjolhede, 2004), underdeveloped mammary glands (Rasmussen, 2007) and lower prolactin response to initial suckling

(Rasmussen & Kjolhede, 2004). Furthermore, obese mothers report more difficulties breastfeeding (such as pain and exhaustion), are more likely to use nipple shields (which can interfere with milk production [Woolrdige, 1980]), believe their milk supply to be inadequate, feel embarrassed feeding in public and seek less support with problems than non-obese mothers (Mok, Multon, Piguel, Barroso, Goua, Christin, Perez, & Hankard, 2008). Obesity also increases the risk of complications during pregnancy and the birth which are in turn associated with a decreased breastfeeding duration (Linne, 2004). Infants born to obese mothers are also at risk of complications including infant macrosomia (Cedergren, 2004), shoulder dystocia, head trauma and fractues at birth (Rasmuseen, 2007) and congenital abnormalities (Baeten, Bukusi & Lambe, 2001) all of which make it more difficult for the infant to breastfeed.

Infants of obese mothers are therefore more likely to be formula fed. Furthermore, as maternal and child weight are closely associated, it is possible that the association between formula feeding and child overweight is explained through maternal overweight rather than being a direct association. The few studies which do control for maternal BMI however show that breastfeeding duration is associated with infant weight gain independently of maternal BMI. However, the inclusion of BMI reduces the significance (Scholtens et al. 2007). Baker et al. (2004) for example showed that the greatest risk of overweight occurred when mothers had an increased prepregnant BMI and breastfed for a short duration of time or not at all.

1.6.2 Socioeconomic status and breastfeeding duration

Breastfeeding duration is also inversely associated with socioeconomic status (SES), including measures of age, education, occupation, housing status and income and deprivation level (Barton, 2001; Meyerink & Marquis, 2002; Rossem; Oenema; Steegers; Steegers; Moll; Jaddoe; Hofman; Mackenbach & Raat, 2009). This trend can also be seen with prenatal intention to breastfeed (Mitra, Khourty, Hinton & Carothers, 2004). Short duration of breastfeeding amongst mothers of lower SES is complex. Knowledge of the health benefits of breastfeeding is good (Zimmerman & Guttman, 2001), but initiation and continuation poor. Reasons for formula use include embarrassment, difficulties, inconvenience and lack of support (Bailey, Pain & Aarvold, 2004; Mcfadden & Toole, 2006). The problem is

exacerbated by high levels of formula use amongst family and friends (Scott, Mostyn et al. 2003; Wambach & Koehn, 2004).

As mothers from lower socioeconomic backgrounds are more likely to be overweight (Molarius et al. 2000) and less likely to breastfeed their infant, again the association between formula feeding and increased risk of obesity could be spurious. However, the few studies which have controlled for SES have still found a reduction in obesity risk for children who were breastfed (Armstrong et al. 2002; Von Kries, Koltezko & Sauerwald, 1999; Oddy, Landsborough, Kendall, Henderson & Downie, 2006). Nonetheless, controlling for maternal SES and education does reduce the odds ratios (Grummer-Strawen & Mei, 2004; Toshcke et al. 2002).

Breastfeeding is therefore associated with a reduced risk of later obesity independently of maternal weight and socioeconomic status. Explanations for the link therefore turn to differences between milk content and feeding style for breast and formula fed infants.

1.6.3 Growth patterns of breast and formula fed infants

Firstly, growth patterns differ for breast and formula fed infants during the first year and into the second year. The DARLING study (Davis Area Research on Lactation in Infant Nutrition and Growth) compared differences in growth between infants who were breastfed and infants who were bottle fed, charting their growth between birth and two years (Dewey, Heinig, Nommsen, Peerson & Lonnerdal, 1993). Findings showed that although both groups of babies increased in fatness during the first six months of life and decreased in body fat after that, breastfed babies showed a faster decline in body fat mass than those who were formula fed. Breastfed babies were significantly lower in skin fold tests between nine and 17 months and also showed lower body fat percentages between five and 24 months. They also consumed less non-milk foods offered to them at six – nine months than formula fed babies of the same age. The greatest difference in weight occurred between 11 and 16 months. Length and head circumference however were similar for the two groups resulting in a leaner shape for breastfed infants. Similarly Kramer et al. (2002) compared weight gains for infants breastfed at birth who were either weaned within the first months or breastfed for 12 months or more. Infants who were breastfed for longer showed

initial greater weight gains but were lighter by twelve months. No difference in head circumference was ever seen. Furthermore, formula fed infants show increased weight gain between 6 to 12 months of age in the period of introduction to complementary foods whilst breastfed infants appear to show a decline in weight (vanDijk & Innis, 2009). Although increased growth is often thought to be a positive indicator of infant health (Haslam et al. 2005; Wright & Weaver, 2007), infant weight gain during the first year postpartum can have serious and long term consequences. Notably, increased weight gain, or in particular rapid weight gain, can impact upon childhood and adult overweight and obesity. It is thought that this early weight gain may programme the body to encourage continued increased weight gain.

Overweight during infancy is predictive of childhood and adult obesity (Margarey, Daniels, Boulton, & Cockington, 2003; Stettler, Zemel, Kumanyika & Stallings, 2002; Vogels, Posthumus, Mariman et al. 2006) and later hypertension, diabetes, heart disease and insulin resistance (Barker, Eriksson, Forsen & Osmind, 2002; Law et al. 2002). Moreover, infants who gain more weight during the first year postpartum are at increased risk of overweight during childhood, adolescence and adulthood (Kinra, Baumer & Smith, 2005; Ong, Ahmed, Emmett, Preece & Dunger, 2000; Tanaka, Matsuzaki, Kuromaru et al. 2001; Toschke, Beyerlein & von Kries, 2005). Moreover, the rate of weight gain appears to affect risk of obesity. Although the first year postpartum is a time of relative infant weight gain, infants who increase their weight at a significantly faster rate than average are at risk of obesity during childhood, adolescence and adulthood (Dennison, Edmunds, Stratton & Pruzek, 2006; Ekelund, Ong, Linne, Neovius, Brage, Dunger, Wareham & Rossner, 2006; Law, Shiell, Newsome et al. 2002; Eriksson, Tynelius & Rasmussen, 2008; Stettler, Kumanyika, Katz, Zemel & Stallings, 2003). Evidence is also accumulating that very early rapid growth can have negative effects. Rapid growth in the first two weeks of life has been associated with later obesity and insulin resistance (Singhal, Fewtrell, Cole & Lucas, 2003; Singhal & Lucas, 2004).

Although infants who gain weight rapidly during infancy are often longer as infants and taller as adults, greater relative weight increases between birth and six months of age are associated with increased weight and skin fold measurements at three years of age suggesting overweight rather than greater size (Holzhauer, Hokken-Kolega;

Ridder; Hofman; Moll; Steegers; Witteman & Jaddoe, 2009; Taveras, Rifas-Shiman, Belfort, Kleinman, Oken & Gillman, 2009). Moreover, the origins of later childhood obesity are often found in the early years with the vast majority of excess weight amongst 9 year olds gained in the first five years. (Gardner, Hosking, Metcalf, Jeffery, Voss & Wilkin, 2009). This increase is also associated with later metabolic disorders (Ong & Loos, 2006). Formula fed infants are significantly more likely to gain weight rapidly in this way (Karaolis-Dunckert, Buyken, Kulig, Kroke, Forster, Kamin, Schuster, Hornberg, Bergmann, Wahn & Lau, 2008).

1.6.4. Differences in energy intake between breast and formula fed infants

Differences in growth between breast and formula fed infant can be explained partly by increased energy intake amongst formula fed infants during the first year (Garza & Butte, 1990, Heinig, Nommsen, Peerson, Lonnerdal & Dewey, 1993). Studies show that formula fed infants are receiving greater volumes of milk at six and 14 weeks postpartum (Kohler, Meeuwisse & Mortensson, 1984) with differences observed even in the first two days of life (Dollberg, Lahav & Mimouni, 2001). Here, average intake of breast milk on day 1 was 9.6 ml/kg/day compared to 18.5 ml/kg/day for formula fed infants. On day 2, average intake for breastfed infants was 13.0 ml/kg/day compared to 42.2 ml/kg/day for the formula fed infant. Moreover, formula fed infants consume milk at a greater rate than breastfed infants (Paul, Dittrichova & Papousek, 1996). At two weeks of age breastfed infants drank on average 8 ml per minute compared to 28.5ml in the formula fed group. Furthermore, breastfed infants spend more time in sucking pauses than formula fed infants, consuming the milk at a slower rate and thus allowing for satiety recognition (Richards & Bernal, 1971).

By eight months of age, a formula fed infant has received approximately 30,000 more calories than a breastfed infant (Jones & Bartlett, 1999). Indeed, in the DARLING Study (Dewey et al. 1993) when energy intake was accounted for, feeing method was no longer a significant predictor of weight gain, suggesting that differences in weight gain are attributable to energy intake and not breast or formula feeding per se. This increase in energy is associated with excess weight during later infancy. In one study, infants who regularly drained a bottle of formula in the first six months postpartum were 69% more likely than those who rarely emptied bottles to

be overweight in the second six months postpartum (Li, Fein & Grummer-Strawn, 2008). Supporting this, Roberts, Savage, Coward, Chew & Lucas (1988) tracked infants from birth to one year. Those who were overweight at one year consumed 42% more energy at 6 months than those who were not overweight.

1.6.5 Differential hormonal and nutrient profile

Breast and formula milk also have different contents and concentrations which may explain differences in growth patterns (Michels et al. 2007). Indeed, formula milk is based on cow's milk which is intended for calves and their pattern of growth not human infants. Calves typically double their birth weight by 47 days, whereas a breastfed infant is expected to double its birth weight by 180 days postpartum (Hambreus, 1977). Moreover, early infant human growth is based on brain development, whereas calf growth emphasises overall size (Legarraga, 2006). Consequently, cow's milk has much higher levels of protein and minerals to support this rapid growth in size (Hambreaus, 1977). Following on from this, formula milk contains higher levels of protein which may increase infant growth (Whitehead, 1995). At three – six months of age, formula fed infants are consuming 66 – 70% more protein than breastfed infants and, depending on content of supplementary food, intake at 12 months may be five times as much as is needed (Heinig et al. 1993). This extra intake is surplus to requirements rather than breast milk being insufficient (Ziegler, 2006). Indeed, there is evidence that a high intake of protein at ten months old is associated with later overweight and body fat distribution (Parizkova & Rolland, 1997; Rolland, Deheeger, Akrout & Bellisle, 1995).

Evidence is just emerging that reducing the protein concentration may have an effect upon infant growth and subsequent overweight. Infants were randomly assigned infant formula containing low levels (1.77g / 100kcal) or high levels (2.9g / 100kcal) of protein. At two years of age those infants fed the low protein formula had significantly lower weight-for-length scores than those receiving the higher protein formula. Moreover, those in the low protein group showed no difference in size to those who were exclusively breastfed (Koletzko et al. 2009a; Koletzko et al. 2009b).

Breast and formula milk also differs in terms of other nutrients. Formula milk has higher plasma-insulin concentrations that may stimulate fat deposition (Lucas, Sarson, Blackburn, Adrian, Aynsley-Green & Bloom, 1980). It also has increased levels of insulin – like growth factor 1 (Chellakooty et al. 2006). This could lead to increased insulin resistance in formula fed infants which could, in turn, affect insulin programming (Stocker, Arch & Crawthorne, 2005). Further associations with weight gain, obesity and type two diabetes have been noted (Odeleye, de Courten, Pettitt & Ravussin, 1997). Breast milk, on the other hand, has a number of bio-active properties not found in formula milk. Factors such as immunoglobins, enzymes, pituitary hormones and brain-gut peptides may all regulate growth in the infant (Hamosh, 2001). Breast milk has a different hormone profile to formula milk including different levels of leptin, adiponectin, resisten and ghrelin. Levels of leptin in breast milk have been shown to be inversely associated with infant weight gain (Miralles et al. 2006). Infants who were breastfed had lower ratios of leptin to concentration to fat mass at 13 to 16 years of age, with those who were breastfed for the longest duration showing the lowest ratio (Singhal, Farooqi, O'Rahilly, Cole, Fewtrell & Lucas, 2002). It is thought that greater body fat in early infancy may programme the body to show greater leptin resistance in later life, leading to greater weight gain and fat distribution.

1.6.6. Breastfeeding and future eating patterns

Breastfeeding also appears to have positive associations with future eating patterns. Formula feeding is associated with earlier introduction of solid foods (Fewtrell, Lucas & Morgan, 2003) and a higher intake of commercial infant drinks at four months (Alder, Williams, Anderson, Forsyth, Florey & Van der Velde, 2004; Noble & Emmett, 2006; Wright, Parkinson & Drewett, 2004). Earlier introduction of solids is associated with later overweight (Kalies et al. 2005). Notably however, infants who were breastfed for the first six months have slower weight gain than infants who were formula fed independently of timing of introduction of complementary foods (Baird et al. 2008). Breastfeeding is also associated with later eating style. Children who are formula fed have a lower intake of fruit and vegetables (Noble & Emmett, 2006) and increased intake of chocolate, soft drinks and fried snacks (Scholtens et al. 2008).

Breastfeeding appears to have a positive effect upon neophobia. Sullivan & Birch (1994) found that children who were breastfed were more likely to eat a new vegetable than those who had been bottle fed, and Galloway, Kee & Birch (2003) found that pickiness was linked to being breastfed for less than six months. A possible explanation for this is that those children who had been breastfed had been exposed to a wider variety of flavours in the milk and were therefore more accustomed to these flavours when they were weaned. For example, babies who were exposed to carrot juice either pre- or postnatally (through their mothers' breast milk) were more likely to eat cereal made with carrot juice at the time of weaning than those who had not experienced this flavour (Mennella, Jagnow & Beauchamp, 2001). Moreover, infants who were breastfed increased their intake of a novel vegetable faster than infants who were formula fed over the course of ten exposures (Sullivan & Birch, 1994). Indeed, where formula milk has been manipulated to represent certain tastes of foods, intake of that food has increased (Menella & Beauchamp, 2002).

Breastfed infants therefore accept and eat a healthier diet during childhood, reducing risk of obesity. However, a number of studies have shown that breastfeeding reduces risk of child obesity independently of childhood diet (Arenz et al. 2004; Owen et al. 2004). For example, in an association between breastfeeding duration and risk of overweight at eight years, the association did not significantly change when adjusted for diet, suggesting diet in later childhood does not mediate between breastfeeding and overweight (Scholtens et al. 2008).

1.6.7. Breastfeeding and infant self regulation

A further explanation as to the association of breastfeeding with a reduced risk of obesity is the natural daily variation in energy density of breast milk. Research has shown that young infants are sensitive to a change in energy density of milk and will naturally regulate their intake accordingly. For example, at six weeks old, infants naturally consumed lower volumes of calorie dense compared to more dilute formula milk (Fomon, Filer, Anderson & Nelson, 1975). The ability to self-regulate intake of milk is therefore present initially in both formula and breastfed infants.

However, whereas formula fed infants are usually presented with meals of a constant volume and energy content, breast milk is not a uniform product, changing in energy content and other properties across a 24-hour period (Nommsen, Lovelady, Heinig, Lönnerdal & Dewey, 1991). A number of studies have shown that breastfed infants respond to this variation, adapting their intake of milk and feeding patterns accordingly. For example, Dewey & Lonnerdal (1986) showed that when breastfeeding mothers increased the production of breast-milk by expressing extra milk, infants initially ate larger meals, but moderated intake by reducing meal duration within a short time period. In addition, infants whose mothers produce milk with a higher fat content consume less milk and feed for shorter periods of time than those who receive a lower level of fat in their milk (Tyson, 1992). Research has also shown that if a breastfed infant reduces the interval between feeds, it consumes a decreased volume at each feed. Formula fed infants do not, however, make this compensation (Wright, Fawcett & Crow, 1980).

By one month postpartum, many breastfed infants have a diurnal rhythm of consumption, usually consuming a greater volume in the morning and less over the course of the day (Pao, Hines & Roche, 1980). Indeed, most breastfeeding mothers report a time of day when their infant is most hungry, yet less than half of formula feeding mothers note any variation (Wright, 1993). Furthermore, breastfed infants have been shown to *not* take all available milk at a feed (Kent, Mitoulas, Cregan, Ramsay, Doherty, & Hartmann, 2006; Saint, Maggiore & Hartmann, 1986) and no difference is seen in overall energy intake between infants age four – six months when exclusively breastfed or breastfed alongside a solid diet. Breastfed infants reduce their intake of milk naturally in line with solid foods: formula fed infants receiving solids do not (Cohen, Brown, Canahuati, Rivera & Dewey, 1994). In addition, infants who are given formula supplements alongside breastmilk consume more calories overall than fully breastfed infants (Haisma et al. 2003).

The early experiences of breastfeeding may therefore allow a breastfed infant to remain adept in responding to the energy density of their meal. Formula fed infants however become accustomed to feeds of equal volume and density and are cued to stop feeding when their bottle is finished. Again, this early experience could programme an infants hunger and satiety cues.

1.7. Breastfeeding and maternal control of feeding patterns

One further explanation for the association of breastfeeding with a reduced risk of obesity is through maternal experience of breast and formula feeding. As stated earlier, mothers who breastfeed go on to exert lower levels of control over later child diet (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004). Lower levels of later maternal control are associated with lower levels of childhood obesity (Faith & Kerns, 2005). One rationalisation for the lower levels of maternal control associated with breastfeeding is due to differences in feeding style between mothers who breast and formula feed. In brief, although the Department of Health in the UK recommends that all infants are fed on demand (DH, 2007), breast and formula fed infants are often subject to differing levels of maternal control. Whilst breastfeeding requires a feeding style which is primarily infant-led thus allowing the infant to self regulate their energy intake according to internal hunger and satiety cues, formula feeding on the other hand is open to greater levels of caregiver manipulation and thus control (Woolridge, Ingram, & Baum, 1990). Breastfeeding is infant-led, because the frequency, amount and duration of feeds are determined by the infant (Dewey, Heinig, Nommsen & Lonnerdal, 1991). Mothers who formula feed however have greater opportunity to control amount consumed and may inadvertently or deliberately encourage over feeding in their infant, encouraging rapid and increased weight gain.

This can impact on feeding in two main ways. Firstly breastfed infants have greater opportunity compared to formula fed infants to self regulate their intake of milk. This has immediate consequences in the short term upon milk intake and weight gain and may teach the infant in the long term to self regular their energy intake (Nommsen et al. 1991). Secondly, through experience of letting the infant set their own pace of feeding, mothers who breastfeed may develop a feeding style which is low in control (Taveras et al. 2004). Mother-infant formula feeding dyads are less likely to experience these opportunities however. Differences between maternal feeding styles between mothers who breast and formula feed may emerge due to a number of factors including variations in feeding mechanisms, visual cues to the amount consumed and interactions between mother and infant during feeds.

1.7.1 Feeding mechanisms

Feeding mechanisms are different for the breast and formula fed infant. For the formula fed infant, obtaining milk is relatively easy and the infant plays a relatively passive role. Milk is consumed via a simple suck mechanism and by virtue of gravity, milk can drip into the infant's mouth. The caregiver can thus encourage a formula fed infant to consume a greater amount than necessarily required (Adair, 1984; Wiessinger, 1998). Breastfeeding however is a sequence of actions as the infant latches onto the breast and manipulates it within its tongue and jaw. The infant must open its mouth widely and place the tongue under the areola in order to suck efficiently (Riordan, Gill–Hopple & Angeron, 2005). The infant is in control of the latch procedure and if the latch is incorrect or the infant ceases to suck, milk is unlikely to flow (Righard & Alade, 1992). It is very difficult therefore to persuade a breastfed infant to consume more milk than they desire, allowing the infant to match milk intake to hunger.

Two studies of formula fed infants in the 1960's, discussed by Fomon (1974), highlight the ease of which a formula fed infant can be encouraged to over consume if desired. Brown, Tuholski, Sauer, Minsk & Rosenstern (1960) carefully bottle fed infants until they showed subtle signs of satiety and did not cry when the bottle was taken away. Infants consumed on average 168 ml/kg/day. Conversely Fomon, Owen & Thomas (1964) fed infants the greatest possible feed they would consistently accept. Infants in this study consumed an average of 189ml/kg/day.

It is therefore possible that, if desired, mothers could encourage a formula fed infant to consume more milk than required. Over time this could lead to increased intake of energy and thus infant weight gain. Breastfed infants however are more difficult to overfeed in this way.

1.7.2. Visual cue to amount of milk consumed

As no visual cue to the amount of milk consumed is present during breastfeeding, the mother must rely on the infant to self regulate energy intake. Breastfeeding infants give subtle signs to satiety such as a reduced rate of sucking or drowsiness to indicate the end of a meal (Gillman et al. 2001; Wright, Fawcett & Crow,

1980). Signs of milk consumption include indicators such as observed and audible swallowing (Riordan et al. 2004) and wet and soiled nappies (Nommsen–Rivers, Heinig, Cohen, & Dewey, 2008) but actual amount consumed is not visual. Mothers must trust their infants to feed to satiety. Formula feeding on the other hand is open to maternal manipulation. Feeds of a certain size tend to be prepared and are clearly visible in the bottle. Intake of milk can be closely monitored and the infant encouraged to finish the contents of the bottle (Dewey, 2001; Fomon et al. 1975). Breastfed infants are therefore again given increased opportunity to self regulate their own intake of milk whereas formula fed infants could be subjected to greater levels of maternal control and encouraged to overfeed.

1.7.3. Breastfeeding frequency and milk supply

Moreover, breastfeeding and milk supply are best established when an infant is fed on demand according to infant hunger rather than a maternal determined schedule (Daley & Hartmann, 1995). Breastfeeding and milk supply work on a demand and supply basis (Hartmann, Atwood, Cox & Daly, 1994). The more the infant feeds (or milk is expressed), the more milk is produced and vice versa. Restricting feeds or trying to impose a maternal-led infrequent schedule can signal that the milk is not needed, and supply will drop (Dewey & Lonnerdal, 1986; Macy, Hunscher, Donelson & Nims, 1930; Prentice, Paul, Prentice, Black, Cole & Whitehead, 1986). On demand unrestricted breastfeeding is also associated with an earlier onset of milk production (Salariya, Easton & Carter, 1978; Woolridge, Greasley & Silpisornkosol, 1985), faster regain of birth weight (de Carvalho, Robertson, Merkatz & Klaus, 1982; Illingworth, Stone, Jowett & Scott, 1952) and a reduced occurrence of issues related to breastfeeding discontinuation such as nipple soreness and engorgement (Illingworth et al. 1952). Therefore feeds need to be regular and in line with the infant's cues to feed, rather than be based on a maternal-led routine. Following a rigid routine or feeding at longer restricted intervals (e.g. four hourly) is associated with breastfeeding discontinuation (Perez-Escamilla, Pollitt, Lonnerdal & Dewey, 1993; Renfrew, Lang, Martin & Woolridge, 2000), whereas frequent on demand feeding is associated with exclusive breastfeeding (Hornell, Aarts, Kylberg & Gebre-Medhin, 2001; Koosha, Hashemifesharaki & Mousavinasab, 2008).

Moreover, use of formula supplementations alongside breastfeeding are associated with decreased milk supply and a shorter duration of breastfeeding (Donath & amir, 2003; Forster, MCLachlan & Lumley, 2003). If a feed is given using formula, milk is not removed from the breast and supply can decrease (Daley & Hartman, 1995). Successful establishment of breastfeeding is therefore associated with exclusive on demand breastfeeding. A breastfeeding mother who feeds in this way may thus learn to react to her infants hunger cues rather than giving a feed when she believes the infant needs energy. A mother who formula feeds however is likely to be influenced by specific timings of feeds and recommended volumes of milk to be prepared rather than feeding to infant demand.

1.7.4. Feeding patterns of breast and formula fed infants

Patterns of feeding often differ between breast and formula fed infants with breastfed infants feeding more frequently and irregularly than formula fed infants from the first week of life (Casiday, Wright, Panter-Brick & Parkinson, 2004). A newborn infant for example may breast feed on average 8 to 12 times during a 24 hour period whereas a formula fed infant may feed less frequently (Gartner, Morton, Lawrence et al. 2005). Formula fed infants have significantly greater longest feeding intervals than breastfed infants from the first month of life (Shealy, Scanlon, Laniner-Wolfe, Fein & Grummer-Strawn, 2008).

One reason for this more frequent feeding pattern in breastfed infants is the different energy density of breast and formula milk. Breast milk is tailored specifically for the infant and is more easily digested than formula milk (Van Den Driessche, Peeters, Marien, Ghoos, Devlieger, Veereman-Wauters, 1999). Feeds therefore tend to be more frequent. For example, in a study examinng time taken to reach a fasting state in neonates aged 5 – 36 days, 75% of breastfed infants reached a fasting state within 3 hours from the last feed compared to 17% of formula fed infants (Tomomasa, Hyman, Itoh, Hsu, Koizumi, Itoh & Kurome, 1987). Furthermore, patterns of breastfeeding can be irregular. Especially during the first few weeks postpartum, breastfed infants may feed very frequently over a period of a few hours; a pattern known as cluster feeding (Frantz, 1985). This is thought to aid in increasing milk supply. Breastfed infants also continue, on average, receiving night feeds for a longer period of time than formula fed infants

(Mohrbacher & Stock, 2003). This pattern of feeding, although perhaps inconvenient to the mother, may be beneficial to the infant. As well as increasing milk supply, there is some evidence to suggest that larger, but less frequent feeds are associated with greater adiposity possibly due to increased milk intake (Agras, Kraemer, Berkowitz, Korner & Hammer, 1987).

In summary whereas formula fed infants feed less regularly, more predictably and often sleep through the night sooner, breastfeeding requires a responsive, infant-led, unpredictable feeding style. This feeding style may follow through to later feeding style. Mothers learn to respond to their childs hunger rather than a preprescribed schedule of energy intake.

1.7.5. Differences in feeding style of breast and formula feeding mothers

Differences in maternal behaviour during feeds have also been noted between breast and formula feeding mothers. A recent study showed that mothers give a wide range of both mother and infant-led reasons for terminate a milk feed, many of which are not based on infant cues of satiety (Hodges, Hughes, Hopkinson & Fisher, 2008). These include time since the last feed, maternal-led feeding schedules or only allowing the infant a certain amount of milk. However, no distinction was made between breast and formula feeding mothers in this study. Other studies however reveal differences in interactions between mother and infant and recognition of infant satiety cues between mothers who breast of formula feed. Consistent with the notion that breastfeeding mothers may exert lower control during breastfeeding, Fomon et al. (1975) found that, in comparison to bottle feeding mothers, breast feeding mothers showed greater sensitivity to their infants signals in terms of frequency and volume of feeds. Moreover, observed during a typical feed, mothers who formula fed initiated more starts and stops to a feed than breastfeeding mothers who looked to their infant's signs of satiety (Wright, Fawcett & Crow, 1980).

Mothers who breastfeed also show increased awareness of subtle infant-led satiety or hunger cues such as appearing sleepy, looking content or slowing suckling pace. In contrast, mothers who formula feed tend to rely on more forceful infants cues to terminate a feed such as the infant spitting out the teat (Wright, 1988).

Furthermore, formula feeding mothers reported less variation in their infants hunger across the course of the day than mothers who breastfed. It is possible that mothers who formula feed are not recognising cues or are feeding in such a way that the infant does not signal hunger (Wright, 1988). Finally, in general, breastfeeding mothers have been shown to interact more with their infants during feeding, including touch and gaze. Gazes are longer and mutual touch during feeds increases at a faster and earlier rate than in formula fed infants (Lavelli & Poli, 1998). Interaction between mother and infant appears stronger during breastfeeding which may explain maternal recognition and understanding of infant satiety cues.

Lack of sensitivity to infant satiety cues may impact on infant weight. In a recent study, mothers who were exclusively formula feeding were examined during a milk feed when their infants at six months old using the Nursing Child Assessment Satellite Training Feeding Scale (Barnard, 2004) which examines maternal interactions with their infant during feeds. Mothers who showed less sensitivity to their infants feeding cues had infants who were significantly heavier at twelve months old (Woroberym Lopez & Hoffman, 2009).

In summary, mothers who breastfeed appear to be more aware of their infants subtle signs of hunger and satiety and react accordingly. Mothers who formula feed appear to take greater control in deciding whether an infant should terminate a feed. This could impact both on infant ability to self regulate feeds and affect the development of an infant or mother centred feeding style.

1.8. Does the infant-led nature of breastfeeding encourage a maternal feeding style which is low in control?

Breastfeeding therefore presents few opportunities for the mother to actively manipulate milk intake. Thus one explanation for why breastfeeding mothers go on to exert lower levels of control when their child is consuming solids is because they have learnt through experience to allow their child to self-regulate their own intake of food. They are not used to being able to monitor milk intake or encourage an infant to finish a feed, and therefore use the same feeding strategies when feeding their child in later years. Alternatively, as the infant has learnt to self-

regulate intake of diet and is more likely to eat a healthier diet (Galloway et al. 2003), the mother does not need to use high levels of control in reaction to the child. Experience of breastfeeding thus encourages a feeding style to deverlop which is low in control. In line with this, an interesting finding by Haycraft & Blissett (2008) found that fathers used less restriction and fewer incentives to eat when their child was eating solids (child age range 18 – 67 months) if that child had been breastfed. This finding could be interpreted in one of two ways. Firstly, the child may have developed a self-regulatory feeding style due to its experience of being breastfed. As they grow older, they then display an autonomous eating style, needing little prompting or control. Alternatively, perhaps fathers of breastfed infants are used to using a low level of control around their child, because their partner has taken primary responsibility for all milk feeds. They witness her showing low levels of control and follow her feeding style. Further examination of the relationship between breastfeeding and paternal control is needed.

There is also the possibility that a low level of maternal control over later child diet is not simply the consequence of learning to exert low levels of control during infant feeding. It is possible that rather than a low level of maternal control developing through the experience of breastfeeding, that tendencies for control are stylistic and present from birth (or even prenatally). As breastfeeding requires an infant-led feeding style, perhaps mothers who desire an approach to infant feeding (or perhaps parenting in general) where they are able to exert control, choose not to breastfeed (Farrow & Blissett, 2006a). Indeed, beliefs that breastfeeding is inconvenient, difficult and time consuming are common amongst mothers, even prenatally, and are cited as reasons for formula use (Digirolamo, Thompson, Martorell, Fein & Grummer-Strawn, 2005). Thus experience of milk feeding may not impact upon later control, but general maternal desire for control affects both milk choice and later child feeding. Earlier, the association between parenting style and maternal feeding style was discussed, showing that parents who like to exert high levels of control through an authoritarian parenting style adopt a feeding style high in control (Hubbs-Tait et al. 2008). It could well be that mothers with a controlling approach to parenting do not breastfeed due to its infant-led nature and

thus the association between formula use and higher levels of control may be explained through overall parenting style.

1.9. Breastfeeding in the UK

Despite the proven health benefits, the UK has one of the lowest breast feeding rates in Europe. Rates are much below countries such as Sweden where 98% of women initiate breastfeeding at birth (Brekke, Ludvigsson, Odijk & Ludvigsson, 2005). The most recent figures from the Infant Feeding Survey in 2007 (Bolling, Grant, Hamlyn & Thornton, 2007) showed initiation of breast feeding by 76% of mothers in the UK, a significant increase from the 2002 figures. However, by six weeks only 48% of mothers are breastfeeding, and by six months only 25% of mothers are giving any breast milk at all. Seventeen per cent of mothers who initiate feeding stop within the first week, with 6% stopping within the first two days (Bolling et al. 2007).

Initiation and continuation of breastfeeding is complex. A small percentage (estimates range from 0.2 to 2% [Powers, 1999; Huggins, 2000]) of women are physically unable to breastfeed and medical contraindications to breastfeeding do arise (Fetherston, 1998; Hoover, 2002; Lewallen et al. 2006). The majority of the cases where breastfeeding is not initiated or continued are however related to breastfeeding management rather than biological issues (Neifert, 2001). Attitudes towards breastfeeding or experience of difficulties breastfeeding lead women to formula feed from birth or to breastfeed for a short duration of time (DiGirolamo et al. 2005; Forster et al. 2006; Scott et al. 2006). Although mothers who breastfeed believe breastfeeding to be more convenient, natural and increases bonding (Arora, McJunkin, Wehrer & Kuhn, 2000), negative attitudes about breastfeeding are widespread. Attitudes towards breastfeeding are present prenatally and affect planned initiation and duration of breastfeeding. Specifically, women who intend to breastfeed for the known health benefits but hold negative views about breast milk alongside positive views about formula milk are more likely to cease breastfeeding prematurely (Dennis, 2003).

Reasons given for use of formula milk are wide and varied, including physical, social and emotional reasons. Notably, it appears that many reasons attributed to formula

use are strongly associated with the desire to have a method of infant feeding that is controllable, convenient and predictable. Due to the infant-led nature of breastfeeding with its frequent and irregular feeding patterns and immeasurable nature, it is possible that mothers are choosing to formula feed in order to gain control over their infants' feeding schedule and consumption of milk. Indeed, use of formula milk is associated with beliefs that breastfeeding is inconvenient, difficult and embarrassing, alongside a lack of support to establish and continue breastfeeding or a negative experience breastfeeding (Thulier & Mercer, 2009).

1.9.1 Breastfeeding as inconvenient

As noted above, breastfeeding requires the infant to be fed on demand with feeds that are often frequent and irregular (Casiday et al. 2004). Moreover, as breast feeding works on a supply and demand basis, giving formula supplementations can reduce milk supply (Forster et al. 2003). In contrast formula feeds tend to follow a regular, less frequent pattern. Beliefs with regards to the inconvenience of breast feeding are widespread and often cited for cessation. Common beliefs include the notion that formula-fed infants feed less frequently but more regularly and sleep for longer periods (Thulier & Mercer, 2009), and that breastfeeding is problematic and inconvenient (Arora, McJunkin, Wehrer, & Kuhn, 2000; Wright & Weaver, 2007).

Indeed, many mothers cite choosing to stop breastfeeding due to the frequent demands of the breastfed infant leaving the mother feeling exhausted (Wright & Weaver, 2007) and suffering from sleep deprivation (Dykes, Moran, Burt & Edwards, 2003). In relation to this significant others such as partner, family and friends may encourage formula use, because it means the mother can have a break from the infant and that others can participate in caring for the infant (Earle, 2002; Zimmerman & Guttman, 2001). Mothers also report choosing to formula feed as breastfeeding leaves them feeling tied to the infant (Arora et al. 2000) or unable to get on with other activities (Cohen, Haddix, Hurtado & Dewey, 1995). Likewise, a return to work or education is commonly cited as a reason for giving up breast feeding (Rea & Morrow, 2004; Taveras, Capra, Braveman, Jensvold, Escobar & Lieu, 2003). This is particularly the case if the woman faces hostility at work over a possible decision to continue breastfeeding (McKinlay & Hyde, 2004).

Breastfeeding, as it is infant-led, therefore affords the mother little control over feeding patterns and schedules which can be viewed as inconvenient. It is possible that women elect to formula feed or switch from breast to formula early on because they wish to have more control over feeding. Formula allows a more predictable day to day routine for the mother.

1.9.2. Breastfeeding as problematic

Breastfeeding, although natural, is a skill which can take time to master (Morhbacher & Stock, 2004). Whilst formula feeding is relatively straightforward, with suggested feeding schedules outlined by the manufacturers, mothers who breastfeed may encounter difficulties as breastfeeding becomes established. Many women cite these challenges as a key reason for cessation of breastfeeding (Thulier & Mercer, 2009).

Breastfed infants need to latch onto the breast correctly in order to feed (Riordan et al. 2005). Problems with latching the infant on may lead to decreased milk production (David, Emmett, Steer & Emond, 2007; Scott, Binns, Oddy & Graham, 2006) or pain from sore or cracked nipples (Gatrell, 2007; McDonald, 1995; Wambach, Campbell, Hill, Dodgson, Abiona & Heinig, 2005). These problems are especially associated with breastfeeding cessation in the first few days postpartum (England et al. 2003). Moreover, breastfeeding can be complicated through issues such as mastitis or thrush, but these can be treated (Minchin, 1998; Riordan, 1990). Latch can also be fixed, and teaching women correct positioning techniques can increase feeding and weight gain, as well as reduce pain (Duffy, 1997).

These worries are often compounded by a lack of knowledge or understanding about the mechanisms of breastfeeding (Chezem, Friesen & Boettcher, 2003; Spear, 2006). Mothers who have prepared themselves for the practicalities of breastfeeding and are knowledgeable about the skill, often breastfeed longer than those who are less prepared (Mitra, Khourty, Hinton & Carothers, 2004; Whelan & Lupton, 1998). Mothers who attend antenatal classes are more likely to feed for longer (Donath & Amir, 2003; Shepherd et al. 2000) as are those who seek professional and expert support after the birth (Heinig, Follett, Ishii, Kavanagh-Prochaska, Cohen & Panchula, 2006; Nelson, 2007; Taveras et al. 2003). Familial and peer support is also associated with an increased duration of breastfeeding (Gill, Reifsnider & Lucke,

2007; Ingram et al. 2002) whereas ridicule or encouragement to use formula is associated with a decreased duration (McFadden & Toole, 2006). In particular support from the woman's partner is key (Sullivan, Leathers & Kelley, 2004). Inconsistent or conflicting advice, on the other hand, or lack of information from health professionals is associated with poorer initiation and continuation rates (Berridge, McFadden, Abaymoi & Topping, 2005).

It is possible that the challenges of breastfeeding may affect women's decisions to initiate or continue breastfeeding. Problems latching the infant on pain from cracked or sore nipples may increase anxiety or make formula milk may appear to be the simple option. If a woman is experiencing problems feeding her infant, formula milk may give her greater control over the situation.

1.9.3. Breastfeeding and anxiety

Difficulties breastfeeding may increase levels of stress and anxiety in the mother. Another key difference between breast and formula feeding is the lack of visual cue to the amount consumed by a breast fed infant (Dewey, 2001). Whereas mothers who formula feed are advised how many ounces of milk to feed their infant over the course of the day and can view amount actually consumed, breastfeeding mothers have to trust their infant to self regulate intake of milk to meet requirements. Furthermore, as the breastfed infant must latch onto the breast to remove milk, it is difficult to persuade a breast fed infant to consume more milk, unlike formula fed infants who can be encouraged to finish a larger feed (Wiessinger, 1998).

Many mothers, however, struggle with this aspect of infant-led breastfeeding. Being unable to view the amount consumed and the fact that breast fed infants often feed more frequently leads to anxiety about low milk production (Ingram et al. 2002; Li, Fein, Chen & Grummer-Strawn, 2008) or that the infant is not receiving enough milk (Wambach & Cohen, 2009; Arora et al. 2000). Moreover, as breastfed infants are smaller on average than formula fed infants this can further increase anxiety about milk consumption (Lewallen et al. 2006; Sachs, Dykes & Carter, 2006) especially amongst mothers with infants of low birth weight (Miracle, Meier & Bennett, 2004). Furthermore, as there is an emphasis on weight gain during early infancy (Haslam & Satter Lean, 2006), and a belief that a larger infant is a healthy infant (Kuan et

al.1999), breastfeeding mothers may compare their infant in size to a formula fed infant and believe that low milk production or consumption is causing a deficit in weight gain. Actual inability to produce enough milk however is rare with mothers from developing countries experiencing nutritional hardship produce similar amounts of milk of similar quality to mothers in developed countries (Prentice et al. 1986). A common reaction to perceived insufficient milk supply or that the infant is not gaining weight is to supplement breastfeeding with formula milk (Wright & Weaver, 2007). However, as formula supplementations can interfere with breast milk supply (Forster et al. 2003), supplementation is associated with a shorter duration of breastfeeding (Baxter & Cooklin, 2009; Li, Zhang, Scott & Binns, 2004; Simard, O'Brien, Beaudoin, Turcotte, Damant, Ferland et al. 2005). By supplementing their perceived low supply of breast milk, mothers may actually decrease their supply leading to a need for formula use.

Maternal anxiety about breastfeeding is therefore associated with decreased breastfeeding duration (Forster et al. 2006; Miracle et al. 2004; Sisk, Lovelady, Dillard & Gruber, 2006). Moreover, maternal anxiety can impact on breast milk production. Stress is believed to interfere with the oxytocin reflex which supports milk production, thus leading to a decrease in milk supply, further confounding the problem (Lau, 1999). Confidence and feeling informed conversely are positively associated with breastfeeding duration (Chezem et al. 2005). Positive cognitive strategies in particular are associated with continuing to breastfeed. For example, increasing knowledge about breastfeeding if a problem occurs, trying to stay relaxed and looking after herself, mindfulness and positive self talk are all associated with continuing to breastfeed (O'Brien, Buikstra, fallon & Hegney, 2009).

Maternal anxiety surrounding milk production and intake can therefore have a negative impact on breastfeeding duration. If a mother is concerned about her milk production or her infants weight gain, she may wish to encourage the infant to consume more milk. As this is incompatible with breastfeeding, she may choose to formula feed as this method allows greater maternal control over amount consumed relieving anxiety. As formula fed infants often gain weight more quickly and amount consumed can be viewed, a higher use of control is rewarded and may thus be continued.

1.9.4. Experience of motherhood and breastfeeding

Alongside difficulties mastering the art of breastfeeding, experiences surrounding the birth and postnatal period can impact upon breastfeeding duration. In particular, events which are stressful, traumatic or involve illness of either mother or infant can lead to formula use or a shorter breastfeeding duration. The best breastfeeding outcomes are associated with a straightforward birth experience where mother and infant remain together and breastfeeding is started as soon as possible after the birth, preferably within one hour after delivery (DiGirolamo, Grummer-Strawn & Fein, 2008). In particular, immediate skin to skin contact between mother and infant has been associated with a longer duration of breastfeeding (Anderson, Moore, Hepworth & Bergman, 2003; Rojas, Kaplan, Quevedo, Sherwonit , Foster, Ehrenkranz & Mayes, 2003). This however is often not possible if there have been problems during the birth or with the infant's health.

Analgesia used during labour can affect the infants suck and rooting behaviour (Ransjo-Arvidson, Matthieson, Lilja, Nissen, Widstrom & Uvnas-Moberg, 2001). Pethidine, a pain killing injection, and epidural anaesthesia can delay initiation of breastfeeding and reduce alertness in the newborn meaning they are reluctant to breastfeed after birth (DiGirolamo et al. 2008; Jordan, Emery, Bradshaw, Watkins & Friswell, 2005; Nissen, 1997; Wiklund, Norman, Uvnas-Moberg, Ransjo-Arvidson & Andolf, 2009). Furthermore, mode of birth can affect breastfeeding duration. Many studies show that mothers who have a caesarean section breastfeed for a shorter duration of time (Baxter & Cooklin, 2009; Dennis, 2003; Shawky & Abalkhail, 2003). Similarly, mothers who report their birth experience as stressful or traumatic may breastfeed for a shorter duration (Beck & Watson, 2008). Interventions such as forceps or vacuum extraction may interfere with the infants ability to latch and suck (Ransjo-Arvidson et al. 2001; Wall & Glass, 2006; Smith, 2007). Moreover, intervention increases risk of psychological birth trauma and postnatal depression in the mother, both of which are associated with a decreased breastfeeding duration (Dennis & McQueen, 2009; Mancini, Carlson & Albers, 2007).

Separation of mother and infant in the moments after birth can also interfere with breastfeeding, especially if the birth was medicated. Even if the separation is short

(less than 20 minutes), sucking problems can occur (Righard & Alade, 1990) and mothers who are separated from their infants after birth breastfeed for a shorter duration (Rojas et al. 2003). Separating mother and infant after the birth, for example placing the infant in a nursery instead of rooming in, is associated with a decreased breastfeeding duration (DiGirolamo et al. 2008; Perez-Escamilla, Segura-Millan, Pollitt & Dewey, 1992; Strachan-Lindenberg, Cabreara-Artola & Jimenez, 1990). Risk of separation of mother and infant is increased if the infant is born prematurely or needs special care alter the birth. Despite the increased importance of breast milk for low birth weight infants (Vohr, Poindexter & Dusick, 2007), mothers with an infant in special care often breastfeed for a shorter duration. Premature or low birth weight infants often have difficulties breastfeeding at first due to an undeveloped sucking reflex (Nyqvist, 1999) but expression of milk is recommended due to the benefits for the infant (Gorvslien & Groon, 2009). If an infant is premature the constituents of breast milk change to aid that infants development (Mathur, 1990). Many mothers however experience physical difficulty expressing milk (Baxter & Cooklin, 2009) or face issues with physical access to their infant, anxiety or lack of support (Gonzales, Meinzen-Derr, Burke, Hibler, Kavinsky & Hess, 2008; Merewood, Ohillipp, Chawla & Cimo, 2003).

In summary, difficulties surrounding the birth and motherhood can impact on breastfeeding duration. These can impact upon both infant ability to breastfeed and maternal anxiety and confidence in doing so. Decreased confidence in ability to breastfeed can lead to early cessation of breastfeeding and formula use (Sisk et al. 2006).

1.9.5. Breastfeeding and body image

Issues of self identity and body image are also interlinked with breastfeeding duration and formula use, especially for younger mothers (McFadden & Toole, 2006; Wambach & Cohen, 2009). Factors such as leaking nipples (Lewallen et al. 2006), changes in the appearance of the breast (Arora et al. 2000) and feeling her body is still no longer her own (Earle, 2002) contribute to the use of formula. Women may feel that the infant is still controlling her body even though she is no longer pregnant. Not knowing anyone else who had breastfed, of feeling embarrassed about feeding in front of others influences breastfeeding duration (Arora et al. 2000; Khoury,

Moazzem, Jarjoura, Carothers & Hinton, 2005; Nelson & Sethi, 2005). Negative or supposedly humorous comments from others exacerbate this (Dykes et al. 2003). Formula feeding however removes this source of embarrassment and concern for the mother. She does not have to breastfeed in front of others or to worry about doing so in public. It allows her body to return to its pre-pregnancy state. In short it allows her to become in control of her body again.

Studies examining later maternal feeding style and control show that mothers with greater weight concerns exert higher levels of control over their child's feeding pattern (Duke et al. 2004; Francis et al. 2001). Perhaps similar mechanisms are at work. Mothers with a negative body image wish to use a feeding method which allows a higher level of maternal control.

1.10. Summary: Maternal control of child feeding patters

Maternal control of child feeding patterns is therefore a complex area with a wealth of studies exploring the link between maternal use of restriction and pressure to eat and factors such as child weight, eating style and breastfeeding duration. Tables one and two present a summary of the key studies which have examined the behaviours and variables associated with maternal use of restriction and pressure to eat. These studies form a basis for exploring and understanding the relationship between breastfeeding duration and maternal subsequent use of control.

Table 1: Key studies examining the factors associated with maternal use of restriction

	Authors	Participants	Findings
Increase in liking for food	Liem et al. (2004)	44 children 4–5 years	A higher level of parental reported restriction associated with increased child liking of restricted food
Eating in the absence of hunger	Birch & Fisher (2000)	197 girls aged 5 years old	Greater maternal restriction associated with daughters lower ability to compensate for a preload and higher intake of palatable snacks in the absence of hunger
	Birch et al. (2003)	197 girls aged 5 years old	Higher levels of restriction at 5 years of age predicted higher EAH at 7 and at 9 years of age
Increased consumption of restricted foods	Fisher & Birch (1999a)	71 children aged 3 – 5 years	Maternal high restriction predicted daughters increased intake of snack foods in free access setting
	Fisher & Birch (1999b)	31 children aged 3 – 5 years	Restricting access to a food increases children's subsequent selection and intake of that food
Increased child weight	Fisher & Birch (1999a)	71 children aged 3 – 5 years	Restricting access to a snack food increases liking for that food. This is increased in children who are heavier and whose parents use the greatest amount of restriction
	Francis et al. (2001)	104 overweight & 92 normal weight mothers of 5-year-olds	Mothers report increased restriction when their daughters are overweight or they were are concerned about their daughters weight
	Musher-Eizenman (2007)	Mothers of 126 4 - 6 year olds	Parental concern about child overweight is related to higher restrictive feeding practices
	Faith et al. (2004)	57 families at high or low risk for obesity	At age five child weight predicts maternal restriction but restriction at age five predicts a heavier child weight at age seven independently of weight at age five.
SES	Orell-Valente (2007)	142 families of 4 – 5 year olds	Mothers high in SES report higher levels of restriction
	Blissett & Haycraft (2008)	48 children and their parents mean age 42 months	Mothers with a higher level of education report using lower levels of restriction
Maternal BMI	Haycraft & Blissett (2008)	214 mothers and fathers of children aged 18–59 months	A higher maternal BMI is associated with increased reported (but not observed) use of restriction
	Brown et al. (2008)	518 parents of 4 -7 year olds	Parents with a lower BMI used greater overt and covert control over food intake
Parenting style	Hughes et al. (2005)	231 parents of 3 – 5 year olds	Indulgent parents were less likely to use restriction whilst Authoritarian more likely to restrict
	Hubbs–Tait et al.(2008)	Two hundred thirty-nine parents of first-grade children	Authoritarian parents report greater levels of restriction whilst authoritative and permissive parents show lower levels of restriction and
Breastfeeding duration	Taveras et al. (2004)	1160 mothers with 12 month old infant	A longer duration of breastfeeding is associated with lower levels of restriction at one year
	Blissett & Farrow (2007)	62 mothers of 2 year olds	A shorter breastfeeding duration was associated with greater use of pressure to eat at one year and greater restriction at two years
	Farrow & Blissett (2008)	62 mothers of 2 year olds	No relationship between breastfeeding and restricting behaviours at twelve months

Table 2: Key studies examining the factors associated with maternal use of pressure to eat

	Authors	Participants	Findings
Increased Pickiness	Carruth et al. (1998)	118 mothers of children 2 – 3	Mothers who reported higher levels of pressure to eat had children who were pickier eaters
	Farrow et al. (2008)	80 parents of sibling pairs (one aged 3 – 6 years)	Parents used greater levels of pressure to eat with siblings who were slower to eat, fussier and undereate
Decreased nutrient intake	Fisher et al. (2002)	191 families of 5-year-old girls	Higher levels of maternal pressure to associated with daughters lower consumption of nutrients
	Galloway et al (2003)	192 7 year olds and mothers	Lower levels of nutrient intake were associated with a higher use of maternal pressure to eat
Decreased liking	Galloway et al (2006)	173 9 year olds and mothers	Pressure to eat was associated with decreased liking and consumption of a soup
	Birch et al. (1987)	22 preschool children	Giving children a reward for consuming a food increased consumption but decreased liking
Lower child weight	Farrow & Blissett (2008)	62 mothers with a child aged 2 years old	Pressure to eat at one year was associated with lower weight at two years independently of weight at one year
	Brann & Skinner (2005)	49 boys aged 8 to 10 years and their parents	Pressure to eat was used more for boys who had a lower BMI
	Faith et al. (2004)	57 families at high or low risk for obesity	Pressure to eat at age five negatively predicted child weight at age seven, independently of initial weight.
	Kroller & Warschburger (2008)	219 mothers and their children aged 3 to 6	Mothers of already overweight children use less pressure to eat
Socioeconomic status	Matheson et al. (2006)	108 fifth-graders and mothers	No relationship between food insecurity and pressure to eat
	Saxton et al. (2009)	180 families of 4 year olds	No relationship between education and pressure to eat
Maternal BMI	Haycraft & Blissett (2008)	214 parents of children aged 18 – 59 months	Maternal BMI was associated with increased observed (but not reported) use of pressure to eat
	Francis et al. (2001)	196 mothers of 5 year girls	Overweight mothers use a higher level of pressure to eat if their daughter is thinner
	Wardle et al. (2002)	214 families of same sex twins	No difference in encouragement to eat between obese and normal weight mothers.
Parenting style	Hughes et al. (2005)	231 parents of 3 – 5 year olds	Authoritative parents report using lower levels of pressure to eat
	Hubbs – Tait (2008)	239 parents of 4- 5 year olds	Authoritative parents report using lower pressure to eat than authoritarian parents
Breastfeeding duration	Farrow & Blissett (2006)	87 mothers of 1 year old infant	Breastfeeding was associated with lower levels of pressure to eat at one year
	Blissett & Farrow (2007)	62 mothers of 2 yr olds child	A shorter breastfeeding duration was associated with greater use of pressure to eat at one year
	Farrow & Blissett (2008)	62 mothers of 2 yr old child	Mothers who breastfed used lower levels of pressure to eat when their children were 12 months
	Taveras et al. (2004)	1160 mothers of 12 month old	No association between breastfeeding duration and pressure to eat

1.11. Implications and Questions

Breastfeeding during the first year postpartum has been associated with a reduced level of maternal control over later child diet (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004). The reasons for this association are unclear, but it has been hypothesised that the infant-led nature of breastfeeding encourages mothers to exert low levels of control during milk feeding which in turn follows through when they are feeding their child solid foods (Taveras et al. 2004). Indeed, examination of the feeding practices of mothers who breast or formula fed showed that breastfeeding mothers pay closer attention to their infants cues of hunger and satiety, whereas mothers who formula feed employ greater levels of maternal control (Fomon et al. 1975).

However, in order to breastfeed successfully mothers need to be infant-led in their approach to feeding. Mothers need to feed frequently and irregularly and to trust their infant to self regulate their own intake of milk. Many however view these infant-led behaviours as inconvenient and difficult and believe that formula fed infants are more settled and content (Li et al. 2008). Concerns about milk intake and weight gain encourage formula use (Ingram et al. 2002). These beliefs are present prenatally and mothers who hold negative beliefs about breastfeeding either do not initiate breastfeeding as a consequence or cease to breastfeed after a short duration of time (Li et al. 2008). It is therefore possible that the low level of maternal control that breastfeeding affords prevents mothers from initiating breastfeeding. Mothers who wish to have a high level of control over milk feeding may choose to formula feed as they believe breastfeeding is too infant-led. A belief that breastfeeding is best for health may encourage initiation of breastfeeding, but continuation is unlikely as they hold too many negative beliefs about breastfeeding (Dennis, 2003). Indeed, Kavannagh, Cohen, Heinig & Dewey (2008) undertook an intervention with formula feeding mothers where they were encouraged to feed their infants responsively. The intervention group were given general advice upon infant feeding plus guidance on not making up too large feeds (greater than 6 oz) and to stop feeding at the first infant signs of satiety. The control group simply received the general infant feeding advice. Formula intake records were completed at two and 14 weeks of age. No significant differences were found in formula intake at any time. Both groups

increased in bottle emptying behaviours and giving of larger bottles. It appears that mothers who formula feed may not want to reduce the control they have over their infant, and in fact may have chosen to bottle feed for this very reason.

It is therefore possible that rather than breastfeeding affecting level of maternal control, that maternal desire for control affects breastfeeding duration. Mothers who desire a high level of control generally choose to use formula milk as it allows this control, and therefore continue using a high level of control when feeding their child solid foods. The desired level of control is primary, the method of infant feeding simply a spurious variable. Studies examining later child feeding show an association between an authoritarian parenting style and increased maternal control (Hubbs-Tait et al. 2008). Therefore it is possible that general maternal approach to parenting could impact upon choice to breast or formula feed.

In line with this, Bramhagen, Axellson & Hallstrom (2006) raise the idea of two main types of parenting in relation to later child feeding; flexible and controlling. Mothers identified as flexible responded to their child's cues and signals. They believed in their child's ability to self regulate their intake of food. Controlling mothers however described a need for routine and established maternal enforced rules for mealtimes. They felt that they needed to be in charge of their child's intake of food. Differences have also been identified in personality characteristics between mothers who breast or formula feed. Breastfeeding mothers score more highly on the traits of extraversion, openness and agreeableness as identified by the NEO – PI – R (Wagner, Wagner, Ebeling, Chatman, Cohen & Hulsey, 2006). It could well be that mothers match their choice to breast or formula feed with ideas of how infant-led or mother led they want their overall parenting approach to be.

On the one hand it is therefore possible that experience of the infant-led nature of breastfeeding encourages mothers to adopt a later feeding style which is low in control. On the other hand, mothers who have a general desire for increased levels of maternal control may choose not to breastfeed as the infant-led nature of breastfeeding does not afford them this control. This control may perhaps be a general trait, such as desire parenting style or perhaps may develop out of anxieties about milk intake and weight gain (Ingram et al. 2002) or from a negative

experience (Beck & Watson, 2008). Most probably, and as suggested by numerous studies evaluating the causality between later maternal control and experience, it is likely that the development of control of child feeding is bi-directional (Faith & Kerns, 2005). Mothers approach feeding with beliefs about control, but these are affected by experience of feeding. Depending on factors such as how easy they find breastfeeding, how frequently their infant feeds and their infant's weight, they change or modify their control level. Indeed, for breastfeeding mothers, duration of breastfeeding has been shown to be associated with both prenatal attitudes towards breastfeeding and actual experience and support postnatally (Swanson & Power, 2005).

This thesis therefore has several aims.

1. To explore whether differences in maternal control can be identified in relation to milk feeding

2. To establish whether differences in control during milk feeding are associated with breastfeeding duration

3. To examine the origins of these differences in control. Are they associated with certain attitudes, beliefs and experiences? Do they develop as a consequence or as a precursor to infant feeding?

The findings would be of interest for a number of reasons. Firstly, maternal control behaviours, once developed, appear to be stable over time (Faith et al. 2004). If mothers are developing a rigid mother-led feeding style as a consequence of formula feeding, then it is important to understand that these may follow on into later child feeding and potentially impact on child eating style and weight. Secondly, if desire for control is a general trait behaviour and present prenatally, modifications can be attempted before the infant is born, in order to prevent or reduce over-control of child diet. Thirdly, if beliefs about the infant-led breastfeeding are causing the mother not to initiate breastfeeding or to only breastfeed for a short duration of time, better designed and targeted interventions could be developed in order to educate and inform mothers prenatally as to the importance and normality of infant-led feeding.

Study 1 is reported in **Chapter 2**. This study examined the influences upon maternal choice to breast or formula feed. Employing semi structured interviews, the beliefs and experiences of mothers who had recently breast or formula fed an infant were compared and contrasted with the beliefs held by key workers working with parents of young children as to why parents made choices in regard to infant feeding. Findings showed that mothers were influenced by a wide range of factors but clearly, beliefs surrounding the infant-led nature of breastfeeding influenced maternal choice to initiate breastfeeding and breastfeeding duration.

Chapter 3 presents the findings of Study 2. Mothers with an infant aged 6 to 24 months completed a retrospective questionnaire detailing their experiences of milk feeds during the first six months postpartum. This included a modified copy of the Child Feeding Questionnaire in relation to milk feeding alongside items examining attitudes and experiences. Maternal control during milk feeding was identified in terms of two specific behaviours; scheduling and encouraging feeds. Mothers high in control during milk feeds breastfed for a shorter duration with mothers who breastfed for a short period of time reporting lower levels of control than mothers who formula fed from birth. Moreover, attitudes surrounding the infant-led nature of breastfeeding were associated with both breastfeeding duration and maternal control suggesting that perhaps maternal desire for control drove breastfeeding duration.

Study 3 is reported in **Chapter 4**. This study examined intended breastfeeding duration and intended levels of maternal control over milk feeding using a prospective version of the modified CFQ amongst primiparous pregnant women. Differences in intention to schedule and encourage feeds were present with mothers who planned to breastfeed for a longer duration planning to use lower levels of control compared to mothers who planned to formula feed from birth or breastfeed for a short duration. Again, attitudes surrounding the infant-led nature of breastfeeding were associated with a higher intention to control feeds and a shorter breastfeeding duration.

Study 4 is presented in **Chapter 5.** Study four consisted of a follow up questionnaire of participants who completed the questionnaire prenatally in study 3 when their infants were six months postpartum. The questionnaire examined actual

breastfeeding duration, actual use of maternal control using the modified CFQ, postnatal attitudes and experiences of birth and milk feeding. Findings showed that whilst maternal desire to schedule feeds predicted actual use of scheduling feeds, actual use of encouraging feeds was dependent on experience. Perceived infant size and negative postnatal experiences predicted use of encouraging feeds.

To conclude, **Chapter 6** details the General Discussion.

Chapter 2

An examination of maternal and professional beliefs regarding the factors surrounding breastfeeding initiation and duration

The association between maternal control of child diet and child weight and eating style is well documented (Ventura & Birch, 2008). In general, high levels of maternal control are associated with negative eating patterns and possibly weight issues in children over the age of twelve months (Faith et al. 2004). Emerging evidence suggests that mothers who breastfeed during the first year go on to exert lower levels of control over child diet when they are consuming solid foods (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004). One explanation for this relationship is that through experience of infant-led breastfeeding, the mother adopts a later feeding style which is low in control (Taveras et al. 2004). As the frequency, length and duration of feeds are determined by the breast fed infant and not the mother (Riordan et al. 2005), and the amount consumed is not visual (Dewey et al. 1991) the mother learns to allow her child to self regulate intake of food.

An alternative suggestion however, is that differences may be found amongst women who choose to breast or formula feed (Farrow & Blissett, 2006a). Perhaps, as breastfeeding requires an infant-led feeding style which is low in maternal control, mothers who desire a feeding style or perhaps parenting style in general which is high in control opt to formula feed. Indeed, a number of studies have shown that factors related to the infant-led nature of breastfeeding are associated with formula use. For example, a short duration of breastfeeding is associated with beliefs that breastfeeding is difficult, inconvenient and that formula fed infants are more content alongside fears surrounding low milk supply and that the infant is not receiving enough milk (Guttman & Zimmerman, 2000; McFadden & Toole, 2006; Wambach & Koehn 2004). Moreover, as successful breast milk production requires frequent,

infant-led feeds, attempts to control the feeding pattern of a breastfed infant may lead to reduced milk supply and thus formula use (Riordan et al. 2005). Therefore, the later relationship between experience of breastfeeding and maternal control may be explained through a dispositional desire for control rather than experience of feeding affecting later maternal feeding style. Mothers who want to exert a high level of control over their child's eating behaviour, choose to both formula feed and use greater levels of control over later diet. Mothers who are happy to be infant-led in their approach to child feeding are able to breastfeed *and* naturally also exert lower later levels of control. Therefore, possibly from the beginning of infant feeding, styles of feeding that are mother-centred (formula feeding) or infant-centred (breastfeeding) are present.

Although early observations noted that, generally, formula feeding mothers are more maternal-led in their feeding approach compared to mothers who breastfed (Fomon et al. 1975), research has not examined maternal reported use of control during milk feeding. The aim of this initial study was to explore the reasons associated with breastfeeding duration, in particular examining whether maternal control beliefs may impact upon milk feeding choice. It sought to understand the reasons both mothers and those working closely with mothers of young infants attributed to using formula milk from birth or for breastfeeding for a short duration of time. Specifically, the study set out to examine reference to the infant-led nature of breastfeeding and the controllable nature of formula feeding in relation to initiation and duration of breastfeeding. In line with the suggestion that maternal desire for control may drive breastfeeding duration, it was hypothesised that, amongst other reasons, mothers who formula fed from birth or who breastfed for a short duration of time would cite factors relating to the infant-led nature of breastfeeding as reasons for formula use. It was speculated that aspects of breastfeeding such as being unable to measure amount of milk consumed, irregular frequent feeding patterns and concerns about milk supply would be associated with a short or absent duration of breastfeeding.

This initial study employed semi structured interviews to retrospectively examine the early milk feeding experiences of mothers with an infant aged six to twenty four months alongside the beliefs of individuals who work closely in supporting mothers during breast or formula feeding. It was intended that information gained from these

exploratory interviews would inform later quantitative examination of maternal control during milk feeding.

2.1. Method

Participants

Twenty individuals working within maternal and child health completed a semi structured interview to evaluate their understanding of why mothers' breast or formula feed. Participants worked within the NHS, Social Services, Community and Voluntary sectors. The sample consisted of Social Workers (N = 4), Midwives (N = 4), Health Visitors (N = 4), Community and Family Centre workers (N = 4) and Breastfeeding Counsellors or Peer supporters (N = 4). Participants were recruited through opportunity sampling of professionals working with new mothers across the county area. All participants were female. This was incidental, as the target group was based on their roles rather than an attempt to source female opinion. From here on, this sample is referred to as 'Key Workers'.

A further sample of thirty mothers with a child aged between six and twenty four months of age (mean age = 12.58 months) completed a semi structured interview about their experiences of breast or formula feeding. Mothers were recruited to a study exploring maternal experience of breast or formula feeding during the first six months postpartum. Posters were placed in local nurseries and community centres hosting mother and baby groups. These community groups were located in areas with varying degrees of social deprivation as measured by the Welsh Index of Multiple Deprivation (WIMD, 2008). The mean age of the sample was 26.52, with a range from 17 to 38 years of age. Twenty one of the mothers interviewed were primiparous. Those who were multiparous discussed their experiences of feeding all children but focused primarily on their youngest child. This sample is referred to as 'Mothers'.

Materials

Two interview schedules were used. The schedule for Key Workers targeted beliefs about why women chose to breast or formula feed and the factors associated with breastfeeding duration (Appendix 1C). Key Workers provided basic information

regarding their post, type of organisation and remit of work. Participants were then asked a range of questions surrounding their experience of working with mothers with young infants who were breast of formula feeding and the reasons they believe led to this choice. The interviews were exploratory and the interview schedule semi structured to allow examination of any new issues that arose. The interview schedule can be found in Appendix 1D.

The Mothers group completed a semi structured interview regarding their experiences of breast or formula feeding. Firstly, they provided demographic information; age at childbirth, years in education, maternal occupation, household income and marital status. Prior to the interview, mothers provided details of infant birth weight and gestational age at birth. Interviews were not conducted if infants had a low birth weight (< 2500g), were born prematurely (< 37 weeks) or had serious health or developmental problems which would have impacted severely upon breastfeeding. Further, mothers provided information about their breastfeeding duration up to the six month postpartum (180 days). With regard to their youngest or only child, twenty five mothers initiated breastfeeding at birth. Fifteen breastfed for six months or longer. Of the ten remaining, breastfeeding duration ranged from 3 days to 8 weeks. The schedule then went on to examine areas such as what had influenced their choice, and whether they had encountered any problems. A further question targeted ideas for improving breastfeeding rates. Details of the interview schedule can be found in Appendix 1D

Procedure

Approval for this study was granted by the Swansea University Department of Psychology Research Ethics Committee. All applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research. All interviews with Key Workers were conducted face-to-face. Interviews conducted with Mothers were held face-to-face (N = 14), over the phone (N = 10) or via email (N = 6).

All participants were informed as to the purpose of the study. Those who agreed to participate were requested to return a consent form (Key workers: Appendix 1A, Mothers Appendix 1B). Due to the semi-structured nature of the interview, length of

discussion varied. With the consent of the participants, all interviews conducted face to face or over the phone (speaker phone) were recorded via Dictaphone and then transcribed. Interviews conducted via email consisted of the participant completing the questions in open ended format via a word document which passed between researcher and participant several times. These responses therefore served as the direct data. All participants were thanked by the interviewer and fully de-briefed. Mothers who completed the interview were given a £5 shopping voucher in return for their time.

2.2. Results

All interviews were transcribed and all identifying information was removed from each. Key Worker responses were identified by group only. Mother responses were identified by length of breastfeeding duration. 'BF' was also used to identify those who breastfed and 'FF' those who formula fed (followed by the duration of breastfeeding if applicable). Key Worker and Mother interview responses were considered separately. For each set, a content analysis was performed on each script. Here each script was read through from start to finish and emerging themes identified and coded on each. After each script had been coded, scripts were compared to identify common themes. Overarching themes were identified and sub categories grouped into these. For example, one overarching theme identified was 'breastfeeding as inconvenient'. Within this theme fell the sub categories of 'sharing the feeding with others', 'formula fed infants more settled' and 'routine'. An independent judge was consulted regarding the final coding of a subset of randomly selected scripts and agreement was reached in all cases. Supporting quotations were selected to highlight findings.

Overall, a variety of themes was raised with regard to why mothers choose to use formula milk. Differences in reported experiences and attitudes from mothers who breastfed for at least six months or who used formula either from birth or after a short duration of breastfeeding were examined. Responses given from both key workers and mothers who had used formula themselves suggested commonalities. Interestingly, mothers who breastfed for at least six months often cited opposing personal experiences, yet recognised the difficulties other mothers faced.

Five main themes surrounding formula feed choice were identified; (1) bottle feeding as the norm, (2) breastfeeding and body image, (3) bottle feeding as convenient, (4) breastfeeding as difficult and (5) anxiety and breastfeeding. Within each of these themes a number of categories emerged. Additionally, interviewees suggested a number of different ways in which breastfeeding could be encouraged and supported.

As an overview, viewing bottle feeding as typical behaviour appeared to be an overarching theme, impacting on a number of different beliefs a mother may hold about breastfeeding. This view was experienced even by mothers who breastfed for an extended duration. It seemed to foster the attitude that although breastfeeding is natural, it is not necessary – and thus should not be seen in public (exacerbating issues with body image). Believing bottle feeding to be the norm encouraged the belief that breastfed infants' behaviour is abnormal and inconvenient. Furthermore, lack of knowledge of breastfeeding due to little experience led to little preparation or support with breastfeeding difficulties. This in turn impacts on mothers' confidence to breastfeed. In summary, reasons for choosing formula milk were complex, multifaceted and interlinked.

1. Bottle feeding as the norm

A key issue raised by both mothers and key workers was the concept that bottle feeding has become the normal way to feed an infant in the UK today. Results from the latest Infant Feeding Survey (2007) show that only 78% of mothers initiate breastfeeding at birth, with only 25% continuing to breastfeed for six months or more (Bolling et al. 2007). Therefore, those who follow World Health Organisation guidelines (WHO, 2002) to breastfeed exclusively for at least six months are in the minority. These figures were reflected in interview responses from both mothers and key workers. Key workers felt that bottle feeding was integrated into society and breastfeeding was seen almost as an abnormal behaviour. In their experience, mothers encountered little experience of breastfeeding amongst family or in public before they make the decision on how to feed their own infant. They do, however, often see formula feeding and perhaps internalise this behaviour as the norm. This may lead new mothers to view bottle feeding to be *the way* in which to feed an infant. However, this belief also impacts on successful breastfeeding, as , even if

breastfeeding is initiated knowledge and understanding of breastfeeding is low. Mothers compare their breastfed infants behaviour to the apparent normal behaviour of a formula fed infant and become concerned that something is wrong.

> 'Many women have a completely unrealistic idea of what breastfeeding is like, even many health professionals are ignorant of this and tend to think of bottle-fed babies' behaviour as being normal. Friends and family certainly aren't much support, especially if they didn't breastfeed their own children' (Breastfeeding Counsellor).

> 'Images of bottle feeding are just everywhere - on clothes and wrapping paper for newborn babies...children are given baby dolls with bottles...I mean I was even at a school nativity once where the baby Jesus had a bottle!' (Midwife).

> 'Mums have such little knowledge about what breastfeeding is really like so make their choices based on what they know and have experience – formula feeding. It's so unusual to see breastfeeding when you are out and about and there are no positive role models' (Community Worker).

The idea that formula milk was seen as the accepted choice was echoed by mothers in the sample regardless of whether they chose breast or formula milk. Mothers who breastfed felt that they were in the minority and that the majority of friends and family used and encouraged formula milk. This was often cited as an important trigger in stopping breastfeeding, because they felt they had little support from others when they did try to breastfeed.

> 'Its just second nature for people to bottle feed these days. They see friends and family doing it and think it's the norm. I mean I tried to breastfeed as I had heard that it had lots of benefits for the baby but certainly no one made me feel wrong or different for giving it up...the opposite in fact. If anything I then had more support and encouragement ... and really, after all the initial fuss there didn't seem to be much difference between my baby and my friends who formula fed from the start' (BF 6 weeks).

> 'All my family and friends have formula fed and wanted me to formula feed too. I haven't ever really seen anyone breastfeed properly, at least not up close. I wouldn't have known where to start' (FF from birth).

This lack of support extended even to health professionals. Conversely, mothers who used formula felt that its use was widely accepted and that they had plenty of support and sources of advice if they encountered problems. Mothers who breastfed however felt they had no avenues of support if they experienced problems feeding their infant.

> 'No one breastfeeds around here. If I want advice or help with any problems I need to go to a support group as everyone else thinks I'm a bit odd and should bottle feed. Even my midwife and doctor presumed I would formula feed because I was so young when I had her.' (BF > 6 months).

'One young girl on my ward desperately wanted to breastfeed and kept buzzing the nurse all night stating she was worried the babe wasn't getting enough milk. After about the fourth buzz the midwife took the infant away and gave formula. The girl promptly gave up breastfeeding' (BF > 6 months)

However, many of the mothers who did breastfeed for six months or longer felt that, to them, breastfeeding was the natural way to feed an infant and that was what breasts were intended for. A number of mothers raised the idea that feeding an infant with the milk from another species seemed incongruous. All of the mothers who breastfed for six months or more recalled knowing that they would breastfeed before they became pregnant. Many stated that there was no choice to be made.

For me it was just a "given" that I would use my breasts for the purpose they were designed for (BF > 6 months).

It is incredibly important, this is the baby's first taste of nutrients outside the womb... surely it makes more sense to give our babies tailored made milk rather than that for an animal? (BF > 6 months)

If breastfeeding was considered the normal way to feed your baby and formula only used when this was not possible, then mothers wouldn't be so confused (BF > 6 months)

Mothers who breastfed for at least six months also felt that they were part of a small but supportive environment where breastfeeding was encouraged. They felt that family and peers supported their decisions which helped reinforce their belief that they were making the right choice, even if on a wider level they were in the minority. Mothers who breastfed for at least six months particularly mentioned the support of their partner as being important.

My mother in law breastfed my partner for over two years so was great whenever I had any problems or just needed a moan. She was really supportive of breastfeeding and is determined it is the best way to feed a baby and that was great to have that source of support (BF > 6 months)

My sister breastfed her babies, the first being born when I was 15. I understood the benefits as she was very pro breastfeeding explaining all to me (BF > 6 months)

My partner has been great. He was breastfed and comes from a background where everyone breastfeeds. He is strongly pro breastfeeding and very adamant about the benefits so that really helps (BF > 6 months)

Nevertheless, although mothers were surrounded by others who were supportive of their decisions and often grew up in an environment where breastfeeding was the norm, mothers still encountered negative reactions to them breastfeeding. Although

some mothers found that others were supportive at first, they appeared to change their attitude once the infant was older than a newborn and particularly after six months old. Criticism of the mother's ability to successfully breastfeed was a common experience. Often the mother bore the brunt of supposedly comical remarks about her decision to breastfeed.

> 'I found it difficult receiving criticism from some family about it being important to put my daughter on formula to know how much she was drinking. Then some got a little tired of it and came to the attitude of 'give up and switch to formula- it's easier. By the time we got past a year they thought I was downright odd' (BF > 6 months)

> 'My friends seemed to handle me feeding a newborn but couldn't cope with the idea of me feeding for longer. Some made remarks about how they'll still want it at 18 ... some think it weird , not right. Some commented about them coming back from pub and asking for it. I had lots of 'bitty' comments which were apparently hilarious' (BF > 6 months)

In summary, mothers who breastfed for at least six months were part of an environment where breastfeeding was common and considered the normal way to feed an infant. Although they encountered some negative reactions from others, and often had to seek out advice with problems themselves, their family and friends were generally supportive of breastfeeding. Conversely, mothers who formula fed or who breastfed for a short period of time were part of a network where formula feeding was common and advice, knowledge and support for formula feeding low.

2. Body image

A second theme running through the interviews was the attitude that breastfeeding had a negative impact upon maternal weight, appearance and body image. Key workers reported a number of mothers choosing to formula feed because of the immediate consequences of breastfeeding to their body. Breastfeeding changed the shape and function of a woman's breasts and meant that her body was still involved in the nurturing process rather than returning to her pre pregnant state. Moreover, concerns about the supposed long term effects of breastfeeding to breast shape and size encouraged formula use.

> 'Mums are keen to get back to normal after the birth – their figure, their social life and their relationship. Breastfeeding however is all about nursing bras and breast pads, leaking nipples and swollen breasts.' (Midwife)

'One of the main reasons I think is because of their body image. Mums are acutely aware of how they look and breastfeeding isn't compatible with that. They're trying to get their figure back, they associate their breasts with sexuality not feeding, they hear that it will make their breasts droop and so on' (Community Worker)

'You're into the territory of leaking breasts, padded bras...none of these things are really attractive for them' (Social Worker)

Mothers reported feeling embarrassed by the changes in their body at a time when they already feel conscious of their appearance after giving birth. Although some tried to overcome these issues, it often proved too much and they felt happier using formula. For others, the apparent risk of breastfeeding to their appearance was too much and they used formula from birth over the fear that breastfeeding would leave them misshapen and unattractive.

'I was so body conscious when I was breastfeeding – my boobs were droopy and my tummy was saggy and I just hated it. I had really wanted to breastfeed for all those benefits they say about but bottle feeding gave me my confidence back' (BF 3 weeks)

'People told me what breastfeeding would do to your boobs. I was only young and that really scared me. I didn't want my partner seeing me with droopy boobs when I was only twenty' (FF from birth)

In addition to fears of the consequences of breastfeeding to their breasts and body shape, issues of embarrassment and sexuality were raised by both key workers and mothers. In particular, the idea amongst mothers that breasts should remain sexual and be for the mothers partner not her infant was strong. Furthermore the concept of using breasts to feed an infant in public was embarrassing or even viewed as disgusting or unnatural by some mothers. The key workers were well aware of these attitudes.

'Bottle feeding is tied in with this stupid idea of breasts and sexuality. Women find it hard to relate that part of their bodies to feeding an baby. Partners also find it hard – they get jealous that their partner's breasts are not available just for them' (Midwife)

'Its easier to give a bottle due to other peoples attitudes. Mums are made to feel isolated and shut away from the world as no one wants to see them feeding in public.' (Social Worker)

A common theme in the existing literature is that of mothers feeling too self conscious or embarrassed to feed in public, including in front of family and friends (McFadden & Toole, 2006). This was certainly echoed amongst the mothers who

chose to use formula milk, some of whom even believed breastfeeding in front of others was wrong and should be avoided in public.

> "I was 18 when I had my baby and very conscious of my body and what other people thought. There was no way I was getting them out in front of people" (FF from birth)
>
> 'My partner was supportive of breastfeeding but found it hard really. He thought it was a bit odd and his friends did make comments. He never said anything but he was relieved I think when I stopped and they were 'his' again' (BF 12 weeks).
>
> 'I'm sorry but I just don't think women should breastfeed in public. I'm not anti breastfeeding as such but I don't want to see that and I'm a mum, I can't imagine how other people must feel. Feed them before you go out or take a bottle with you. If they really can't wait go somewhere private. You're getting your boobs out in a public place for god's sake' (FF from birth)

Conversely however, mothers who did breastfeed for at least six months showed a different attitude. Although many reported feeling anxious at the start, this soon passed with mothers feeling proud to be breastfeeding. Rather than feeling worried about possible comments mothers expressed the attitude that they would ignore or even challenge anyone who criticised them for breastfeeding.

> 'I felt a bit embarrassed in the first few weeks but didn't care after that and would breastfeed anywhere. I learnt the art of doing it discreetly and almost wanted someone to challenge me just so I could show them up for the ignorant people they are' (BF 6 months)
>
> 'I was always ready for an argument out in public when feeding but no one ever approached me, said anything or made me feel uncomfortable feeding out & about' (BF 6 months)

To summarise, issues with body image and appearance influenced maternal decision to breastfeed. It appears that concerns about the impact of breastfeeding upon body shape and using her breasts in a functional way encouraged formula use or a short duration of breastfeeding. Moreover, the belief that breastfeeding in front of others was embarrassing and discouraged in public further reduced breastfeeding duration.

3. Bottle Feeding is viewed as more convenient

A third major theme identified was the impact of breast or formula feeding upon maternal lifestyle. Both key workers and mothers who used formula raised the idea that formula was less demanding upon maternal lifestyle than breastfeeding. Formula feeding was regarded as less time consuming and more regular, and formula fed infants as more settled. Importantly others could share in the feeding and care of the infant more easily if formula was used. In summary, formula feeding allowed

maternal lifestyle to be maintained whereas breastfeeding was viewed as needing to be very infant-led and thus inconvenient to the mother.

Other people can formula feed the infant

Key Workers in particular had a strong perception that many mothers chose to formula feed in order that they were not solely responsible for feeding the infant themselves. If the mother introduced formula, other people could care for the infant allowing them to get on with other tasks. Formula feeding meant that mothers could get a welcome break from the exhausting cycle of infant care

> 'If someone else can give the baby a bottle it's a break. If someone else can feed them they can leave the baby a lot sooner – you aren't tied in the same way as if you are breastfeeding' (Midwife)
>
> 'Other people can do it for them and as the child gets a bit older they leave the child in the pram with a bottle propped up and just get on with whatever else they are doing' (Social Worker)
>
> 'If a mum feels overwhelmed by having a baby she will want to take any help she can get. Feeding is often one area which people like helping with rather than dealing with nappies or a crying baby. She won't get that break if she breastfeeds...she knows it and so does everyone else. ' (Community Worker)

Indeed, this concept was supported by mothers who chose to formula feed from birth or switched to formula after a short period of breastfeeding. A common idea raised was that formula allowed other people to feed the infant and this was not just beneficial to the mother. Other people wanted to share in the care of the infant, particularly feeding and pressurised the mother into letting them do so. Formula allowed this and many mothers relished the break and freedom this gave them.

> 'Friends and family all wanted me to bottle feed and gave really good reasons why. I knew breastfeeding was better but bottle feeding is easier and lets everyone else get involved. I could sleep, dad could feed. Just so much easier...I did feel a bit guilty at first but she's fine' (BF for 3 days)
>
> 'I wanted to breastfeed but people kept on at me to formula feed then I could share the feeds. I could have a break and they could feed the baby. They thought it was selfish to breastfeed as I would be keeping her to myself' (FF from birth)
>
> 'It was easier on me as others were able to help with the feeding and my partner and I took it in turns with the night feeds which meant I was able to get some sleep' (BF for 7 days)

Conversely however, mothers who did breastfeed for six months or more actually felt breastfeeding was a more convenient option for them. Indeed they expressed

confusion as to why other mothers found formula feeding more convenient. However, desire to leave their infant or to let someone else be responsible for feeding seemed to be low in this group. They appeared to follow a very infant-led style of parenting rather than wanting the infant to fit in with their routine.

> It just seems the easier option to me – its more convenient, I don't have to get up in the night or make up bottles or worry when I'm out – its always there, always ready and always at the right temperature. (BF > 6 months)

> 'I really don't see why anyone would formula feed. Its so much hassle to make up bottles, sterilise them, clean them, heat them, wait for them to cool down. I mean in the night I just roll over and she's fed – I couldn't cope with actually getting out of bed to warm up a bottle' (BF > 6 months)

> 'I always looked at formula feeding mums and thought they were having an easy ride. Now I feel that I am lucky as its so convenient and the bond we share is great. I enjoy feeding her myself, I wouldn't want everyone and anyone to be able to do it...it's our time together' (BF > 6 months)

Formula fed infants are viewed as easier

Another issue raised was the idea that formula fed infants fed less frequently, especially at night, and were more likely to feed to a predictable schedule. Key workers confirmed the idea that this is often attractive to new mothers as they can organise and predict their day to day lives more easily. Although many realise that breastfeeding has many health benefits, once they experience the demands of breastfeeding many feel it is not worth the effort involved. Formula fed babies were believed to feed less frequently, sleep longer and be more settled; In summary they were seen as being easier to parent. This led to the mother feeling she had some control over her time and also increased her confidence levels. Breastfeeding however is very infant-led and leaves the mother very little control.

> 'I think many have the knowledge that breastfeeding is better but still bottle feed. It's not just about knowing the health benefits it's about the overall situation. Mums realise breastfeeding is better but feel that bottle feeding is easier' (Health Visitor)

> 'A lot of mums just don't realise the reality of having a newborn baby. They just don't expect it to be so hard and it just becomes about getting the baby to stop crying half the time. I mean, it's exhausting and its no wonder they chose what appears to be the easiest method. Unfortunately formula does seem to settle babies more quickly even though that's not necessarily good for them' (Midwife)

> 'Bottle fed babies tend to sleep for longer go longer between feeds meaning less work for the mum – but that doesn't mean that's a good thing. Babies aren't meant to do that and the sooner we realise that the better' (Midwife)

Mothers who chose to formula feed appeared to strongly believe that formula fed babies were easier and more settled. Common themes included the idea that formula fed babies fed less frequently, slept for longer and were generally more content. Mothers confirmed this as one of the positive sides of formula milk. Some even expressed pride over this and the belief that they were helping their babies by encouraging them to sleep for longer.

> 'They are more contented and sleep longer on the bottle than breast. Ok, so maybe breast milk has other benefits for them but this way I was happier and you know what they say...happy mum happy baby' (FF from birth)

> 'When I was breastfeeding she was never satisfied. I would feed her, she would fall asleep then when I put her down she would wake straight away. With formula she slept. She often went four hours between feeds rather than feeding all the time. We were all happier. There was definitely a difference even though my health visitor said there wouldn't be (BF 2 weeks)

> 'I know breast is meant to be best but as soon as I put him on the bottle he started sleeping through. This was at six weeks. I have friends who are breastfeeding and their babies still don't sleep through at six months. I mean, they say breast milk is so much better and all that but that can't be good for anyone can it' (BF 6 weeks)

Mothers who breastfed successfully for six months were very aware of the idea that bottle feeding was associated with an 'easier' infant. Indeed they came under pressure to switch to formula in order to encourage their babies to sleep through the night. Some were even criticised for continuing to breastfeed frequently as others believed they were harming the infant in some way. Despite feeling that formula milk may have encouraged their infants to sleep for longer periods and generally be more settled, mothers in this group did not believe that was a strong enough reason to stop breastfeeding. They believed that breastfeeding was still best for the infant and moreover enjoyed the experience of breastfeeding. Rather than simply being a means to nourish their infant, mothers recalled enjoying the experience and feeling sad, yet proud once it was over.

> 'Breastfeeding was such a lovely experience. Especially when she got that little bit older and didn't want to sit still for cuddles so much. It was quiet time...our time. I really miss that time.' (BF > 6 months)

> 'She did feed a lot and through the night for a long long time. But I told myself it wouldn't be forever, and actually, there was something special about those middle of the night feeds. Just me and her whilst the world slept. I enjoyed them'

'People kept telling me he should be sleeping through. It was even suggested that if I swapped to formula he would sleep better and this would be healthier for him. Of course I wanted a full nights sleep...doesn't any mother...but I wasn't going to put myself over my baby's need for the best possible milk for him' (BF > 6 months)

The belief that breastfeeding was inconvenient and placed too many demands upon the mother therefore appeared to be a strong influence upon formula use. Mothers who formula fed or breastfed for a short duration of time struggled with the idea of feeding to an unpredictable and irregular schedule and did not want to feel tied to their infant. In short, the infant-led nature of breastfeeding was incompatible with their way of life. Conversely, mothers who breastfed, although admitting that the infant-led nature of breastfeeding could be demanding believed breastfeeding to the the best method of feeding their infant and were therefore happy to follow this feeding style.

4. Breastfeeding as difficult

A further common theme discussed was the belief that breastfeeding was difficult and presented a lot of problems for the mother. It was perceived as a skill that mothers needed to learn but would face many problems along the way. Formula feeding on the other hand was viewed as simple and free of difficulties. Key workers in particular highlighted how breastfeeding can appear, or be made more difficult, through lack of knowledge and understanding of how breastfeeding works. They felt that mothers were ill equipped for the realities of breastfeeding which caused, or exacerbated problems such as pain and soreness. Moreover as they, or those around them, had little knowledge of breastfeeding, when they did face problems they had no understanding of where to go for help and support.

'Mothers who start out breastfeeding often don't have the right information and support at the right time. Breastfeeding isn't easy and when they then encounter difficulties they stop rather than finding the right support' (Breastfeeding Counsellor)

"Mums are surrounded by other people who bottle feed and who show them how to do so. Bottle feeding in those first few weeks is easier than breastfeeding there's no doubt about it. Its not until you pass those first few weeks, get things established, get used to it that it becomes easy. But people don't give it a chance" (Community Worker)

'Breastfeeding can be difficult. Mums can have problems with latch, cracked nipples, pain, thrush, mastitis...its not easy but what is about motherhood. Problem is that formula gives you an easy route out of this' (Midwife)

The belief that breastfeeding was difficult was strongly portrayed, particularly amongst mothers who stopped breastfeeding before six months. Mothers cited a range of problems which led to them swapping to formula milk, centring on pain and discomfort. Anger was often expressed that they were not told about or supported with such problems and many mothers felt guilty for stopping breastfeeding. Mothers felt that there was no one to support them and the common solution appeared to be to give formula milk.

> 'It was absolutely exhausting. It was difficult, I couldn't get him to latch, I didn't know when he would feed. I was feeding all the time which was just ridiculous. I tried to get help but people would just tell me it was normal or suggested formula. In the end formula let me sleep and gave me my sanity back' (BF 8 weeks)

> 'The whole experience was agony and the books just don't tell you that. First she wouldn't latch on but when she did it was so painful but the health visitor just told me it would pass. Then my nipples cracked and I would be crying with the pain but apparently that was normal too. When they actually started bleeding during a feed I drew the line and stopped. I knew it was better for her and I did try so hard ...but come on' (BF 3 weeks)

> "He just kept feeding and feeding ... all the time...and I was in so much pain. People just kept telling me to give her formula. I was so tired and drained that I gave in. It was so much easier but I felt terribly terribly guilty and still feel bad about it now. I just had to stop though, it wasn't my fault ...and so far touch wood her health is fine" (BF 4 weeks)

The belief that breastfeeding is difficult was widespread even amongst mothers who have had no actual experience of breastfeeding. All mothers who formula fed explained that the supposed difficulties of breastfeeding stopped them from even trying to breastfeed in the first place. They had heard negative stories of breastfeeding from family or friends who made them not want to breastfeed or made them feel they would be unable to breastfeed.

> 'A few of my friends tried but most weren't able to and went through a lot of hassle and guilt in the process. I decided formula was fine and I wasn't going to put myself through something that I probably wouldn't be able to do' (FF from birth)

> 'I saw the state my friends' nipples were in ... I mean one was nearly hanging off. There was no way I was doing that to myself no matter how good it was meant to be!' (FF from birth)

Interestingly, mothers who chose to breastfeed for at least six months were very aware of the difficulties of breastfeeding. In fact all mothers in this group experienced at least one problem in establishing and continuing breastfeeding. However mothers continued to breastfeed in spite of problems. They were very

aware of the benefits of breastfeeding for their infant and determined they were going to do so, almost at whatever the cost to themselves. In general however, although this entire group met initial problems, they explained how once these were overcome breastfeeding was an easy option for them.

> 'Where do I begin...letdown pain, thrush, stupid comments from family, latching on in public with boobs that shoot milk 5 feet in the air, stares ... it certainly wasn't the beautiful experience they show in the books' (BF > 6 months)

> 'It's exhausting and difficult at first. I was feeding all the time and felt tired and drained. People were just telling me to give formula but I was determined to carry on as I knew how good it was for her' (BF > 6 months)

> 'Despite the endless hours of cluster feeding, a bout of mastitis and having to use a nipple shield for 3 months I was determined I wasn't going to formula feed' (BF > 6 months)

Mothers who chose to formula feed from birth were therefore adamant that formula feeding was an easier option, despite any potential health benefits for to breastfeeding for their infant. Moreover mothers who initiated breastfeeding but stopped after a short duration of time described a number of difficulties they experienced which led to the cessation of breastfeeding. Notably however, mothers who did breastfeed for six months or more were not void of problems in establishing and continuing breastfeeding but believed the benefits of breastfeeding to outweigh any potential difficulties faced.

5. Lack of confidence

A closely associated theme to breastfeeding being a difficult option was the association between low levels of confidence and use of formula. Both mothers and key workers raised the issue that whilst formula milk is a very measurable and visible method of feeding an infant, mothers cannot track and measure breast milk in the same way. This leads to fears that the mother is not producing enough milk, or the infant is not consuming enough energy. This is further exacerbated by the more frequent feeding of the breastfed infant and the tendency for formula fed infants to gain weight more quickly that breastfed infants. Indeed, key workers described a worrying tendency for mothers to doubt their ability to make enough milk for their infant. This was often exacerbated by others echoing this belief and arguing that formula milk will be much better for their infant. If a mother experienced such

anxieties, using formula milk and being able to see how much the infant was consuming removed this anxiety for the mother.

> 'One of the biggest problems is the myth that breastfeeding is difficult or they don't have any milk. Mums get worried about this, then they have people telling them its easier to put baby on the bottle and in the end their inexperience and anxiety get to them and the baby is being formula fed' (Health Visitor)

> 'Mums really worry that they are not doing it right. They worry even before they have the baby that they won't have enough milk. Friends tell them that they didn't have enough and they are anxious before they start. Formula however lets you see how much the baby is getting' (Midwife)

> 'Many people make breastfeeding mums feel inadequate telling them they haven't got enough milk which leads to confusion and lack of confidence in their ability to breastfeed. Bottle feeding can seem like an easier option as babies tend to drink more and put on more weight ...then they feel like a good mum because their baby is getting fatter' (Health Visitor)

Indeed mothers often cited the measurable nature of formula milk as a reason for not initiating or stopping breastfeeding. Mothers described how so much emphasis was placed on child weight gain from both professionals and friends and family that they grew anxious about how much their infant was feeding and how much weight they gained. Mothers doubted their milk supply and were uncomfortable not being able to see how much the infant had consumed. Whilst breastfed infants were seen as difficult to feed, bottle feeding allowed the mum to coax her infant to feed more, thus filling them up. Moreover, denser formula milks were available on the market or mothers gave their infants milk intended for older infants in order to try to extend times in between feeds. The consequence of this was increased weight gain which made the mothers feel proud and secure that their infant is growing well. This manipulation and in turn increased growth was not possible when breastfeeding and led to mothers stopping.

> 'He grew so well on formula milk and so quickly even though they say breast milk is meant to be better for them. He was much bigger than my friend's baby who was breastfed. He was obviously eating well and growing big and strong' (FF from birth)

> 'I had to use formula as my milk was running out and I was worried. Once he was on formula he put on lots of weight which showed he cant have been getting much despite my health visitor telling me it was fine...I was sad though as I read that breastfeeding was so good for them but obviously not my milk' (BF 6 weeks)

> 'I noticed within a few weeks of stopping breastfeeding that he had gone up the charts quite a bit. People started commenting on how much he had grown so I felt a lot better about stopping breastfeeding as I knew I had done the right thing' (BF 6 weeks)

'I wasn't really comfortable with the idea of breastfeeding and now a days bottle feeding is just as a good as breastfeeding with the advantage you know how much they are getting. I didn't need to worry about how much milk she was getting on top of everything else' (FF from birth)

Mothers who did breastfeed for at least six months were aware of this difference between breast and formula feeding. Being unable to view the amount of milk consumed during breastfeeding, alongside more frequent feeds caused anxiety about milk supply and consumption to start for some mothers, mothers who continued breastfeeding overcame this anxiety and learned to trust their infant to regulate their own intake of milk. These mothers often struggled with the idea that their infant was not as large as some formula fed infants but realised that this was normal growth and not a consequence of low milk supply. Some expressed anger that their infant was seen as abnormal when in fact the formula fed infants were often being overfed. Many of the mothers felt that because of this belief, others tried to undermine their confidence and to tell them that their infant wasn't receiving enough milk.

'My baby was noticeably smaller than a lot of my friends babies who were formula fed. I did worry a lot to start with to be honest but after talking to mums at the peer support group and a breastfeeding counsellor they made me see that she was happy and alert and obviously not lacking in milk. She was growing as she should. It didn't stop the comments from other people though' (BF 6 months)

'Breastfed babies are smaller but this is normal. Formula fed babies are actually overweight. My health visitor was great and would use a different chart to measure his growth but other people used to say he was too small and my milk must be useless. It got me so angry... he was fine and growing perfectly well...why did he have to be overweight for me to be doing a good job...its complete rubbish and unfair that new mums get made to feel like this for actually doing the best thing.' (BF 6 months)

'When he was 10 weeks old he was having what I now know to be a growth sport and was feeding loads. My mother in law said "oh well your milk might not be good enough for him, he deserves better' ...I was upset and shocked but luckily I knew better, but imagine if I hadn't (BF 6 months)

The reflections set out in this section indicate that the infant-led nature of breastfeeding may be discouraging women from initiating or continuing to breastfeed past the first few days or weeks. Women who did not breastfeed, or only did so for a short period of time cited the immeasurable nature of breastfeeding as a reason for formula use. Whilst breastfeeding caused concern about intake and weight gain, formula allowed milk intake to be tracked and infants to gain weight quickly. Women who breastfeed appeared knowledgeable about the mechanisms of breastfeeding and were confident in their ability to nourish their infant, but still

received negative attitudes and discouragement from others who believed formula was superior to breast milk.

6. Increasing breastfeeding duration

Finally, a number of ideas were raised as to how mothers could be encouraged to initiate breastfeeding and to breastfeed for longer. Ideas centred on the concept of seeing breastfeeding as the normal, accepted and best way to feed an infant, coupled with the idea of increased support. Key Workers especially believed further support was needed but criticised a lack of time and funding

> 'Understanding that breastfeeding is the normal behaviour, anything else is different. Babies who feed as breastfed babies are intended to do not have anything wrong with them. More people need to hear and understand this and stop pushing the idea of the supposedly sleeping contented formula fed baby as happy and healthy' (Breastfeeding Counsellor)

> 'Peer support – seeing other mums feeding and enjoying it. Seeing how breastfed babies feed and how that's fine and you can have a life once you've got the hang of it. Realising that it's not all negatives. ' (Health Visitor)

> 'More support. I would love to set up a peer support group here but we just don't have the time or resources. If they could just see other mums feeding their babies – they need the visualisation you know?' (Midwife)

> 'Banning all bottle images! No dummies and bottles for baby dolls. All baby dolls should come with a breast pump instead. Formula milk promotion and advertising has a devastating effect. It tries to convince mums they are doing the best for their babies by giving formula milk. It really undermines breastfeeding' (Social Worker)

Based on their own experiences, mothers had clear views as to the ways in which they thought breastfeeding could be promoted and future support should be targeted. Again more help with breastfeeding difficulties, especially from peer supporters was highlighted. In fact a number of respondents described how their decision to breastfeed their child actually had a positive impact on those around them. They found that others were often interested in why they had chosen to breastfeed and how they had breastfed successfully. Some reported how on seeing how much they enjoyed breastfeeding; others then chose to breastfeed their babies, even if they had formula fed in the past.

> 'New mums really need more support. I tried to find it when I had difficulties but there wasn't any and everyone else was just telling me to use formula. I do regret stopping feeding her myself and perhaps if I had support then I would have fed her for longer' (BF 2 weeks)

> I think the problem is there isn't enough support for mums, especially those who are so keen to breastfeed and have difficulties and eventually resort to formula. It is all too easy to promote 'breast is best' but the real challenge is showing mums that yes this is the best option AND there is help for you out there. (BF 6 months)
>
> Women need to be supported the minute the baby is born, there is not enough visible presence and you usually have to go looking for help, it is not easily available to a lot of people. I think the government needs to start funding breastfeeding support and getting counsellors available in hospitals and at health clinics. This is the best start for infant. (BF 6 months)
>
> My best friend formula fed her first child, but after seeing me breastfeed my second and talk about my experiences she decided she wanted to breastfeed her second, who coincidentally was born yesterday morning! Baby is feeding well and mum is delighted! (BF 6 months)

In summary, key workers and mothers presented a wide range of issues surrounding the initiation and duration of breastfeeding. Mothers were influenced by the attitudes of others, the apparent norm of bottle feeding and embarrassment and concerns about the effects of breastfeeding upon their body. Moreover, worries about the impact of breastfeeding upon their lifestyle were common. Mothers viewed formula feeding to be easier and more convenient, with babies feeding less frequently and sleeping for longer. In addition formula feeding was viewed to be easier whilst breastfeeding was associated with anxieties over how much milk the infant was consuming and how much weight they had gained. In short, formula feeding, despite the belief that breastfeeding was better for the infant, was deemed to be the easier option. Concerns about the infant-led nature of breastfeeding were clearer evident and associated with a shorter breastfeeding duration.

2.3. Discussion

The aim of this initial exploratory study was to examine the reasons both mothers and the key workers supporting them attribute to the low rates of breastfeeding in the UK. A particular objective was to explore whether the infant-led nature of breastfeeding is indeed affecting mothers decisions to initiate and continue breastfeeding. In short, the findings revealed that breastfeeding initiation and duration was influenced by a number of factors, with the irregular, frequent and immeasurable feeding style associated with breastfeeding being cited strongly in explanations for formula use.

Previous research has established that the short duration of breastfeeding in the UK is complex. Mothers choose to formula feed as they feel alone in their decision to breastfeed, feel embarrassed feeding in front of others or feel uncomfortable equating

their breasts with feeding an infant (Lewallen, et al. 2006; Earle, 2002). In particular, desire to adopt a maternal-led method of feeding in terms of schedule, routine and being able to keep track of feeds is associated with a short or absent duration of breastfeeding (Thulier & Mercer, 2009). Beliefs that breastfeeding is inconvenient, difficult or tying to the infant, alongside anxiety raised by the need to allow the infant to self regulate feeds, all affect the mother's decisions to initiate or continue breastfeeding (Kuan et al.1999; Arora et al. 2000; Taveras et al. 2003).

In the current study a variety of influences upon mothers' decisions to formula feed or breast feed for a short duration of time were raised. These strongly echoed existing themes in the literature. Mothers cited reasons including society viewing bottle feeding as the norm, a lack of support, body image and embarrassment as reasons for using formula. Moreover, they strongly emphasised the difficulties mothers face with following a method of feeding which is strongly infant-led. Mothers who used formula or only breastfed for a short period of time viewed breastfeeding as inconvenient, tying to the infant, and/or exhausting and believed that formula fed infants were easier, more settled and slept better. Furthermore, anxieties surrounding inability to measure milk intake during breastfeeding and issues with infant weight gain were associated with formula use. Mothers who appeared to want more control over their infants intake of milk and feeding patterns seemed to be drawn towards formula feeding. These themes are common in the current literature (Li et al. 2008; Thulier & Mercer, 2009) but have not as yet been considered as a possible explanation for the relationship between breastfeeding duration and later maternal control. Emphasis has usually been placed on the idea that experience of infant-led breastfeeding leads to lower levels of later maternal control (Taveras et al. 2004). Instead, it is possible that maternal desire for a feeding style high in control impacts both upon breastfeeding initiation and duration and later control.

Notably, each of the themes raised with regard to breastfeeding initiation and cessation were discussed by both mothers and key workers. Indeed, responses from key workers and mothers followed similar themes, highlighting comparable reasons for short breastfeeding duration in the UK. This firstly suggested that common, prevalent influences upon breastfeeding duration existed. Secondly it reflected that

key workers understood the factors influencing mothers in their decision on how to feed their infant.

Little difference was seen in attitudes towards breastfeeding between mothers who chose to formula feed from birth or who initiated breastfeeding but stopped before six months. All gave similar responses in terms of believing breastfeeding to be inconvenient and time consuming and viewed formula fed infants to be more settled and easier to parent. However, mothers who initiated breastfeeding appeared to have been prepared at least to try breastfeeding in spite of the beliefs held by themselves and others close to them that the method was inconvenient and difficult. The main difference between those who chose to initiate breastfeeding at birth or to formula feed was the belief held by those who breastfed for a short duration that breastfeeding had health benefits compared to formula feeding. Belief in the health benefits of breastfeeding however did not appear to be motivation enough to carry on past the first few weeks.

Mothers who breastfed for at least six months often expressed opposing attitudes or experiences to those who used formula. Whereas those who breastfed for a short time or never breastfed viewed breastfeeding in a negative light, seeing it as inconvenient and believing that formula fed infants were easier and more settled, those who breastfed for six months or more reported the opposite. These mothers expressed confusion as to how formula feeding was easier and divulged how they genuinely enjoyed the experience of breastfeeding. This echoes findings which show that many mothers who do establish breastfeeding feel that they have chosen the simpler option (Arora et al. 2000). Strikingly, mothers who breastfed for at least six months did not experience any fewer problems breastfeeding than those who stopped breastfeeding before six months. All mothers who breastfed for any duration reported experiencing problems in some form. Mothers who carried on breastfeeding however appeared to overcome these difficulties, expressing determination to continue. This could be related to their greater knowledge and confidence in terms of breastfeeding as many studies have highlighted the association between increased knowledge, confidence and self efficacy and increased breastfeeding duration (Chezem et al. 2003).

A central theme running throughout the interview responses was the recognition of the differences between breast and formula feeding in terms of feeding schedules and

being able to measure the amount of milk consumed. In short, although the superior health benefits of breastfeeding were recognised, breastfeeding was viewed as difficult, demanding and incompatible with maternal lifestyle, whilst formula feeding was believed to bring order, security and routine. Breastfeeding was infant-led whilst formula feeding was under greater maternal control. Indeed, a number of mothers appeared to chose to formula feed from birth or to breastfeed only for a short duration due to the ability to control feeds according to maternal schedule when using formula. This stemmed from wanting the infant to fit in with their lifestyle as formula fed infants were seen as more settled, sleeping better and going longer between feeds. Formula therefore enabled the mother to feed the infant less frequently, to set routine and to also let others feed the infant thus making daily routine and lifestyle easier and more predictable. Mothers who seemed to have a strong desire for control over their infants feeding behaviour tended to choose to formula feed, either immediately or after a short duration of breastfeeding.

Alternatively mothers with anxieties about judging accurately how much the infant was consuming appeared to find reassurance in using formula milk. This concern was compounded by beliefs that formula fed infants gained weight more quickly which was a desired behaviour and a view that frequent feeding in a breastfed infant was indicative of poor milk supply. These beliefs discouraged some women from initiating breastfeeding and for others cut a planned breastfeeding duration short. Mothers compared their breastfed infant to the weight gain and feeding patterns of their formula fed peers and grew anxious that they were not able to breastfeed well. Formula thus provided the solution. Babies often grew quicker and apparently became more settled, reassuring the mother they had made the right choice. Weight gain acted as a positive and immediate positive feedback to the mother, reinforcing her choice to use formula milk.

Conversely, mothers who chose to breastfeed for at least six months seemed happy to follow the infant-led approach of breastfeeding, feeding frequently and on demand and trusting their infant to self regulate their intake of milk. They raised issue with the idea that formula feeding was somehow more convenient and expressed the view that although following an infant-led feeding style could be demanding, they believed it to be best for infant health. Mothers in this group naturally followed the

infant-led style of breastfeeding as they believed it to be normal. They understood the mechanisms of breastfeeding and patterns of normal weight gain, and despite encountering criticism were determined to carry on breastfeeding for infant and maternal health.

The findings of this first study therefore offer initial speculative support to the idea that the relationship between breastfeeding duration and later maternal control (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004) is not merely affected by experience of following an infant-led feeding style. Indeed, they suggest, that possibly, the infant-led nature of breastfeeding with its frequent irregular feeding pattern and immeasurable nature discourages some women from initiating or continuing to breastfeed. Mothers who want a style of feeding that is predictable, trackable and under maternal rather than infant control appear to choose to formula feed or only manage to breastfeed for a short breastfeeding duration. Rather than experience of breastfeeding encouraging a feeding style which is low in control, perhaps mothers who want a high level of control over feeding (or parenting in general) choose not to breastfeed. Formula allows them the routine and control they desire.

The current study provides an indication that control during early milk feeding is worthy of further study. It appears that negative attitudes associated with breastfeeding use, notably the beliefs that it is difficult, inconvenient and formula fed infants are more settled are leading women to chose to formula feed. Rather than mothers who breastfeed adopting a feeding style which is infant-led and low in maternal control, perhaps formula feeding allows the mother to hold a higher level of control, both in terms of monitoring intake and planning feeding patterns. Thus desire for control may drive breastfeeding or formula use. The following studies will therefore explore these ideas further. They will aim to understand

1. Are there differences in feeding style between mothers who breast and formula feed? Can differences in early maternal control be measured?

2. Do differences in maternal control of milk feeds drive breastfeeding duration or do they emerge as a consequence of breastfeeding duration (as speculated by Taveras et al. 2004)

3. Are these differences, if present, associated with the attitudes raised in the current study? Do beliefs about the inconvenience of breastfeeding or concerns about milk intake associated with wanting a feeding style that is under greater maternal control?

4. How do these attitudes and experience of feeding interact to determine maternal control during milk feeding? Is maternal control driven by a combination of both attitudes and experiences?

Chapter 3

Maternal retrospective reports of control during milk feeding

The aim of study one was to initially explore the finding that breastfeeding during the first year is associated with a lower level maternal of control over later child feeding from 12 months old (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004). Although a number of studies have revealed this significant association, the relationship between breastfeeding and later maternal control has not been examined further. Tentative explanations suggest that because breastfeeding is infant-led, mothers who breastfeed adopt an infant feeding style low in control which follows through into later child feeding (Taveras et al. 2004). Alternatively, it is speculated that differences between mothers who choose to breast or formula feed explain both breastfeeding duration and later maternal control (Farrow & Blissett, 2006a). As breastfeeding is infant-led, perhaps mothers who desire a maternal-led style of feeding with a high level of control choose to formula feed, thus explaining the latter relationship between breastfeeding and decreased maternal control.

Indeed, numerous studies in the current literature highlight that mothers view the infant-led nature of breastfeeding as negative, choosing to use formula milk which is viewed as convenient and easy to use (Li et al. 2008; Thulier & Mercer, 2009). Study one thus explored maternal experience of breast and formula feeding, specifically examining the influence of the infant-led nature of breastfeeding upon breastfeeding initiation and duration. In line with previous research in the area, mothers raised the idea that formula feeding was easier, formula fed infants were more content and that formula feeding allowed for a predictable day to day routine. Moreover, formula fed infants were viewed as gaining weight more easily, and the visual, measurable nature of formula milk as a positive aid to tracking infant milk intake and weight gain. In

short, whereas breastfeeding was seen as infant-led, formula milk allowed a greater level of maternal control over infant feeding pattern and milk intake and thus maternal day to day routine. The results confirmed initial hypotheses that beliefs about the infant-led nature of breastfeeding may be driving breastfeeding duration.

The results of study one suggested that maternal desire to adopt a feeding style that is predictable and high in maternal control may be associated with a short breastfeeding duration or formula use from birth. It is possible therefore that rather than experience of infant feeding affecting later levels of maternal control, that desire for a high level of maternal control may drive breastfeeding duration. It appears that maternal control could be linked to a trait or personality style which determines overall control of child feeding or perhaps parenting in general. Indeed, evidence links a controlling parenting style with high levels of maternal control in later childhood (Hubbs-Tait et al. 2008) suggesting that maternal individual differences may also influence control during milk feeding. Mothers may begin feeding with a desire for control rather than feeding experience modifying control level.

The main aim of study two was therefore to further empirically examine the association between maternal control over child feeding and breastfeeding duration. Specifically the study aimed to ascertain whether differences in maternal control could be identified during milk feeding and if present the factors associated with different levels of this control. A retrospective design was employed, to explore reported differences in maternal control of milk feeding during the first six months post partum. A self selecting sample of mothers with an infant aged 6 – 24 months responded to a questionnaire examining breastfeeding duration alongside use of control during milk feeding and attitudes and experiences surrounding breastfeeding and the first six months postpartum. As research into maternal control during milk feeding is sparse, these methods allowed a large number of participants to be recruited through which to explore initial hypotheses and predictions.

Six main questions were therefore examined in study two:

1. Are there reported differences during milk feeding in infant feeding style between mothers who breastfed or formula fed? Does duration of breastfeeding affect this?

2. Could differences in attitudes towards breastfeeding, especially the infant-led nature of breastfeeding, affect either breastfeeding duration and / or maternal control?

3. Does maternal confidence impact upon breastfeeding duration and maternal control? Is this explained through concern of following an infant-led approach?

4. Is maternal or infant weight associated with use of scheduling or encouraging milk feeds?

5. Does maternal experience of pregnancy and birth affect breastfeeding duration and use of scheduling and encouraging feeds?

6. Which of the above measures provide the strongest predictions of scheduling and encouraging feeds?

It was hypothesised that differences in maternal control would be measurable in relation to milk feeding and that these would differ according to breastfeeding duration. Specifically, mothers who breastfed for a longer duration of time would report using lower levels of control over their infant's intake of milk than mothers who formula fed from birth or who breastfed for a shorter duration as suggested by the relationships found between breastfeeding and later use of maternal control (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004).

Secondly, based on the findings from study one and supporting studies in the existing literature (Li et al. 2008; Thulier & Mercer, 2009), it was speculated that maternal attitudes towards the infant-led nature of breastfeeding would be associated with both

breastfeeding duration and reported use of control. Specifically mothers who viewed breastfeeding to have a negative impact upon their lifestyle or who were concerned about the inability to measure milk intake would breastfeed for a shorter duration and report using higher levels of control over milk intake.

Finally it was speculated that reported use of control may in fact be a consequence of experience of pregnancy and the early postnatal period. In particular, difficulties or complications during pregnancy or the birth or concern about infant growth may affect breastfeeding duration and maternal control through raised concern and monitoring. Mothers who experienced difficulties feeding their infant may increase their levels of control in order to try and combat these concerns. Formula may allow a higher level of control than breastfeeding for these mothers. Certainly, a number of studies show an association between high levels of maternal weight with a suggestion that maternal control develops as a consequence of a child who is under or over weight (Farrow & Blissett, 2008; Musher-Eizenman et al. 2007). Study two examines whether this relationship exists during the period of milk feeding.

3.1. Methods

Participants

Six hundred and thirty three mothers with at least 1 child between 6 months and 24 months of age (mean age 12.80 months) completed the questionnaire. Multiparous mothers were asked to complete the questionnaire in relation to their youngest child in this age range. Participants were recruited from day care centres, postnatal groups and mother and infant groups in the City and County of Swansea and online internet based parenting forums based in the UK[1]. The community groups were located in areas with varying degrees of social deprivation as measured by the Welsh Indices of Multiple Deprivation (WAG, 2008). No significant difference was seen in mean age, years in education or breastfeeding duration between mothers who who were recruited online or through local groups.

[1] www.bounty.com; www.ivillage.co.uk; www.infantcentre.co.uk; www.mumsnet.com

Participants provided details about their age, level of education and gave measures of socioeconomic measures of socioeconomic status (Table 3). Occupations were coded according to the National Statistics Socio – Economic Classification self – coded method (NS – SEC, 2005). Post code was also provided in order to establish deprivation level according to the Welsh (WAG, 2008) and English (Noble, McLennan, Wilkinson, Whitworth, Barnes, Dibben, 2007) Indices of Multiple Deprivation. These measures categorise areas across the country based on postcode on level of relative deprivation based on a number of socioeconomic indicators including factors such as income, education, employment, health, housing and crime and therefore give a wider view of neighbourhood deprivation.

The mean age of the respondents at childbirth was 29.16 years, (range from 16 to 45) and the mean number of years in education was 14.61. 72.3% of mothers were primiparous. Mean age of the child when the questionnaire was completed did not differ significantly between primiparous and multiparous mothers (12.64 and 13.22 months respectively).

Table 3: Sample distribution by Demographic Factors

Indicator	Group	N	%
Age	≤ 19	14	2.2
	20 – 24	124	19.6
	25 – 29	173	27.2
	30 – 34	180	28.4
	35 ≥	142	22.6
Education	No formal	25	3.9
	School	150	23.6
	College	137	21.6
	Higher	321	50.6
Marital Status	Married	336	53.1
	Cohabiting	197	31.3
	Single	99	15.6
Home	Owned	349	55.1
	Rented	244	38.4
	Council	85	13.5
	Other	4	0.8
Maternal occupation	Professional & managerial	210	33
	Skilled	46	7.2
	Unskilled	80	12.6
	Other	29	4.6
	Declined	270	42.5
Paternal occupation	Professional & managerial	214	33.7
	Skilled	53	8.3
	Unskilled	62	9.8
	Other	12	1.9
	Declined	306	48.2

Participants indicated their pre-pregnant and current weight along with their height. Three measures were produced: pre-pregnancy BMI, current BMI and the difference between pre-pregnancy and current weight. Participants also provided infant birth weight and gestational age at birth. Infants were excluded from the analysis if they had a low birth weight (< 2500g) or were born prematurely (< 37 weeks) (World Health Organisation, 1992). In addition participants provided a measure of perceived size of their infant through the item "As your infant was growing was she/he" [Very small for age; Small for age; Average size for age; Large for age; Very large for age].

All participants gave informed consent prior to inclusions in this study. All aspects of the study were performed in accordance with the ethical standards set out in the 1964 Declaration of Helsinki. Approval for this study was granted by the Swansea University Department of Psychology Research Ethics Committee (Appendix 2A).

Measures

Participants completed a retrospective questionnaire asking them about their experiences feeding their infant between birth and 6 months of age when milk was the primary source of nutrition (Appendix 2B). The questionnaire included:

- Measures of breastfeeding duration and formula use
- A modified version of the child – feeding questionnaire
- Attitudes towards breastfeeding
- Confidence in breast or formula feeding

Breastfeeding duration and formula use

Participants indicated whether they initiated breastfeeding at birth, for how long they breastfed and any use of supplementary formula (Table 4). Any mother who reported breastfeeding but gave formula milk more than once a day was excluded (N = 9). Participants also provided information about whether they fed their infant on a maternal-led schedule (eg perhaps every three or four hours) or on infant demand (eg whenever the infant signalled hunger) and estimated the frequency of milk feeds over the course of 24 hours.

Table 4: Breastfeeding duration for the entire sample

Breastfeeding duration	N	%
Formula milk from birth	57	9%
Breastfed < 1 week	148	23.3%
Breastfed 1 – 6 weeks	108	17.0%
Breastfed 7 – 25 weeks	20	3.2%
Breastfed 6 months plus	297	47.2%

Breastfeeding duration was significantly positively associated with maternal age, education and income. Mothers who breastfed for a longer duration were significantly more likely to have a higher ranked occupation, as was their partner. Mothers who were married and who owned their own homes breastfed for significantly longer than mothers who were not married or home owners. Finally breastfeeding duration was inversely associated with deprivation as measured by both the Welsh and English Indices of deprivation (Table 5).

Table 5: Association between breastfeeding duration and socioeconomic status

Socioeconomic indicator	Breastfeeding duration
Age	.243**
Education	.309**
Income	.441**
Maternal occupation	-.370**
Maternal occupation	-.367**
Welsh IMD	-.379**
English IMD	-.352**
Home ownership	.292**
Marital status	.283**

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Modified child-feeding questionnaire

Participants recalled their feeding practices when giving their infant milk feeds during the first six months postpartum. A self-report questionnaire was used based on the Child Feeding Questionnaire (CFQ) designed and validated by Birch et al. (2001). The CFQ evaluates parental beliefs, attitudes and practices towards children's diet and was designed to be used with parents whose children are consuming solid foods, with a suggested age range of approximately two to eleven years. The CFQ aims to assess the level of primary carer involvement and control over the child's diet and targets behaviours including perceived responsibility, concerns about child weight, restriction, pressure to eat and monitoring feeds alongside perceptions of both parental and child weight. As no validated questionnaire examining maternal control exists for use with parents with milk-fed infants it was decided to modify the items of the CFQ in the context of milk feeds (Appendix 2C). Questions were reworded to apply specifically to milk feeding in retrospect. Any individual items that could not be modified relevant to milk feeding were omitted. Response options were as the original CFQ (agree, slightly disagree, neither agree nor disagree, slightly disagree and disagree). For example the question 'How much do you keep track of the food your child eats?' became 'How much did you keep track of the amount your infant drank?. Although scoring advice is given to group items into factors for the original CFQ, as the questionnaire used was a modified version a factor analysis was conducted for the new scale and cronbach's alpha computed. This process is describe below.

Attitudes towards breastfeeding and confidence in infant feeding

Based on the issues raised in study one, participants rated a series of statements regarding their attitudes towards breastfeeding. Issues such as ease of breastfeeding, embarrassment and the health benefits of breastfeeding were examined. Respondents also completed a series of questions examining their confidence and self efficacy with regard to their experience of milk feeding. Response options for both sub sections were designed to match the modified Child Feeding questionnaire (agree, slightly disagree, neither agree nor disagree, slightly disagree and disagree).

Data analysis

A factor analysis of the three sub sections of the questionnaire was carried out using SPSS v13, SPSS UK Ltd. A principal component analysis was conducted that was subject to varimax rotation. Factors with eigenvalues over 1 were used. The factor scores computed were saved as regression scores and used for the data analysis as recommended by Tabachnik and Fidell (2006). Multivariate ANOVA were performed to compare maternal use of control, attitudes, confidence and maternal and infant weight for three feeding groups (formula-fed from birth, breastfed for up to one week and breastfed for at least six months). Post-hoc Bonferroni tests were used to compare differences between groups. Finally Chi square tests were carried out to compute associations between feeding group and maternal use of an infant-led or maternal-led schedule to time their infant's feeds.

3.2. Results

Question One: Are there reported differences during milk feeding in feeding style between mothers who breastfed or formula fed? Does duration of breastfeeding affect this?

An exploratory factor analysis was conducted to establish the factor structure of the modified CFQ (Appendix 2D). The rotated component matrix explained 53.5% of the variance and produced four factors which reflected different variants of maternal control. The first accounted for 28.87 % of the variance and was weighted on six items which described restricting, scheduling and stretching out feeds. This factor was labelled 'scheduling feeds'. The second factor accounted for 9.33% of the variance and was based on items that encouraged the infant to consume more milk alongside anxieties that the infant was underweight. This was labelled 'encouraging feeds'. A third factor labelled 'using milk for comfort' was based on feeding in response to infant behaviour in order to comfort or calm behaviour. This factor accounted for 8.71% of the variance. Finally, accounting for 6.62% of the variance, the factor 'perceived responsibility' was produced. This described aspects such as carrying out most of the feeding and feeling responsible for the amount or milk consumed. Two confirmatory factor analyses were conducted on random subsets of the data that resulted in similar factor structures. Therefore the factors extracted by

using the entire sample size were used. Factor scores for the four dimensions were created using the regression method. In summary four factors were revealed:

- Scheduled feeding
- Encouraging feeds
- Using milk for comfort
- Perceived responsibility

Cronbach's Alpha for each scale is reported alongside each dimension (Appendix 2D). For the three scales of encouraging feeds, scheduling feeds and using milk for comfort internal validity was high ranging from .723 to .778. The score was lower for perceived responsibility at .512.

Breastfeeding duration and feeding style

To establish whether differences in feeding style were reported according to breastfeeding duration, three main groups of participants were identified. Levels of reported use of scheduling and encouraging feeds were compared for mothers who formula fed from birth (n = 57), mothers who breastfed for seven days or less (n = 148) and mothers who breastfed for at least six months (n = 297). The aim was to understand whether mothers who initiated breastfeeding even for a short duration of time, differed in their feeding style compared with mothers who formula fed from birth or mothers who breastfed for an extended period.

A multivariate ANOVA indicated that scheduling and encouraging feeds significantly differed according to the duration of breastfeeding (Table 6). Bonferroni's test confirmed that mothers who breastfed for six months or more scheduled and encouraged feeds significantly less frequently than formula-feeders or mothers who initiated breastfeeding but ceased within 1 week ($P < 0.001$ in both cases). Moreover, mothers who breastfed for 7 days or less reported scheduling ($P < 0.05$) and encouraging ($P < 0.001$) feeds significantly less than mothers who formula fed from birth. For using milk as comfort, mothers who breastfed reported using significantly higher levels of this behaviour than both those who formula fed or breastfed for only a short duration ($P < 0.001$). No significant difference was seen between mothers who breastfed for 7 days or less or formula fed from birth. Finally, no significant differences were seen between any feeding group

for the factor perceived responsibility. Table 6 shows both the mean factor scores and computed scores for use of control for each group. The scores for each factor were saved as z scores from the factor analysis (ranging from – 1 to + 1) and therefore difficult to clearly interpret differences between groups. Therefore scores were computed for each factor based on the mean score (as per Likert scale response 1 to 5 where 1 = disagree and 5 = agree) for each of the items that clustered on each factor. As the main aim of study was to examine control over child feeding, only the two behaviours of scheduling and encouraging feeds are further reported.

Table 6: Differences in reported maternal control by duration of breastfeeding

Control	Mean (SEM)	Formula	BF ≤ 7 days	BF ≥ 6 Months	Significance
Limit feeds	Factor score	.757■▲ (.122)	.456▲ (.075)	-.325 (.053)	F (2,501) = 23.362, p < 0.001
	Computed score	2.571	2.383	1.483	
Encourage feeds	Factor score	.512■▲ (.122)	.125▲ (.075)	-.300 (.053)	F(2, 501) = 16.931, p < 0.001
	Computed score	3.293	2.881	.769	
Milk for comfort	Factor score	-.593▲ (.112)	-.596▲ (.069)	.602 (.049)	F (2, 501) = 124.071, p < 0.001
	Computed score	1.71	2.10	3.93	
Perceived Responsibility	Factor score	-.294 (.136)	.050 (.084)	-.008 (.059)	F (2, 498) = 2.402, p > 0.05
	Computed score	3.95	4.23	3.92	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 7 days; ▲$p < 0.05$ compared to BF ≥ 6 months

Table 6 shows both the mean factor scores (z scores) and computed scores for use of control for each group. The computed scores were used for ease of comparison and are based on the mean score (as per likert scale response 1 to 5) for each of the items that clustered on each factor.

Confounding variables

It is possible that the differences in feeding style that related to breastfeeding duration were attributable to factors that predicted breastfeeding rather than the act itself. However, the relationships remained significant when maternal age, years in

education, income, deprivation score, occupation and maternal BMI were controlled for as covariates. Indeed, apart from maternal age, none of these factors were significantly associated with scheduling or encouraging feeds. The age of the mother was significantly associated with scheduling feeds ($p < 0.001$); younger mothers were more likely to report scheduling feeds.

The potential confounding methodological variables of the age of infant at time of answering the questionnaire and the parity of mothers were also considered. It could be suggested that the older the infant at the time of completion, the greater the likelihood of memory error or that responses would reflect current feeding style. However, no significant association was seen between age of infant at time of completion and breastfeeding duration or scheduling and encouraging feeds. Similarly, it could be argued that multiparous mothers would report different responses to primiparous mothers because of greater experience and increased opportunity for memory errors. An effect of parity was seen for breastfeeding duration. Primiparous mothers breastfed for significantly longer than multiparous mothers as is consistent with current literature (Thulier & Mercer, 2009). However, parity had no effect on scheduling or encouraging feeds (Table 7). Although socioeconomic factors and infant characteristics were not associated with maternal reported use of scheduling and encouraging feeds it was decided to control for the key variables of maternal age, maternal years in education, infant age at time of questionnaire and parity throughtout the multivariate analyses. Further demographic information was not controlled for as it would have reduced participant numbers in the analyses.

Table 7: Association between age of infant and parity of mother with breastfeeding duration and control.

	Breastfeeding duration	**Scheduling feeds**	**Encouraging feeds**
Age of infant	.019	.028	.054
Parity	.200**	.023	-.044

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Formula supplementation

In addition to breastfeeding duration, mothers who initiated breastfeeding were asked how frequently they supplemented their breast milk with formula milk. 49.6% of mothers who breastfed also used formula milk, ranging in frequency from once a day to using formula supplements very rarely (Table 8). Frequency of formula supplementation was negatively associated with the duration of breastfeeding. The longer the duration of breastfeeding, the less frequently mothers used formula supplements. Furthermore, independently of breastfeeding duration, the frequency of formula use was positively associated with the reported use of scheduling (Pearson's $r = 0.172$, $P < 0.001$) and encouraging feeds (Pearson's $r = 0.254$, $P < 0.001$).

Differences were seen in reported use of scheduling and encouraging feeds between mothers who only used formula from birth and mothers who breastfed but supplemented with formula once a day. Mothers who formula fed from birth reported significantly higher levels of scheduling feeds [$F(1, 164) = 5.057$, $p < 0.05$] and encouraging feeds [$F(1, 164) = 8.805$, $p < 0.01$] than mothers who breastfed and offered one bottle of formula a day. Notably relationships between formula use and control were not affected by infant weight, perceived size or gestation.

Table 8: Use of formula supplementation by breastfeeding duration

Breastfeeding duration	% formula supplement once a day
Formula milk from birth	-
Breastfed < 1 week	40.9%
Breastfed 1 – 6 weeks	54.1%
Breastfed 7 – 25 weeks	35.5%
Breastfed 6 months plus	7.1%

Additional measures of maternal control

Alongside the modified child feeding questionnaire, participants were asked whether in general they breast or formula fed according to their infants demand or to a maternal imposed schedule irrespective of their infants hunger signals (for example four hourly feeds). Furthermore they were asked to estimate how frequently their

infant fed over the course of the day (for example every two hours). Patterns of feeding can be found in Table 9.

Table 9: Breastfeeding duration and feeding routine.

Breastfeeding duration	% fed to upon infant demand*
Formula milk from birth	35.7%
Breastfed < 1 week	52.0%
Breastfed 1 – 6 weeks	61.1%
Breastfed 7 – 25 weeks	67.9%
Breastfed 6 months plus	94.0%

* % of infants fed on infant demand rather than maternal-led schedule

Mothers who breastfed for at least six months tended to feed to an infant-led schedule, whereas mothers who used formula milk were more likely to feed to a maternal-led schedule [χ^2 (4, 503) = 147.200, $p < 0.001$] (Table 9). Moreover a tendency to use a maternal-led schedule was associated, independently of breastfeeding duration, with scheduling [F (1, 568) = 4.892, $p < 0.05$] and encouraging feeds [F (1, 568) = 5.092, $p < 0.05$].

In terms of frequency of feeds, mothers who breastfed for at least six months estimated that they fed their infants significantly more frequently than both formula-feeders and mothers who breastfed for less than one week (2.4 vs. 3.6 and 3.6 hours respectively) [F(2, 501) = 20.730, $p < 0.001$]. Moreover, mothers who fed to a maternal schedule fed significantly less frequently than mothers who fed on infant demand, independently of actual breastfeeding duration [F (1, 570) = 8.774, $p < 0.05$]. Furthermore, independently of breastfeeding frequency, the less frequently mothers reported feeding their infants, the greater their reported use of scheduling feeds (Pearson's r = .163, $p < 0.001$).

In summary, mothers who breastfed for at least six months reported using lower levels of control than mothers who formula fed from birth or who breastfed for one

week or less. Mothers who breastfed for at least six months were less likely to report encouraging or scheduling feeds, were less likely to feed to a maternal-led schedule, fed their infants more frequently and were less likely to use formula supplements. Moreover, mothers who breastfed for a short duration of time showed lower levels of control than mothers who formula fed from birth.

Question Two: Could differences in attitudes towards breastfeeding, especially the infant-led nature of breastfeeding, affect either breastfeeding duration and / or maternal control?

The results of question one revealed a significant difference in the use of control during milk feeding between mothers who breast or formula fed. Mothers who breastfed for at least six months reported significantly lower levels of scheduling and encouraging feeds than both mothers who breastfed for a short duration of time (7 days or less) or who formula fed from birth. This offers initial support to the proposal that experience of infant-led breastfeeding may encourage a feeding style that is low in control (Taveras et al. 2004). However, mothers who initiated breastfeeding but ceased within 7 days postpartum reported lower levels of control than mothers who used formula milk from birth. As experience of breastfeeding duration was so short (mean duration 3.29 days), it is unlikely to have modified use of control to a significant extent. This suggests that perhaps differences were present between these groups before feeding began, supporting suggestions by Farrow & Blissett (2006). Perhaps mothers who only breastfed for a short duration of time differed in some way to those who formula fed from birth which enabled them to initiate breastfeeding at birth. Looking back at the results of study one, it is possible that this difference is in someway associated with attitudes towards breastfeeding.

The next sections therefore examine some of the possible influences upon differences in control reported according to breastfeeding duration. Due to the retrospective design of the study, some of the findings are considered with caution as causality cannot be determined. However, it is assumed that scheduling and encouraging feeds are the outcome measures.

Attitudes towards breastfeeding

All participants completed a questionnaire examining their attitudes towards breastfeeding based on findings from study one. Participants responded to a series of statements regarding beliefs such as inconvenience, difficulty, and embarrassment. These questions were based on themes produced in study one and a thorough review of the literature pertaining to attitudes and influences upon breastfeeding duration (e.g. Thulier & Mercer, 2009). It was decided to construct a new questionnaire for the purpose of this study as no validated questionnaire exists which targets all attitudes under examination. Again exploratory factor analysis was conducted in order to establish factor structure (Appendix 2E). The rotated component matrix explained 51.79% of the variance and produced five factors. The first accounted for 30.77 % of the variance and was weighted on ten items which described breastfeeding as a difficult experience. This factor was labelled 'breastfeeding as difficult'. The second factor accounted for 8.55% of the variance and was based on items surrounding body image, embarrassment and sexuality. This was labelled 'breastfeeding as embarrassing'. A third factor labelled 'breastfeeding as inconvenient' was based on viewing breastfeeding as interfering with maternal lifestyle and placing greater responsibility on the mother than formula feeding would. This factor accounted for 5.08% of the variance. The fourth factor was weighted on three items and reflected the beliefs that formula fed infants were easier and more settled. This was labelled 'formula fed infants more contented'. Finally, accounting for 3.49% of the variance, the factor 'breastfeeding as healthier' was produced. This described the beliefs that breastfeeding was best for maternal and child health and should be actively promoted by health professionals. Two confirmatory factor analyses were conducted on random subsets of the data resulting in similar factor structures. The factors extracted from the entire sample size were therefore used. Factor scores for the five dimensions were created using the regression method. In summary five factors were revealed:

- Breastfeeding as difficult
- Breastfeeding as embarrassing
- Breastfeeding as inconvenient
- Formula fed infants as more content
- Breastfeeding as healthier

Internal consistency for each scale was again measured using Cronbach's Alpha and is reported alongside each dimension in Appendix 2E. Each item showed high internal consistency ranging from .710 to .808 apart from a lower level for 'breastfeeding as embarrassing' at .576.

Association between maternal attitudes and duration of breastfeeding

All attitudes were compared by feeding group (breastfed for six months or more, breastfeed for 7 days or less and formula fed from birth) using multivariate ANOVA to examine whether attitudes towards breastfeeding were associated with breastfeeding duration. Significant differences were seen between the three groups for each attitude (Table 10). Table 10 shows both the mean factor scores for each group and a computed score based on the mean likert scale score for each attitude as described previously.

Mothers who breastfed for at least six months reported significantly lower beliefs that breastfeeding was embarrassing and that formula fed infants were more content than both mothers who formula fed from birth or breastfed for 7 days or less. A similar pattern was seen for the belief that breastfeeding was healthier. Mothers who breastfed for at least six months also believed breastfeeding to be significantly better for health than mothers who formula fed from birth or breastfed for 7 days or less. Similarly, mothers who breastfed for less than 7 days believed breastfeeding to be significantly better for health than mothers who formula fed from birth.

For the belief that breastfeeding was inconvenient, mothers who breastfed for six months or more were significantly less likely to state that breastfeeding was inconvenient when compared to mothers who formula fed from birth. Mothers who breastfed for 7 days or less believed breastfeeding to be significantly less inconvenient than those who formula fed from birth. No difference was seen between those mothers who breastfed for 7 days or less or six months or more. No difference was seen in the attitude that breastfeeding was difficult for mothers who formula fed from birth or breastfed for 7 days or less. Mothers who breastfed for at least six months believed breastfeeding to be significantly less difficult than both these groups.

Table 10: Differences in attitudes towards breastfeeding by breastfeeding duration

Attitude	Mean (SEM)	Formula	BF ≤ 7 days	BF ≥ 6 months	Significance
Difficult	Factor score	.589▲ (.101)	.822▲ (.059)	-.757 (.043)	F (2, 477) = 259.651, P < 0.001
	Computed score	3.893	4.074	1.919	
Embarrassing	Factor score	1.092▲ (.137)	.0396▲ (.079)	-.196 (.060)	F (2, 477) = 38.702, p < 0.001
	Computed score	2.732	1.655	1.192	
Inconvenient	Factor score	.544■▲ (.143)	.143 (.083)	-.065 (.060)	F (2, 477) = 8.730, p < 0.001
	Computed score	2.982	2.277	1.556	
Formula fed infants more content	Factor score	.534▲ (.141)	.144▲ (.081)	-.168 (.059)	F (2, 477) = 13.323, p < 0.001
	Computed score	4.286	3.277	2.131	
Breastfeeding as healthier	Factor score	-.536■▲ (.142)	-.021▲ (.082)	.218 (.060)	F (2, 477) = 9.825, p < 0.001
	Computed score	3.571	4.257	4.769	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 7 days; ▲$p < 0.05$ compared to BF ≥ 6 months

Association between maternal control and attitudes towards breastfeeding

Attitudes towards breastfeeding were therefore associated with breastfeeding duration. However it was also questioned whether these attitudes were associated with the maternal control behaviours of scheduling and encouraging feeds. Indeed, both scheduling and encouraging feeds were significantly correlated with believing breastfeeding to be inconvenient, problematic and that formula fed infants were

easier. In addition, scheduling feeds was associated with the belief that breastfeeding was embarrassing. Neither scheduling nor encouraging feeds were associated with believing breastfeeding to be best for health (Table 11).

Table 11: Association between attitudes towards breastfeeding and reported used of scheduling and encouraging feeds

Attitude	Scheduling feeds	Encouraging feeds
Difficult	.354**	.252**
Embarrassing	.162**	.102**
Inconvenient	.149**	.190**
FF more content	.100*	.152**
Health	-.048	.028

Pearson's r: * $p < 0.05$, ** $p < 0.001$

In summary, negative attitudes surrounding the infant-led nature of breastfeeding appear to be associated with both a shorter breastfeeding duration and increased use of scheduling and encouraging feeds.

Question three: Does maternal confidence impact upon breastfeeding duration and maternal control? Is this explained through concern over following an infant-led approach?

Previous literature shows that increased breastfeeding duration is associated with greater confidence about feeding (Ingram et al. 2002). Moreover, mothers often cite concerns over the infant-led nature of breastfeeding as a reason for stopping breastfeeding. For example, mothers worry that they are not producing enough milk, that their infant is not taking adequate feeds or that their breast milk is not calorific enough for infant weight gain (Arora et al. 2000). These anxieties are seemingly reduced by using formula which by its nature is measurable and controllable (Dewey, 2001). It was therefore hypothesised that low maternal confidence would be associated with a shorter breastfeeding duration and that low maternal confidence

would be associated with higher reported use of control as mothers strived to gain a sense of routine and predictability over their infants feeding pattern. Specifically it was believed that reported use of encouraging feeds would be related to both a short breastfeeding duration and lower maternal confidence as mothers were concerned their infant was not consuming enough milk.

Mothers responded to five questions with regard to their confidence about milk feeding. Again these items were based on findings from study one and those in the current literature which explore maternal confidence and breastfeeding duration. An exploratory factor analysis (Appendix 2F) extracted only one component and therefore the solution could not be rotated. This factor explained 48.15% of the variance and contained the five items posed. Items in this factor included beliefs such as feeling informed, receiving help and whether problems were encountered. The factor was labelled as 'confidence'. Two confirmatory factor analyses conducted on subsets of the data also produced just one factor. Data was therefore used from the entire sample size. Inernal consistency for this item was high with a Cronbach's Alpha of .719. Feelings of confidence about infant-feeding differed significantly by feeding group (Table 12). Confidence in feeding was lowest in those women who ceased breastfeeding within 1 week post-partum compared to both formula-feeders and those who breastfed for at least six months [$P < 0.001$]. Confidence in feeding was also higher in those who breastfed for six months than those in the exclusive formula group.

Table 12: Differences in maternal confidence by breastfeeding duration

Mean (SEM)	**Formula**	**BF ≤ 7 days**	**BF ≥ 6 Months**	**Significance**
Factor score	.024■▲ (.118)	-.727▲ (.069)	.505 (.050)	$F(2, 479) = 99.796$, $p < 0.001$
Computed score	3.518	2.081	4.077	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 7 days; ▲$p < 0.05$ compared to BF ≥ 6 months

Confidence in feeding was also associated with maternal control and attitudes towards breastfeeding (Table 13). Confidence was inversely associated with believing breastfeeding to be difficult, inconvenient and embarrassing and also significantly inversely associated with reported use of scheduling and encouraging feeds.

Table 13: Association between maternal confidence, control of feeding and attitudes towards breastfeeding

Factor	Confidence
Scheduling feeds	-0.223**
Encouraging feeds	-0.240**
Difficult	-.337**
Embarrassing	-.141**
Inconvenient	-.131*
FF more content	-.029
Health	.028

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Confidence about infant feeding, breastfeeding duration and attitudes towards breastfeeding were therefore intercorrelated. Due to the retrospective design, direction of these relationships cannot be determined. However, it is possible that low levels of confidence are affecting the levels of control mothers exert over their infants feeding pattern.

Question four: Is maternal or infant weight associated with breastfeeding duration and use of scheduling or encouraging feeds?

A number of studies have highlighted an association between maternal obesity and reduced breastfeeding duration (Armstrong et al. 2002; Gilman et al. 2001). Moreover, low-birth-weight infants are significantly less likely to be breastfed,

although biological and physical difficulties impact upon this relationship (Vohr et al. 2007). In the current study, measures were collected of maternal BMI, infant birth weight, gestation and perceived size. Maternal BMI was significantly different according to breastfeeding duration. Mothers who formula fed from birth reported a significantly higher BMI than mothers who breastfed for one week or less or breastfed for six months or more. No significant difference was seen between these two groups. In terms of infant weight and size, both gestation and perceived size differed significantly according to breastfeeding duration (Table 14). Mothers who formula fed from birth gave birth significantly earlier than mothers who breastfed for one week or less or who breastfed for six months or more. No significant difference were seen between these latter two groups. In terms of perceived size, whilst no significant difference was seen in perceived size between mothers who breastfed for at least six months or who formula fed from birth, both these groups perceived their infants to be significantly larger than mothers who breastfed for one week or less.

Table 14: Breastfeeding duration and measures of maternal and infant weight and perceived size

Mean (SEM)	Formula	BF < 7 days	BF ≥ 6 Months	Significance
BMI	30.24■▲ (.769)	27.33 (.468)	26.79 (.328)	F (2, 493) = 8.508, p < 0.001
Birth weight (kg)	3.36 (.061)	3.41 (.037)	3.46 (.026)	F (2, 497) = 1.514, p > 0.05
Gestation (weeks)	39.08■ (.201)	40.00▲ (.124)	39.88 (.088)	F (2, 497) = 7.906, p < 0.001
Perceived size	3.42■ (.152)	2.90■▲ (.093)	3.40 (.066)	F (2, 497) = 4.461, p < 0.05

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 7 days; ▲$p < 0.05$ compared to BF ≥ 6 months

Previous research has suggested associations between maternal BMI, maternal use of control and child weight status. Some studies have shown that obese mothers show

less control over their child's diet (Wardle et al. 2002). Others suggest that mothers who have a poorer body image try to restrict their children's intake of food (Francis et al. 2001). In this study, whilst maternal postnatal BMI was inversely associated with breastfeeding duration (Pearson's $r = -.074$, $p < 0.05$), postnatal maternal weight status was not significantly associated with either scheduling or encouraging feeds.

Further research has highlighted an association between maternal use of control and child weight status. Generally, mothers who report high levels of restriction have a child who is heavier, whilst pressure to eat is associated with a lower child weight (Ventura & Birch, 2008). Direction of these relationships is unclear. Some studies suggest that maternal use of control affects child weight (Faith et al. 2004) whilst others suggest maternal control develops in reaction to child weight (Farrow & Blissett, 2008). In this study, scheduling feeds was associated with a higher birth weight, longer gestation and greater perceived size. In contrast, encouraging feeds was associated with decreased birth weight and perceived size (Table 14). Relationships between birth weight, perceived size, gestation and birth weight were independent of each other. Furthermore, mothers of female infants were significantly more likely to encourage feeds [$t(573) = -.335$, $p < 0.05$]. However this relationship disappeared once birth weight was controlled for.

The literature examining later control and child weight suggests that child weight may increase maternal concern which in turn leads to increased use of control (Benton, 2004). It was further hypothesised therefore that infant birth weight, perceived size and gestation may be associated with attitudes towards breastfeeding and confidence. As a lot of emphasis is placed on infant weight and growth in the first year (Haslam et al. 2005) it was speculated that an infant who was perceived as small may increase concerns about milk intake and weight gain. Mothers whose infant was a greater weight at birth were significantly less likely to report breastfeeding to be difficult or inconvenient. Gestation was inversely associated with believing formula fed infants to be more content. Perceived size however was associated with numerous attitudes. The smaller the infants perceived size, the more likely the mother was to believe breastfeeding to be difficult, inconvenient and formula fed infants to be more content. Moreover, confidence was inversely associated with perceived size (Table 15).

Table 15: Associations between infant weight characteristics, scheduling and encouraging feeds, attitudes and maternal confidence

Factor	Birth weight	Gestation	Perceived size
Scheduling feeds	0.106**	0.071*	0.317**
Encouraging feeds	-.304**	-.146**	-.499**
BF Difficult	-.127**	-.060	-.098*
BF embarrassing	.044	.025	-.034
BF Inconvenient	-.109*	-.037	-.076*
FF more content	-.021	-.074*	-.054
BF Healthier	-.026	-.002	-.065
Confidence	-.025	-.059	-.079*

Pearson's r: * $p < 0.05$, ** $p < 0.001$

The relationships between infant size, attitudes and use of scheduling and encouraging feeds therefore suggested that even at an early age mothers may be reacting to their infant's size.

Question five: Does maternal experience of pregnancy and birth affect use of scheduling and encouraging feeds?

Complications during pregnancy, the birth or the postnatal period have been associated with decreased breastfeeding duration and increased maternal anxiety and depression (Sisk et al. 2006). It was hypothesised that mothers who recalled negative experiences during this time may be more likely to attempt to control feeds either through increased general concern or a desire to regain some control over their

mothering experience. In addition, experiences during this time may affect attitudes towards breastfeeding and levels of confidence in feeding.

Mothers were asked three open ended questions as to whether they had any complications during pregnancy, the birth or the postnatal period and to provide details of such problems. Mothers responded with a variety of different issues but for simplicity these were coded by number of different issues raised. For example pregnancy complications included pre eclampsia, hyperemesis, gestational diabetes or anaemia. Birth complications included foetal distress, failure to progress and assisted delivery to name a few. Finally postnatal complications involved issues such as postnatal depression, maternal infection or illness. In addition mothers were asked how they gave birth which was coded into 'vaginal birth' and 'caesarean section'. A caesarean section was treated as a complication. The number of complications was then summed to give mothers a score for 'complications'.

477 participants (75.6%) had at least one complication. Number of complications ranged from 0 to 10 with a mean of 3.223 (SD: 2.873). Breastfeeding duration was associated with number of complications reported (Table 16). Mothers who breastfed for at least six months reported significantly fewer complications compared to mothers who breastfeed for up to one week or who formula fed from birth. Moreover, mothers who formula fed from birth reported significantly more complications than mothers who breastfed for up to one week.

Table 16: Breastfeeding duration and maternal report of complications during pregnancy, birth and the postnatal period

Mean (SEM)	**Formula**	**BF ≤ 7 days**	**BF ≥ 6 Months**	**Significance**
Number of complications	4.25 (.374)	3.73 (.230)	2.81 (.162)	$F(2, 501) = 9.504$, $p < 0.001$

Furthermore, number of complications was significantly positively associated with scheduling feeds, reporting that breastfeeding was difficult and that formula fed

infants were more content. Finally confidence was inversely associated with number of complications experienced (Table 17).

Table 17: Association between maternal complications, breastfeeding duration, control, attitudes towards breastfeeding and confidence

	BF duration	Scheduling feeds	Confidence	BF difficult	FF more content
Complications	-.127*	.166**	-.122**	.097*	.076*

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Complications during birth, pregnancy and the postnatal period therefore appear to have a possible effect upon maternal use of control. This relationship may possibly be explained through complications making breastfeeding more difficult.

Question six: Which variables explain the greatest proportion of the variance for scheduling and encouraging feeds?

The previous five sections have examined a number of variables related to the reported use of scheduling and encouraging feeds. Both scheduling and encouraging feeds were associated with breastfeeding duration, attitudes towards breastfeeding, maternal confidence, infant weight characteristics and maternal experience of complications during pregnancy, birth and the postnatal period. Moreover, a number of these variables were further interrelated (Table 18).

Correlations between variables were therefore numerous. However, due to the retrospective design of the study, causality between these variables and scheduling and encouraging feeds cannot be confidently stated. Speculatively however, it was assumed that scheduling and encouraging feeds were the outcome variables. It was however recognised that relationships between any of the variables could be bi directional and this is examined further in both the discussion and further studies.

Both scheduling and encouraging feeds had numerous variables associated with them. In order to establish which of these variables independently explained the

greatest proportions of the variance, linear regression analysis using the enter method with either scheduling or encouraging feeds as the outcome measure was performed.

Table 18: Intercorrelations between breastfeeding duration, control, attitudes, infant weight and maternal confidence and complications

	BF duration	Limit feeds	Encourage feeds	BF difficult	BF embarrassing	BF inconvenient	FF more content	BF healthier	Maternal confidence	Complications	Birth weight	Gestation	Perceived size
BF duration		-.328**	-.266**	-.728**	-.115**	-.021	-.130**	.158**	548**	-.127**	.084*	-.010	.109**
Limit feeds	-.328**		-.004	.354**	.162**	.149**	.100**	-.048	-.223**	.166**	.106**	.071**	.317**
Encourage feeds	-.266**	-.004		.252**	.102**	.190**	.152**	.028	-.240**	.019	-.330**	-.146**	-.499**
BF difficult	-.728**	.354**	.252**		.384**	.138**	.375**	.164**	-.337**	.097**	-.127*	-.060	-.032
BF embarrassing	-.115*	.162**	.102**	.384**		.150**	.338**	-.140**	-.121**	-.029	.011	.025	-.034
BF inconvenient	-.021	.149**	.190**	.138**	.150**		.240**	-.254**	-.131**	.043	-.109*	-.037	.076*
FF more content	-.130**	.100**	.152**	.375**	.338**	.240**		-.194**	-.115**	.076*	.021	.074*	-.054
BF healthier	.158**	-.048	.028	-.164**	-.194**	-.140**	-.254**		.034	-.011	-.026	-.002	-.094*
Maternal confidence	.548**	-.223**	-.240**	.337**	-.043	-.131**	-.115*	.034		-.122**	.025	-.059	.079*
Complications	-.127**	.166**	.019	.097**	-.029	.043	.076*	.011	-.122**		.075*	.031	.048
Birth weight	-.084*	-.015	-.330**	-.127**	.011	-.109**	.021	-.026	.025	-.075*		.390**	.262**
Gestation	.010	.071*	-.146**	-.060	.025	-.037	.074*	-.002	-.059	.031	.390**		.079*
Perceived size	.109**	.317**	-.499**	-.032	-.034	.076*	-.054	-.094*	.079*	.048	.262**	.079*	

Pearson's r: * $p < 0.05$, ** $p < 0.001$

For scheduling feeds the model explained 24.4% of the variance [F (12, 523) = 15.059, $p < 0.001$]. The variables perceived size, breastfeeding as inconvenient, breastfeeding duration, gestation and breastfeeding as embarrassing remained predictive (Table 19).

Table 19: The unstandardised and standardised regression coefficients for variables associated with maternal use of scheduling feeds.

Variable	B	SE B	β
Perceived size	.245	.032	.307**
Breastfeeding inconvenient	.199	.054	.216**
Breastfeeding duration (in days)	-.002	0.001	-.184*
Gestation	.060	.025	.101*
Breastfeeding embarrassing	.093	.041	.092*
Complications	.053	.015	.068
Formula fed more content	.047	.037	.051
Birth weight	-.125	.089	-.061
Breastfeeding difficult	.046	.037	.216
Confidence	-.033	.040	-.036
Breastfeeding healthier	.015	.038	.016

Pearson's r: * $p < 0.05$, ** $p < 0.001$

B = Unstandardised coefficient; SEB = Standard error of Unstandardised coefficient; β = Standardised Beta

For encouraging feeds, the model explained 42.1% of the variance F (12, 523) = 32.276, $p < 0.001$. The variables perceived size, breastfeeding as difficult, birth weight, maternal confidence, breastfeeding as inconvenient and formula fed infants as more content remained predictive (Table 20).

Table 20: The unstandardised and standardised regression coefficients for variables associated with maternal use of encouraging feeds.

Variable	B	SE B	β
Perceived size	-.427	.031	-.494**
Breastfeeding as difficult	.155	.035	.152**
Birth weight	-.305	.084	-.137**
Confidence	-.133	.038	-.132**
Breastfeeding inconvenient	.169	.052	.168*
Formula fed more content	.096	.035	.097*
Complications	.020	.014	.058
Gestation	-.027	-.023	-.042
Breastfeeding healthier	.019	.036	.019
Breastfeeding embarrassing	.016	.039	.014
Breastfeeding duration (in days)	-.005	.001	-.004

Pearson's r: * $p < 0.05$, ** $p < 0.001$

B = Unstandardised coefficient; SEB = Standard error of Unstandardised coefficient; β = Standardised Beta

In short, linear regression analysis reduced the number of significant predictors of scheduling and encouraging feeds. Moreover, different factors appeared to be associated with scheduling and encouraging feeds. Scheduling feeds was associated with variables surrounding the impact of breastfeeding upon maternal lifestyle such as the beliefs breastfeeding was inconvenient and embarrassing. Encouraging feeds on the other hand appeared to be associated with maternal low confidence, concerns for infant size and believing formula feeding to be an easier method.

3.3. Discussion

The aim of this study was to establish whether differences in the maternal reported use of controlling feeds could be identified in the early postpartum period when an infant is consuming milk feeds and secondly whether these were associated with breastfeeding duration. Thirdly, possible influences upon maternal control during milk feeding were examined.

The results suggested that maternal behaviour patterns indicative of control are evident in early infancy when milk is the primary source of nutrition. The modified CFQ used in the context of early infant feeding confirmed the use of control strategies such as scheduling or encouraging feeds during milk feeding. Scheduling feeds included questions relating to maternal use of restricting and scheduling feeds such as 'I tried to stretch out my infant's feeds' and 'I scheduled my infant's feeding'. Mothers scoring high on this variable attempted to control their infants feeding pattern so that they were feeding less frequently and to a stricter, more predictable routine. It suggested manipulation of feeds to suit maternal routine and reflected use of control for mother centred reasons. Encouraging feeds included questions such as 'I have to be especially careful that my baby drinks enough' and 'If I don't guide my baby's feeding she will drink to little'. This represented behaviour of trying to encourage the baby to consume too much milk out of anxiety that the baby was underweight and consuming too little milk. It suggested manipulation of feeds out of infant centred concerns. Scheduling feeds was based on similar behaviours to the later factors of restriction and monitoring as measured by the CFQ and encouraging feeds represented pressure to eat. The findings also demonstrated that maternal control over early infant-feeding was dependent on feeding method, as mothers who breastfed for at least 26 weeks were less likely to report using a controlling approach to feeding compared to mothers who did not breast-feed or ceased breastfeeding within 1 week post-partum. The results also indicated that there was a relationship between attitudes and beliefs about the ease of breastfeeding both in terms of impact on maternal life-style and infant behaviour, and the use of controlling child-feeding strategies.

The existence of a controlling maternal child-feeding style when children are 12 months or older is well documented (Birch et al. 2000; Faith et al. 2004; Fisher et al. 1999b; Fisher et al. 2002; Johnson, 2000; Ventura et al. 2008). By employing a modified version of the CFQ modified for early infant feeding the results of this

study extended the previous literature by demonstrating that a controlling child-feeding style is measurable in the first 6 months post-birth, before weaning occurs. The emergence of maternal control in earlier in infancy than previously shown is an important finding as several authors have suggested that once established parental child-feeding practices are stable (Blissett & Farrow, 2007; Faith et al. 2007).

Several studies have also demonstrated that mothers who have breastfed their infants are less likely to use restrictive or pressurising child-feeding practices after weaning than mothers who used formula (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004). In this study mothers who breastfed reported lower use of control during milk-feeds compared to formula-feeding mothers, and the longer breastfeeding continued the less controlling child-feeding strategies were used. One interpretation of these data is that mothers may develop a particular child-feeding style early in infancy, dependent on their chosen feeding method and the extent to which it is experienced, which may persist once milk ceases to be the primary source of nutrition. As breastfeeding is infant-led, mothers may learn to become child centred in their approach to feeding. In support of this notion, Taveras et al. (2004) reported that the odds ratio for maternal use of restriction decreased with longer breastfeeding duration, although there was no similar effect for pressure to eat. Although it has been assumed that breastfeeding may encourage a child-feeding style that is low in control due to the infant-led feeding style of the breastfed infant (Taveras et al. 2004), research so far has not examined use of controlling feeding strategies during early infancy.

Breastfeeding presents few opportunities for the mother to actively manipulate milk intake. In order to establish milk supply, infants need to be fed on infant demand, often in a frequent irregular pattern and the amount of milk consumed is not visual (Daley & Hartman, 1995; Riordan et al. 2004). Thus one explanation for why breastfeeding mothers report lower levels of controlling child-feeding practices is that they learn through experience to allow the infant to take control of feeding. However, control in women who initiated breastfeeding at birth but switched to formula-feeding by the seventh day post-partum was also examined. This group of women reported significantly lower levels of both scheduling and encouraging feeds than formula-feeders, but reported higher levels of these control factors than women who breastfed for at least 26 weeks. There are two ways in which to interpret this finding. Firstly, perhaps even a short exposure to breastfeeding goes some way towards promoting a less controlling feeding style. However, this seems unlikely

because the majority of the women ceased breastfeeding within 72 hours post-partum, before the supply of breast milk had begun. Alternatively, initiation and duration of breastfeeding may be influenced by maternal attitudes towards breastfeeding and general desire for control over feeding. If mothers view breastfeeding to be infant-led, and for whatever reason are uncomfortable with this approach, perhaps this affects breastfeeding duration. Perhaps maternal differences, or desire for control encourage mothers to breast or formaul feed (Farrow & Blissett, 2006a).

In an attempt to understand how maternal control is associated with early infant feeding, attitudes about infant feeding, maternal confidence and their relationship with maternal control were examined. Firstly it is recognised that due to the retrospective design of the study that causality is impossible to determine. However, certain patterns in the findings raise speculative conclusions as to how breastfeeding duration, control, attitudes and experience may be interrelated. It is assumed, with great caution, that scheduling and encouraging feeds are the outcome variables.

Firstly, it appears that scheduling and encouraging feeds are two separate behaviours. The two behaviours are not significantly associated with each other and secondly a different pattern of attitudes and experiences were related to each behaviour. Examination of the pattern of attitudes associated with scheduling and encouraging feeds suggested that maternal control of milk feeding may stem from concerns mothers hold about the infant-led nature of breastfeeding. In short, it appears that mothers may attempt to control feeds through either mother centred concern about the impact of feeding upon their lifestyle (thus scheduling and stretching out feeds) or through infant centred concern about whether their infant is consuming enough milk (thus encouraging more frequent feeds).

Secondly, different patterns of attitudes and experiences were associated with scheduling and encouraging feeds. The attitudes that breastfeeding is inconvenient and breastfeeding is embarrassing were positively associated with reported use of scheduling feeds. Although causality cannot be assumed due to the retrospective design of the study, this further suggested that a desire to schedule and plan feeds may result from an attempt to minimise the impact of feeding upon maternal lifestyle. Mothers who view the frequent, irregular nature of breastfeeding as inconvenient may view feeding their infant as a chore which needs to be planned and structured. Moreover, mothers who believe breastfeeding to be embarrassing may

attempt to control and schedule feeds as they are uncomfortable feeding their infant in public or in front of others. Formula feeding with its predictable routine may alleviate these concerns.

Both scheduling feeds and the beliefs that breastfeeding is inconvenient and embarrassing were inversely associated with breastfeeding duration. Mothers who scored highly on the factor of scheduling feeds appeared to want to feed to a predictable, infrequent feeding schedule. However, this type of feeding pattern is incompatible with breastfeeding as breastfeeding demands an infant-led approach. Breastfed infants naturally feed frequently and irregularly (Wright et al. 1990) and attempts to schedule or stretch out feeds can interfere with milk supply (Daley & Hartmann, 1995). It is likely therefore that mothers who want to schedule and stretch out their infant's natural feeding pattern will either choose to formula feed from birth or to only breastfeed for a short duration of time. This could be because they find that breastfeeding is too difficult to maintain with their desire for control or because their attempts to schedule and stretch out feeds result in a poor milk supply. In short mother centred concerns lead to a desire to schedule feeds which is incompatible with breastfeeding.

The second factor which emerged from the modified CFQ, encouraging feeds, was the behaviour of controlling infant feeding patterns for reasons of infant concern. This factor was characterised by anxieties about the infant's intake of milk and weight gain and reflected attempts to encourage the infant to consume more milk. Rather than reflecting maternal desire to control feeding pattern for maternal benefit, this factor represented desire to control intake of milk out of concern for the infant. Scores on this factor were again related to attitudes. Mothers who scored highly on encouraging feeds reported breastfeeding to be difficult and inconvenient and believed formula fed infants were more content. Moreover they scored lowly on measures of confidence. This suggests that mothers who are encouraging their infant to consume bigger feeds are doing so out of anxiety and concern about their ability to feed their infant. This anxiety may be due to presumptions about the infant-led nature of breastfeeding. Indeed, many studies report that even prenatally mothers hold beliefs that breastfeeding is difficult and that formula fed infants are more content and settled (Arora et al. 2000; Cohen et al. 1995). Alternatively, these beliefs may stem from the experience of breastfeeding. Mothers who struggle with breastfeeding in the first few days may become anxious and try to encourage their infant to consume more milk.

Encouraging feeds is likely to be incompatible with breastfeeding and is reflected in the inverse relationships between encouraging feeds and breastfeeding duration . Firstly, a breastfed infant is very hard to encourage to consume more milk, unlike a formula fed infant who can be coerced to finish a larger feed (Wiessinger, 1998). Secondly, breastfeeding gives no visual cue to the amount of milk consumed. Unlike formula feeding where feeds are measured out and consumption can be tracked, a mother who is breastfeeding needs to rely on the infant to self regulate feeds (Wright et al. 1990). Mothers who have found, or believe, breastfeeding to be difficult, or who are concerned about amount of milk consumed may however find this infant-led approach very difficult and choose to formula feed from birth or to only breastfeed for a short duration of time. Indeed, maternal concern over whether the infant is receiving enough milk has been shown to be common amongst breastfeeding mothers, leading them to question their ability to provide an adequate supply of breast milk (Arora et al. 2000).

Scheduling feeds was also associated with measures of infant size. Mothers who had a larger infant at birth and perceived their infant to be larger were significantly more likely to schedule feeds. As the infants were young, it is unlikely that mothers are responding to actual overweight in their infants. Instead, mothers may even at this early stage be anxious about possible weight implications for their child in the future and be attempting to control intake of milk. However, there is considerable emphasis on weight gain in infancy as a positive indicator of health and larger infants are often viewed positively (Haslam et al. 2006). It is unlikely mothers are therefore actively restricting their infants intake for this reason. Another explanation is that perhaps a larger infant ignites greater confidence in a mother to be able to schedule and schedule feeds. Certainly, this presents an interesting avenue for future research as evidence of maternal control and child weight is scare for young infants. Farrow & Blissett (2008) found that a lower level of pressure to eat at one year was associated with higher infant birth weight, suggesting that mothers may be reacting to infant size during the first year postpartum

The relationship between breastfeeding duration and later feeding style may therefore actually be a consequence of maternal attitudes or anxieties surrounding the infant-led nature of breastfeeding rather than actual feeding experience. However, in the regression analysis, breastfeeding duration remained a significant predictor of scheduling feeds, but interestingly not encouraging feeds. It is possible therefore that the argument that experience of breastfeeding affects maternal control (Taveras et al.

2004) stands. Through experience of infant-led breastfeeding, tendency to schedule feeds is reduced with greater reduction associated with prolonged duration of breastfeeding. Alternatively mothers who formula feed and become accustomed to its regular, measured and controllable nature learn to be in greater control of their child's feeding pattern. A longitudinal study may help explain this relationship.

The lack of association between breastfeeding duration and encouraging feeds is interesting. Instead attitudes, confidence and perceived size predict greater encouragement of feeds. This suggests that the initial relationship between breastfeeding duration and encouraging feeds may be a consequence of these factors rather than a direct association. As speculated earlier, concerns for infant weight gain may lead to greater use of encouraging feeds which is incompatible with breastfeeding. Perhaps using formula does not teach the mother to encourage feeds, instead tendency to encourage feeds stems from anxiety and as a result formula is used. A prospective study is clearly needed to understand direction and causality. However it is probable that attitudes, experience and breastfeeding duration may have a cumulative effect on actual control which may then possibly extend into later feeding.

There are a number of limitations to this study, which could be addressed in future research. Full consideration is given to these issues in the general discussion (chapter 7) but are raised briefly here. Firstly mothers completed the modified CFQ in retrospect, recollecting the experience of feeding their only or youngest child from birth to 6 months. Current child-feeding practices could have influenced responses to the CFQ or the accuracy of information recalled from memory could be questioned. However, age of child at completion of questionnaire was not associated with responses. The greatest problem with this design is that the direction between attitudes, control and breastfeeding duration is impossible to accurately specify. However, the relationships do allow for speculation which can be investigated further in future studies. Secondly, although the sample was large and included a wide range of maternal age and socio-economic status, participants were self-selecting and a high proportion of participants breastfed for an extended period. However, when a sub section of the data set was used to construct a representative sample of expected breastfeeding duration as per the Infant Feeding Survey (2007), the main effects of scheduling and encouraging feeds and breastfeeding duration remained unchanged. Data from the whole sample was therefore used.

Limitations aside, this study provides an insight into how maternal control over child feeding may be present earlier than thought. Maternal use of child-feeding strategies, such as scheduling and encouraging feeds, were evident before 6 months. It will be important to ascertain next, through longitudinal studies, the direction and relationship between attitudes, experience of breastfeeding and use of scheduling and encouraging feeds.

In summary:

- Differences in maternal control were identified with regard to milk feeding. Mothers reported attempts to control milk intake in order to schedule feeds or encourage milk intake. These behaviours were unrelated suggesting they measured separate issues.

- Breastfeeding duration was inversely associated with both scheduling and encouraging feeds.

- Attitudes towards breastfeeding, confidence and infant size were associated with scheduling and encouraging feeds. Different patterns of attitudes were associated with scheduling and encouraging feeds.

- Scheduling feeds was associated with mother centred concerns about the impact of infant-led feeding. Mothers who wanted a structured approach to feeding for convenience were more likely to schedule feeds. Breastfeeding and its irregular nature was incompatible with this.

- Encouraging feeds reflected infant centred concerns about the immeasurable nature of breastfeeding. Mothers who were anxious about their infant's intake of milk, especially those who perceived their infant to be smaller were more likely to encourage feeds. The immeasurable nature of breastfeeding was incompatible with this.

- Mother and infant centred concerns about the infant-led nature of breastfeeding may affect breastfeeding initiation and duration. Reasons behind desire to control early feeding may affect later feeding style. A prospective, longitudinal study is clearly needed in order to better understand causality between attitudes, experience and control.

Chapter 4

Intended use of maternal control during milk feeding amongst primiparous pregnant women

Study Two examined mothers' retrospective reports of their use of control during milk feeding in the first six months postpartum. The modified CFQ used in the context of milk feeds identified two main behaviours; scheduling and encouraging feeds. Scheduling feeds described the behaviour of stretching out and trying to feed to a routine whereas encouraging feeds reflected concern that the infant was not consuming enough milk and trying to increase intake. Breastfeeding duration was inversely associated with both scheduling and encouraging feeds which offered initial speculative support to the idea that following the infant-led nature of breastfeeding reduced maternal control over feeding (Taveras et al. 2004).

However, in study two, mothers who breastfed for only a few days were significantly less likely to report scheduling or encouraging feeds than mothers who formula fed from birth. As experience of breastfeeding was short, the difference was unlikely to be through experience alone. Moreover, attitudes and confidence were related to scheduling and encouraging feeds. Patterns of attitudes associated with these behaviours identified two possible main reasons for scheduling and encouraging milk feeds; maternal centred concerns and infant centred concerns. Scheduling feeds was associated with maternal centred concerns that breastfeeding was incompatible with lifestyle and routine whereas encouraging feeds reflected infant centred concerns and anxieties that the infant was not receiving enough milk.

Reported use of scheduling and encouraging milk feeds was therefore associated with attitudes towards breastfeeding. A speculative conclusion from study two was that negative attitudes about the infant-led nature of breastfeeding (for maternal centred or infant centred reasons) led to desire to control feeding patterns and / or measure intake of milk which was incompatible with breastfeeding. However, due to

the retrospective design of the study it was impossible to confidently state causality between attitudes, control and breastfeeding duration.

This study was designed to examine whether attitudes influenced maternal control independently of the influence of actual feeding experience. Mothers who were pregnant with their first child completed a similar questionnaire to that used in study two, examining their attitudes towards breastfeeding, confidence and intended breastfeeding duration. Furthermore they completed a prospective version of the modified CFQ examining their intentions to schedule and encourage feeds once their infant was born. The aim was to establish whether mothers who had no prior experience of feeding their own infant would express a desire to control feeds once that infant was born and if present, what would influence this level of control. Six main questions were therefore examined in this study. These were broadly similar to those posed in study two and sought to confirm and expand its main findings.

1. Do mothers who are pregnant with their first child, and thus have no experience of feeding their own infant hold opinions as to the level of control they will use when giving their infant milk feeds in the first six months postpartum? Are these related to intended duration of breastfeeding?

2. Could differences in attitudes towards breastfeeding, especially the infant-led nature of breastfeeding, affect either intended breastfeeding duration and / or intended maternal control?

3. Does maternal confidence about feeding impact upon intended breastfeeding duration and maternal control? Is this explained through concern about following an infant-led approach?

4. Is maternal weight and / or body image associated with intended use of control?

5. Does maternal experience of pregnancy affect intended breastfeeding duration and / or intended control?

6. Which of the above measures provide the strongest predictions of intended use of scheduling and encouraging feeds?

Firstly it was hypothesised that differences in intended control would be measurable amongst primiparous pregnant women. Maternal control beliefs would be present prenatally and not have developed merely through experience of feeding an infant. Secondly, it was speculated that intended maternal control of infant feeding would be inversely related to planned breastfeeding duration. Mothers who planned to breastfeed would differ significantly in their planned use of scheduling and encouraging feeds compared to mothers who planned to formula feed from birth. Intended breastfeeding duration would be inversely associated with intended control. Thirdly, based on the findings from study two, it was predicted that attitudes towards breastfeeding would be associated with intention to control feeds. Specifically, beliefs that breastfeeding was inconvenient to maternal lifestyle would predict intention to schedule feeds whilst anxieties about breastfeeding and low maternal confidence would predict desire to encourage fears. These maternal or infant centred concerns would drive both intended control and intended breastfeeding duration.

4.1. Methods

Participants

All participants gave informed consent prior to inclusion in this study (Appendix 3A). All aspects of this study were performed in accordance with the ethical standards set out in the 1964 Declaration of Helsinki. Approval for this study was granted by the Swansea University Department of Psychology Research Ethics Committee. Four hundred and twenty women expecting their first infant completed the questionnaire. Forty six participants were excluded from the study for reasons described below, leaving 374 participants in the analysis. All women were in their second or third trimester of pregnancy (13 – 42 weeks) and believed to be pregnant with a singleton. The mean age of the respondents was 28.98 years (SD: 6.09) and the mean number of years in education was 15.70 (SD: 3.06). Mean gestational age was 25.34 weeks (SD: 8.35). Participants indicated their pre-pregnant weight and height from which prepregnant BMI was calculated. Participants also provided measures of socioeconomic status. Occupations were coded according to the National Statistics Socio – Economic Classification self – coded method [NS – SEC, 2005] (Table 21). Participants were recruited from Antenatal groups and Community Centres in the City and County of Swansea and the surrounding area and in addition online parenting forums based in the UK[2]. Members of the National Childbirth Trust

[2] www.bounty.com; www.mumsnet.com; www.infantcentre.co.uk

attending antenatal meetings across the UK also took part. Locations with varying degrees of social deprivation according to the Welsh Indices of Multiple Deprivation (WIMD, 2008) were targeted for recruitment. No significant difference was seen in mean age, years in education or breastfeeding duration between mothers who participated online or through the different groups.

Table 21. Sample distribution by Demographic Factors

Indicator	Group	N	%
Age	≤ 19	34	9.0
	20 – 24	67	17.7
	25 – 29	85	22.5
	30 – 34	109	28.8
	35 ≥	79	20.9
Education	No formal	15	4.0
	School	79	20.9
	College	102	27.0
	Higher	178	47.1
Marital Status	Married	229	60.6
	Cohabiting	84	22.2
	Single	61	16.2
Home	Owned	201	53.2
	Rented	72	19.0
	Council	21	5.6
	Other	9	2.4
Maternal occupation	Professional	122	32.3
	Skilled	74	19.6
	Unskilled	52	13.8
	Other	55	14.6
	Declined	30	7.9
Paternal occupation	Professional	126	33.3
	Skilled	63	16.7
	Unskilled	61	16.6
	Other	35	9.3
	Declined	25	6.6

Measures

Participants completed a questionnaire asking them about their intended behaviour when giving their infant milk feeds between birth and 6 months of age (Appendix 3B). The questionnaire included:

- Measures of intended breastfeeding duration and formula use
- A prospective version of the modified child – feeding questionnaire
- Attitudes towards breastfeeding
- Confidence in breast or formula feeding
- Experience of pregnancy

As participants were being asked about future behaviour, it was stated clearly at the start of each section that if they were unsure or, or had not considered, the aspects of behaviour under question, to leave that question or section blank.

Infant feeding method

Participants indicated whether they intended to initiate breastfeeding at birth and if applicable for how long they intended to breastfeed (Table 22). As future intention was measured, participants were given the response option 'I haven't decided yet'. Twenty one participants who completed the questionnaire had not considered how they would feed their infant and were therefore excluded from the analysis. A further eight participants did not complete other measures and were therefore also excluded leaving 374 participants in the analysis. 86.9% (N=325) intended to breast-feed from birth. 51.1% of these planned to continue until at least 26 weeks. Mean length of intended breastfeeding was 21.22 weeks (SD: 18.42). Mothers who planned to breast-feed were asked about their intended use of formula supplements whilst breastfeeding. Those who planned to use formula more than once a day were excluded from the analysis (n = 17).

Table 22. Planned breastfeeding duration

Breastfeeding duration	N	%
Formula milk from birth	43	11.4
Breast feed $\leq$ 6 weeks	43	11.4
Breastfeed 7 – 25 weeks	90	23.8
Breastfeed exactly 6 months	133	35.2
Breastfeed 6 months plus	56	14.8

Intended breastfeeding duration was significantly positively associated with maternal age, education and income. Mothers who intended to breastfeed for a longer duration were significantly more likely to have a higher ranked occupation, as was their partner. Mothers who were married and who owned their own home intended to breastfeed for significantly longer than mothers who were not married or home owners. Finally intended breastfeeding duration was inversely associated with deprivation as measured by both the Welsh and English Indices of deprivation (Table 23).

Table 23: Association between planned breastfeeding duration and socioeconomic status

Socioeconomic indicator	Breastfeeding duration
Age	.290**
Education	.309**
Income	.441**
Maternal occupation	.269**
Paternal occupation	.247**
Welsh IMD	-.279**
English IMD	-.313**
Home ownership	.250**
Marital status	.178**

** p< 0.01, * p < 0.05

Modified child-feeding questionnaire

Participants completed a variation of the modified CFQ used in study two (Appendix 3C). The questionnaire consisted of the same items but was rephrased to measure future intention. For example questions included 'If I do not guide my infant's feeding she will feed too much' and 'I will try and get my infant into a feeding routine'. Response options remained the same.

Maternal Attitudes Questionnaire

Respondents rated a series of statements regarding attitudes and beliefs surrounding breastfeeding using a five point likert scale [agree to disagree]. Items were again based on those identified in study one and used in study two. As the questionnaire was aimed at primiparous pregnant women, ethical considerations were given to the nature of the statements posed in this section. Specific negative statements about

breastfeeding were avoided so as not to cause unnecessary concern amongst participants who had not considered that attitude. For example, whereas in study two, participants responded to the statement 'Breastfeeding is painful', items such as this were avoided. Where possible, the item was reversed. For example statements such as 'breastfeeding is more convenient than formula feeding' rather than 'breastfeeding is inconvenient' were used. Overall, issues such as breastfeeding being best for health, breastfeeding being normal and ease of breastfeeding were considered.

It was realised however that this may not target a number of important attitudes and beliefs. Therefore participants were asked two open ended questions 'Does breastfeeding have any advantages?' and 'Does breastfeeding have any disadvantages'. Participants were invited to list their thoughts and beliefs. These were coded into advantages / disadvantages for the mother and those for the infant. Responses were then summed and four scores given for each participant; number of advantages for mother, advantages for infant, disadvantages for mother and disadvantages for infant. A random sample of responses was checked and verified by an independent coder.

In addition, participants rated a series of statements regarding their experience of pregnancy and thoughts about caring for their infant once it was born. The first group of these statements examined maternal confidence about feeding their infant after the birth, such as whether they envisaged any problems and whether they felt they would receive enough support. The second section examined maternal confidence more generally about giving birth and caring for their infant. The third section targeted emotions experienced during pregnancy and asked participants to rate how frequently they experienced a range of emotions. Emotions such as feeling positive, anxious, ambivalent or prepared were presented and respondents indicated whether they experienced them 'All the time', 'most of the time', 'sometimes', 'rarely' or 'never'. Finally participants rated a series of statements regarding their body image and eating habits during pregnancy.

Data analysis

A factor analysis was carried out for both the modified child feeding questionnaire and the attitudes questionnaire using SPSS v13, SPSS UK Ltd. A principal component analysis was extracted that was subject to varimax rotation. Factors with eigenvalues over 1 were used. The factor scores computed were saved as regression

scores and used for the data analysis as recommended by Tabachnik and Fidell (2006). Multivariate ANOVA were performed to compare intended use of maternal control, maternal attitudes and maternal weight for three feeding groups based on intended duration of breastfeeding (formula feed from birth, breast feed for six weeks or less and breast feed for six months or more). Post-hoc Bonferroni tests were used to compare differences between groups.

4.2. Results

Question One: Do mothers who are pregnant with their first child, and thus have no experience of feeding their own infant hold opinions as to the level of control they will use when giving their infant milk feeds in the first six months postpartum? Are these related to intended duration of breastfeeding?

An exploratory factor analysis was conducted to establish the factor structure of the modified CFQ (Appendix 3D). The rotated component matrix explained 55.63% of the variance and produced four factors. The first accounted for 28.84 % of the variance and was weighted on four items which described encouraging feeds. This factor was labelled 'encouraging feeds. The second factor accounted for 10.63% of the variance and was based on items such as scheduling and stretching feeds. This was labelled 'scheduling feeds'. A third factor labelled 'using milk for comfort' was based on feeding in response to infant behaviour in order to comfort or calm behaviour. This factor accounted for 9.19% of the variance. Finally, accounting for 6.96% of the variance, the factor 'perceived responsibility' was produced. This described aspects such as carrying out most of the feeding and feeling responsible for the amount of milk consumed.

Two confirmatory factor analyses were conducted on random subsets of the data that resulted in similar factor structures. Therefore the factors extracted by using the entire sample size were used. Factor scores for the four dimensions were created using the regression method. Four factors were revealed:

- Encouraging feeds
- Scheduling feeds
- Using milk for comfort
- Perceived responsibility

Cronbach's Alpha for each scale is reported alongside each dimension (Appendix 3D). For the three scales of encouraging feeds, scheduling feeds and using milk for comfort internal consistency was high ranging from .747 to .876. The score was lower for perceived responsibility at .522.

Intended Breastfeeding duration and intended feeding style

In order to examine whether intended feeding style significantly differed according to intended breastfeeding duration three main groups of participants were identified. Intended levels of scheduling and encouraging feeds were compared for mothers who planned to formula fed from birth (n = 43), who planned to initiate breastfeeding at birth but to cease breastfeeding within 6 weeks (n = 43) and those who planned to breastfeed for at least six months (n = 189). In study one, participants were included in the short duration of breastfeeding group if they breastfed for one week or less. However, it was decided to use a wider range in this study as few mothers *planned* to only breastfeed for a few days.

A multivariate ANOVA indicated that intended use of both scheduling and encouraging feeds significantly differed by intended breastfeeding duration (Table 24). Bonferroni's test confirmed that mothers who intended to breast-feed for six months reported lower intention to schedule and encourage milk feeds than mothers who planned to formula feed or mothers who planned to cease breastfeeding within the first 6 weeks. No significant differences were seen in intention to encourage or schedule feeds between those who planned to formula feed from birth or to cease breastfeeding within six weeks.

In relation to the other control behaviours, mothers who planned to breastfeed for at least six months intended to use higher levels of comfort feeding than mothers who planned to formula feed from birth or to breastfeed for six weeks or less. Moreover, mothers who planned to breastfeed for six weeks or less planned to use higher levels of feeding for comfort than mothers who planned to formula feed from birth. No significant difference was seen between groups for perceived responsibility over future feeds. Again, the two behaviours of scheduling and encouraging feeds form the focus of the research and only these variables are further reported.

It could be argued that the differences in intended feeding style according to breastfeeding duration were attributable to demographic factors that predicted

intention to breastfeed rather than control itself. However, the variables of age, education, income, maternal occupation, paternal occupation and maternal BMI did not explain the relationship between intended control and breastfeeding duration. Despite this, maternal age, maternal years in education, infant age at time of questionnaire and parity were again controlled for throughtout the multivariate analyses.

Table 24: Differences in intended use of scheduling and encouraging feeds by intended duration of breastfeeding

Control	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Schedule feeds	Factor score	.674▲	.329▲	-.188	F (2, 279) = 17.997, p < 0.001
		(.137)	(.145)	(.070)	
	Computed score	2.600	1.909	1.518	
Encourage feeds	Factor score	.641▲	.561▲	-.188	F (2, 279) = 18.210, p < 0.001
		(.137)	(.145)	(.070)	
	Computed score	3.914	3.485	2.633	
Milk for comfort	Factor score	-.177■▲	-.561▲	.006	F (2, 279) = 4.778, p < 0.01
		(.135)	(.143)	(.068)	
	Computed score	2.171	1.818	2.662	
Perceived Responsibility	Factor score	-.111	.004	-.096	F (2, 279) = 2.407, p > 0.05
		(.119)	(.126)	(.061)	
	Computed score	3.543	3.344	3.424	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Table 24 shows both the mean factor scores (z scores) and computed scores for use of control for each group. The computed scores were used for ease of comparison and are based on the mean score (as per likert scale response 1 to 5) for each of the items that clustered on each factor.

Formula supplementation

Mothers who planned to breastfeed were asked to indicate how often they planned to supplement with formula milk during their planned breastfeeding duration. 62.8% of mothers who intended to breastfeed also planned to supplement feeds with formula milk. This ranged from once a day to the occasional bottle (Table 25). Frequency of intended formula supplementation was inversely associated with intended breastfeeding duration (Pearson's $r = -.447$, $p < 0.001$). Moreover, frequency of intention to supplement was associated to intention to schedule (Pearson's $r = .117$, $p < 0.001$) and encourage (Pearson's $r = .241$, $p < 0.001$) feeds.

Table 25: Planned breastfeeding duration and formula use

Breastfeeding duration	% formula supplement once a day
Formula milk from birth	-
Breast fed $\leq$ 6 weeks	74.4
Breastfed 7 – 25 weeks	47.8
Breastfed 6 months	15.8
Breastfeed > 6 months	3.6%

Differences were also seen in planned levels of scheduling feeds between mothers who intended to use formula milk from birth and mothers who planned to breastfeed but supplement with formula once a day. Mothers who planned to formula feed from birth reported significantly higher intention to schedule feeds [$F(1, 146) = 3.142$, $p < 0.05$] than mothers who planned to breastfeed but offer one bottle of formula a day. No difference was seen between these two groups for encouraging feeds.

To summarise, mothers who were pregnant with their first child held opinions as to the level of control over milk feeds they planned to use when their infant was born. Mothers who planned to breastfeed for at least six months planned to use lower levels of both scheduling and encouraging feeds than mothers who planned to formula feed from birth or to breastfeed for six weeks or less. Notably, in contrast to study two, no significant difference was found in planned use of control between mothers who planned to formula feed from birth or to breastfeed for a short duration of time.

Question Two: Could differences in attitudes towards breastfeeding, especially the infant-led nature of breastfeeding, affect either intended breastfeeding duration and / or intended maternal control?

Significant differences in intended use of scheduling and encouraging feeds were found according to intended breastfeeding duration. As mothers were primiparous and had no direct experience of feeding their own infant it was hypothesised that beliefs formed prenatally by mothers about breastfeeding may affect either intended breastfeeding duration and / or intended control. Therefore differences in attitudes towards breastfeeding were examined according to feeding group.

Firstly, an exploratory factor analysis was conducted to establish the factor structure of the attitudes questionnaire (Appendix 3E). The rotated component matrix explained 67.38% of the variance and produced four factors. The first accounted for 40.41 % of the variance and was weighted on four items which described breastfeeding as being best for infant and maternal health and the health promotion of breastfeeding. This factor was labelled 'breastfeeding as healthiest'. The second factor accounted for 9.78% of the variance and was based on items such as being comfortable around others breastfeeding, believing it was acceptable to breastfeed in public and that breastfeeding was natural. This was labelled 'breastfeeding as normal' and was felt to reflect the reverse attitude of the variable 'breastfeeding as embarrassing' in study two. A third factor labelled 'negative attitude towards formula' was based on the idea that formula milk should not be promoted or be available on postnatal hospital wards. This factor accounted for 8.95% of the variance. Finally, accounting for 8.25% of the variance, the factor 'breastfeeding as easy' was produced. This described breastfeeding as convenient and easy.

Two confirmatory factor analyses were conducted on random subsets of the data that resulted in similar factor structures. Therefore the factors extracted by using the entire sample size were used. Factor scores for the two dimensions were created using the regression method. In summary four factors were revealed:

- Breastfeeding as healthiest
- Breastfeeding as normal
- Negative beliefs towards formula feeding
- Breastfeeding as easy

internal consistency for each scale was again measured using Cronbach's Alpha and is reported alongside each dimension in Appendix 3E. Each item showed higher internal consistency ranging from .752 to .864.

A multivariate ANOVA using the factor scores indicated that when compared to mothers who planned to formula-feed or cease breastfeeding within six weeks, mothers who planned to breast-feed for at least six months believed breastfeeding to be healthier, more normative and easier (Table 26) . In addition, Bonferroni's test showed that mothers who intended to breastfeed for at least six weeks believed breastfeeding to be significantly better for health than mothers who planned to formula feed from birth. However, no significant difference was seen between these two groups for the beliefs breastfeeding as normal and breastfeeding as easy. Finally, no significant difference was found between any group for the attitude 'negative beliefs about formula'.

Table 26: Differences in attitudes towards breastfeeding according to intended breastfeeding duration

Attitude	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Healthiest	Factor score	-.899■▲	.489▲	-.376	F (2, 281) = 78.104,
		(.117)	(.124)	(.059)	P < 0.001
	Computed score	3.489	3.866	4.74	
Normal	Factor score	-.364▲	-.470▲	.306	F (2, 281) = 17.527,
		(.138)	(.146)	(.073)	p < 0.001
	Computed score	2.93	3.16	4.35	
Negative formula beliefs	Factor score	-.205	-.101	-.103	F (2, 281) = 2.161, p
		(.145)	(.153)	(.073)	> 0.05
	Computed score	1.77	2.54	2.74	
Easier	Factor score	-.261▲	-.495▲	.280	F (2, 477) = 12.223,
		(.136)	(.144)	(.069)	p < 0.001
	Computed score	2.75	2.90	4.34	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

In terms of the open ended questions examining advantages and disadvantages to breastfeeding, a wide variety of responses were seen (Table 27). Mothers who planned to breastfeed for at least six months provided significantly more advantages to breastfeeding for both mother and infant than mothers who planned to formula feed from birth or to breastfeed for six weeks or less. Furthermore, mothers who planned to breastfeed for six weeks or less listed significantly more advantages for the infant than mothers who intended to formula feed from birth. No difference between these two groups was seen in terms of advantages for the mother however.

Table 27: Differences in perceived numbers of advantages and disadvantages to breastfeeding for mother and infant according to intended breastfeeding duration

Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Advantage infant	2.15■▲ (.273)	2.55▲ (.296)	3.83 (.139)	F (2, 276) = 17.06, p < 0.001
Advantage mother	1.86■▲ (.310)	2.33▲ (.336)	4.08 (.158)	F (2, 276) = 27.46, p < 0.001
Disadvantage infant	.48▲ (.063)	.38▲ (.069)	.047▲ (.032)	F (2, 276) = 26.23, p > 0.01
Disadvantage mother	3.73 (.355)	3.74 (.384)	4.07 (.181)	F (2, 281) = .587, p > 0.05

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

For the question 'Are there any disadvantages to breastfeeding for the infant', 84.7% of respondents stated however that there were no disadvantages. 11.8% of the sample listed one disadvantage and 3.5% listed two disadvantages. Negative beliefs of being breastfed for the infant were therefore low. Reasons that were give almost exclusively centred on the beliefs that the infant had to feed too frequently when breastfeeding and slept less soundly, both which were viewed as tiring, inconvenient or unhealthy for the infant. Mothers who planned to breastfeed for at least six months believed there to be significantly fewer disadvantages for the infant to breastfeeding than both mothers who planned to breastfeed for six weeks or less or to formula feed from birth. No significant difference was seen between those who planned to use formula from birth or to breastfeed for only a short duration. Notably, there were no

significant differences between any of the feeding groups for the number of disadvantages to the mother listed. In fact, mothers who planned to breastfeed for at least six months noted a greater number of reasons that both other groups (albeit non significant).

Attitudes and beliefs were therefore significantly related to intended breastfeeding duration. It was also questioned whether attitudes would have any relationship to planned intention to schedule or encourage feeds. Indeed, intention to schedule feeds was inversely related to the beliefs that breastfeeding was healthiest, normal, negative attitudes to formula and that breastfeeding was easier. Encouraging feeds was also inversely associated with the beliefs that breastfeeding was healthiest, normal and easier (Table 28)

Table 28: Association between attitudes towards breastfeeding and intended use of scheduling and encouraging feeds

	Healthiest	Normal	Anti formula	Easier
Schedule	-.281**	-.351**	-.158**	-.210**
Encourage	-.239**	-.221**	.057	-.162*

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Furthermore, both intention to schedule and encourage feeds were related to the number of advantages and disadvantages of breastfeeding listed (Table 29). Mothers who intended to schedule feeds listed significantly fewer advantages for both infant and mother whilst noting significantly more disadvantages for both infant and mother. Those who planned to encourage feeds listed significantly fewer advantages for mother and infant whilst listed significantly more disadvantages for the infant. Encouraging feeds was not significantly related to disadvantages for the mother.

Table 29: Association between perceived advantages and disadvantages to breastfeeding for mother and infant and intended use of scheduling and encouraging feeds

	Advantage infant	Advantage Mother	Disadvantage infant	Disadvantage mother
Schedule	-.199**	-.288**	.156*	.122*
Encourage	-.289**	-.125*	.119*	.071

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Question three: Does maternal confidence impact upon intended breastfeeding duration and maternal control? Is this explained through anxiety of following an infant-led approach?

Mothers completed a series of questions examining their confidence and concerns about feeding their infant after the birth. A further section of questions identified general concerns surrounding impending motherhood with the aim to identify mothers who had high levels of general concerns. Again these were based on issues raised in study one and themes apparent in the current literature.

Exploratory factor analysis was again conducted in order to establish factor structure (Appendix 3F). The rotated component matrix explained 48.16% of the variance and produced three factors. The first accounted for 27.62 % of the variance and was weighted on ten items which described feeling informed and prepared about feeding their infant once it was born. This factor was labelled 'informed about feeding'. The second factor accounted for 11.25% of the variance and was based on items such as feeling anxious, worrying about feeding their infant and believing feeding their infant will be difficult. This was labelled 'anxiety about feeding'. A third factor labelled 'anxiety about motherhood' was based on general anxiety about becoming a mother; coping with childbirth, worrying about looking after the infant and not feeling confident about becoming a mother. This factor accounted for 9.29% of the variance.

Two confirmatory factor analyses were conducted on random subsets of the data resulting in similar factor structures. The factors extracted from the entire sample size were therefore used. Factor scores for the three dimensions were created using the regression method. In summary three factors were revealed:

- Informed about feeding
- Anxiety about feeding
- Anxiety about motherhood

Interal consistency as measured by Cronbach's alpha was high for each item ranging from .706 to .742. Scores can be found alongside the items in Appendix 3F.

Measures of confidence were associated with breastfeeding duration (Table 30). Mothers who planned to breastfeed for at least six months felt significantly more informed about infant feeding than mothers who planned to formula feed from birth

or to breastfeed for six weeks or less. No significant differences were seen between the latter two groups. For the factor 'anxious about motherhood', mothers who planned to breastfeed for at least six months were significantly less anxious than mothers who planned to formula feed from birth. No significant differences were seen between any other group. Finally, no significant difference was seen between groups for anxiety about feeding.

Table 30: Differences in anxiety towards feeding and motherhood according to intended breastfeeding duration

Attitude	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Informed	Factor score	-.356▲	-.366▲	.338	F (2, 277) = 16.522,
		(.137)	(.145)	(.070)	p < 0.001
	Computed score	2.65	2.78	3.68	
Anxious feeding	Factor score	.085	.018	.117	F (2, 277) = .165, p
		(.147)	(.155)	(.075)	> 0.005
	Computed score	2.53	2.34	2.95	
Anxious motherhood	Factor score	-.211▲	-.145	.202	F (2, 281) = 4.335, p
		(.145)	(.153)	(.074)	< 0.05
	Computed score	2.11	1.98	3.02	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Measures of confidence were also associated with intended maternal control and attitudes towards breastfeeding (Table 31). Both intention to schedule and encourage feeds were inversely associated with feeling informed about feeding and positively associated with anxieties about motherhood. Intention to encourage feeds was further positively associated with anxiety about feeding.

Attitudes were also associated with anxiety. Mothers who reported feeling informed about feeding were significantly more likely to believe breastfeeding to be healthier, normal and to hold negative views about formula milk. Moreover they listed significantly greater numbers of advantages of breastfeeding for both mother and

infant and believed there to be significantly fewer disadvantages for the infant. Notably, mothers who were high in anxiety about feeding also believed breastfeeding to be healthier and to have significantly more advantages for both mother and infant. Anxiety about feeding was inversely associated however with the belief breastfeeding is easier. Finally, mothers who scored highly on anxieties about motherhood were significantly less likely to believe breastfeeding was normal, to hold negative views about formula, and to believe breastfeeding was easier. Furthermore they reported significantly more disadvantages to the mother of breastfeeding.

Table 31: Association between anxiety, intended control and attitudes towards breastfeeding

	Informed	Anxious feeding	Anxious motherhood
Schedule	-.124*	.018	.124*
Encourage	-.258**	244**	.377**
Healthier	.191**	.171**	.060
Normal	.304**	.001	-.208**
Formula negative	.136**	-.049	-.099*
Easier	.061	-.358**	-.137**
Advantages mother	.248**	.119*	.054
Advantages infant	.324**	-.125*	.009
Disadvantages mother	.030	.042	.090*
Disadvantages infant	-.144**	-.072	.020

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Question four: Is maternal weight or body image associated with intended use of scheduling or encouraging feeds?

Mothers provided their height and pre pregnant weight which was used to calculate their pre pregnant BMI. Participants also completed a series of questions examining their body image in relation to pregnancy. This contained issues such as current concerns about their changing shape, fears for their appearance after pregnancy alongside questions based around food restriction or dieting during pregnancy.

An exploratory factor analysis was conducted on the items relating to body image in order to establish factor structure (Appendix 3G). The rotated component matrix explained 48.40% of the variance and produced two factors. The first accounted for 38.29 % of the variance and described items relating to body image concerns such as changing shape, postnatal appearance and stretch marks. This factor was weighted on eight factors and was labelled 'body image concerns'. The second factor was labelled 'dieting during pregnancy and accounted for 10.11% of the variance and was based on behaviours such as restricting food intake and dieting during pregnancy.

Two confirmatory factor analyses conducted on random subsets of the data resulted in similar factor structures. The factors extracted from the entire sample size were therefore used. Factor scores for the two dimensions were created using the regression method. In summary two factors were revealed:

- Body image concerns
- Dieting during pregnancy

Internal consistency for the two items varied (see Appendix 3G for scores). Body image was high at .772 whilst dieting during pregnancy had a lower score of .638. n

Firstly, each measure of maternal weight and body image was compared for the three feeding groups. Whilst maternal BMI was not significantly associated with intended breastfeeding duration, mothers who planned to breastfeed for at least six months had significantly lower levels of body image concerns and dieting behaviour during pregnancy than mothers who planned to formula feed from birth or only breastfeed for a short duration of time. No significant differences were seen between mothers who planned to formula feed from birth or breastfeed for six weeks or less for either body image concerns or dieting during pregnancy (Table 32).

Table 32: Differences in BMI, body image and dieting during pregnancy according to feeding group

Attitude	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
BMI	Mean score	25.56 (.697)	25.51 (.735)	25.14 (.358)	F (2, 277) = .197, p > 0.05
Body image concerns	Factor score	.591▲ (.136)	.285▲ (.144)	-.283 (.070)	F (2, 277) = 19.369, p < 0.001
	Computed score	3.98	3.28	2.08	
Dieting during pregnancy	Factor score	.451▲ (.697)	.405▲ (.735)	-.241 (.358)	F (2, 280) = 15.489, p < 0.001
	Computed score	3.02	2.84	2.25	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Measures of weight and body image were further associated with intention to schedule and encourage feeds. Both body image concerns and dieting during pregnancy were significantly positively correlated with intention to schedule and encourage feeds. No significant association was seen between BMI and either control behaviour. Furthermore, both body image concerns and dieting during pregnancy were inversely associated with the beliefs that breastfeeding was healthier, normal, easier and negative views towards formula. Moreover, mothers scoring highly on body image concerns and dieting during pregnancy listed significantly fewer advantages of breastfeeding for mother and infant and significantly more disadvantages for the mother. No association was seen between any attitude and maternal BMI (Table 33).

Table 33: Association of maternal BMI, body image and dieting during pregnancy with measures of control and beliefs about breastfeeding

	BMI	Body image concerns	Dieting during pregnancy
Schedule	-.033	.211**	.316**
Encourage	.083	.254**	.244**
BF Healthier	-.030	-.164*	-.289**
BF normal	-.085	-.301*	-.306**
Negative formula	-.081	-.134*	-.170**
BF easiest	.001	-.108*	-.098*
Advantages infant	-.012	-.219**	-.112*
Advantages mum	.048	-.260**	-.247*
Disadvantages infant	-.050	.035	.025
Disadvantages mum	.034	.143*	.111*

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Question five: Does maternal experience of pregnancy affect intention to schedule or encourage feeds?

Studies one and two suggested that maternal experiences that raise concerns for the mother, both specifically to feeding or more generally to motherhood may increase maternal use of control. Here, maternal experience of pregnancy was measured to identify how pregnancy was affecting mothers mood and well being. Experience of pregnancy was measured through a number of items. Participants indicated their experience of pregnancy so far by responding to how frequently they felt a series of moods. Secondly participants indicated whether they had experienced any complications so far during pregnancy. Responses were coded into yes (experienced) and no (none experienced).

An exploratory factor analysis was conducted on the questions targeting moods in order to establish factor structure (Appendix 3H). The rotated component matrix explained 53.09% of the variance and produced four factors. The first accounted for 26.12 % of the variance and was labelled 'positive'. This factor described positive moods such as feeling happy, content and lucky. The second factor was labelled

'prepared' and accounted for 11.27% of the variance. This was based on moods such as feeling knowledgeable, confident and prepared. The third factor accounted for 8.18% of the variance and described negative behaviours such as feeling stressed, nervous and unable to cope. This factor was labelled 'Anxious'. Finally, the fourth factor accounted for 7.50% of the variance and was named 'restless'. This factor encompassed emotions such as feeling bored, impatient and restless of being pregnant.

Two confirmatory factor analyses conducted on random subsets of the data resulted in similar factor structures. The factors extracted from the entire sample size were therefore used. Factor scores for the four dimensions were created using the regression method. In summary four factors were revealed:

- Positive
- Prepared
- Anxious
- Restless

Cronbach's Alpha for each item was fairly high ranging from .647 to .774. Scores can be found alongside each item in Appendix 3H.

Moods during pregnancy differed according to feeding group (Table 34). Mothers who planned to breastfeed for at least six months felt significantly more positive and prepared during their pregnancy than mothers who planned to formula feed from birth or to breastfeed for six weeks or less. No significant difference was seen between mothers who planned to formula feed from birth or to breastfeed for six weeks or less. In addition, no significant difference between feeding groups was seen for the emotions anxious or restless.

In terms of complications experienced so far during pregnancy, 103 mothers (27.2%) experienced complications whilst 271 had not. Complications included unexplained bleeding, gestational diabetes, placenta problems and growth problems to illustrate a few. No significant difference in planned breastfeeding duration was seen between mothers who had experienced complications so far or not.

Table 34: Differences in moods reported during pregnancy and intended breastfeeding duration

Mood	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Positive	Factor score	-.218▲ (.142)	-.423▲ (.150)	.120 (.072)	F (2, 281) = 6.542, p < 0.05
	Computed score	2.57	2.89	2.16	
Prepared	Factor score	-.420▲ (.135)	-.372▲ (.143)	.315 (.068)	F (2, 281) = 17.808, p < 0.001
	Computed score	2.01	2.32	3.09	
Anxious	Factor score	1.50 (.139)	.115 (.147)	-.088 (.071)	F (2, 281) = 1.630, p > 0.05
	Computed score	3.18	3.15	2.95	
Restless	Factor score	.190 (.141)	.217 (.149)	-.071 (.072)	F (2, 281) = 2.411, p > 0.05
	Computed score	2.71	3.06	2.53	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Moods experienced during pregnancy were also associated with scheduling and encouraging feeds (Table 35). Intention to schedule feeds was inversely associated with feeling positive and prepared and positively associated with feeling restless about being pregnant. Intention to encourage feeds was also inversely associated with feeling positive and prepared but positively associated with feeling anxious during pregnancy. Moreover, moods during pregnancy were associated with attitudes towards breastfeeding. Mothers who scored highly on feeling positive were significantly more likely to believe breastfeeding to be healthier and normal. A higher score on the emotion prepared was associated with increased beliefs that breastfeeding was healthier, normal and easier. Finally, both feeling anxious and restless during pregnancy were inversely associated with the beliefs that breastfeeding was healthier, normal and negative beliefs about formula.

In addition, some significant associations were seen between the number of advantages and disadvantages to breastfeeding listed and moods during pregnancy. Mothers who felt prepared or anxious listed significantly more advantages for both infant and mother. No further associations were found.

Table 35: Association between moods experienced during pregnancy, intended use of control and attitudes towards breastfeeding

	Positive	Prepared	Anxious	Restless
Schedule	-.127**	-.140**	.034	.257**
Encourage	-.219**	-.340**	.153**	.029
BF Healthier	.163**	.148*	-.112*	-.092*
BF normal	.222*	.203**	-.097*	-.088*
Negative formula	-.051	.009	-.154**	.251**
BF easiest	.076	.217**	-.077	-.020
Advantages infant	.006	.278**	.125**	-.066
Advantages mum	.084	.251**	.138**	.065
Disadvantages infant	-.058	-.010	.018	.035
Disadvantages mum	-.061	.060	.066	.074

Pearson's r: * $p < 0.05$, ** $p < 0.001$

No significant differences were seen in intended use of scheduling or encouraging feeds for mothers who had experienced complications during pregnancy or not. Indeed, no significant differences were found for attitudes towards breastfeeding or advantages / disadvantages listed between the two groups. The only significant difference emerged for the belief that breastfeeding was healthier. Mothers who experienced complications during pregnancy believed breastfeeding to be significantly better for health than mothers who had not experienced complications [$t(371) = 1.618$, $p < 0.05$]. In terms of emotions experienced, the only significant difference found was for that of anxiety. Mothers who experienced complications during pregnancy reported higher levels of anxiety than mothers who experienced no complications [$t(372) = 1.845$, $p < 0.05$].

Question six: Which variables explain the greatest proportion of the variance for intention to schedule or encourage feeds?

A number of plausible influences upon intended breastfeeding duration and intended use of scheduling and encouraging feeds have been examined in the previous five sections. As in study two, correlations and inter correlations between the variables are multiple. Both planned use of scheduling and encouraging feeds were associated

with intended breastfeeding duration, attitudes towards breastfeeding, confidence, maternal body image and experience of pregnancy (Table 36 - 38).

Although direction of causality between variables is easier to predict than in study two, it is still possible that causality is reversed or indeed bi directional between some of the different factors. For example, planned breastfeeding duration may determine planned control or alternatively planned control may determine planned breastfeeding duration. However, it was assumed, cautiously, that intended attitudes, body image, confidence and emotions stood as predictor variables to the outcomes of intended breastfeeding duration and control. Speculatively intended use of scheduling and encouraging feeds and intended breastfeeding duration were alternatively placed as the outcome variables in linear regression analyses using the enter method. Each variable which was significantly correlated with the outcome variable was entered in order to establish which independently explained the greatest proportion of variance.

Table 36: Inter correlations between intended breastfeeding duration, intended control and attitudes

	BF duration	Schedule feeds	Encourage feeds	BF healthier	BF normal	Formula negative	BF easier	Advantage mother	Advantage infant	Disadvantage mother	Disadvantage infant
BF duration		-.265**	-.258**	.363**	.282**	.278**	.281**	.363**	.396**	.035	-.284**
Schedule feeds	-.265**		-.025	-.281**	-.351**	-.158**	-.061	-.199**	-.288**	.041	.156**
Encourage feeds	-.258**	-.025		-.239**	-.221**	.057	-.210**	-.195**	-.218**	.071	.119*
BF healthier	.363**	-.281**	-.239**		.257**	.290**	.342**	.312**	.219**	.052	-.205**
BF normal	.282**	-.351**	-.221**	.257**		.263**	.320**	.237**	.216**	.000	-.104*
Formula negative	.278**	-.158**	.057	.290**	.263**		.374**	.136**	.275**	-.052	-.081
BF Easier	.281**	-.210**	-.162**	.342**	.320**	.374**		.175**	.151**	-.007	-.135**
Advantages mother	.363**	-.199**	-.195**	.312**	.237**	.136**	.175**		.506**	.025	-.151*
Advantages infant	.396**	-.288**	-.218**	.219**	.216**	.275**	.151**	.506**		.016	-.027
Disadvantage mother	.035	.122*	.071	.052	.000	-.052	-.007	.025	.016		.003
Disadvantage infant	-.284**	.156**	.119*	-.205**	-.104*	-.081	-.135**	-.151*	-.027	.003	

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Table 37 (table 36 cont): Intercorrelations between intended breastfeeding duration, intended control, attitudes, anxiety, body image and emotions during pregnancy

	BF duration	Schedule feeds	Encourage feeds	BF healthier	BF normal	Formula negative	BF easier	Advantage mother	Advantage infant	Disadvantage mother	Disadvantage infant
Informed	.343**	-.264**	-.258**	.191**	.304**	.136**	.061	.324**	.030	.0248**	-.144**
Feeding anxiety	-.119*	.018	-.244**	-.171**	.001	-.049	.358**	-.003	119*	.042	-.072
General anxiety	-.175**	.166**	-.377**	.060	-.208**	-.099*	.137**	.009	.105*	.090	-.020
BMI	-.030	-.083	-.033	-.030	.095*	-.081	.001	-.012	.048	-.050	.034
Body image	-.332**	.211**	.254**	-.164**	-.301**	-.134**	-.108*	-.219**	-.260**	.035	.143**
Dieting	-.235**	.316**	.244**	-.289**	-.306**	-.170**	-.098*	-.112*	-.247**	.025	.111*
Complications	.037	-.058	.019	.106*	-.084	-.010	.065	-.039	-.013	-.058	-.068
Positive	.124**	-127**	-.219**	.163**	.222**	.051	.076	.084	-.006	-.058	.061
Prepared	.324**	-.140**	-.340**	.148**	.203**	.009	.217**	.278**	.251**	-.010	-060
Anxious	-096*	.029	.257**	-.112*	.097*	-.154**	-.077	-.138**	-.125**	.018	.066
Restless	-.055	.153**	.034	-.092*	-.088*	.251**	-.020	.065	-.066	.035	.061

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Table 38 (table 36 and 37 cont) : Intercorrelations between anxiety, maternal body image and emotions during pregnancy

	Informed	Feeding anxiety	General anxiety	BMI	Body image	Dieting	Complications	Positive	Prepared	Anxious	Restless
Informed		.364**	.315**	-.032	.255**	.123**	.127**	-.115*	-.377**	.127**	.228**
Feeding anxiety	.364**		.393**	-.080	.139**	.003	.093*	-.043	-.198**	-.029	-.117*
General anxiety	.315**	.393**		.012	-.336**	-.124**	-.074	1.00*	.308**	-.101*	-.012
BMI	.012	-.080	-.032		-.039	.166**	-.075	-.072	.084	.069	.047
Body image	-.336**	.139**	.255**	-.039		.230**	.047	-.161*	-.271**	.269**	.117*
Dieting	-.124**	.003	.123**	.166**	.230**		.066	-.288**	-.254**	.235**	.011
Complications	-.074	.093*	.127**	-.075	.047	.066		-.025	-.046	.095*	.014
Positive	1.00*	-.043	-.115*	-.072	-.161*	-.288**	-.025		.242**	-.311**	-.121**
Prepared	.308**	-.198**	-.377**	.084	-.271**	-.254**	-.046	.242**		-.269**	-.051
Anxious	-.101*	-.029	.127**	.069	.269**	.235**	.095*	-.311**	-.269**		.032
Restless	-.012	-.117*	.228**	.047	.117*	.011	.014	-.121**	-.051	.032	

Pearson's r: * $p < 0.05$, ** $p < 0.001$

For scheduling feeds the model explained 23.9% of the variance [F (16, 344) = 7.760, $p < 0.001$]. The attitudes breastfeeding as normal, healthier and easier (all inverse), maternal dieting during pregnancy and number of disadvantages to the mother listed remained significant (Table 39). As in study two, the variables which remained predictive appeared to centre around beliefs that breastfeeding was inconvenient to maternal lifestyle. Mothers felt that breastfeeding was something that should be hidden and was embarrassing, was inconvenient and listed a number of disadvantages specifically to themselves. Moreover, weight concerns in the form of dieting during pregnancy remained predictive of scheduling feeds.

Table 39: The unstandardised and standardised regression coefficients for variables associated with intended maternal use of scheduling feeds.

Variable	B	SE B	B
Normal	-.274	.058	-.271**
Healthiest	-.215	.059	-.214**
Easier	-.115	.053	-.115*
Dieting during pregnancy	.124	.055	.054*
Disadvantages mum	.121	.056	.054*
Informed	-.020	.019	-.299
Body image concern	.055	.057	.054
Advantages mum	-.025	.028	-.054
Emotion: prepared	-.054	.061	-.037
Emotion: positive	-.037	.054	-.055
General anxiety	-.064	.064	-.063
Disadvantages infant	.096	.108	.045
Concerns motherhood	-.048	.053	-.047
Duration of breastfeeding	.002	.003	.033
Anxiety feeding	.024	.060	.024
Advantages infant	-.009	.030	-.017
Negative formula	-.015	.054	-.015

Pearson's r: * $p < 0.05$, ** $p < 0.001$

B = Unstandardised coefficient; SEB = Standard error of Unstandardised coefficient; β = Standardised Beta

For encouraging feeds the model explained 29.2% of the variance [F (15, 355) = 10.623, $p < 0.001$]. Feeding anxiety, general anxiety, positive emotions (inverse), informed about feeding (inverse), breastfeeding as easier (inverse) and feeling prepared (inverse) remained significant (Table 40). The results of the regression reflected those in study two. Mothers who planned to encourage feeds were higher in concern; both specific to feeding and motherhood in general. Low scores on the emotional factors of feeling prepared and positive alongside believing breastfeeding to be inconvenient and awkward predicted intended use of encouraging feeds.

Table 40: The unstandardised and standardised regression coefficients for variables associated with intended maternal use of encouraging feeds.

Variable	B	SE B	B
Feeding anxiety	.159	.053	.166**
General anxiety	.154	.055	.158**
Positive emotion	-.110	.048	-.116*
Informed about feeding	-.107	.052	-.110*
Easier	-.099	.050	-.102*
Prepared emotion	-.106	.054	-.102*
Dieting during pregnancy	.089	.054	.093
Negative emotion	.074	.048	.076
Normal	-.069	.052	-.071
Body image	.061	.055	.063
Disadvantages infant	.076	.099	.037
Breastfeeding duration	.002	.003	.043
Advantages infant	-.012	.028	-.024
Advantages mother	-.001	.025	-.003

Pearson's r: * $p < 0.05$, ** $p < 0.001$

B = Unstandardised coefficient; SEB = Standard error of Unstandardised coefficient; β = Standardised Beta

It is also possible that maternal control was not the outcome measure. Intended breastfeeding duration may not predict intended level of control, instead desired level of control may determine intended breastfeeding duration. Mothers who wish to be in control of feeding may decide not to breastfeed due to its infant-led nature. A further regression analysis was therefore conducted with breastfeeding duration as the outcome measure. The model explained 42.6% of the variance [F (17, 350) = 16.272,

$p < 0.001$]. Breastfeeding as healthier, negative attitudes to formula, breastfeeding as normal, breastfeeding as convenient, disadvantages for the infant (inverse), advantages infant, feeling prepared and informed remained significant (Table 41). Mothers who held positive attitudes towards breastfeeding and felt knowledgeable and prepared to feed their infant intended to breastfeed for the longest duration. Notably, intended use of scheduling or encouraging feeds did not remain a significant predictor of breastfeeding duration. Likewise, in the previous regression analyses (Tables 37 and 38) breastfeeding duration did not remain a significant predictor of scheduling or encouraging feeds. Instead, both breastfeeding duration and intended control were predicted by maternal attitudes, confidence and emotion.

Table 41: **The unstandardised and standardised regression coefficients for variables associated with intended maternal use of encouraging feeds**

Variable	B	SE B	B
BF Healthier	5.375	.956	.286**
Formula negative	4.477	.844	.238**
BF easiest	3.723	.870	.196**
BF normal	3.381	.966	.180**
Disadvantages infant	-5.098	1.730	-.126*
Advantages infant	1.036	.486	.106*
Emotion: prepared	1.895	.953	.102*
Informed	1.740	.925	.091*
Body image	-1.665	.974	-.087
Emotion: negative	1.236	.855	.065
Feeding anxiety	1.057	.945	.056
Advantages mum	.398	.455	.047
Schedule feeds	.654	.928	.035
Emotion: positive	.371	.850	.020
Encourage feeds	.408	1.015	.021
Dieting in pregnancy	.198	.998	.011
General anxiety	.173	.985	.009

Pearson's r: * $p < 0.05$, ** $p < 0.001$

B = Unstandardised coefficient; SEB = Standard error of Unstandardised coefficient; β = Standardised Beta

4.3. Discussion

The aim of this study was to establish whether differences in planned use of maternal control could be identified prenatally, before actual experience of feeding had occurred. Specifically, were these intended differences in maternal control associated with intended breastfeeding duration and what factors may influence their occurrence?

A number of interesting findings arose from this study. Firstly, maternal control beliefs surrounding milk feeding are present prenatally. All mothers who completed the questionnaire were primiparous and despite therefore having no experience of feeding an infant of their own, responded to detailed questions probing their intended use of future control. Participants were instructed to leave the section blank if they had not considered or could not respond to the questions regarding control of child feeding. However, only 8 participants (2.1%) left this section unanswered.

Secondly, the modified CFQ used in the context of future intention to control milk feeds again produced the factors of scheduling and encouraging feeds which reflected similar clusters of items to those produced in study two. Again, these show resemblance to the factors of restriction / monitoring (scheduling feeds) and pressure to eat (encouraging feeds) produced by the original CFQ (Birch et al. 2001). As in study two, the behaviours of intention to schedule and encourage feeds were not significantly associated suggesting two separate behaviours.

Thirdly, significant differences in intention to schedule and encourage feeds were identified according to planned breastfeeding duration. Specifically, mothers who planned to breastfeed for at least six months intended to employ lower levels of scheduling and encouraging feeds compared to mothers who planned to formula feed or to breastfeed for less than six weeks after birth.

The findings of this study offer further speculation to the possible mechanisms of the association between breastfeeding during the first year postpartum and lower levels of later maternal control (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004). Although it has been

speculated that experience of an infant-led feeding style encourages mothers who breastfeed to adopt a later feeding style which is low in control (Taveras et al. 2004), here mere intention to breastfeed for six months or longer was associated with lower intended levels of control. Notably the sample in this study were all primiparous so could not be basing their attitudes on actual experience of feeding their own infant. As attitudes towards breastfeeding, particularly the infant-led nature of breastfeeding are present prenatally (Dennis, 2003) perhaps beliefs about the level of maternal control breastfeeding and formula feeding permit lead to maternal decision to breast or formula feed after birth. Mothers may recognise that breastfeeding requires an infant-led feeding style to be adopted whereas formula milk will allow more control. Mothers who are not prepared to adapt to adopt and commit to a baby-led lifestyle may choose to plan to formula feed from birth whereas mothers with a lower desire for control can initiate breastfeeding. Thus maternal control may be a dispositional trait, specific to feeding or parenting in general, which is present before the mother has any experience of feeding that child.

A notable difference between the findings of study two and the current study was the level of control of those in the groups who intended to breastfeed for a short duration of time, or who did breastfeed for a short duration of time. In study two, mothers who breastfed for only a short period reported significantly lower levels of control than mothers who formula fed from birth. In the current study there were no significant differences in intended control between mothers who planned to breastfeed for a short duration of time or to formula feed from birth. One hypothesis is that perhaps a short duration of breastfeeding reduces maternal control as suggested by Taveras et al. (2004). However, as the two samples were separate, a longitudinal study tracking how prenatal intention to control feeds interacts with actual feeding experience is needed to better answer this question.

There appears to be little difference between mothers who planned to formula feed from birth or to breastfeed for a few weeks in terms of both intended control of milk feeding and attitudes and confidence. However, the one area where these two groups did differ was in their attitudes towards breastfeeding and health. Mothers who planned to initiate breastfeeding believed breastfeeding to be significantly better for infant health than mothers who were planning to formula feed from birth. Perhaps

neither of these groups is prepared to take an infant-led approach to feeding but some are prepared to initiate breastfeeding, if only for a short duration of time, in order for their infant to receive the associated health benefits involved. Desire for control may however discourage them from attempting to breastfeed for a longer duration of time and/or hinder the successful establishment of feeding.

Consistent with the retrospective study reported in the previous chapter, intention to schedule or encourage feeds appeared to be two separate unrelated behaviours. In line with this, the results of the regression analysis again produced two different sets of attitudes and experiences surrounding the behaviours of scheduling and encouraging feeds. These supported the findings of study two which suggested that certain mothers may have a desire for control over milk feeding which stems from either maternal centred concerns (impact of feeding upon lifestyle and routine) or infant centred concerns (infant weight and milk consumption). In the current study scheduling feeds was again associated with maternal centred concerns about the impact of breastfeeding upon routine and lifestyle. Mothers who scored highly on desire to schedule feeds believed breastfeeding to be significantly more inconvenient and listed significantly more disadvantages to the mother for breastfeeding. This was coupled with low beliefs as to the normality and health benefits of breastfeeding suggesting that mothers may not feel any incentive to change their desire for control and to adopt the infant-led nature of breastfeeding.

The second behaviour of encouraging feeds again followed the same cluster of attitudes as in study two, reflecting infant centred concerns. In the current study, mothers who were high in intention to encourage feeds scored highly on a number of specific and general measures of anxiety. Desire to encourage feeds was associated with concerns about feeding their infant, general concerns about motherhood and feeling ill prepared. Moreover, mothers high on intention to encourage feeds scored lowly on the emotions of feeling positive and prepared during pregnancy. Again it appears that encouraging feeds may be a representation of a mother who wishes to control her infant's intake of milk and feeding pattern because of anxiety about the infant's well being and low confidence in herself as a mother.

The results of the regression analyses raised a further interesting finding about the possible relationships between intended control and intended breastfeeding duration. When intended use of scheduling or encouraging feeds was placed as the dependent variable in the regression analysis, intended breastfeeding duration did not remain a significant predictor. Similarly, when intended breastfeeding duration was treated as the dependent variable, intended use of scheduling and encouraging feeds did not remain significant predictors. In all cases it was attitudes, confidence and emotions which remained significant predictors of both intended use of control and intended breastfeeding duration. It is therefore plausible that maternal attitudes and confidence determine intention to control feeds and as a consequence of this, intention to breast of formula feed. Desire to be in control of infant feeding, based on either mother centred (inconvenience) or infant centred (anxiety) concerns may determine intended breastfeeding duration. Mothers who desire a high level of control believe the infant-led nature of breastfeeding to be incompatible with this and thus choose to use formula. Those who possess a high level of control but believe in the health benefits of breastfeeding may plan to initiate breastfeeding but to only continue for a short duration of time.

A further notable finding was the association between maternal dieting during pregnancy and intention to schedule feeds which remained once the regression was performed. Mothers who reported limiting their intake of food and dieting during pregnancy expressed a greater intention to schedule feeds. Actual pre pregnancy BMI was not associated with scheduling feeds at any point. It is possible therefore that maternal perception of body size and weight may affect maternal control. One explanation is that maternal concern over her own weight translates to concern for infant weight. Indeed, increased maternal BMI has been linked with higher levels of maternal restriction (Wardle et al. 2002) and greater concern for a child's future health (Johannsen, Johannsen & Specker, 2006). As the mothers were primiparous, planned feeding style may be based on their own eating behaviour, as they have no direct experience of feeding their own child. However, it could also be that dieting during pregnancy is a variant of general desire for control. Mothers who want to remain in control of their weight gain during pregnancy also want to feed to a regular and prescribed pattern once their infant is born. This could perhaps be indicative of a

general controlling personality trait. Certainly this presents an interesting avenue for future research.

There are a number of drawbacks to this study which will again be discussed in greater depth in the general discussion (chapter 6.). Although the sample was large and included a wide range of age and socio-economic status, participants were self-selecting. Therefore the sample was marginally skewed towards those with higher levels of education (DIUS, 2007) and attracted a high proportion of mothers who planned to breastfeed for at least six months (Bolling et al. 2007). Secondly, participants completed the questionnaire regarding future beliefs which may only be a reflection of intention rather than the behaviour that will actually follow. Intended behaviour does not always lead to actual behaviour , especially with regard to health (Conner & Norman, 1996) and specifically breastfeeding duration (Swanson & Power, 2005). Moreover, expectant mothers' ideals often differ from reality (Mitra et al. 2004). For this reason alongside the findings from study two that infant characteristics and experience of feeding can impact upon maternal control, and that maternal control can emerge in reaction to child weight and eating behaviour (Faith et al. 2007), it would be worthwhile to establish how prenatal attitudes expectations interact with actual experience of feeding to produce actual control.

Limitations aside, this study expands the findings of study two and raises the question of possible prenatal influences upon maternal control of child feeding. Maternal desire to have control over infant feeding is measurable prenatally and associated with both mother and infant centred concerns over the infant-led nature of breastfeeding. The next stage is to ascertain, through longitudinal study, how prenatal intentions and beliefs interact with actual experiences of breast or formula feeding and measures of infant weight and size to determine actual use of scheduling and encouraging feeds.

In summary:

- Differences in desired use of control during milk feeding were measurable prenatally in primiparous mothers. Mothers expressed desire to schedule and encourage feeds once their infant was born.

- Mothers who intended to breastfeed for six months or more planned to schedule or encourage feeds less than mothers who planned to use formula at birth or breastfeed for a short duration. No difference in control was seen between these latter two groups.

- Mothers who planned to breastfeed for a short duration believed breastfeeding had significantly higher health benefits than mothers who planned to formula feed. However, high levels of control in this group may impede desire to breastfeed for longer.

- Different patterns of attitudes and confidence were associated with planned use of scheduling and encouraging feeds.

- Intention to schedule feeds was associated with concerns about the inconvenience and disadvantages of breastfeeding. Maternal centred concerns about lifestyle and routine appeared to drive desired control

- Intention to encourage feeds was associated with increased anxiety over both feeding and motherhood. Mothers wanted to control feeds for infant centred concerns of weight gain and milk consumption.

- Prenatal mother and infant centred concerns about the infant-led nature of breastfeeding may affect intended control of milk feeding and as a consequence breastfeeding initiation.

Chapter 5

Intention and experience in determining maternal use of control during milk feeding

Studies two and three examined maternal use of control during milk feeding in the first six months postpartum. Both studies indicated that maternal control behaviours were present during milk feeding and associated with breastfeeding duration. Specifically, a shorter planned or actual duration of breastfeeding was associated with increased planned or actual use of scheduling and encouraging feeds. Moreover, both breastfeeding duration and maternal control were associated with attitudes surrounding the infant-led nature of breastfeeding. There is greater opportunity for higher levels of maternal control with formula milk and thus, formula appeared to be used when mothers held concerns about the impact of infant-led breastfeeding.

Study two revealed differences in retrospective reports of use of scheduling and encouraging milk feeds for infants between birth and six months of age. Greater levels of control were associated with a shorter duration of breastfeeding. This provided possible support for the idea that experience of infant-led breastfeeding decreased use of control in mothers who breastfed for a longer duration of time (Taveras et al. 2004). However, a significantly lower reported use of control between mothers who breastfed for 7 days or less compared to mothers who formula fed from birth was found suggesting that differences in maternal control may not be purely due to experience. It was unlikely that mothers who breastfed for a very short duration of time modified their use of control to a significant extent. Therefore perhaps differences in attitudes and beliefs, present before the infant was born, drove maternal control behaviour. Maternal control, rather than being dependent on experience, was perhaps a dispositional trait.

The results of study three highlighted differences in intention to schedule and encourage feeds amongst primiparous pregnant women. Differences in intended use of control were also associated with intended duration of breastfeeding. Mothers who

intended to breastfeed for a longer duration of time intended to use lower levels of control. As the women had no experience of feeding their own infant, it was likely that intention to control feeds was associated with attitudes and beliefs about the infant-led nature of breastfeeding. In both studies, attitudes were associated with maternal control with both analyses suggesting that mothers desired a high level of control during milk feeds for two main reasons. Mothers who wanted to maintain lifestyle and have a predictable routine wanted to use high levels of scheduling feeds. Conversely, mothers who were anxious about milk consumption and infant weight gain wanted to encourage feeds in their infant. Attempting to control infant feeding patterns however is incompatible with the establishment of breastfeeding and thus both intention and actual use of scheduling and encouraging feeds were associated with lower actual or desired breastfeeding duration.

From these findings it could be concluded that differences in maternal control, both during milk feeding and perhaps later child feeding, emerge from a general dispositional trait for control. This general desire for control is present prenatally and thus determines both level of control exerted during child feeding and breastfeeding duration. As breastfeeding needs to be infant-led; frequent on demand feeding with no visual cue to amount consumed; mothers who desire a high level of control may choose to formula feed. Thus formula feeding is associated with higher levels of later maternal control. However, the results of studies one and two indicated that experience of motherhood and feeding could also impact upon breastfeeding duration. In study one, mothers who only breastfed for a short duration of time described difficulties feeding their infant, problems with infant weight gain and feeling exhausted and despondent as reasons for choosing to start using formula milk due to its predictable, measurable nature. Furthermore, study two highlighted the association between maternal confidence during feeding, perceived infant size and experience of complications as predictive of both breastfeeding duration *and* maternal control, especially in relation to encouraging feeds. In short, difficult or demanding experiences caring for the infant appeared to decrease breastfeeding duration *and* increase maternal control. Experience appeared to play an important role alongside prenatal attitudes in determining the level of control a mother exerted over milk feeds and apparently as a consequence, breastfeeding duration.

The design of studies one to three did not allow comparison of prenatal and postnatal influences however and the retrospective design of study two made it difficult to establish direction between attitudes and experiences. The current study therefore aimed to establish how prenatal intentions regarding infant feeding and postnatal experience of infant feeding affected actual breastfeeding duration and use of maternal control. A sub sample of mothers who completed the initial questionnaire used in study three whilst pregnant completed a follow up questionnaire when their infant was at least six months postpartum. The questionnaire examined maternal actual breastfeeding duration and use of encouraging and scheduling feeds alongside maternal experiences and attitudes surrounding birth and feeding their infant. The overall aim was to investigate how intention interacted with experience to produce actual use of control and how this may impact upon actual breastfeeding duration. The study aimed to examine ten main questions:

1. Did intended breastfeeding duration predict actual breastfeeding duration?

2. Was intention to encourage or schedule feeds associated with actual use of encouraging or scheduling feeds?

3. Are differences in planned or actual breastfeeding duration associated with planned or actual use of encouraging or scheduling feeds?

4. Are maternal attitudes towards breastfeeding associated with actual breastfeeding duration and use of control?

5. Is actual breastfeeding duration and use of control associated with experiences during pregnancy?

6. Is there an association between actual breastfeeding duration or use of encouraging or scheduling feeds and birth experience?

7. Is there an association between actual breastfeeding duration or use of encouraging or scheduling feeds and feeding experience?

8. Is infant or maternal weight associated with actual breastfeeding duration or use of encouraging and scheduling feeds?

9. Which variables explain the greatest proportion of the variance for actual breastfeeding duration and use of scheduling or encouraging feeds?

10. Do intended levels of encouraging and scheduling feeds change over time? Which factors influence this change?

5.1. Methods

Participants

All participants gave informed consent prior to inclusion in this study. All aspects of this study were performed in accordance with the ethical standards set out in the 1964 Declaration of Helsinki. Approval for this study was granted by the Swansea University Department of Psychology Research Ethics Committee (Appendix 4A). 136 mothers initially completed the follow up questionnaire. Mothers were sent the follow up questionnaire at six months postpartum although completion aged varied from 6 to 18 months. It was decided to exclude all participants who completed the questionnaire when their infant was over 12 months old (N = 13). Mean age of infant at completion was 7.47 months (SD: 1.65) with 43.6% of the sample completing the questionnaire when their infant was 6 months old. Participants provided infant birth weight and gestational age at birth. Infants were excluded from the analysis for multiple birth [n = 1] or if they had a low birth weight (< 2500g) or were born prematurely (< 37 weeks) [n = 5] (World Health Organisation, 1992).

117 mothers were therefore included in the analysis. This comprised of 31.28% of the phase one sample. Mean age of the phase two sample was 29.17 (SD: 5.689) and mean number of years in education 13.99 (SD: 2.25). This was comparable to a mean age of 28.98 years (SD: 6.09) and a mean number of years in education of 13.82 (SD: 2.33) for the phase one sample. No significant differences were therefore seen between samples collected at phase one and phase two. Socioeconomic indicators of the phase two sample can be seen in Table 42 where the sample is compared with the socioeconomic profile of the sample from phase one.

Table 42: Demographic characteristics of phase 1 and phase 2 samples.

		Phase one		Phase two	
Indicator	**Group**	**N**	**%**	**N**	**%**
Age	≤ 19	34	9.0	8	6.8
	20 – 24	67	17.7	21	17.9
	25 – 29	85	22.5	27	12.8
	30 – 34	109	28.8	38	33.1
	35 ≥	79	20.9	23	19.7
Education	No formal	15	4.0	3	2.6
	School	79	20.9	25	21.4
	College	102	27.0	25	21.4
	Higher	178	47.1	64	41.7
Marital Status	Married	229	60.6	80	68.4
	Cohabiting	84	22.2	25	21.4
	Single	61	16.2	12	9.3
Home	Owned	201	53.2	61	52.1
	Rented	72	19.0	16	13.7
	Council	21	5.6	7	6.0
	Other	9	2.4	1	0.9
Maternal occupation	Professional	122	32.3	43	36.8
	Skilled	74	19.6	18	15.4
	Unskilled	52	13.8	14	12.0
	Other	55	14.6	16	13.7
	Declined	30	7.9	26	22.2
Paternal occupation	Professional	126	33.3	41	35.0
	Skilled	63	16.7	14	12.0
	Unskilled	61	16.6	17	14.5
	Other	35	9.3	10	8.5
	Declined	25	6.6	35	29.9

Measures

Participants completed a questionnaire documenting their birth experience and the first six months postpartum with their infant (Appendix 4D). A number of measures from the initial questionnaire were repeated. The questionnaire consisted of

- Measures of breastfeeding duration and formula use
- Measures of birth experience
- The modified retrospective child feeding questionnaire used in phase one
- The attitudes to breastfeeding questionnaire completed when pregnant
- Experiences of milk feeding

Measures of breastfeeding duration and formula use

Participants indicated whether they breastfed at birth and if applicable for how long they did so. Mothers who initiated breastfeeding at birth also indicated how frequently they used formula supplements. No mother who breastfed used formula more than once a day. Participants also specified whether they fed in general upon infant demand or to a maternal-led schedule. Mothers also provided information regarding the time after birth when their infant had their first milk feed.

As mothers completed the follow up questionnaire from six months postpartum, actual breastfeeding duration was only measured up to six months postpartum. Therefore mothers who planned to initially breastfeed for more than 26 weeks were treated as intending to do so for 26 weeks for the purpose of this comparison. Mean length of intended breastfeeding duration in the sample was 18.28 weeks (SD: 10.40). Prior to this alteration, mean intended breastfeeding duration was 22.59 weeks (SD: 19.20) which compared to a mean planned duration of 21.22 weeks (SD: 18.42) for the whole sample.

Measures of birth experience

Mothers indicated type of delivery (Vaginal or Caesarean section) and details of birth experience. Mothers reported whether they had skin to skin contact with their infant after birth and how soon after birth this occurred. Mothers also rated their experience of birth using a five point likert scale (very negative to very positive).

The modified child feeding questionnaire used in study two

Mothers completed the modified child feeding questionnaire that was used in study two to report their use of control over milk feeding during the first six months postpartum. All questions and response options remained the same.

The attitudes to breastfeeding questionnaire completed in phase one

Participants completed a second copy of the attitudes questionnaire they completed when pregnant. All questions and response options remained the same.

Experiences of milk feeding

Mothers reported their experiences of milk feeding. This included items targeting confidence about feeding, attitudes surrounding ease and convenience and perceived support.

Data analysis

Factor analyses were carried out for the modified child feeding questionnaire, attitudes questionnaire and experiences of breastfeeding items using SPSS v13, SPSS UK ltd. For each, a principal component analysis was extracted that was subject to varimax rotation. Factors with eigenvalues over 1 were used. The factor scores computed were saved as regression scores and used for the data analysis as recommended by Tabachnik and Fidell (2006). Cronbach's alpha were computed to measure internal validity of new scales.

Multivariate ANOVA were performed to compare differences in intended and actual use of maternal control, maternal attitudes, maternal experiences and infant characteristics for three feeding groups based on actual duration of breastfeeding (formula fed from birth, breastfed for six weeks or less and breastfed for six months or more). Post-hoc Bonferroni tests were used to compare differences between groups. Pearson's correlations were used to examine relationship between prenatal and postnatal maternal behaviour, experiences and attitudes and actual use of control. Linear regression analysis was used to ascertain the independent predictors of breastfeeding duration, scheduling feeds and encouraging feeds. Finally, repeated measures ANOVA were performed to examine differences in prenatal and postnatal intended and actual use of scheduling and encouraging feeds and the variables which caused significant interactions.

5.3 Results

Question one: Did intended breastfeeding duration predict actual breastfeeding duration?

Mothers indicated actual duration of breastfeeding up to six months post partum (Table 43). This was coded as breastfeeding duration in weeks for ease of comparison to planned breastfeeding duration which was measured in weeks. 14.5% of the sample however breastfed for 7 days or less (n = 17), ranging from two to seven days of breastfeeding. In addition, In phase one, a proportion of mothers reported that they intended to breastfeed for longer than 26 weeks (six months). To allow comparison with the follow up sample where breastfeeding duration was capped at 26 weeks, these participants were treated as intending to breastfeed for 26 weeks.

Table 43: Intended and actual breastfeeding duration

Breastfeeding duration	Intended		Actual	
	N	%	N	%
Formula milk from birth	43	11.4	17	14.5
Breast feed ≤ 6 weeks	43	11.4	49	33.4
Breastfeed 7 – 25 weeks	90	23.8	10	8.5
Breastfeed 6 months	133	35.2	51	43.6
Breastfeed ≥ 6 months	56	14.8	n/a	n/a

Mean adjusted intended duration of breastfeeding was 18.28 weeks (SD: 10.40) compared to mean actual breastfeeding duration of 13.57 weeks (SD: 11.71). Actual breastfeeding duration was significantly shorter than mean intended duration of breastfeeding [t (116) = -.566, $p < 0.001$]. Intended duration of breastfeeding was correlated with actual duration of breastfeeding (Pearson's r = .673, $p < 0.001$). 55.6% of participants breastfed for as long as they intended (n = 65), 6.0% for longer than they intended (n = 7) and 38.5% for a shorter duration than intended (n = 45).

69.0% (n = 49) of participants who planned to breastfeed until at least six months did breastfeed until at least this time. One participant from this group did not initiate

breastfeeding at birth. Of those who initiated but stopped before six months, duration of breastfeeding ranged from two days to 22 weeks. Of those who planned to initiate breastfeeding but stop before 26 weeks, only one participant actually breastfed for the exact proportion of time she planned (one week or less). Of the remaining mothers, 74.2% (n = 23) breastfed for a shorter duration of time with 22.6% (n = 7) breastfeeding for longer. Of those who planned to formula feed from birth, 100% did so (n = 13).

Question two: Was intention to encourage or schedule feeds associated with actual use of encouraging or scheduling feeds?

Firstly, an exploratory factor analysis was conducted for the follow up sample on the modified CFQ which was completed during pregnancy. As the factor structures were similar it was decided to use the scores from the larger initial sample and therefore participants kept their phase one CFQ scores. Again, only the two factors of encouraging and scheduling feeds were examined.

A second factor analysis was conducted on the phase two modified CFQ (Appendix 4C). The rotated component matrix explained 71.97% of the variance and produced four factors similar to those in studies two and three. The first accounted for 37.28 % of the variance and was weighted on four items which described encouraging more frequent feeds and anxiety over milk intake. This factor was labelled 'encouraging feeds. The second factor was based on items such as scheduling and stretching feeds and accounted for 13.21% of the variance. This was labelled 'scheduling feeds'. A third factor labelled 'using milk for comfort' accounted for 12.79% of the variance and was based on feeding in order to comfort or calm behaviour. Finally, accounting for 8.68% of the variance, the factor 'perceived responsibility' was produced. This described aspects such as carrying out most of the feeding and feeling responsible for the amount of milk consumed. The sample was too small to reliably conduct confirmatory factor analyses on random subsets of the data. However, speculative analyses resulted in similar factor structures. Factor scores for the four dimensions were created using the regression method.

In summary four factors were revealed:

- Encouraging feeds
- Scheduling feeds
- Using milk for comfort
- Perceived responsibility

Internal consistency for each scale was measured using Cronbach's Alpha and is reported alongside each dimension in Appendix 4C. Each item showed high internal consistency ranging from .727 to .791 again apart from perceived responsibility which was lower at .598.

Again, only the two behaviours of scheduling and encouraging feeds are further reported. The relationship between intended use of encouraging and scheduling feeds and actual use of encouraging and scheduling feeds was examined (Table 44). Intention to encourage feeds was significantly associated with actual use of encouraging feeds. Likewise intention to schedule feeds was significantly associated with actual use of scheduling feeds. No association was seen between actual use of encouraging feeds and scheduling feeds (again suggesting two separate behaviours). However, intended use of encouraging feeds was inversely associated with actual use of scheduling feeds. In the same way, intended use of scheduling feeds was inversely associated with actual use of encouraging feeds. Neither intended nor actual use of scheduling and encouraging feeds was significantly associated with age, education, marital status, housing status, maternal occupation or paternal occupation. However, maternal age, maternal years in education, infant age at time of questionnaire and parity were again controlled for throughtout the multivariate analyses.

Table 44: Association between intended and actual use of encouraging and scheduling feeds

	Planned encourage	Planned schedule	Actual encourage	Actual schedule
Planned encourage		-.102	.176*	-.162*
Planned schedule	.102		-.170*	.525**
Actual encourage	.176*	-.170*		.101
Actual schedule	-.162*	.525**	.101	

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Question three: Are differences in planned or actual breastfeeding duration associated with planned or actual use of encouraging or scheduling feeds?

Two main analyses were considered within this question

1. Did actual use of control differ according to intended breastfeeding duration?

2. Could differences in intended use of control be seen for differences in actual breastfeeding duration?

Firstly the relationship between intended breastfeeding duration and actual levels of scheduling and encouraging feeds was examined by comparing mothers who planned to formula feed from birth (n = 15), breastfeed for six weeks or less (n = 31) or breastfeed for at least six months (n =71). A multivariate ANOVA showed that actual use of scheduling and encouraging feeds significantly differed by intended breastfeeding duration (Table 45). Mothers who intended to breastfeed for at least six months reported significantly lower levels of actual use of scheduling and encouraging feeds than mothers who intended to breastfeed for six weeks or less or formula feed from birth. In terms of scheduling feeds, mothers who planned to breastfeed for six weeks or less reported significantly lower levels of scheduling feeds than mothers who planned to formula feed from birth. No significant difference was seen between these two groups in terms of encouraging feeds.

Table 45: Differences in actual use of scheduling and encouraging feeds by intended duration of breastfeeding

Control	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Schedule feeds	Factor score	.842■▲ (.222)	.119▲ (.141)	-.395 (.138)	F (2, 114) = 30.644, p < 0.001
	Computed score	3.56	2.87	2.26	
Encourage feeds	Factor score	.394▲ (.239)	.077▲ (.141)	-.206 (.138)	F (2, 114) = 11.332, p < 0.001
	Computed score	3.55	3.68	2.65	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Finally, differences in intended use of scheduling and encouraging feeds were examined by actual breastfeeding duration. A significant difference was seen between groups for intended use of scheduling feeds (Table 46). Mothers who breastfed for at least six months intended to use lower levels of scheduling feeds than mothers who formula fed from birth or who breastfed for six weeks or less. Moreover, mothers who breastfed for six weeks or less intended to use lower levels of scheduling feeds compared to mothers who formula fed from birth. No significant difference between groups was seen for intention to encourage feeds.

Table 46: Differences in intended use of scheduling and encouraging feeds by actual duration of breastfeeding

Control	Mean	Formula	BF ≤ 6 weeks	BF ≥ 6 Months	Significance
Schedule feeds	Factor score	.916■▲ (.227)	.114▲ (.135)	-.243 (.134)	F (2, 111) = 20.193, p < 0.001
	Computed score	3.56	2.87	2.26	
Encourage feeds	Factor score	.588 (.242)	.170 (.144)	-.198 (.142)	F (2, 111) = 2.035, p > 0.05
	Computed score	3.55	3.68	2.65	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

The next stage of the analysis was to examine how attitudes and experiences affected both actual use of encouraging and scheduling feeds and breastfeeding duration. There were three main aims for the analyses:

1. Do prenatal attitudes and experiences affect postnatal behaviour in terms of maternal control and breastfeeding duration?

2. Does maternal experience of birth and the postnatal period, including experience of feeding the infant affect actual use of control and breastfeeding duration?

3. How do intention and experience interact to affect actual behaviour? Which factors are most important in predicting actual use of maternal control and breastfeeding duration?

Question four: Are maternal attitudes towards breastfeeding associated with actual breastfeeding duration and use of control?

Mothers completed a series of attitudes statements regarding breastfeeding both prenatally and postnatally when their infant was six months old. The association between these attitudes and breastfeeding duration and actual use of encouraging and scheduling feeds was examined.

Prenatal attitudes

The prenatal measure consisted of a series of statements towards breastfeeding. An exploratory factor analysis was conducted on these responses for the follow up sample. Factor loadings were again similar and therefore factor scores were used which were computed from the entire initial sample. To recap, four attitudes towards breastfeeding were produced

- Breastfeeding as healthier
- Breastfeeding as the norm
- Negative attitudes towards formula
- Breastfeeding as easier

As the sample was primiparous, the items in the attitudes questionnaire completed during pregnancy had been positively worded in favour of breastfeeding (e.g. breastfeeding is easy). Therefore participants also provided open ended responses as to what they believed the advantages and disadvantages to be to breastfeeding for both mother and infant. These were summed to give four main scores for each participant; advantages for mother, advantages for infant, disadvantages for mother and disadvantages for infant.

In terms of attitudes towards breastfeeding, the only prenatal attitude which showed significant differences for actual breastfeeding duration was breastfeeding as healthiest. Mothers who formula fed from birth held significantly lower beliefs that breastfeeding was best for health than mothers who breastfed for six weeks or less or six months or more. No significant difference was seen between those who breastfed for six weeks or less or six months or more. No significant differences were seen between the three groups for the prenatal attitudes breastfeeding as the norm, breastfeeding as easier and negative beliefs about formula (Table 47).

Table 47: Prenatal attitudes and actual breastfeeding duration

Prenatal Attitude	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 Months	Significance
Healthiest	Factor score	-.140■▲ (.193)	.212 (.114)	.270 (.113)	F (2, 113) = 12.914, P < 0.001
	Computed score	3.17	4.53	4.76	
Normal	Factor score	-.237 (.238)	-.115 (.140)	.194 (.139)	F (2, 113) = .833, p > 0.05
	Computed score	4.00	4.28	4.70	
Negative formula beliefs	Factor score	-.429 (.330)	-.030 (.194)	.175 (.113)	F (2, 113) = .259, p > 0.05
	Computed score	1.41	2.34	2.72	
Easier	Factor score	-.221 (.305)	-.158 (.179)	.230 (1.78)	F (2, 113) = .230, p > 0.05
	Computed score	3.05	3.75	4.42	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲ $p < 0.05$ compared to BF ≥ 6 months

In terms of the number of advantages and disadvantages to breastfeeding listed prenatally however, there were significant differences between the three groups. Significant differences were seen for the number of advantages listed for the mother, for the infant and the number of disadvantages for the mother (Table 48). Mothers who breastfed for at least six months listed significantly more advantages and fewer disadvantages to breastfeeding than mothers who breastfed for six weeks or less or who formula fed from birth. Mothers who breastfed for six weeks or less listed significantly more advantages and less disadvantages than mothers who formula fed from birth. Again however, range of responses for this option was low; 83.8% of participants did not list a disadvantage of breastfeeding for the infant.

Table 48: Differences in number of advantages and disadvantages to breastfeeding listed prenatally and actual breastfeeding duration

Prenatal Attitude	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Advantages mother	1.94■▲ (.405)	3.00 (.239)	4.11 (.234)	F (2, 113) = 12.496, P < 0.001
Advantages infant	1.58■▲ (.569)	3.14 (.335)	4.17 (.329)	F (2, 114) = 8.145, p < 0.001
Disadvantages mother	6.05■▲ (.389)	3.42 (.229)	2.07 (.224)	F (2, 113) = 40.047, p < 0.000
Disadvantages infant	.352 (.162)	.163 (.095)	.274 (.093)	F (2, 113) = .636, p > 0.05

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Postnatal attitudes

In the follow up questionnaire, participants completed a second identical copy of the attitudes questionnaire completed during pregnancy. This was again factor analysed (Appendix 4D). The rotated component matrix explained 82.07% of the variance and produced four factors similar to those in study three. The first factor accounted for 53.49 % of the variance and was weighted on three items which described beliefs that breastfeeding was best for infant and maternal health and that formula milk use

should not be encouraged. This factor was labelled 'breastfeeding as healthier'. The second factor described beliefs that breastfeeding was normal behaviour, should be allowed in public and was not embarrassing. This factor accounted for 13.95% of the variance and was labelled 'breastfeeding as the norm'. The third factor was labelled 'negative attitudes to formula' and accounted for 9.50% of the variance. These described attitudes such as feeling formula milk should not be promoted or its use encouraged. Finally, the fourth factor accounted for 5.12% of the variance and described breastfeeding as being easier and convenient. This was labelled 'breastfeeding as convenient'. The factor scores were created using the regression method.

In summary four factors were created. These factors had a very similar structure to those used in the questionnaire completed during pregnancy.

- Breastfeeding as healthier
- Breastfeeding as the norm
- Negative attitudes towards formula
- Breastfeeding as easier

Internal consistency was high for each item ranging from .756 to .900. Cronbach's Alpha values are show in Appendix 4D.

Firstly, significant differences were seen between the three feeding groups for the three postnatal attitudes breastfeeding as healthiest, breastfeeding as the norm and breastfeeding as easier. No significant differences were seen between the groups for the attitude negative beliefs about formula (Table 49). Mothers who breastfed for at least six months reported breastfeeding to be significantly easier, better for health and the norm than mothers who formula fed from birth or breastfed for six weeks or less. Furthermore, mothers who breastfed for six weeks or less believed breastfeeding to be significantly better for health and the norm than mothers who formula fed from birth. No significant difference was seen however for the attitude breastfeeding as easier between mothers who formula fed from birth or breastfed for six weeks or less.

Table 49: Differences in postnatal attitudes towards breastfeeding according to actual breastfeeding duration

Attitude	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Healthiest	Factor score	-.121■▲ (.218)	-.075▲ (.128)	.474 (.126)	F (2, 114) = 26.158, P < 0.001
	Computed score	2.23	4.16	4.86	
Normal	Factor score	-.835■▲ (.179)	-.018▲ (.105)	.296 (.103)	F (2, 114) = 9.361, p < 0.001
	Computed score	3.82	4.61	4.92	
Negative formula beliefs	Factor score	-.262 (.321)	-.363 (.189)	.437 (.185)	F (2, 114) = 10.064, p > 0.05
	Computed score	1.35	1.93	2.98	
Easier	Factor score	-.663▲ (.276)	-.209▲ (.163)	.690 (.160)	F (2, 113) = 12.909, p < 0.001
	Computed score	1.41	2.83	4.66	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Attitudes and actual use of scheduling and encouraging feeds

Secondly, the association between pre and post natal attitudes and actual use of scheduling and encouraging feeds was examined. Actual use of scheduling feeds was inversely associated with the prenatal attitudes 'breastfeeding as healthier' and 'negative attitudes to formula'. It was also inversely associated with the number of advantages for both mother and infant of breastfeeding listed prenatally and positively associated with the number of disadvantages to breastfeeding for the mother. Finally, all four postnatal attitudes were inversely associated with actual

used of scheduling feeds. Mothers who reported using a high level of scheduling feeds disagreed that breastfeeding was healthier, normal and easier and held more positive views towards formula (Table 50). Actual reported use of encouraging feeds was also associated with prenatal and postnatal attitudes. Actual use of encouraging feeds was inversely associated with the prenatal belief that breastfeeding was easier, the numbers of advantages to breastfeeding for mother and infant listed prenatally and positively associated with the number of disadvantages to the mother listed. Finally, encouraging feeds was significantly inversely associated with all four postnatal attitudes. Mothers who believed breastfeeding to be easier, the norm, healthier and who held negative attitudes towards formula were significantly less likely to report encouraging feeds.

Table 50: Association between prenatal and postnatal attitudes and actual use of scheduling and encouraging feeds

		Actual scheduling feeds	Actual encouraging feeds
Prenatal attitudes	BF healthiest	-.175*	-.079
	BF normal	-.099	-.030
	Negative formula	-.207*	-.112
	BF easier	-.148	-.172*
Prenatal open ended questions	Advantage mother	-.175*	-.399**
	Advantage infant	-.131*	-.121*
	Disadvantage mother	.312**	.457**
	Disadvantage infant	.040	.031
Postnatal attitudes	BF healthiest	-.398**	-.303**
	BF normal	-.194*	-.195*
	Negative formula	-.236**	-.312**
	BF easier	-.288**	-.300**

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Question five: Is actual breastfeeding duration and use of control associated with experiences during pregnancy?

In the first stage of the questionnaire completed during pregnancy, participants rated a series of statements describing their experiences during pregnancy. It is possible that experience during pregnancy impacts upon later behaviour – either directly or through underlying factors influencing both. Therefore the association between experiences during pregnancy and actual breastfeeding duration and use of control was analysed. In the first section, mothers reported their mood during pregnancy. Four main factors were produced:

- Feeling prepared
- Feeling happy
- Feeling anxious
- Feeling restless

Firstly, no significant differences were found in any of the different moods between the three actual feeding groups. Moreover, no significant association was found between any of the moods and actual use of scheduling and encouraging feeds. Secondly, during pregnancy, mothers were asked to report their confidence and anxiety levels, both directly in relation to feeding their infant and more generally about impending motherhood. Three main factors were produced:

- Feeling informed about feeding
- Feeling anxious about feeding
- Feeling anxious generally about motherhood

Significant differences in prenatal confidence were seen for the three actual feeding groups. Mothers who breastfed for at least six months reported significantly higher levels of feeling informed during pregnancy than mothers who formula fed from birth [$F\ (2, 114) = 4.238$, $p < 0.05$]. No significant difference was seen between mothers who breastfed for six months or more or for six weeks or less, nor between those who breastfed for six weeks or less or who formula fed from birth. No significant differences between the feeding groups were seen for prenatal anxiety about feeding or anxiety about motherhood.

Feeling informed about feeding during pregnancy was significantly inversely associated with actual use of encouraging and scheduling feeds. Mothers who felt informed about feeding their infant used lower levels of encouraging and scheduling feeds (Table 51). No associations were seen between anxiety about feeding or motherhood and actual breastfeeding duration or use of control.

Table 51: Association between maternal confidence during pregnancy and actual use of encouraging and scheduling feeds

	Actual encouraging feeds	Actual scheduling feeds
Informed	-.225**	-.203*
Anxious feeds	-.023	-.044
Anxious motherhood	.068	-.065

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Finally, neither actual breastfeeding duration nor actual use of encouraging or scheduling feeds was associated with experience of complications during pregnancy.

Question six: Is there an association between actual breastfeeding duration or use of encouraging or scheduling feeds and birth experience?

Participants provided details of their birth and experience of feeding their infant. In terms of birth experience, mothers indicated whether they

- Gave birth vaginally or via caesarean section
- Had any complications during the birth
- Their experience of birth
- Whether they experienced skin to skin contact with their infant after the birth, and if applicable how long after the birth they first had this
- How long after the birth they gave their infant its first milk feed

79.5% of respondents (n = 93) gave birth vaginally whilst 20.5% (n = 24 had a caesarean section. 35.9% (n = 42) experienced complications during the birth whilst 64.1% (n = 75) did not. No significant difference was seen for birth type of birth complications upon actual breastfeeding duration. Birth experience however was associated with breastfeeding duration (Table 52). Participants indicated via a 5 point

likert scale their experience of birth (very negative to very positive). Mothers who breastfed for at least six months rated their birth experience as significantly more positive than mothers who breastfed for six weeks or less or who formula fed from birth. No significant difference in birth experience was seen between mothers who formula fed from birth or who breastfed for six weeks or less.

82.9% of respondents (n = 89) experience any skin to skin contact after the birth. Mean time until skin to skin contact was 13.79 minutes (SD: 33.76) with a range from 'immediately' to five hours. No significant difference in duration of breastfeeding was seen for those who experienced skin to skin contact or not. However, significant differences were seen in speed of skin to skin contact by breastfeeding duration (Table 52). Mothers who breastfed experienced skin to skin contact significantly quicker than mothers who formula fed or who breastfed for six weeks or less. Notably mothers who breastfed for six weeks or less experienced a significantly longer wait for skin to skin contact than mothers who formula fed from birth. Mean duration of time until the first feed was 57.37 minutes (SD: 75.45) with a range from one minute to five hours. Significant differences were seen between feeding groups for time until first feed (Table 52). Mothers who breastfed for at least six months gave a first feed significantly more quickly than mothers who formula fed from birth or who breastfed for six weeks or less. Again, notably, mothers who breastfed for six weeks or less gave a first feed significantly later than mothers who formula fed.

Table 52: Differences in experiences of birth by breastfeeding duration

Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Birth experience	3.471▲ (.281)	3.469▲ (.171)	4.255 (.157)	F (2, 114) = 5.874, P < 0.01
Time until skin to skin (minutes)	18.85■▲ (8.776)	23.39▲ (5.327)	4.11 (4.895)	F (2, 94) = 3.747, p < 0.05
Time until first feed (minutes)	61.17■▲ (15.532)	83.38▲ (9.427)	32.37 (8.663)	F (2, 114) = 7.186, p > 0.05

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Significant associations were also seen between birth experience and actual use of scheduling and encouraging feeds (Table 53). Birth experience was inversely associated with both actual use of encouraging and scheduling feeds. Mothers who rated their birth as a positive experience reported using lower levels of encouraging and scheduling feeds. Experiencing any skin to skin contact after the birth was associated with decreased use of encouraging feeds [$t\ (115) = -3.075$, $p < 0.05$] although no effect was seen for use of schedule. Time until skin to skin contact was established after the birth was also inversely associated with use of encouraging feeds but not scheduling feeds (Table 53).

Table 53: Association between birth experiences and actual use of encouraging and scheduling feeds.

	Actual encouraging feeds	Actual scheduling feeds
Birth experience	-.195*	-.252**
Skin to Skin	.089	-.197*
First feed	.076	.152

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Question seven: Is there an association between actual breastfeeding duration or use of encouraging or scheduling feeds and feeding experience?

Partcipants completed a series of questions examining their experiences of feeding their infant. This covered areas such as ease of feeding, any problems encountered and confidence and was again based on issues raised during study one and existing themes in the literature. An exploratory factor analysis was carried out on these items (Appendix 4E). The rotated component matrix explained 69.84% of the variance and produced three factors. The first of these accounted for 51.57% of the variance and described items such as feeling confident, supported and that feeding was easy. This was labelled 'positive experience'. The second accounted for 11.15% of the variance and reflected experiences such as finding feeding stressful and difficult. This was labelled 'difficult experience'. Finally, the third factor explained 7.11% of the

variance and described items such as finding feeding time consuming and demanding. This was labelled 'demanding experience'.

In summary three factors were produced:

- Positive experience
- Difficult experience
- Demanding experience

Internal consistency was high for each item ranging from .742 to .900. Cronbach's Alpha values are show in Appendix 4E.

Experience of feeding differed according to breastfeeding duration (Table 54). In terms of an enjoyable experience both mothers who breastfed for at least six months or who formula fed from birth scored significantly higher than those who breastfed for six weeks or less. No significant difference was seen between those who breastfed for six months or more or who formula fed from birth. For the factor 'difficult experience', mothers who breastfed for six months or more scored significantly lower than mothers who formula fed from birth or who breastfed for six weeks or less. Moreover, mothers who breastfed for six weeks or less scored significantly higher than mothers who formula fed from birth. No significant difference was seen between the three groups for the belief feeding as demanding.

Table 54: Differences in experiences of milk feeding by breastfeeding duration

Attitude	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
Enjoyable	Factor score	.362 (.361)	-.527 (.213)	.389 (.209)	F (2, 114) = 14.457, P < 0.001
	Computed score	4.706	2.898	4.235	
Difficult	Factor score	-.133■▲ (.322)	-.053■ (.190)	.496■ (.186)	F (2, 114) = 33.494, p < 0.001
	Computed score	1.64	4.11	2.79	
Demanding	Factor score	.499 (.311)	-.264 (.183)	.087 (.180)	F (2, 114) = 4.226, p > 0.05
	Computed score	3.23	2.04	2.56	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Experience of feeding was also associated with use of encouraging and scheduling feeds. Mothers who believed feeding to be a positive experience scored significantly lower on measures of encouraging and scheduling feeds whilst a belief that feeding was a difficult experience was associated with high levels of encouraging and scheduling feeds (Table 55). No association was seen between use of control and the belief that feeding was a demanding experience.

Table 55: Association between experience of milk feeding and actual use of encouraging and scheduling feeds

	Actual encouraging feeds	Actual scheduling feeds
Positive experience	-.314**	-.254*
Difficult experience	.341**	.403**
Demanding experience	.027	-.152

Pearson's r: * $p < 0.05$, ** $p < 0.001$

Question eight: Is infant or maternal weight associated with actual breastfeeding duration or use of encouraging and scheduling feeds?

Participants provided details of their infant's birth weight and gestation at which they were born. Participants also indicated perceived size of their infant (very small for age, small for age, average size for age, large for age and very large for age). No difference in birth weight, gestation or perceived size was seen between the three feeding groups. However, mothers with a larger infant at birth were significantly more likely to report scheduling feeds. Furthermore, mothers who perceived their infant to be small were significantly more likely to encourage feeds (Table 56).

Table 56: Association between infant characteristics and actual use of encouraging and scheduling feeds

	Actual encouraging feeds	Actual scheduling feeds
Birth weight	-.073	.154*
Gestation	.036	-.052
Perceived size	-.339**	-.038

Pearson's r: * $p < 0.05$, ** $p < 0.001$

During pregnancy mothers provided details of their height and pre pregnant weight from which BMI was computed and completed a series of items examining their body image during pregnancy. Two factors were produced. These were:

- Negative body image during pregnancy
- Dieting during pregnancy

Whilst no significant difference was found for BMI for the three feeding groups, mothers who formula fed from birth scored significantly higher on measures of body image dissatisfaction and dieting during pregnancy than both mothers who breastfed for six months or more or who breastfed for six weeks or less (Table 57). No difference was seen between those who breastfeed for six months or more or six weeks or less for either measure. No association however was seen between maternal weight and body image and actual use of scheduling and encouraging feeds.

Table 57: Differences in maternal BMI and pre pregnancy body image by actual breastfeeding duration

Attitude	Mean (SEM)	Formula	BF ≤ 6 weeks	BF ≥ 6 months	Significance
BMI	Mean	24.71	24.87	26.35	F (2, 114) = 1.138, p > 0.05
Body image pregnancy	Factor score	.544■▲ (.992)	-.099 (.584)	-.089 (.578)	F (2, 114) = 3.061, p < 0.05
	Computed score	3.88	3.71	2.04	
Dieting pregnancy	Factor score	.478■▲ (.204)	-.022 (.120)	-.141 (.119)	F (2, 114) = 345, p <0.05
	Computed score	1.82	1.34	1.14	

Bonferroni's test: ■ $p < 0.05$ compared to BF ≤ 6 weeks; ▲$p < 0.05$ compared to BF ≥ 6 months

Question nine: Which variables explain the greatest proportion of the variance for actual breastfeeding duration and use of scheduling or encouraging feeds?

The previous five sections have examined a number of prenatal and postnatal influences upon maternal use of encouraging and scheduling feeds. As found previously, correlations and intercorrelations between the variables are multiple. Actual use of encouraging and scheduling feeds were associated with prenatal intentions to control feeds and prenatal attitudes and beliefs alongside postnatal experiences of birth, motherhood and infant feeding. Moreover, both intended and actual breastfeeding duration are strongly associated with maternal use of control.

Again, it is difficult to ascertain the direction of the relationship between maternal control and breastfeeding duration. Both prenatal intention to control milk feeds and prenatal intended breastfeeding duration predict postnatal use of control and actual breastfeeding duration. Moreover, the relationship is complicated through maternal attitudes and experiences. In order to reduce the number of variables associated with

maternal control and breastfeeding duration, regression analyses were run with maternal use of scheduling and encouraging feeds and actual breastfeeding duration as the outcome measures. Linear regression using the enter method was performed with each variable which was significantly correlated with the outcome variable entered in order to establish which independently explained the greatest proportion of variance.

For encouraging feeds the model explained 36.6% of the variance [F (17, 95) = 4.223, $p < 0.001$]. A higher level of encouraging feeds was associated with a smaller perceived size of infant, shorter intended breastfeeding duration, a prenatal attitude that breastfeeding was difficult, a postnatal attitude that breastfeeding was difficult, a negative feeding experience and a higher number of disadvantages to the mother of breastfeeding listed prenatally (Table 58).

Table 58: The standardised and unstandardised regression coefficients for the variables predictive of actual use of encouraging feeds

Variable	B	SE B	β
Perceived size	-.142	.045	-3.122**
Intended breastfeeding duration	-.039	.052	-3.003**
Prenatal: BF easier	-.219	.728	-3.000*
Postnatal: BF easier	-.2.20	.739	-2.981*
Postnatal: Negative formula	-.271	.132	-2.045*
Negative feeding experience	.278	.136	2.004*
Disadvantages mother	.189	.094	2.021*
Birth experience	.146	.105	1.390
Postnatal: BF healthiest	-.264	.195	-1.356
Advantages mother	-.098	.075	-1.315
Positive experience	-.162	.171	-.952
Postnatal: BF normal	-.144	.181	-.795
Intended schedule	.125	.204	.613
Advantages infant	-.024	.055	-.443
Informed	.049	.157	.313
Intended encourage	-.027	.163	-.164
Actual breastfeeding duration	.001	.013	.090

Pearson's r: * $p < 0.05$, ** $p < 0.001$

B = Unstandardised coefficient; SEB = Standard error of Unstandardised coefficient; β = Standardised Beta

For scheduling feeds, the model explained 38.5% of the variance, [F (18, 95) = 4.302, $p < 0.001$]. A high use of scheduling feeds was associated with a high level of intended use of scheduling feeds, a low number of disadvantages listed prenatally for breastfeeding for the infant, a high number of disadvantages listed prenatally for the mother and a shorter breastfeeding duration (Table 59).

Table 59: The standardised and unstandardised regression coefficients for the variables predictive of actual use of scheduling feeds

Variable	B	SE B	β
Intended use of schedule	.373	.117	3.178**
Advantages: infant	-.084	.032	-2.616*
Disadvantages: mother	.123	.054	2.259*
Actual breastfeeding duration	-.194	.092	-2.112*
Intended encouraging feeds	.009	.007	1.200
Postnatal: Negative formula	-.090	.077	-1.171
Birth experience	-.063	.059	-.109
Prenatal: Negative formula	.060	.064	.935
Advantages: Mum	-.040	.045	-.891
Negative experience	.064	.076	.836
Postnatal: BF Healthier	-.090	.113	-.096
Birth weight	-.039	.052	-.067
Positive experience	-.070	.097	-.720
Intended breastfeeding duration	-.004	.015	-.281
Postnatal: BF easier	-.011	.071	-.153
Postnatal: BF norm	.016	.105	.150
Prenatal: BF Healthier	.011	.110	.101
Informed	-.005	.090	-.052

Pearson's r: * $p < 0.05$, ** $p < 0.001$

B = Unstandardised coefficient; SEB = Standard error of Unstandardised coefficient; β = Standardised Beta

For breastfeeding duration, the model explained 49.3% of the variance [F (25, 77) = 3.997, $p < 0.001$]. A longer breastfeeding duration was associated with a high prenatal belief that breastfeeding was normal, a low score on the negative experiences of feeding, a high score on the positive experiences of feeding, a low intended use of scheduling feeds, a low actual use of scheduling feeds, quick skin to skin contact with the infant, a postnatal belief that breastfeeding is normal and low levels of dieting during pregnancy (Table 60).

Table 60: The standardised and unstandardised regression coefficients for the variables predictive of actual breastfeeding duration

Variable	B	SE B	β
Prenatal: BF norm	4.159	1.275	3.262**
Negative experience	-4.025	1.330	-3.026**
Positive experience	5.479	1.924	2.848**
Intended use of schedule	-5.296	1.961	-.2701**
Actual use of schedule	-4..754	1.895	-2.509
Skin to skin	-.084	.035	-2.417
Postnatal: BF norm	-5.569	2.236	-2.395
Dieting during pregnancy	-3.525	1.608	-2.192*
Intended encouragement	-3.398	1.686	-1.896
Informed	2.779	1.556	1.786
Prenatal: Easy	14.942	8.383	1.782
Birth experience	2.228	1.293	1.723
Postnatal: BF easier	14.014	6.519	1.645
First feed	-.032	.020	-1.91
Advantages: Mum	1.170	.799	1.463
Postnatal: BF healthier	2.436	2.035	1.197
Intended BF duration	-.380	.509	-.746
Postnatal: Negative formula	-.857	1.398	-.613
Emotion: Prepared	.581	1.006	.578
Actual encourage feeds	-.613	1.066	.0575
BMI	.105	.205	.510
Prenatal: Negative formula	-.248	1.057	-.235
Advantages: Infant	-.109	.508	-.215
Disadvantages: Mum	-.204	1.030	-1.98

Pearson's r: * $p < 0.05$, ** $p < 0.001$

B = Unstandardised coefficient; SEB = Standard error of Unstandardised coefficient; β = Standardised Beta

Question ten: Do intended levels of encouraging and scheduling feeds change over time? Which factors influence this change?

Participants indicated intended levels of encouraging and scheduling feeds when they were pregnant. Actual behaviour during the first six months postpartum was measured at around six months postpartum. Differences between prenatal and postnatal measures were examined alongside possible influences upon any significant change.

Two methodological adjustments were made for these analyses. Firstly, where variables were not categorical (e.g. factor scores for the belief that feeding was an positive experience), the median split was used to categorise the variable into two levels; high and low. Secondly, using the z scores from the factor analysis of encouraging and scheduling feeds was not appropriate for an analysis of variance for the entire sample. Although the intention scores were saved from the factor analysis from the larger prenatal sample, the mean score remained close to zero. Likewise, the mean value of the postnatal control measures was zero making an analysis of variance comparison flawed. Therefore the computed scores based on the mean value of those items loaded highly on the factor were used for comparison.

Encouraging feeds

For the sample as a whole, actual use of encouraging feeds was significantly higher than intended use of encouraging feeds $F(1, 113) = 17.357$, $p < 0.001$. Significant interactions were seen for a number of variables. These were based around

- Breastfeeding duration
- Experience of birth
- Infant characteristics
- Experience of breastfeeding.

Firstly, changes in use of encouraging feeds were seen for actual breastfeeding duration. Mothers who breastfed for six months or more showed little difference in their pre and post natal scores. Both mothers who formula fed from birth or who breastfed for six weeks or less showed significant increases in their actual level of encouraging feeds in comparison to their planned levels (Table 61). In addition, differences in use of encouragement to feed between mothers who reached their intended breastfeeding duration and those who did not reach this target were examined. Mothers were split into three groups; those who breastfed for as long as they intended (n = 65), those who breastfed for a shorter duration than intended (n = 45) and those who breastfed for a longer duration than intended (n = 6). As so few mothers breastfed for a longer duration than intended, for the purpose of this analysis they were grouped with those who breastfed for as long as they intended.

Changes in use of encouraging feeds were dependent upon whether mothers reached their target duration of breastfeeding. Mothers who did not reach their breastfeeding target increased their use of encouraging feeds significantly more than those who did reach this target (Table 61).

Table 61: Differences in intended and actual use of encouraging feeds by breastfeeding duration (showing mean and standard error of the mean)

Factor	Group	Intended encourage	Actual Encourage	Significance
Actual breastfeeding duration	Formula	2.85 (.199)	3.53* (.270)	$F(2,111) = 3.218$, $p < 0.05$
	BF ≤ 6 weeks	2.57 (.119)	3.38** (.161)	
	BF ≥ 26 weeks	2.39 (.117)	2.55 (.159)	
Reached breastfeeding target	Reached	2.48 (.099)	2.78 (.136)	$F(1, 112) = 4.952$, $p < 0.05$
	Did not reach	2.62 (.125)	3.48** (.172)	

Significant change * $p < 0.05$, ** $p < 0.001$

Secondly, factors surrounding the birth were associated with a change in use of encouraging feeds (Table 62). Mothers who described a negative birth experience increased their use of encouraging feeds significantly more than mothers who described a positive or neutral birth experience. Moreover, experiencing any skin to skin contact was associated with a significantly smaller increase in encouraging feeds compared to those who did not experience skin to skin contact.

Table 62: Differences in intended and actual use of encouraging feeds by birth experiences (showing mean and standard error of the mean)

Factor	Group	Intended encourage	Actual encourage	Significance
Birth experience	Positive	2.46 (.100)	2.72 (.135)	$F(1, 112) = 6.424$, $p < 0.05$
	Negative	2.65 (.123)	3.56** (.167)	
Skin to Skin	Yes	2.51 (.085)	2.91* (.117)	$F(1, 112) = 20.503$, $p < 0.001$
	No	2.69 (.196)	3.80** (.270)	

Significant change * $p < 0.05$, ** $p < 0.001$

Further differences in a change between planned and actual use of encouraging feeds occurred in interaction with infant characteristics (Table 63). Mothers who perceived their infant to be small increased their use of encouraging feeds significantly more than those who perceived their infant to be larger. Furthermore, mothers of male infants increased their use of encouragement significantly more than mothers of female infants. This interaction was not explained by birth weight.

Table 63 Differences in intended and actual use of encouraging feeds by infant characteristics (showing mean and standard error of the mean)

Factor	Group	Intended encourage	Actual Encourage	Significance
Perceived size	Smaller than average	2.65 (.198)	3.70** (.225)	F (2, 111) = 4.877, p < 0.01
	Average	2.45 (.113)	2.95* (.109)	
	Larger than average	2.51 (.127)	2.55 (.144)	
Gender	Male	2.41 (.108)	3.29** (.153)	F (1, 112) = 9.540, p < 0.01
	Female	2.67 (.110)	2.81 (.156)	

Significant change * p < 0.05, ** p < 0.001

Infant feeding patterns were also associated with changes in use of encouragement to feed (Table 64). Mothers whose infant fed less frequently increased their use of encouragement to feed significantly more than those whose infant fed more frequently. Moreover, mothers who chose to employ a schedule to feed their infant rather than feeding on demand, increased their use of encouragement to feed significantly more.

Table 64: Differences in intended and actual use of encouraging feeds by infant feeding patterns (showing mean and standard error of the mean)

Factor	Group	Intended encourage	Actual Encourage	Significance
Frequency	Two hourly	2.17 (.133)	2.33 (.183)	F (2, 111) = 3.813, p < 0.05
	Three hourly	2.75 (.111)	3.28* (.152)	
	Four hourly	2.61 (.156)	3.73** (.215)	
Feeding schedule	Schedule	2.63 (.149)	3.54** (.206)	F (1, 112) = 4.232, p < 0.05
	Demand	2.50 (.092)	2.76 (.127)	

Significant change * p < 0.05, ** p < 0.001

Finally, experience of infant feeding was associated with changes in use of encouragement to feed (Table 65). Mothers who scored highly on the negative aspects of feeding significantly increased their use of encouragement compared to those who scored lowly. Similarly, those who scored lowly on the negative aspects of feeding significantly increased their use of encouragement compared to those who scored highly. Finally, those who scored lowly on the postnatal attitude 'breastfeeding as easier' significantly increased their use of encouragement to feed compared to those who scored more highly . No significant interaction was seen for any of the other variables. Notably, changes between planned and actual use of encouragement to feed did not interact with any prenatal measure.

Table 65 Differences in intended and actual use of encouraging feeds by experience of feeding (showing mean and standard error of the mean)

Factor	Group	Intended encourage	Actual Encourage	Significance
Negative experience	High	2.57 (.115)	3.39** (.167)	F (1, 95) = 6.328, p < 0.05
	Low	2.39 (.114)	2.55 (.166)	
Positive experience	High	2.44 (.115)	2.66 (.169)	F (1, 91) = 5.261, p < 0.024
	Low	2.52 (.122)	3.36** (.179)	
Postnatal: Easy	Easy	2.31 (.106)	2.59 (.146)	F (1, 111) = 4.047, p < 0.05
	Difficult	2.74 (.106)	3.51** (.147)	

Significant change * $p < 0.05$, ** $p < 0.001$

Scheduling feeds

For the sample as a whole, no significant difference was seen between intended use of scheduling feeds and actual use of scheduling feeds . The mean scores for intended and actual use of scheduling feeds are shown below in Table 66 .

Table 66 Intended and actual use of scheduling feeds by actual breastfeeding duration (showing mean and standard error of the mean)

Group	Intended schedule	Actual schedule	Significance
Formula	3.35 (.155)	3.42 (.164)	F (1, 116) = .442, p > 0.05
BF ≤ 6 weeks	2.59 (.091)	2.64 (.097)	
BF ≥ 26 weeks	2.23 (.089)	2.26 (.095)	

Furthermore, out of all the variables, significant interactions with scheduling feeds were only found for two variables (Table 67). Firstly, mothers who felt less informed during pregnancy increased their use of scheduling feeds significantly more than mothers who felt more informed. Secondly, mothers who experienced high levels of negative factors associated with feeding increased their use of scheduling feeds more than those who had a lower score on this variable .

Table 67 Differences in intended and actual use of scheduling feeds by significant interactions (showing mean and standard error of the mean)

Factor	Group	Intended encourage	Actual Encourage	Significance
Informed	Low	2.30 (.092)	2.5 (.102)	F (1, 114) = 7.446, p < 0.01
	High	2.89 (.092)	2.45* (2.65)	
Negative experience	Low	2.40 (.091)	2.30 (.099)	F (1, 98) = 4.038, p < 0.05
	High	2.36 (.091)	2.71* (.099)	

Significant change * p < 0.05, ** p < 0.001

5.3. Discussion

The aim of this study was to examine the interaction of maternal prenatal intention to encourage and schedule milk feeds with actual experience of events during pregnancy, birth and the postnatal period. Specifically did prenatal intention to control feeds predict actual use of maternal control during milk feeding or did experience surpass planned behaviour? The findings generally echoed and support those of studies two and three. However, a longitudinal design also provideed important further support for the relationships between breastfeeding and control through allowing the comparison of prenatal and postnatal influences.

A number of pertinent issues were raised by the study. Firstly, the modified CFQ used in the context of milk feeds and modified for retrospective reports again produced the factors of scheduling and encouraging feeds. These factors were based on similar clusters of items found in studies two and three and once more showed resemblance to the factors of restriction and pressure to eat produced by the original CFQ (Birch et al. 2001). Furthermore, as in studies two and three reports of scheduling and encouraging feeds were not significantly associated with each other suggesting two separate behaviours. Again, significant differences in use of scheduling and encouraging feeds were found according to actual breastfeeding duration. Mothers who breastfed for at least six months used lower levels of both behaviours than mothers who breastfed for six weeks or less or who formula fed from birth. In addition, mothers who breastfed for six weeks or less used lower levels of control compared to mothers who formula fed from birth.

Attitudes surrounding the infant-led nature of breastfeeding were also again associated with both breastfeeding duration and use of encouraging and scheduling feeds. As in studies two and three, two main clusters of attitudes emerged. Scheduling feeds was associated with beliefs about the difficulties and inconvenience of breastfeeding for the mother and suggested a desire to schedule feeds in order to allow routine and maintain lifestyle. Encouraging feeds was again associated with concerns about the difficulty of breastfeeding and maternal low confidence. Once more it appears that mothers may desire a high level of control during milk feeding for reasons of convenience or anxiety, which is incompatible with the infant-led nature of breastfeeding. Desire for control may be hindering women from initiating breastfeeding at birth or preventing them from carrying on past the first few weeks.

The results provide further support for a central idea which emerged in previous studies. Namely, maternal use of encouraging and scheduling feeds appear to be two separate behaviours with different factors triggering their occurrence. Moreover, the current study suggests that whilst both control behaviours are identifiable and measurable prenatally, encouraging feeds appears to be affected by postnatal experience whilst scheduling feeds appears to be more stable. The first line of evidence for this argument was the finding that whilst prenatal intention to schedule feeds was associated with actual breastfeeding duration, prenatal intention to encourage feeds was not. Although postnatal use of encouraging feeds (and scheduling feeds) was associated with actual breastfeeding duration, intention to encourage feeds did not remain predictive of actual use of encouraging feeds. Moreover in the first regression analysis (Table 6: intention to schedule feeds, actual use of scheduling feeds, actual use of encouraging feeds) the two factors that remained predictive of breastfeeding duration were prenatal intention to schedule feeds and postnatal actual use of encouraging feeds. It appears that encouraging feeds may be dependent on postnatal experience whilst scheduling feeds is a behaviour pattern determined by factors present prior to the birth and actual experience.

Secondly, in the overall regression analyses, different variables remained predictive of actual use of scheduling and encouraging feeds. The largest predictor of actual use of scheduling feeds was intended use of scheduling feeds suggesting a clear association independent of experiential factors between the two. Furthermore, the number of advantages to the infant and the number of disadvantages to the mother listed prenatally remained significant. Mothers who believed there were few advantages to the infant of breastfeeding yet high numbers of disadvantages to the mother were more likely to report high levels of scheduling feeds. If mothers hold these attitudes alongside a desire to feed to a schedule, it is unsurprising that they choose to formula feed from birth or to breastfeed for only a short duration of time. In order to breastfeed for a longer duration they would have to alter their control beliefs for a method of feeding they do not believe to be highly beneficial.

Encouraging feeds was associated with different measures in the regression analysis. Whilst prenatal measures predicted actual use of scheduling feeds, postnatal experiences predicted actual use of encouraging feeds. Higher levels of encouragement to feed were associated with perceiving the infant to be smaller,

beliefs that breastfeeding was difficult, a negative feeding experience and high levels of reasons why breastfeeding is disadvantageous to the mother. The predictive variables are therefore mostly related to experiences of feeding the infant suggesting that difficulties feeding may lead to mothers encouraging their infant to feed more often, possibly as a consequence of low confidence. A prenatal belief that breastfeeding was difficult and held greater numbers of disadvantages also remained predictive of use of encouraging feeds however, suggesting that low confidence may start prenatally. Identifying those mothers low in confidence during pregnancy and targeting support appropriately, may have beneficial effects upon maternal use of control and breastfeeding duration.

The largest predictor of encouraging feeds was smaller perceived size of the infant. This supports previous research in the area showing that mothers increase pressure to eat if their preschool children are underweight (Francis et al. 2001; Galloway et al. 2003). The association of this variable with encouraging feeds also echoes findings of both studies two and three suggesting an important influence upon use of encouraging feeds. Notably, it is perceived size rather than birth weight or gestation that predicts encouraging feeds. As so much emphasis is placed on weight gain during the postpartum period (Haslam et al. 2006; Wright & Weaver, 2007) , it is likely that mothers who perceive their infant to be smaller than average could become concerned that their infant is not consuming enough milk. In combination with the finding that breastfed infants are on average smaller than formula fed infants, this could further promote use of encouraging feeds. This is a difficult task however with a breastfed infant as firstly the amount consumed cannot be easily tracked and secondly, unlike with formula feeding, it is difficult to persuade a breastfed infant to consume more milk than is needed (Wiessinger, 1998). It is likely that these concerns may therefore lead to formula use where feeds can be measured and tracked and infants appear to gain more weight (Dewey et al. 1993).

Further support for the separation of scheduling and encouraging feeds into two distinct behaviours came from the results of the repeated measures ANOVA's. In terms of scheduling feeds, no significant difference in prenatal intention to schedule feeds and actual use of scheduling feeds was reported for the whole sample. Beliefs regarding use of scheduling feeds appeared to remain stable over time and experience. Moreover, only limited variables interacted with any changes in intended and actual use of scheduling feeds. The picture was much more complicated however

for encouraging feeds. For the sample as a whole, encouraging feeds increased over time. Moreover, significant interactions with this change were seen dependent on experience. In particular, variables which measured experiences which could impact upon maternal confidence showed the greatest interactions. Notably no significant interactions were between use of encouraging feeds and prenatal measures.

Firstly, a change between intended and actual use of encouraging feeds interacted with breastfeeding duration. Mothers who breastfed for six months or more showed little change in their use of encouragement to feed. This further challenges the argument put forward by authors such as Taveras et al. (2004) that experience of breastfeeding helps the mother develop an infant-led approach to breastfeeding. Instead whilst mothers who breastfed for six months or more reported using similar levels of encouragement to feed as they intended to use prenatally, mothers who formula fed increased their use of encouraging feeds. As formula milk is measurable and visible and it is possible to encourage and infant to consume more milk than required (Wiessinger, 1998), perhaps mothers who formula fed could more easily adopt a mother-led method in feeding their infant. If mothers who formula fed had concerns that not enough milk was being consumed then they could increase the amount they presented to their infant.

Consistent with this notion, encouraging feeds increased the most in those who breastfed for six weeks or less. Due to the associations of encouraging feeds, perceived size and negative feeding experiences revealed in the regression analysis, it seems likely that these mothers struggle with breastfeeding precisely because of its infant-led nature. Speculatively, due to their negative experiences or low confidence, they may worry about perceived lack of milk, weight gain and milk intake and try to increase feeds which is very difficult in a breastfed infant. As a consequence they may become more anxious and switch to formula milk, continuing their attempts to encourage milk intake. Formula milk allows the mother to encourage the infant to consume more milk (and therefore perhaps gain more weight) and thus the mother may believe her method is working and continue encouraging feeds. This idea echoes previous work examining use of restriction with children with little autonomy to access food themselves. Here, a high level of restriction with two year old children reduced weight overtime (Farrow & Blissett, 2008; Grubbels et al. 2008). In the short term this could appear to be a successful strategy as the child cannot access their own foods but could have negative long term consequences in terms of self regulation and

food salience. Similarly in the current study, encouraging feeds using formula may increase intake in young infants who may benefit from initial weight gain but this may have long term consequences in terms of increased risk of later overweight (Ong et al. 2000; Toschke et al. 2005).

The argument that experiencing difficulties with breastfeeding can increase use of encouragement to feed is further supported by the interaction with intended breastfeeding duration. Mothers who did not breastfeed for as long as they planned to increased their use of encouraging feeds significantly more than those who breastfed for as long as intended. Again, it is possible that mothers want to breastfeed but struggle with the immeasurable infant-led nature of breastfeeding or perceived poor weight gain and try to encourage intake of milk. This is difficult in a breastfed infant leading to the mother introducing formula milk where the mother can have more control over intake.

Interactions also occurred with experiences surrounding the birth and postnatal period. Mothers who had a negative birth experience or did not experience skin to skin contact increased their encouragement to feed significantly more than mothers experiencing a positive birth or who had skin to skin contact. It is likely that a lack of skin to skin contact is closely related to complications surrounding the birth and a negative birth experience. Both are likely to raise general concern and anxiety which may impact upon maternal confidence during feeding. Moreover, a difficult birth experience could be associated with complications with the infant and indeed, those who reported a negative birth experience were significantly more likely to perceive their infant as smaller. All in all it is likely that events surrounding the birth may raise concerns and decrease confidence in the mother. This may make the infant-led nature of breastfeeding difficult to follow or she may want to be structured in her feeding and parenting in general to regain a level of control. Formula appears to offer both this opportunity for control and sense of security in knowing the infant is consuming milk and gaining weight.

Significant interactions were also seen for experience of feeding. Specifically, mothers who scored lowly on the factor 'enjoyment of feeding' or highly on 'difficulty of feeding' increased their use of encouraging feeds significantly more. Likewise, mothers who rated breastfeeding to be more difficult postnatally increased their use of encouraging feeds. Again, it appears that encouraging feeds may be born

out of anxiety or concern for the infant. Mothers who experience difficulties feeding want to increase their control of feeding patterns which is incompatible with breastfeeding.

Infant characteristics also showed significant interactions with encouraging feeds. Again, perceived size played a role. Mothers who perceived their infants to be significantly smaller increased their use of encouraging feeds significantly more than mothers who perceived their infant to be larger. Moreover, feeding pattern impacted upon mother's use of control. Infants who fed less frequently led to mothers increasing their use of encouraging feeds. It is probable that infants who are smaller and less alert may raise concern in mothers that the infant is not receiving enough milk. Formula which can be measured and consumption viewed may alleviate these concerns.

Several studies have highlighted the association of breastfeeding during the first year and a later feeding style which is low in control (Fisher et al. 2000; Taveras et al. 2004; Blissett et al. 2007). Explanations for this association have often centred around the idea that breastfeeding encourages an infant-led feeding style to develop. Through experience of breastfeeding; feeding on demand to an irregular routine and not being able to measure or view amount consumed (Dewey et al. 2001); the mother develops a feeding style where the infant is in control and allowed to self regulate. It has been proposed that mothers who breastfeed therefore adopt a feeding style which is more infant-led than mothers who formula fed. However, although in all three studies breastfeeding duration was found to be inversely associated with maternal use of control, several findings challenge this straightforward concept. Rather than experience of breastfeeding determining maternal control, perhaps maternal control drives breastfeeding duration. Firstly, differences in intention to control feeds are present before birth and are associated with intended and actual breastfeeding duration. Mothers appear to hold at least speculative beliefs about the level of control they will exert over their infants feeds with this level of control associated with intended breastfeeding duration. Mothers who desire a high level of control appear to choose to formula feed whilst those with lower levels of intended control want to breastfeed. Mothers who have a high level of control but wish to initiate breastfeeding do so, but appear not to be able to follow the infant-led feeding style associated with breastfeeding.

Secondly, the main predictor of postnatal use of scheduling feeds is prenatal intention to schedule feeds. This suggests that scheduling feeds may be part of a dispositional trait for control rather than being affected by experience. Mothers have a view of how they want to feed their infant in terms of routine and this appears to be stable regardless of experience. Experience of breast or formula feeding does not change this attitude.

Thirdly, for the sample as a whole, use of encouraging feeds *increases* over time, in particular for those who formula feed from birth or who breastfeed for a short duration of time. Notably for those who breastfed for at least six months, no significant change was seen between intended and actual use of control suggesting that it stays stable for this group. However, for those who only breastfeed for a short duration, an increase in control was seen. This appears to happen in reaction to negative experiences or difficulties feeding which raise concern. Thus the relationship between breastfeeding and low maternal control is not explained through experience of breastfeeding decreasing control but perhaps anxiety in the first few months postpartum affecting both maternal use of control and breastfeeding duration. Mothers who become concerned about their infant want to increase their use of encouraging feeds which is incompatible with breastfeeding duration. In addition to this, mothers who formula feed from birth also increase their level of control. It is possible that following a method where feeds are measurable and visible, tempts mothers to enrage their infant to consume more milk (Wiessinger, 1998). Thus formula milk becomes associated with an increased level of control rather than breastfeeding being associated with a decreased level of control per se.

There are limitations to this study, which could be addressed in future research. As in previous chapters these are presented briefly here and given full consideration in the general discussion. One possible issue is the size of the sample who completed phase two. Although similar in demographics and breastfeeding intention to those who completed phase one, the sample is relatively small. Sub groups were large enough for most analyses but it would have been interesting to examine the influences upon those who breastfed for longer than planned for example. Only 7 participants came into this category making any analysis difficult. Again, the sample was skewed towards those who breastfed for at least six months but the remaining groups were large enough to perform the required analyses.

Limitations aside, this study adds important findings to those suggested by studies one to three. It supports the idea that maternal control is measurable with regard to milk feeding and identifies two main behaviours; scheduling and encouraging feeds. Analysis of the patterns of attitudes and experiences associated with these again supports the idea of two separate behaviours born out of maternal concerns. Scheduling feeds appears to be based around maternal centred concern for routine and structure to day to day life whilst encouraging feeds appears to be based on infant centred concerns of milk intake and weight gain. Importantly the longitudinal design of the study suggests that whilst scheduling feeds appears to be a stable desire measurable prenatally, encouraging feeds appears to be a consequence of anxieties rising from negative experiences during the birth or postnatally.

In summary:

- Maternal use of encouraging and scheduling feeds was measurable with regard to milk feeds. Both behaviours were inversely associated with breastfeeding duration.

- Encouraging and scheduling feeds are two separate behaviours. Each is associated with different attitudes and experiences

- Scheduling feeds is associated with maternal centred concerns about impact upon lifestyle whilst encouraging feeds is associated with infant centred concerns about weight gain and milk intake.

- Both behaviours are measurable prenatally. Intention to schedule feeds is the largest predictor of actual use of scheduling feeds.

- Encouraging feeds is not predicted by intention to encourage feeds. Instead experiences surrounding birth, feeding and infant characteristics are associated with actual use of encouraging feeds.

- Whilst no significant difference was seen between intended and actual use of scheduling feeds, encouraging feeds increased for the sample as a whole over time.

- Mothers who breastfed for at least six months remained stable in their use of encouraging feeds. Mothers who formula fed or breastfed for six weeks or less increased their actual use of encouraging feeds with the biggest increase seen in those who stopped breastfeeding.

- An increase in encouraging feeds was further associated with a negative birth experience, feeding difficulties and concerns about infant weight gain and milk intake.

Chapter 6

General Discussion

This thesis set out to investigate why breastfeeding during the first year postpartum is associated with lower levels of maternal control when the child is eating solid foods (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al, 2004). Although a number of studies have shown later levels of maternal control to be associated with breastfeeding duration,, there has been no examination of why this relationship occurs. The aim of this research project was to explore whether the infant-led nature of breastfeeding encouraged a child-led feeding style to emerge (Taveras et al. 2004) and/or how maternal individual differences may influence the decision to breast or formula feed and hence later maternal control (Farrow & Blissett, 2006a).

A number of key findings were produced providing support for the notion that maternal disposition may drive both breastfeeding duration and later level of control.

1. Maternal control behaviours were identified in relation to milk feeding with intention to control measurable prenatally.

2. Two distinct and separate maternal control behaviours were identified; scheduling and encouraging feeds.

3. Breastfeeding duration was inversely associated with levels of scheduling and encouraging feeds.

4. Scheduling and encouraging feeds were associated with separate patterns of attitudes and beliefs. Scheduling feeds was associated with maternal-centred concerns that breastfeeding was inconvenient and that formula fed infants were more content whilst encouraging feeds was associated with infant-centred concerns that breastfeeding was difficult and that the infant was not gaining enough weight.

5. Actual use of scheduling feeds was predicted by intended use of scheduling feeds and appeared to be a stable behaviour. Although intention to encourage feeds was identified prenatally, actual experience, particularly negative experiences and concern for infant size, predicted actual use of encouraging feeds.

These data confirm that maternal control behaviours can be identified earlier than previously thought. Mothers are exerting control over their infants milk feeding pattern. Furthermore, mothers who are pregnant for the first time, with no experience of feeding their own infant, have specific beliefs and expectations about the level of control they desire to have over their infants feeding pattern. This desire for control may influence breastfeeding initiation and duration. Mothers who desire a high level of control choose to formula feed from birth or to only breastfeed for a short duration of time. This desire stems from mother or infant centred concerns about the infant-led nature of formula feeding. Maternal control, rather than being shaped by experience of infant-led breastfeeding may therefore be a dispositional trait predicting both breastfeeding duration and later levels of control. The key question to emerge from these findings is therefore how do levels of maternal control present during milk feeding map on to later levels of control following the transition to solid foods?

The control behaviours of scheduling and encouraging feeds emerged from the modified CFQ. Scheduling feeds mirrored the later behaviours of monitoring and restricting feeds as identified by the CFQ and was based on questions such as 'I kept track of the amount of milk my baby consumed' (Birch et al, 2001). Intention to schedule milk feeds predicted actual use of scheduling feeds which raises the question of whether this behaviour will be stable through the transition to complementary foods and later feeding. Restriction over later child diet is associated with concerns about child overweight (Francis et al. 2001; Musher-Eizenman et al. 2007), however it is unlikely that mothers worry about infant overweight during the first six months postpartum, rather they are concerned about impact of feeding upon maternal lifestyle. Does scheduling feeds during infancy therefore have any relation to later maternal restriction or does it relate only to monitoring behaviour? Alternatively do mothers of a controlling disposition who want a strict routine during infancy go on to restrict their child's intake of food as they generally desire a high

level of control over their child? Do underlying personality factors or perhaps overall parenting style predict use of controlling feeding practices from infancy and into later child feeding? A longitudinal study tracking how this behaviour develops when solid foods are introduced would help to elucidate the relationship between early infant-feeding and later child-feeding.

Encouraging feeds was based on similar behaviours as later use of pressure to eat and tapped into items such as 'I was worried about my baby becoming underweight'. Both behaviours appear to be driven by concerns for child weight and intake of nutrients. Although intention to encourage feeds is evident prenatally, it is maternal postnatal experiences that predict actual use of encouraging feeds. In particular this behaviour was prevalent amongst mothers who perceived their infant to be smaller than average. Later studies show that mothers display different levels of pressure to eat in reaction to sibling weight and eating style (Brann & Skinner, 2005; Francis, Hofer & Birch, 2001; Keller et al. 2006). This supports the notion that this behaviour may be dependent on individual experience. How this relates to long term feeding style is interesting. Does this behaviour, once established remain stable or does experience continue to affect it? If a smaller infant gains weight does anxiety decrease or do mothers continue to encourage feeds? Formula milk is associated with greater growth and weight gain (Armstrong et al. 2002), thus the breastfeeding mother who becomes anxious about her infants size may use formula and have her behaviour reinforced as the infant gains weight. What is the long term consequence of this? Also, whereas the first year postpartum is associated with emphasis on weight gain (Haslam et al.2006), concerns about overweight and obesity become more relevant in later childhood (Lobstein et al. 2004). How does this impact on maternal use of encouraging feeds? Do mothers who encourage their infant to feed more frequently and worry about weight gain in the first year still hold these concerns when leanness is emphasised?

6.1. Key conclusions

Maternal control appears to be a dispositional trait which drives both breastfeeding duration and potentially later control over child diet. Desire for control is based either on maternal-centred desire for routine and organisation or infant-centred anxiety that the infant is not consuming enough milk and gaining enough weight. Mothers with a high control trait choose to formula feed from birth or to only breastfeed for a short duration in order to gain the health benefits of breastfeeding.

An intermediate level of control may be associated with initiating breastfeeding but only for a short duration. Mothers may either struggle with following an infant-led feeding pattern or attempt to control feeding patterns thus compromising milk supply. Thus the later association between lower levels of maternal control and breastfeeding during the first year postpartum (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2008; Fisher et al. 2000; Taveras et al. 2004) can be explained through a maternal trait for control rather than experience of infant-led breastfeeding modifying maternal control behaviours. Potentially, mothers who are at risk of struggling with the infant-led nature of breastfeeding could be identified prenatally and educated as to the importance and normality of the mechanisms and patterns of breastfeeding.

6.2. Reliability of measures used

The area under investigation was novel and therefore no pre existing measures could be found to identify maternal use of control during milk feeding. The CFQ is an extensively used validated questionnaire to explore maternal control over older childrens eating but has a suggested age range of 2 to 11 years and has only been used to explore maternal control in relation to a solid diet predominantly in children over the age of twelve months (Birch et al. 2001). The underlying concepts of the CFQ, particularly the scales of restriction and pressure to eat, targeted the behaviours under investigation in this thesis. Rather than constructing a completely new questionnaire it was therefore decided to modify the existing CFQ to be used in relation to milk feeds. Indeed the majority of the questions could easily be applied to milk feeding and changing the tense of the questions to measure retrospective or future behaviour was straightforward. For example the CFQ item 'I have to be especially careful to make sure my child eats enough' was easily translated to 'I had to be careful to make sure my child drank enough'. Items were chosen from the questionnaire which could be applied to milk feeding excluding those that targeted behaviour relevant to older children such as the use of food as a reward. It is common in the current literature to find that studies make use of a selection of scales from the CFQ rather than using the complete measure. Where possible all items from a scale were therefore translated to be used in relation to milk feeding.

Scoring advice is given for the CFQ based on extensive validation. However as the questionnaire had been modified it was decided not to follow these groupings but to conduct a factor analysis on each questionnaire. This gave similar groupings to those

of the CFQ suggesting that common behaviours were being targeted. The items grouped well with clear factors emerging. When a cut off of 0.5 was used there was little, if any, sharing of factors by the different items. Regression scores were saved as variables to use for comparison.

In addition Cronbach's Alpha was computed for each scale. For each version of the modified CFQ cronbach's alpha was high ranging from .7 to .8 for the items schedulging feeds, encouraging feeds and use of milk for comfort suggesting internal consistency. Each time however the value of .5 was computed for perceived responsibility suggesting a low reliability. However, further analyses were not conducted for this item as it was not a target behaviour. Secondly, as discussed below, it is possible that perceived responsibility for feeding is not relevant as a behaviour with regard to young infants. At this stage it is likely that the primary caregiver has almost full responsibility for feeding the infant and they do not receive many feeds in settings outside the carers control. Finally, only two items made up this scale. Scales with large numbers of items are more likely to give high values (Cortina, 1999). Perhaps further versions of the questionnaire might target a greater number of items for this scale. Ideally future use of the questionnaire would be conducted after validation of the questionnaire upon different samples.

The same principles apply for the new scales that were produced in order to measure attitudes, experience and confidence. New scales were used as no validated measures covered the items that needed to be explored. Items were however based both on findings from the qualitative exploration used in study one and existing themes in the current literature. Again factor analysis were conducted for each of these items and the regression scores saved to be used in each of the analyses. Cronbach's alpha were computed with scores for each scale generally showing high consistency with values between .7 to .8 or .9 in some cases. Ocassionally a value was lower at .6. However Kline (1999) notes that in psychological research values below .7 can sometimes be expected due to the diversity of the behaviours being measured. This however applied in a minority of cases. Again future work should ideally be conducted after validation of these scales upon different samples.

6.3. Limitations

The research examined a previously unexplored area of the literature pertaining to maternal control and child weight and eating style. It raised possible explanations for the association between breastfeeding and later lower levels of maternal control which have as yet not been explained (Taveras et al. 2004). The findings of studies one to four complimented each other, suggesting common influences upon maternal use of encouraging and scheduling behaviour during milk feeds. Important consequences for both the development of maternal feeding style and breastfeeding duration are raised. The research however did have its limitations which are present here. Broadly these centred around sampling, employment of internet sources and the use of retrospective reports. Each of these is discussed below alongside justification for its use, suggestions for improvement, and the power of hindsight.

6.2.1. Sampling

The research was examining a new area and thus the studies were exploratory. The main aim was to gain a large sample of participants quickly and easily in order to test initial assumptions. Recruitment therefore took place in the local community and using internet sources rather than using broader NHS samples and the associated time costly ethics process. As a benefit, this method was efficient in gaining access to large numbers of participants. The disadvantage of this method however was that participants were self selecting. This presented issues in two main areas; demography of the sample and infant feeding method.

In terms of demography, a wide sample of participants was recruited, although gaps were seen in some areas. In terms of age, the sample was representative of the general population and showed a similar composition as that recruited through the Infant Feeding Survey (2007). For example, in 2007, 6.49% of all births were to mothers aged under 20 (ONS, 2007) with 7% of the Infant Feeding survey sample aged nineteen and under. Both studies three and four produced a similar sample distribution, with study two meeting similar patterns for those twenty four and under (25.45%).

In terms of education, more of a disparity was seen. Whilst 30.9% of the general population of working age have a level 4 or above qualification (higher education or above) [DIUS, 2007], around 40 - 50% of the current participants did. However, this

is likely to be affected by age of the sample. As numbers attending higher education increase (DIUS, 2007), it is likely that the percentage of individuals within the age range of the questionnaire held a higher qualification. For example, in 2007, 38.1% of those aged 25 – 29 and 39.1% of those aged 30 – 34 had a level 4 qualification and above. Indeed, 38% of mothers in the Infant Feeding Survey (2007) left full time education over the age of 19. This reduces disparity between the current sample and the general population.

In terms of socioeconomic status, a range of respondents were recruited as measured by the Welsh (WAG, 2008) and English (Noble, McLennan, Wilkinson, Whitworth, Barnes, Dibben, 2007) Indices of Multiple Deprivation. These measures categorise areas across the country based on postcode on level of relative deprivation based on a number of socioeconomic indicators. These include factors such as income, education, employment, health, housing and crime. Areas are ranked across the country on a scale from one to one hundred but skewed so that 10% of areas represent the most deprived. Participants from these areas were recruited but not at a representative level. In study two for example, only 4.4% of the Welsh participants and 3.8% of the English participants lived in the most deprived areas. However, apart from maternal age in study one, demographic factors were unrelated to maternal intended or actual use of control in any study further reducing impact. Maternal age was therefore controlled for in any related analysis.

The main sampling issue was through the high numbers of mothers who breastfed until at least six months. The Infant Feeding Survey (2007) indicated that 25% of infants in the UK are receiving any breast milk at all by 6 months postpartum (Bolling et al. 2007). In study two however, 47.2% of mothers who completed the questionnaire reported breastfeeding until at least six months. Similarly, 50.0% of participants in study three planned to breastfeed for at least six months with 43.6% of the follow up sample doing so. In addition, lower numbers than expected of mothers formula fed from birth. 9% of mothers in study two reported doing so and 14.5% in study four. 11.4% planned to do so in study three. In comparison, 24% of mothers in the UK formula feed from birth (Bolling et al. 2007).

It is likely that mothers who have an interest in the area of breastfeeding, either through success at that method or problems doing so were likely to have completed the questionnaire. This is reflected in the fact that relatively few women who formula

fed completed the questionnaire, or those who stopped breastfeeding between 6 and 26 weeks. There is also the issue of maternal guilt or cognitive discomfort. The 'breast is best' message is very clear within the UK with evidence showing that mothers who choose to formula feed from birth still understanding the health benefits of breastfeeding (McFadden & Toole, 2006). Although the questionnaire was advertised as a study 'examining experience of infant feeding', it is possible that mothers who did not choose to breastfeed do not volunteer to take part in a survey potentially examining the benefits of breastfeeding. Similar skewed numbers have been seen in other studies which used self selecting samples (Arden, 2009).

Steps were considered to rectify this disparity in duration of breastfeeding. Reducing the sample size or undertaking targeted recruitment of mothers who formula fed for example was considered but not undertaken for three main reasons. Firstly, as the study was not aiming to produce representative findings for the population but to examine differences between groups it was felt the sample spread was sufficient. Secondly, although in terms of percentage the number of mothers who formula fed from birth was low, in terms of participant numbers, the group was large enough to consider analyses of variance.

Finally, speculatively the sample size from study two was reduced and stratified to reflect the sample presented in the Infant Feeding Survey (Bolling et al. 2007). Participants were randomly removed from the dataset until 24% formula fed from birth, 48% breast-fed until 6 weeks and 25% until six months plus. Key analyses were performed and all remained significant despite the stratified sample. As this reduced the sample size by approximately 200 participants, it was decided to keep the richness of this data and perform all further analyses on the full data set.

6.2.2. Internet sources

Recruitment for both studies two and three used an element of internet recruitment. Alongside groups aimed at pregnant and new mothers in the local community, the study was advertised upon internet based parenting forums in the UK. In study two, 32.1% of the sample was recruited through the internet with 62.3% of participants recruited online for study three. Study three relied on a higher level of internet recruitment as recruiting pregnant women in community settings was a difficult task. Whereas mothers with young children are easily contacted through mother and infant groups and nurseries, primiparous pregnant women do not tend to have such groups

outside NHS settings apart from private antenatal classes. Snowball sampling was also encouraged with pregnant women passing the questionnaire onto their pregnant peers.

The use of the internet in participant recruitment is growing in the social sciences. Numerous studies have made use of online methods to conduct questionnaires, run experiments and recruit participants for face to face methods (Arden, 2009; Fraley, 2004; Vazire & Gosling, 2004; Goldberg, 2003; Rentfrow & Gosling, 2003). Using the internet for participant recruitment has the benefit of being efficient and providing access to wide samples of targeted individuals in terms of geographic location (Gosling, Vazire, Srivastava & John, 2004). Indeed, participants in all studies were located across the UK, from remote locations in the Scottish Highlands to densely populated London. Indeed, in study three it provided easy signposting to large numbers of women who were pregnant for the first time. Many of the internet parenting forums organised specific message boards for pregnant mothers due to give birth in a certain month (eg July 2008). Recruitment could therefore be targeted at precisely the required demographic.

In general, the use of the internet to seek out health information is increasing (Malone, Harris, Hooker, Rucker, Tanna & Honnor, 2004; Tuffrey & Finley, 2002). The internet also provides an avenue of support through online forums and chat rooms, especially for health related issues (Larkin, 2000). In particular, women use the internet to search for health information more than men (Sarkadi & Bremberg, 2005) with large numbers of sites aimed at parents, particularly mothers (Plantin & Danebeck, 2009). Indeed, use of the internet appears to be growing amongst pregnant and new mothers (Bernhardt & Felter, 2004). A recent survey of Midwives in the UK discovered that 91% believed internet usage amongst pregnant women to find information and support had increased with 86% recalling a pregnant woman discussing information she had found online (Lagan, Sinclair & Kernohan, 2009). Indeed, a recent study in Sweden targeting pregnant women attending antenatal clinics found that 91% had access to the internet with 84% reporting that they had used it to seek out health related information during pregnancy (Larson, 2007). Mothers report using the internet regularly to seek out information but also for support from other mothers in online parenting forums (Madge & O'Connor, 2006; Russell, 2006).

Criticisms have been made of the method however (Cline & Haynes, 2001; Mezzacappa, 2000). One criticism is that fact that internet samples are often not representative (Taylor, 2000). Internet recruitment is typically biased towards white, highly educated middle class samples (Azar, 2000) and internet access is associated with a higher level of education (ONS, 2008). However, a study investigating perceived parenting support using Sweden's largest parenting website found that respondents did not have significantly higher levels of education than the general population and actually had lower levels of income than average (Sarkadi & Bremberg, 2005). The current samples were however skewed towards those who had a higher level of socioeconomic status in terms of education, marriage and home ownership. However a range of participants did complete the questionnaires. Moreover, no significant difference was seen in socioeconomic indicators or breastfeeding duration between mothers who participated online or through the different groups in any of the studies.

Another criticism is the lower level of control afforded by internet recruitment over who takes part (Gosling et al. 2006). It is possible that individuals who did not have a child in that age range took part. It is also possible that non serious responses were made (Buchanan, 2000). Moreover, there is the possibility of the questionnaire being completed multiple times (Johnson, 2001). However, there were no significant differences in the main measures for those who were recruited on line or through traditional measures. Moreover, advertisements for the studies were posted on moderated large well publicised message boards targeting mothers who were pregnant or had young children. Membership of the boards was through registration. Individuals outside the target recruitment audience could have taken part but it is likely their impact was minimal. Furthermore, participants did not complete the questionnaire online but contacted the researcher for further information about the study and were sent a copy via email or post. With regard to the issue of multiple completions, participants provided demographic information that was unlikely to be similar to many other participants. Postcode for example was one measure collected. The dataset was checked for completion by multiple respondents at each postcode. Data for multiple entries at a postcode was checked to ensure it was not a repetition.

It is also possible that through using the internet participants are exposed to different types of information and support which may affect their behaviours (Cline & Haynes, 2001). Again however the counter argument returns to the fact that there

was no difference in measures between internet and traditional samples. Moreover, internet use is increasing in the UK suggesting both increased normality and wider access to participant recruitment drives such as this. In 2008, 65% of UK homes had internet access. Moreover, within the target sample, 93% of those aged 16 – 24 and 87% of those aged 25 – 44 had used the internet in the last 3 months (ONS, 2008). Access to the internet is therefore likely to be high in the target group.

6.2.3 Use of retrospective reports

Studies two and four each relied on maternal retrospective reports of maternal control during milk feeding. One possible criticism of this method is that retrospective reports may be open to memory errors or may be affected by current feeding behaviour. People can show memory biases based on their current experiences. Knowledge about the outcomes of an event for example can affect memory of the situations leading up to that event (Pohl, Bender & Lachmann, 2002) and Pieters, Baumgartner & Bagozzi (2006) found that remembered intentions were more closely linked to current behaviour than actual intentions.

A number of counter arguments to this criticism are presented. Firstly, study three showed that differences in desire to control feeds were present in primiparous pregnant women and followed similar patterns to the retrospective reports; intended and actual control were inversely associated with intended and actual breastfeeding duration. Attitudes towards the use of control are actually present before experience of feeding and related to retrospective reports are therefore not simply memory biases from current feeding behaviour. The concept of control during milk feeding is not simply an artefact based on later feeding experience.

Secondly age of infant at the time of questionnaire was unrelated to reported control in both studies two and four. It could be argued that mothers with an older infant would show different responses to those with a younger infant if their responses were biased by their current behaviour. However, firstly in study two, although the sample contained a spread of mothers with infants aged 6 – 24 months, the sample was weighted towards those with a younger infant. 61.7% of mothers who completed the study had an infant aged between 6 and 12 months with 96.8% having an infant aged 6 to 18 months. The modal age was 8 months. Secondly, speculatively, the sample was reduced to contain just those mothers with an infant aged 6 to 12 months (n = 350). The main findings remained significant and therefore the data from the entire

sample was used. Moreover, study two was speculative, to examine whether differences in maternal control of milk feeds were present. Therefore gaining a wider number of participants was prioritised. When the longitudinal study was conducted, the aim was to approach mothers when their infant was only 6 months old. In reality only participants with an infant aged between 6 and 12 months were used (with a mean age of completion at 7 months).

Finally, a number of other studies recalling health behaviour over much greater periods of time have relied on retrospective reports including memories of diet as a child (Batsell, Brown, Ansfield & Paschell, 2002; Brink, Ferguson & Sharma, 1999; Brunstrom, Mitchell & Baguley, 2005; Dube, Anda, Felitti, Croft, Edwards & Giles, 2001) and other health behaviours (Dube, Anda, Felitti, Croft, Edwards & Giles, 2001; Kollins, Joseph, Fuemmeler, 2005; Mondern, de Graaf & Kraaykamo, 2003). These studies involved participants recalling events that happened ten years ago or more rather than events which happened during the last few months. Moreover, examination of the accuracy of retrospective reports has found little evidence that they are unreliable (Brewin, Andrews & Gotlieb, 1999; Willett et al. 1988).

6.3 Implications of findings

The findings extend a popular area of research surrounding the development of child eating habits and overweight. They examine use of maternal control during the prenatal and postnatal period and offer speculation as to why breastfeeding may be associated with later maternal feeding style (Blisett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006; Fisher et al. 2000; Taveras et al. 2004). The research raises a number of notable issues both in the field of breastfeeding duration and maternal control of child feeding style.

6.3.1. Impact upon breastfeeding duration

Breastfeeding has been associated with numerous benefits for both infant and maternal health (Beral, 2002; Fewtrell et al. 2004; Kramer & Kramer, 2002) and the Department of Health in the UK recommends exclusive breastfeeding for the first six months postpartum, followed by breastfeeding up to a year and beyond alongside complementary foods. According to the figures from the latest Infant Feeding survey however, although 84% of women knew the health benefits of breastfeeding, 24% of women formula fed from birth, with only 25% of mothers giving any breast milk at all by six months (Bolling et al. 2007). Numerous studies however have showed that

women however choose not to breastfeed or encounter difficulties with breastfeeding for a variety of reasons. Beliefs about the inconvenience of the method, difficulty feeding, lack of support and familial and peer attitudes have all been associated with a short or absent breastfeeding duration (Li et al. 22008; Thulier & Mercer, 2009).

The current findings focused on the infant-led nature of breastfeeding and how this impacted upon breastfeeding duration. Desire to follow a maternal-led feeding schedule for maternal centred reasons was associated with scheduling feeds whilst infant centred concerns were associated with encouraging feeds. As breastfeeding is infant-led however, entailing irregular and frequent feeds with consumption difficult to measure, this appears to affect initiation and continuation of breastfeeding. Mothers choose not to breastfeed, or struggle with doing so because they cannot feed to a maternal-led schedule or measure the amount consumed. Moreover, attempts to restrict milk intake may impact upon milk supply meaning that the mother has little choice to introduce formula milk. A high level of maternal control during the postpartum period may therefore reduce breastfeeding duration and the multiple benefits that breastfeeding brings.

6.3.2. Impact upon early weight gain: Early programming of weight gain

Numerous studies have indicated that weight in infancy can have long term consequences. Infants who are overweight (Stettler et al. 2002) or who gain weight rapidly in the first year postpartum (Dennison et al. 2006) are at higher risk for overweight and obesity in childhood and adulthood. Breastfeeding however is associated with a lower risk of childhood and adult obesity (Arenz et al. 2004; Armstrong et al. 2002; Dewey, 2003; Gillman et al. 2001; Owen et al. 2005). Breastfed infants have slower weight gain during the first year postpartum compared to formula fed infants which is hypothesised to be linked to lower intake of energy (Garza & Butte, 1990) and nutrient profiles (Michels et al. 2007) compared to formula milk. Moreover it has been speculated that the infant-led nature of breastfeeding may allow greater infant self regulation of milk. Infants who are breastfed react to the changing energy density in milk, adjusting their intake accordingly (Fomon et al. 1975). Moreover, breast-fed infants have been shown to *not* take all available milk at a feed (Kent et al. 2006). Formula fed infants do not appear to make the same adjustments however (Dewey, 1998) Furthermore, as amount consumed cannot be tracked easily (Gilman et al. 2001) and breastfed infants are difficult to encourage to consume more milk (Riordan et al. 2005) mothers need

to rely on the infant to regulate intake. It has been proposed that this may lead to better self regulation of energy in the infant and a lower risk of overfeeding which may have long term consequences on eating patterns and overweight.

The findings showed that mothers who breastfeed for at least six months had the lowest levels of scheduling and encouraging feeds. It is possible therefore that this responsive feeding style allows infant self regulation of energy intake and thus stable and normal infant growth patterns. Breastfeeding may therefore serve to reduce childhood and later overweight through this mechanism (Taveras et al. 2009).

6.3.3. Long term impact upon maternal control, child eating style and overweight

Research suggests that maternal feeding style in early childhood is stable once developed (Blissett & Farrow, 2007; Faith et al. 2007). Indeed here, prenatal intention to schedule feeds was a main predictor of postnatal use of scheduling feeds. Encouraging feeds however was affected by maternal experience and subsequent impact upon confidence and maternal concern. A number of studies have highlighted the negative impact of maternal control during later childhood. Children whose mothers display a high level of control are more likely to fail to account for a preload, to overeat given free access and possibly have weight issues (Birch et al. 2003). Mothers who breastfeed during the first year postpartum however show lower levels of control over later child diet (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004). It is possible therefore that patterns present in early child feeding persist into later feeding. An early use of high levels of maternal control may impact negatively upon child eating style and overweight.

6.4. Future directions

A number of avenues for further research have arisen from the data. These can be grouped into three main areas; extension of the current findings, exploration of the association between maternal feeding style during milk feeding and later feeding and suggestions for interventions based on the findings to support mothers in the early postpartum period. In terms of extending the current research, a number of directions could be explored. The research examined a previously unexplored area of maternal control of child feeding. Based on suggestions that experience of breastfeeding is associated with later maternal control (Blissett & Farrow, 2007; Farrow & Blissett,

2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al. 2004), the use of self reports was suitable in posing initial questions surrounding the issue of maternal control during milk feeding. Further research however may benefit from more detailed examination using a range of methods.

6.4.1. Strengthening current findings

Firstly, a longitudinal study tracking the use of control during milk feeding would be pertinent to examine how feeding behaviour develops over time. It could help ascertain how experiences and attitudes influence changes in control. For example, use of control may be measured in the initial period after birth, at 6 weeks, 3 months and 6 months to track how it changes over time and the possible reasons for this. Measures could be taken of current behaviour rather than relying on retrospective reports. Here, it would be interesting to examine whether the mothers return to work after maternity leave impacts upon maternal control. Many studies cite a return to work as a reason for ceasing breastfeeding (Guendelman, Kosa, Pearl, Graham, Goodman & Kharrazi, 2009) although some mothers do continue breastfeeding once they have returned to work (Fein, Mandal & Roe, 2008). If she chooses to move her infant onto formula in preparation for her return to work what happens to her control behaviours then? What impact does an infant who is reluctant to accept a bottle have on her behaviour? If she continues breastfeeding does her behaviour change? Examining the data in study two, mothers who had returned to work at the time of the questionnaire were significantly more likely to report encouraging their infant to feed [$F(1, 625) = 3.928$, $p < 0.05$]. Furthermore pregnant mothers who planned to return to work were planning to use significantly higher levels of encouraging feeds [$F(1, 357) = 13.486$, $p < 0.001$] with planned use of encouraging feeds significantly inversely associated with age of infant at planned time of return to work (Pearson's $r = -.103$, $p < 0.05$). Notably, these relationships were not dependent on breastfeeding duration. It appears that concerns about return to work may impact upon use of control as mothers consider whether their infant will be consuming enough milk upon their return.

Secondly, the research would benefit from observations of maternal feeding style rather than simply relying on maternal report. One avenue for further research would be the addition of observations during milk feeding. Previous studies report that mothers who breastfeed show greater sensitivity to their infant's satiety cues during milk feeds than mothers who formula feed (Formon et al. 1975; Wright et al. 1980).

It would be interesting to examine the use of maternal control during a milk feed; whether the mother sets a time limit on the feed, encourages the infant to feed more or appears anxious over amount consumed. Do differences occur between breast and formula feeding mothers and is observed behaviour associated with attitudes and experiences? Moreover, is reported use of control related to actual use of control? Reported use of restriction has not been clearly associated with actual use of restriction during mealtimes in older children (Farrow & Blissett, 2006a; Haycraft & Blissett, 2008) possibly as a consequence of parents not needing to restrict food deliberately served to a child (Orrell – Valente et al. 2007). Similarly, it is unlikely that a mother who formula feeds would restrict the amount her infant consumes from a pre prepared bottle. It may however be pertinent to examine feeding behaviours in mothers who are breastfeeding, particularly in relation to duration of breastfeeding. Do mothers who try and control breastfeeds stop breastfeeding sooner? A related concept would be the notion of tracking feeds over the course of a day. It may be difficult to observe scheduling and limiting behaviours during a feed but a pattern may occur in behaviour over the course of the day. How frequently do mothers feed and do they immediately respond with an offer of milk? Does this differ according to feeding type and duration?

The assumption has been made that control beliefs dictate feeding method. Mothers who wish to exert a high level of control are unable to do so whilst breastfeeding so may opt to formula feed. However, it is possible that if mothers understand that breastfeeding needs to be infant-led, that mothers who want to breastfeed choose to exert lower levels of control in order to be able to do so. It would be interesting to examine what happens to the control behaviours of these mothers in a situation where more control is afforded. If mothers who breastfed for a longer duration of time were asked to give their infant a formula feed (or a bottle of expressed breast milk) would their level of control alter? Related to this, what are the levels of control amongst women who choose to feed their infant expressed breast milk (rather than feeding directly from the breast). Reasons for expressing breast milk include separation from the infant, not being able to physically get the infant to latch on for different reasons, concern about milk consumption, not wanting to feed the infant directly from the breast and social reasons e.g. wanting others to share in the feeding (Labiner-Wolfe, Fein, Shealy & Wang, 2008). If we apply the findings of the current research, perhaps women who choose to express their milk for maternal or infant centred concerns would be higher in control than those who need to express milk for

medical reasons. Only one participant offered to complete the questionnaire in study two who had exclusively fed her infant expressed breast milk. She was excluded from the analysis due to these potential differences but it would be interesting to examine the association between expressing breast milk and maternal control. Preliminary findings in study two showed that mothers who formula fed reported higher levels of control compared to mothers who breastfed alongside one bottle of formula a day, with these mothers in turn showing higher control compared to mothers who exclusively breastfed. It would be interesting to examine whether control beliefs are related to the mother (eg a trait) or influenced by method of feeding and therefore fluid.

Although the current study examined birth weight and perceived size of the infant during the first six months, it did not collect data upon growth and weight gain. As breastfeeding and low levels of maternal control are both associated with a healthier child weight (Armstrong et al. 200; Faith et al. 2004), it would be notable to examine how maternal control affects birth weight during the first six months postpartum. Is it too early for maternal behaviour to have an impact upon weight or does encouraging feeds, especially in the formula fed infant, lead to an increase in weight gain? Can restricting feeds, especially in a breastfed infant lead to weight loss or failure to thrive or can differences in weight not be seen until later infancy and beyond?

6.4.2. Further examination of the current data

The datasets used in the research had a considerable number of variables and factors to consider. Presented here are the key findings in relation to scheduling and encouraging feeds, their relationship with breastfeeding duration and the factors that may influence their occurrence. Intercorrelations between variables were multiple but were reduced to identify those most predictive of scheduling and encouraging feeds through regression analysis. However, it could be worthwhile to perform further complex analysis on the inter relations between variables. Thus using statistical analyses such as structural equation modelling or latent class analysis may portray a wider picture. It was felt however that these tests were outside the scope of this particular piece of work, both in terms of complexity and need for brevity.

Moreover, the maternal control behaviours of perceived responsibility and use of milk for comfort were not further examined. In terms of perceived responsibility, no

significant difference was seen between infant feeding groups. However, this may well be an artefact of the timing of the questionnaire. Maternity leave in the UK entitles the mother to up to one year leave from work (DWP, 2009) and it is likely that most mothers in the first six months postpartum will primarily be responsible for their infants care regardless of feeding method. Use of milk to comfort or calm the infant is certainly an interesting area for future exploration but was felt to be a separate behaviour to the factors of scheduling and encouraging feeds based here. The preliminary findings showed that mothers who breastfed for six months or more reported using significantly higher levels of comfort feeding compared to mothers who formula fed from birth or who breastfed for a short duration of time. Later maternal control behaviours which have similarities to this behaviour such as using food for reward emphasise the negative impact of this behaviour in encouraging overeating and weight gain (Birch, Zimmerman & Hind, 1980; Stanek, Abbott & Cramer, 1990). What therefore are the implications for the breastfed infant in being comfort fed? Is breastfeeding simply a means of nourishment as formula feeding is? Recent studies have shown that breastfeeding may have an analgesic effect and infants do suckle for comfort in the same way a formula fed infant may use a dummy (Carbajal, Veerapen, Jugie & Ville, 2003). Further research into the impact of this onto later feeding patterns is warranted.

6.5. Interventions

The findings also raise important questions both in terms of increasing breastfeeding duration and encouraging positive use of maternal control during milk feeding and beyond. Intended feeding choice was associated with actual feeding method at birth although many did not to do for as long as planned. This suggests that mothers have already decided how to feed their infant during pregnancy or before and do not appear to change their decision. Indeed many studies show that decision on whether to breast or formula feed is made by early pregnancy (Maehr et al. 1993). Intervention to increase initiation of breastfeeding may therefore be best suited to before the mother gets pregnant, possibly as part of school education to identify the benefits of breastfeeding for mother and infant (Costa, Diniz-Santos, Santana, Silva, 2006). It suggests that interventions during pregnancy aiming to influence maternal feeding choice may not be the best use of resources.

6.5.1. Increasing understanding of infant-led breastfeeding

In the current study 38.7 % of mothers did not breastfeed for as long as they intended to. A shorter breastfeeding duration was associated with negative attitudes towards breastfeeding and negative experiences doing so. Furthermore mothers who breast-fed for a short duration of time reported using higher levels of scheduling and encouraging feeds in comparison to mothers who breast-fed for six months or more. Both these behaviours appear to be incompatible with breastfeeding which needs to be infant rather than maternal-led in structure. Scheduling feeds can have a negative impact upon milk supply as frequent feeds are needed to establish and maintain milk production (Daley & Hartman, 1995). Moreover, as breast milk is very easily digested, time in between feeds is likely to be more frequent than when using formula milk and thus the infant is likely to become distressed and viewed as unsettled (Casiday et al. 2004). Furthermore, as breast feeding requires the infant to latch onto the breast and manipulate it with its tongue and jaw (Righard & Alade, 1992; Riordan, Gill – Hopple & Angeron, 2005) it is difficult to persuade a breast-fed infant to consume milk that it does not want to. Attempts to encourage feeds are therefore likely to be futile, which may increase maternal anxiety and thus use of formula.

One conceivable intervention could be therefore to target women who intend to breastfeed and provide information and guidance regarding the infant-led nature of breastfeeding. As many mothers feel they live in a 'formula feeding culture' and often have little experience of friends and family breastfeeding, knowledge about breastfeeding is low (McFadden & Toole, 2006; Scott, Mostyn et al. 2003). Conversely both experience and knowledge of formula feeding is high (Bailey et al. 2004). The mechanisms and patterns of breast and formula feeding however are very different and if the rules of formula feeding are applied to breastfeeding, problems are likely to arise. Indeed many mothers report they stop breastfeeding due to worries about frequent feeding or apparent insufficient milk supply when feeding patterns can be completely normal for breast-fed infants (Ingram et al. 2002). Mothers who are at risk of using high levels of control during milk feeding could be identified prenatally using the modified CFQ and information thus targeted, through antenatal appointments, classes or booklets giving information about how breastfeeding works and the importance of infant-led breastfeeding. Mothers could be taught specifically about the mechanisms of breastfeeding, normal patterns of breastfeeding and

alternative signs of adequate milk intake such as wet and soiled nappies rather than purely relying on infant weight gain (Nomssen-Rivers et al. 2008). This may serve to increase both knowledge and confidence levels so once they experience breastfeeding they understand the nature and feeding patterns it may entail. They understand that their breast-fed infant is unlikely to follow the feeding and growth patterns of a formula fed infant. Existing research has shown that mothers who received information about breastfeeding via random assignment to prenatal breastfeeding classes were significantly more likely to still be breastfeeding at six months compared to those who received education only through prenatal health check ups (Rosen, Krueger, Carney & Graham, 2009). Given the clear links between breastfeeding and socioeconomic status (Barton, 2001; Meyerink & Marquis, 2002), perhaps tailored interventions to those from more deprived backgrounds could be beneficial. If mothers in these groups are more likely to be exposed to formula feeding and the practices this entails, then explaining the normality and importance of infant-led breastfeeding may help increase breastfeeding initiation and duration.

The results of the current research showed that use of scheduling feeds appears to be stable. Mothers who intend to schedule feeds during pregnancy tend to do so when they actually feed their infant. It is debateable therefore whether educating women high in this intention as to the importance of infant-led feeding would be beneficial. As scheduling feeds is associated with maternal concern about impact of feeding upon lifestyle it is unlikely that information regarding the importance of frequent feeding, the ease with which breast milk is digested and the need for on demand feeding will increase breastfeeding duration amongst mothers high in intended scheduling. It is possible of course that for some the desire to breastfeed will over ride their desire to schedule feeds and by having greater understanding of the mechanisms of breastfeeding they may disregard their desire to control. However it is also likely that informing women how seemingly demanding and inconvenient breastfeeding needs to be may inhibit them from initiating breastfeeding in the first place as it appears too difficult. Indeed many studies have shown that pregnant women cite the negative experiences of others as the reason they are choosing not to initiate breastfeeding (Li et al. 2008).

6.5.2 Infant-led formula feeding

Formula feeding lends itself to measured, scheduled feeding and in the current study those who planned to formula feed or who did so from birth reported the highest

levels of intended and actual control. Formula feeding does not have to be done to a rigid schedule however. There is no deficit to the infant in being given smaller more regular feeds, being fed upon demand and being given the opportunity to indicate satiation. One possible consequence of this research is the recommendation that mothers who choose or need to formula feed for whatever reason do so to an infant centred routine. Mothers could be taught the importance of infant-led, on demand feeding during pregnancy. It would be interesting to examine the later maternal feeding and child eating styles of mothers who formula fed using a mother centred or infant centred approach.

Interventions to reduce maternal control during formula feeding have been unsuccessful however. Guidance to give smaller more regular feeds and to be responsive to infant satiety cues did not lead to a reduction in maternal control and larger feeds (Kavannagh et al. 2008). In combination with the findings of the current research, it is likely that mothers do not adopt a higher level of maternal control because of formula feeding but that they choose to formula feed because of the higher level of possible control it affords. However, perhaps if further evidence is found to support the idea that high levels of control during infant milk feeding can be detrimental to later child weight and eating style, mothers may be encouraged to reduce their control during milk feeding.

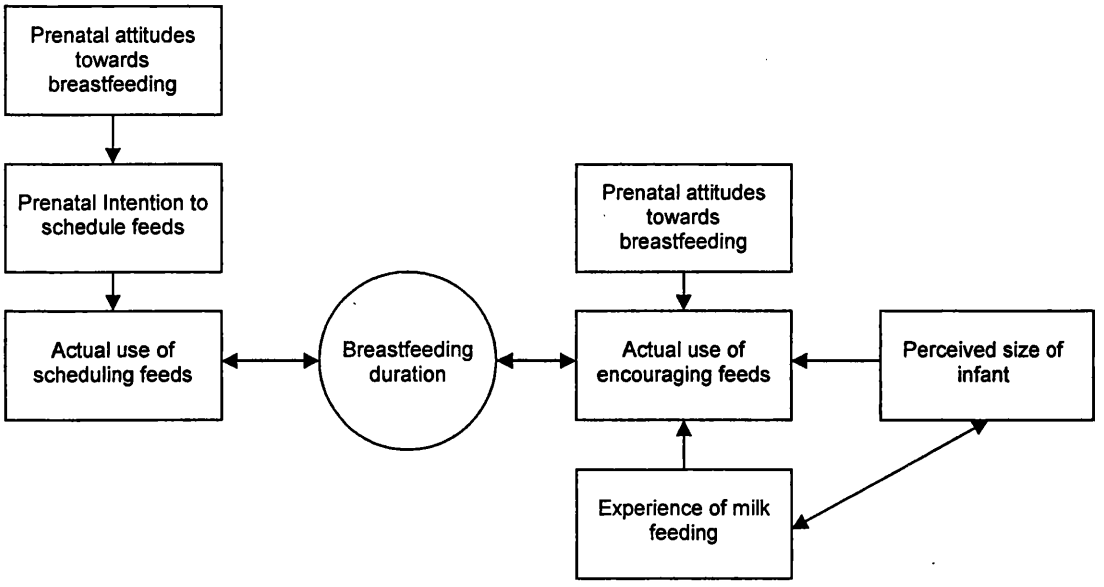
6.6. Conclusions

The aim of this thesis was to investigate why breastfeeding during the first year postpartum is associated with lower levels of maternal control when the child is eating solid foods (Blissett & Farrow, 2007; Farrow & Blissett, 2008; Farrow & Blissett, 2006a; Fisher et al. 2000; Taveras et al, 2004). It explored whether the infant-led nature of breastfeeding encouraged a child-led feeding style to emerge (Taveras et al. 2004) or whether, alternatively, maternal individual differences influenced the decision to breast or formula feed and hence later maternal control (Farrow & Blissett, 2006a).

Differences in maternal control were present during milk feeding with two main behaviours of scheduling and encouraging feeds identified. Formula use, or a short duration of breastfeeding, was associated with higher levels of both scheduling and encouraging feeds. Moreover, maternal control was associated with specific patterns

of attitudes and beliefs surrounding breastfeeding. Scheduling feeds was associated with maternal centred concerns surrounding the impact of infant-led breastfeeding upon lifestyle whilst encouraging feeds was associated with infant centred concerns about milk intake and weight gain. Scheduling feeds appeared to be a stable disposition, with prenatal intention predicting actual behaviour whereas encouraging feeds, although measurable prenatally, was affected by maternal experience in particular concerns about infant size. The relationship between these variables is presented in diagram one below

Diagram One: Influences upon the relationship between maternal use of control and breastfeeding duration



This thesis therefore provides support for the argument that maternal control, rather than being shaped by experience of infant-led breastfeeding (Taveras et al. 2004), is dispositional and actually drives both breastfeeding duration and possibly later levels of control. Mothers with a dispositional trait for high control over their infant choose to use formula milk due to its regular, predictable nature. This desire is driven either by maternal desire for organisation and routine or low levels of maternal confidence. As a consequence, maternal concerns about the infant-led nature of breastfeeding are impacting upon breastfeeding initiation and duration increasing the risk of infant and maternal health issues associated with formula use (Fewtrell, 2004; Moore et al. 2004; Oddy & Peat, 2003). Moreover these patterns of control may persist when the

infant is receiving a solid diet. There is evidence that maternal control over later diet is stable over time (Blissett & Farrow, 2007; Faith et al. 2007). If maternal control is dispositional as this research suggests, do early indications of maternal feeding style have long term consequences? The next key step is therefore to examine patterns of maternal control through the transition to solid feeding and beyond. If patterns of control do emerge as dispositional and thus stable, early maternal education and intervention in terms of negative patterns of control could potentially have a long term positive impact upon child eating styles and weight.

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Appendix One: Study One

1A Consent Form (Key Workers)

I am a PhD Student at the University of Wales Swansea. My research examines the factors associated with whether mums choose to breast or formula feed. The aim is to gain a wider understanding of the influences and to help health professionals understand what mums need. This interview investigates some of the influences upon why mothers decide to use formula milk or to breastfeed, and if they do breastfeed what influences how long they breastfeed for.

The aim of the interview is to understand your experiences and opinions about why mothers choose to breast or formula feed and whether mothers are getting the support they need. It asks you to reflect on any work you carry out specifically with mothers in the area of baby feeding or any experiences you may have in this area. It also looks at the problems you feel mothers may face in feeding their child and any local initiatives that you are involved in or know of that are working to overcome these problems. Finally it looks at your suggestions or ideas as to how the situation could possibly be improved in the future.

If there are any questions you do not want to answer for any reason please just say so and we will move on. Similarly if you do not wish to carry on the interview for any reason we can stop at any time. Any information that you do give in the interview will only be used for the purposes of the study, and will be kept confidential. You will not be identified from your answers in any way. Thank you for your time.

Participant consent

Please read through the following statements and circle your response to each one. If you can answer yes to each question we will start the interview.

- I have read and understood the above information about the study

  YES/NO

- I understand that any information I give will be treated confidentially

  YES/NO

- I understand that I am not obliged to take part in the study and that I can withdraw at any time

  YES/NO

- I agree to participate in the study

  YES/NO

Signed..... Date.....

1B Interview Schedule (Key Workers)

Section One: Background and Healthy eating Knowledge

1 What is your role?

2 Are you involved in working with families with young children?

3 Are you involved at all in dealing with problems or questions about baby feeding children or is your experience indirect?

Section Two: Breast and formula feeding

1. How would you describe your knowledge of breast and formula feeding? Have you had any official training in the area?

2. In your experience, do the mums you work with tend to breast or formula feed? How long do they breastfeed for?

3. What do you think the general view of breastfeeding is in the UK? How does this affect new mums?

4. According to the Baby Feeding Survey (2005) approximately 78% mums start off breastfeeding at birth but many stop within the first few weeks. From your experience why do you think mums don't want to breastfeed in the first place or stop before six months?

5. What specific difficulties do you think mums face with breastfeeding?

6. From your experience what helps mums to carry on breastfeeding until six months and beyond?

7. What do you think needs to be done to both increase breastfeeding rates at birth and to help mums carry on breastfeeding for longer?

Any other comments?

1C. Consent Form (Mothers)

Dear Participant,

I am a PhD Student at the University of Wales Swansea. My research examines the factors associated with whether mums choose to breast or formula feed. The aim is to gain a wider understanding of the influences and to help health professionals understand what mums need. This interview investigates some of the influences upon why mothers decide to use formula milk or to breastfeed, and if they do breastfeed what influences how long they breastfeed for. The interview will ask you about your decision whether to breast, formula or mix feed and the reasons behind that choice. It also looks at your experiences of feeding your baby - did you have any problems and who did you turn to for advice and support. Finally it looks at any suggestions you have which you think might help other mums in the future.

If there are any questions you do not want to answer for any reason please just say so and we will move on. Similarly if you do not wish to carry on the interview for any reason we can stop at any time. Any information that you do give in the interview will only be used for the purposes of the study, and will be kept confidential. You will not be identified from your answers in any way. Thank you for your time.

Please read through the following statements and circle your response to each one. If you can answer yes to each question we will start the interview.

- I have read and understood the above information about the study

  YES/NO

- I understand that any information I give will be treated confidentially

  YES/NO

- I understand that I am not obliged to take part in the study and that I can withdraw at any time

  YES/NO

- I agree to participate in the study

  YES/NO

Signed..... Date.....

1D. Interview Schedule (Mothers)

Demographic Background

Age:
Marital status:
Highest level of education achieved:
Approximate household income:
Employment
Age of baby:

Section One: Baby feeding

1 How did you feed your baby? If you breast fed how long for?

2 When did you start thinking of how you would feed your baby? When you were pregnant? After the birth?

3 How important a decision is it to choose how to feed your baby? Does it really make a difference in the long run?

4 Do you think there is too much or enough emphasis on early feeding? Is there too much pressure on mums to breast feed?

Section Two: For mothers who formula fed from birth

1. What reasons affected your decision to formula feed?
2. How would you describe your experiences feeding your baby in the early months?
3. What did you enjoy or find easy about your experience?
4. What did you find difficult? Did you have any problems?
5. How confident did you feel about feeding?
6. How did you feel about breastfeeding? What did you think it would be like?
7. Did you feel any pressure to breast feed your baby – who from?
8. Have your previous experiences feeding your children affected how you decided to feed this baby? Have you fed them differently (for mums with other children)
9. How do you think you will feed your next baby if you have one?

Section Three: Mothers who breastfed at birth

1 Why did you decide to breastfeed?

2 What were your expectations of breastfeeding?

3 How did you feel about formula feeding?

4 What did you enjoy or find easy about your experience?

5 What did you find difficult? Did you have any problems feeding?

6 Did you feel confident breastfeeding?

7 How did you feel about feeding in public?

8 How would you describe other people's attitudes towards you breastfeeding?

9 How do you think you will feed your next baby if you have one?

Section Four: Stopping Breastfeeding before introduction of solids

1 What reasons affected your decision to stop breastfeeding?

2 How did you feel about stopping breastfeeding?

3 Did you find formula feeding any easier?

4 Could anything have been done to help you continue breastfeeding?

Section Five: Experience of feeding

1 Who or what influenced your initial decision on how to feed your baby?

2 How did those around you feel about your decision to feed your baby?

3 Has anyone ever shared their experiences of feeding with you?

4 How have your friends and family chosen to feed their babies?

5 Who did you turn to for information, advice and support when feeding your baby?

6 What sort of information and advice did you have from health professionals before and after the birth?

7 Do you feel you had enough professional support after the birth? Could you find someone to help with a problem if you needed to?

Any other comments?

Appendix Two: Study Two

2A Consent Form

Dear Participant,

I am a PhD Student at the University of Wales Swansea. My research examines the factors associated with whether mums choose to breast or formula feed. The aim is to gain a wider understanding of the influences and to help health professionals understand what mums need. This questionnaire looks at the different things that can affect a woman's early experiences of feeding her baby. It asks questions about your attitudes and beliefs about breast or formula feeding and looks at factors that affected your own personal early experiences of feeding your baby. For this questionnaire "feeding your baby" or "early feeding" refers to what milk your baby received – breast or formula milk. It does not refer to any other foods that you gave your baby e.g. when you started introducing solid foods.

If there are any questions you do not want to answer for any reason please just leave them blank. Similarly if you do not wish to carry on completing the questionnaire for any reason please do not continue. Any information that you do give in the questionnaire will only be used for the purposes of the study, and will be kept confidential. You will not be identified from your answers in any way.

Please only answer this questionnaire if you have a child between the ages of six months and two years. If you have more than one child please think about your experiences feeding your youngest child when completing this questionnaire. However if this child is under six months of age please think about your next youngest child. There are three sections to this questionnaire. Please answer all three sections.

If you have any questions please do not hesitate to get in contact with Amy Brown in one of the following ways: Email: a.e.brown@swansea.ac.uk Phone: 01792 602282 Post: Amy Brown, Psychology Department, University of Wales Swansea, SA2 8PP

Participant consent

Please read through the following statements and circle your response to each one. If you can answer yes to each question please complete the questionnaire.

I have read and understood the above information about the study YES/NO

I understand that any information I give will be treated confidentially YES/NO

I understand that I am not obliged to take part in the study and that I can withdraw at any time YES/NO

I agree to participate in the study YES/NO

Signed.....

Date.....

2B Questionnaire

Section One: About You and Your Children

•Your date of birth _____

•Your highest level of education achieved _____

•Were you employed before the birth of your first child? _____

•Are you currently employed? _____

•Your height _____

•Your pre pregnant weight _____(weight before first child)

•Your current weight _____

•Who lives in your household? _____

•What is your marital status? _____

•Do you smoke? If so how many approximately a day? _____

•How many units of alcohol do you drink a week? A unit is half a pint of beer, a small glass of wine or one measure of spirits

_____

•Do you know how you were fed as an baby? (Please tick the correct box)

☐ Breast Fed ☐ Formula Fed ☐ Mixed Fed ☐ Don't know

•If you were breast fed do you know for how long? _____

•Do you know how your baby's father was fed as an baby?

☐ Breast Fed ☐ Formula Fed ☐ Mixed Fed ☐ Don't know

• How many children do you have? Please give ages and how you fed these children as an baby e.g. 18 months breast fed and 3 years formula fed

_____

About your youngest child aged between six months and two years

•Date of birth _____

•Birth Weight _____

•Gender _____

•How many weeks pregnant were you when the baby was born?

_____

•Was the birth a vaginal delivery or caesarean?

_____

•Did you have any complications during pregnancy? For example gestational diabetes or pre eclampsia? Please briefly explain

_____

_____

•Were there any complications at the birth? For example the baby needing medical assistance or a complicated delivery? If so please explain

_____

_____

•Did you experience any other complications after the birth such as postnatal depression or illness?

_____

•When did you make the decision on how to feed your baby when they were first born?

Before I was pregnant	First trimester (0 – 13 weeks)	Second trimester (13 – 27 weeks)	Third trimester (27 – birth)	After the birth

• Did you go to antenatal classes when you were pregnant?

_____

• Did you ever go to a breastfeeding support group after the birth

_____

•Has your child ever used a dummy/pacifier?

_____

Section two: Attitudes towards Breastfeeding

Please use the key below to rate how strongly you agree with the following statements. Please circle or highlight the number which corresponds with your answer in the box next to the statement. For example if you agreed with the statement below:

Breast Feeding in Public is wrong	**1**	2	3	4	5

1 = Agree
2 = Slightly Agree
3 = Neither Agree nor Disagree
4 = Slightly Disagree
5 = Disagree

Breast Feeding in public is wrong	1	2	3	4	5
Breast fed babies feed more often than bottle fed babies	1	2	3	4	5
Breast feeding is painful	1	2	3	4	5
Breast feeding is unsexy	1	2	3	4	5
Breast feeding in front of others is embarrassing	1	2	3	4	5
Breasts are sexual not for feeding	1	2	3	4	5
Other people should be able to feed the baby	1	2	3	4	5
Lots of people can't breast feed	1	2	3	4	5
Breast feeding is very difficult	1	2	3	4	5
Formula milk should not be advertised	1	2	3	4	5
Formula milk should not be given in hospitals	1	2	3	4	5
Breast feeding is best for baby's health	1	2	3	4	5
Breast feeding is best for mother's health	1	2	3	4	5
Breast feeding takes up all your time	1	2	3	4	5
It is important to see how much your baby is drinking	1	2	3	4	5
Breast fed babies often don't put on enough weight?	1	2	3	4	5

1 = Agree
2 = Slightly Agree
3 = Neither Agree nor Disagree
4 = Slightly Disagree
5 = Disagree

Lots of women don't have enough milk	1	2	3	4	5
Breast feeding is exhausting	1	2	3	4	5
A breast fed baby will be too clingy to the mother	1	2	3	4	5
Health professionals should encourage breast feeding	1	2	3	4	5
Health professionals should discourage bottle feeding	1	2	3	4	5
You have to do all the feeds if you breast feed	1	2	3	4	5
You can't go back to work if you breast feed	1	2	3	4	5
You can't go out and socialise if you breast feed	1	2	3	4	5
You can't breast feed if you have a caesarean	1	2	3	4	5
Most people bottle feed these days	1	2	3	4	5
Breast feeding means only you can soothe the baby	1	2	3	4	5
Brest feeding is just too much hassle	1	2	3	4	5
Breast feeding is disgusting	1	2	3	4	5
Babies are more content and settled with formula milk	1	2	3	4	5
Babies sleep better with formula milk	1	2	3	4	5
Its easier to get an baby into a routine with formula milk	1	2	3	4	5
Breast feeding helps you loose weight	1	2	3	4	5
Breast feeding ruins the appearance of your breasts	1	2	3	4	5
You are stuck in the house if you breastfeed	1	2	3	4	5
Breastfeeding is too much responsibility	1	2	3	4	5
Breast feeding a child who can walk and/or talk is wrong	1	2	3	4	5

Section Three: Feeding your baby

•Did you feed your baby to a schedule (for example every four hours) or on demand (whenever the baby wanted to feed)?

•How often approximately did your baby feed?

•If you breastfed, on average how often did you supplement your breast milk with a bottle of formula?

More than once a day	Once a day	A few times a week	Once a week	Occasionally	Never

• As your baby was growing was she/he

Very small for age	Small for age	Average size for age	Large for age	Very large for age

•When your child was at home how often were you responsible for feeding her?

Never	Seldom	Half of the time	Most of the time	Always

•How often were you responsible for deciding how much your child drank?

Never	Seldom	Half of the time	Most of the time	Always

•How concerned were you about your baby becoming over weight?

Unconcerned	A little concerned	Concerned	Fairly concerned	Very concerned

•How concerned were you about your baby becoming under weight?

Unconcerned	A little concerned	Concerned	Fairly concerned	Very concerned

•How much did you keep track of the amount your baby drank?

Never	Rarely	Sometimes	Mostly	Always

<u>How strongly do you agree with the following statements?</u>

"I offered milk to my baby as a comfort"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I offered milk to my baby to calm her behaviour (if she wasn't hungry)"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"If I did not guide my baby's feeding she would feed too much"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I had to be especially careful to make sure my baby drank enough"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I fed my baby whenever he/she wanted feeding"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I tried to stretch out my babies feeds so I was feeding him/her less often"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I tried to get my baby into a feeding routine"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I let my baby take control of how much milk he/she drank"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"If my baby did not want to feed when I thought he/she should I tried to get her to feed anyway"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"If I did not guide or regulate my baby's intake of milk he/she would drink less than she should"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I thought my baby should always finish the bottle or breastfeed for a certain length of time"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I limited my baby's feeding"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

Finally please answer the following questions:

"I felt informed in my decision on how to feed my baby"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I feel I received enough advice from health professionals on how to feed my baby"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I experienced a lot of problems feeding my baby"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I received enough professional help with any problems I had feeding my baby"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I felt confident in feeding my baby"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

This is the end of the questionnaire. Thank you very much for taking the time to complete it. Any questions please get in contact via the ways listed at the start of the questionnaire. Please remember all responses will be treated confidentially.

Thank you

2C Modified Child Feeding Questionnaire

CFQ Factor	CFQ Question	Modified Question and / or additional questions	Response options
Perceived Responsibility	When your child is at home how often are you responsible for feeding her?	When your baby was at home how often you were responsible for feeding her?	1. Never 2. Seldom 3. Half of the time 4. Most of the time 5. Always
	How often are you responsible for deciding what your child's portion sizes are?	How often you were responsible for deciding how much your baby drank?	
Concern about Child Weight	How concerned are you about your child being over weight?	How concerned were you about your baby becoming over weight?	1. Unconcerned 2. A little concerned 3. Concerned 4. Fairly concerned 5. Very concerned
		How concerned were you about your baby becoming under weight?	
Monitoring	How much do you keep track of the food your child eats (three questions in original CFQ targeting sweet, snack and high fat food)	I kept track of the amount my baby drank	1. Disagree 2. Slightly disagree 3. Neutral 4. Slightly agree 5. Agree
		I thought my baby should always finish the bottle or breastfeed for a certain length of time	
		I let my baby take control of how much milk he/she drank	
Reward (subset of Restriction)	I offer sweets to my child as a reward for good behaviour	I offered milk to my baby as a comfort	1. Disagree 2. Slightly disagree 3. Neutral 4. Slightly agree 5. Agree
		I offered milk to my baby to calm her behaviour (if she wasn't hungry)	
Restriction	If I did not guide or regulate my child's eating she would eat too much (junk food or favourite food)	If I did not guide my baby's feeding she would feed too much	1. Disagree 2. Slightly disagree 3. Neutral 4. Slightly agree 5. Agree
		I limited my baby's feeding	
		I tried to stretch out my baby's feeds so I was feeding him/her less often	
	I have to be sure that my child does not eat too much (sweets, high fat or favourite foods)	I fed my baby whenever he/she wanted feeding (reverse scored)	
Pressure to eat	I have to be especially careful my child eats enough	I had to be especially careful to make sure my baby drank enough	
	If my child says "Im not hungry I try to get her to eat anyway	If my baby did not want to feed when I thought he/she should I tried to get her to feed anyway	1. Disagree 2. Slightly disagree 3. Neutral 4. Slightly agree 5. Agree
	If I did not guide or regulate my child's eating she would eat less than she should	If I did not guide or regulate my baby's intake of milk he/she would drink less than she should	

2D. Factor analysis of the modified Child Feeding Questionnaire

Item	Scheduling feeds	Encouraging feeds	Use of milk for non nutritional means	Monitoring feeds
When your child was at home how often were you responsible for feeding her?	.036	-.106	.475	**0.575**
How often were you responsible for deciding how much your child drank?	-.042	.087	-.142	**0.775**
How concerned were you about your baby becoming over weight?	**0.555**	.021	-.137	-.152
If I did not guide my baby's feeding she would feed too much	**0.784**	.108	-.051	-.042
I tried to stretch out my baby's feeds so I was feeding him/her less often	**0.726**	.131	-.186	.152
I limited my baby's feeding	**0.739**	.240	-.062	-.076
How concerned were you about your baby becoming under weight?	-.154	**0.690**	-.128	-.068
If my baby did not want to feed when I thought he/she should I tried to get her to feed anyway	.240	**0.641**	-.014	.144
I had to be especially careful to make sure my baby drank enough	.224	**0.698**	-.207	-.042
If I did not guide or regulate my baby's intake of milk he/she would drink less than she should	.208	**0.804**	-.064	.005
I thought my baby should always finish the bottle or breastfeed for a certain length of time	.385	**0.500**	-.128	.043
I offered milk to my baby as a comfort	-.232	-.088	**0.744**	.198
I offered milk to my baby to calm her behaviour (if she wasn't hungry)	-129	-.001	**0.849**	.072
% of variance	**28.877**	**9.330**	**8.714**	**6.621**
α	**.723**	**.750**	**.778**	**.512**

2E. Factor analysis of attitudes towards breastfeeding

	Difficult	Embarrassing	Inconvenient	Formula fed babys more content	Health
Breastfeeding is painful	**.516**		.265	.103	
If you formula feed other people can feed the baby	**.558**	.317		.138	-.174
Lots of mums can't breastfeed	**.771**				
Breastfeeding is difficult	**.652**		.185		
Formula milk should not be advertised	**.712**			-.142	.206
Formula milk should not be given in hospitals	**.774**				.189
You can't see how much a breastfed baby is drinking	**.605**	.341	.183	.294	-.141
Lots of mums don't have enough milk	**.732**	.164	.178		
Breastfeeding is exhausting	**.660**		.196	.117	
Health professionals should discourage formula feeding	**-.592**			.135	.162
Breastfeeding takes too much time	**.550**		.294	.256	
Breastfed babies do not put on enough weight	**.551**	.353	.341	.156	-.124
Breasts are sexual, not for feeding babies		**.713**		.106	-.135
Breastfeeding makes a child clingy	.256	**.524**	.163	.325	-.139
You can't breastfeed if you have a caesarean section	.193	**.504**	.323	-.142	-.161
Breastfeeding is too much hassle	.352	**.559**	.405	.152	-.165
Breastfeeding is disgusting		**.753**	.177		-.165
Breastfeeding ruins your breasts	.126	**.529**		.349	-.117
Breastfeeding stops you losing weight		**.637**	-.229		
Breastfeeding is unsexy	.124	**.713**	.175		
Mothers shouldn't breastfeed an baby who can walk or talk	.355	**.576**		.266	-.166
You have to do all the feeds if you breastfeed			**.638**	.167	
You can't go back to work if you breastfeed	.117	.223	**.693**		-.136
You can't have a social life if you breastfeed	.104	.175	**.731**	.182	-.126
Only you can soothe the baby if you breastfeed		.330	**.642**	.210	
You are stuck in the house if you breastfeed	.191	.250	**.515**	.331	-.218
Breastfeeding is too much responsibility	.281	.397	**.503**	.211	-.120
Formula fed babys are more content	.397	.395	.267	**.538**	-.110
Formula fed babys sleep better	.300	.266	.231	**.698**	
You have more of a routine if you formula feed	.275	.173	.175	**.690**	-.113
Breastfed babies feed more often		-.157	.152	**.527**	.114
Breastfeeding is best for babies health		-.220	-.187		**.771**
Breastfeeding is best for mothers health	-.339		-.275		**.636**
Health professionals should encourage breastfeeding	-.151	-.318	-.138		**.603**
α	.808	.576	.791	.826	**.710**

2F. Factor analysis of confidence about breast or formula feeding.

Item	Confidence
I felt informed in my decision on how to feed my baby	.619
I felt I received enough advice from health professionals on how to feed my baby	.713
I experienced a lot of problems feeding my baby	.598
I received enough professional help with any problems I had feeding my baby	.744
I felt confident in feeding my baby	.778
α	.719

Appendix Three: Study Three

3A. Consent form

Dear Participant,

Please only answer this questionnaire if you are pregnant and have no other children and are at least thirteen weeks pregnant.

I am a PhD Student at the University of Wales Swansea. My research examines the factors associated with whether mums choose to breast or formula feed. The aim is to gain a wider understanding of the influences and to help health professionals understand what mums need. This questionnaire will look at your experiences of pregnancy so far and expectations and plans for the future you have in particular with regard as to how you will feed your baby in those early months. It will ask you some general background questions about yourself and your pregnancy, alongside questions looking at whether you think you will breast or formula feed and who or what has influenced your decision.

You will also be asked some general background questions about yourself including your weight and your height. This information will be used to calculate a BMI (body mass index). If there are any questions you do not want to answer for any reason please just leave them blank. Similarly if you do not wish to carry on completing the questionnaire for any reason please do not continue. There are no right or wrong answers – we are interested in your honest opinions and attitudes so please answer as truthfully as possible. Any information that you do give in the questionnaire will only be used for the purposes of the study, and will be kept confidential. You will not be identified from your answers in any way.

Please return all completed questionnaires either directly to Amy Brown or via Email or Post at the address below. If you have any questions please do not hesitate to get in contact with Amy Brown in one of the following ways: Email: a.e.brown@swansea.ac.uk Post: Amy Brown, Psychology Department, Swansea University, SA2 8PP

Participant consent

Please read through the following statements and circle your response to each one. If you can answer yes to each question please complete the questionnaire.

I have read and understood the above information about the study **YES/NO**

I understand that any information I give will be treated confidentially **YES/NO**

I understand that I am not obliged to take part in the study and that I can withdraw at any time **YES/NO**

I agree to participate in the study **YES/NO**

Signed.....

Date.....

3B. Questionnaire

Section One: About You

•Your date of birth _____

•Your highest level of education achieved _____

•Are you currently employed? What is your job? _____

•Do you plan to return to work after this child? How old will they be? _____

•Is your partner employed? What is his job? _____

•How much is your approximate household income per year? _____

•Your height _____ •Your pre pregnant weight _____

•Who lives in your household? _____

•What is your postcode _____

• Which of these best describes you? Please tick the correct box

Home owner	Private tenant	Council tenant	Living with parents	Other

•What is your marital status? _____

•If you are in a relationship with your baby's father how long have you been in it for?

_____

•Do you suffer from any non pregnancy related health problems such as diabetes?

_____

Section Two: Your pregnancy

•Your due date _____

•How many weeks pregnant are you at the moment eg 34 _____

•How many babies are you expecting? _____

•Do you plan to give birth naturally or by caesarean? _____

•Where do you plan to give birth? For example at home or hospital _____

•Do you currently smoke? If so how many approximately a day? _____

•How many units of alcohol do you currently drink a week? A unit is half a pint of beer, a small glass of wine or one measure of spirits _____

•Have you been taking or did you take folic acid during this pregnancy? For how long?

•Have you been taking any special supplements during this pregnancy such as pregnancy multivitamins and fish oils? Which?

_____

•Have you been avoiding any foods in pregnancy? Which?

_____

•Have you attended antenatal classes or do you plan to attend in the future?

_____

•Have you have any other complications during pregnancy? Please briefly explain

_____

•Have you attended all your midwife appointments so far? Why?

_____

Please mark the box which best describes how you feel for each question using the key below:

1	2	3	4	5
Disagree	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**

	D	SD	NAD	SA	A
Pregnancy has made me feel less attractive	1	2	3	4	5
I worry that my partner finds me unattractive during pregnancy	1	2	3	4	5
I worry that my partner will find me unattractive after pregnancy	1	2	3	4	5
I feel that I am gaining/or have gained too much weight	1	2	3	4	5
I worry about loosing the weight after pregnancy	1	2	3	4	5
I compare my body negatively to other pregnant women	1	2	3	4	5
I am worried about stretch marks	1	2	3	4	5
I have dieted during pregnancy because I am worried about my body	1	2	3	4	5
I have tried to limit my weight gain during pregnancy	1	2	3	4	5
Other peoples comments about my pregnant body have upset me	1	2	3	4	5
I can't wait to have my baby in my arms	1	2	3	4	5
I am looking forward to giving birth to my baby	1	2	3	4	5
I am anxious about giving birth to my baby	1	2	3	4	5
I am looking forward to caring for my baby	1	2	3	4	5
I am anxious about caring for my baby	1	2	3	4	5
I am worried I will not know how to look after my baby	1	2	3	4	5
I feel confident about becoming a mum	1	2	3	4	5

Please think back across your pregnancy so far and circle the answer which best describes how you have felt for each question below:

1	2	3	4	5
Disagree	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**

	A	M	S	R	N
Happy	1	2	3	4	5
Stressed	1	2	3	4	5
Nervous	1	2	3	4	5
Subdued	1	2	3	4	5
Anxious or Worried	1	2	3	4	5
Excited	1	2	3	4	5
Bored	1	2	3	4	5
Impatient	1	2	3	4	5
Unable to cope	1	2	3	4	5
Knowledgeable	1	2	3	4	5
Cant stop thinking about pregnancy and the baby	1	2	3	4	5
Confident	1	2	3	4	5
Lucky to be pregnant	1	2	3	4	5
Overwhelmed by responsibility	1	2	3	4	5
Worried about harming and/or loosing the baby	1	2	3	4	5
Prepared for the future	1	2	3	4	5
Content	1	2	3	4	5

For this questionnaire "feeding your baby" will refer to whether you plan to breast or formula feed NOT solid foods

•Do you know how you are planning to feed your baby when they are born?

Breast feed	Formula feed	Mixed feed	I haven't decided yet

•If you are planning to breast feed how long do you think you will feed for? _____

•If you are planning to breast feed do you think you will supplement with formula too?

More than once a day	Once a day	A few times a week	Once or twice a week	Occasionally	Never

•When did you make the decision on how to feed your baby? (please tick)

Before I was pregnant	First trimester	Second trimester	Third trimester	I haven't decided yet

Section Four: Feeding your baby (Breast or Formula milk)

Please use the scale below to rate how you feel about feeding your baby when they are born. If you have not thought about these issues or are unsure of the answer please leave it blank

1	2	3	4	5
Disagree	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**

	D	SD	NAD	SA	A
I feel informed in my decision on how to feed my baby	1	2	3	4	5
I feel confident in the decision I have made on how to feed my baby	1	2	3	4	5
I have received enough feeding advice from health professionals	1	2	3	4	5
I feel confident about feeding my baby	1	2	3	4	5
I am looking forward to feeding my baby	1	2	3	4	5
I think feeding my baby will be easy	1	2	3	4	5
I am worried about knowing how to feed my baby	1	2	3	4	5
I have spent a lot of time finding out about how to feed my baby	1	2	3	4	5
I feel knowledgeable about feeding my baby	1	2	3	4	5
I know where I will get help if I have problems feeding my baby	1	2	3	4	5
I have heard a lot of negative experiences about breast feeding	1	2	3	4	5
I have heard a lot of positive experiences about breast feeding	1	2	3	4	5

Please think as to how you will feed your baby when they are born. Please rate how much you agree with the following statements using the key below. If you feel you do not know please leave blank.

1	2	3	4	5
Disagree	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**

I will offer milk as a comfort	1	2	3	4	5
I will offer milk to calm behaviour	1	2	3	4	5
If I do not guide my baby's feeding she will feed too much	1	2	3	4	5
I will have to be especially careful to make sure my baby drinks enough	1	2	3	4	5
I will feed my baby whenever he/she wants feeding	1	2	3	4	5
I will try to get my baby into a feeding routine	1	2	3	4	5
I will let my baby take control of how much milk he/she will drink	1	2	3	4	5
If my baby does not want to feed when I think she should I will try to feed her anyway	1	2	3	4	5
If I don't guide my baby's drinking they will have less than they should	1	2	3	4	5
My baby should always finish the bottle/breastfeed for a certain time	1	2	3	4	5
I will limit my baby's feeding	1	2	3	4	5
I will be always responsible for feeding my baby	1	2	3	4	5
I will be responsible for deciding how much my child drinks	1	2	3	4	5
I am concerned that my baby will become over weight	1	2	3	4	5
I am concerned that my baby will become under weight	1	2	3	4	5
I will keep track of the amount my baby drinks	1	2	3	4	5

Section Five: Attitudes towards Breast Feeding

Please use the scale below to highlight how strongly you agree with the following statements:

1	2	3	4	5
Disagree	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**

	D	SD	NAD	SA	A
Mums should be allowed to breast feed wherever they want in public	1	2	3	4	5
Breastfeeding is what breasts were made for	1	2	3	4	5
I would be happy if someone breast fed sitting next to me	1	2	3	4	5
Breast feeding should continue for as long as mum and child are happy	1	2	3	4	5
Formula milk should not be advertised	1	2	3	4	5
Formula milk should not be give in hospitals	1	2	3	4	5
Breast feeding is best for baby's health	1	2	3	4	5
Breast feeding is best for the mother's health	1	2	3	4	5
Health professionals should encourage breast feeding	1	2	3	4	5
Health professionals should discourage formula feeding	1	2	3	4	5
Breast milk is the ideal milk for an baby	1	2	3	4	5
Breastfeeding is more convenient than formula feeding	1	2	3	4	5

Please answer the questions below by writing as much or as little as you like. If you need more space please feel free to attach additional pieces of paper.

1. Does breastfeeding have any benefits? For the baby? For the mum? What?

2. Does breastfeeding have any disadvantages? For the baby? For the mum? What?

3. What are your thoughts and feelings in general towards breastfeeding?

This is the end of the questionnaire. Thank you very much for taking the time to complete it. Any questions please get in contact via the ways listed at the start of the questionnaire. Please remember all responses will be treated confidentially.
Thank you

3D. Factor analysis of modified Child Feeding Questionnaire

Item	Encourage feeds	Schedule feeds	Comfort	Perceived responsibility
I will have to be especially careful to make sure my baby drinks enough	**.534**	.129		.385
I will keep track of the amount my baby drinks	**.567**	.372	.105	.418
If my baby does not want to feed when I think she should I will try to feed her anyway	**.578**	-.127		.300
If I don't guide my baby's drinking they will have less than they should	**.717**	.170	-.200	.173
I am concerned that my baby will become under weight	**.801**		-.145	
If I do not guide my baby's feeding she will feed too much	.387	**.574**		.407
I will feed my baby whenever he/she wants feeding*		**-.657**	.284	-.233
My baby should always finish the bottle/breast-feed for a certain time	.318	**.649**	-.230	.105
I will schedule my baby's feeding	.363	**.669**		.143
I will try and get my baby into a feeding routine	.109	**.775**	-.228	.108
I am concerned that my baby will become over weight	.403	**.633**		
I will offer milk to my baby to calm their behaviour	-.188	-.120	**.886**	-.124
I will offer milk to my baby to comfort them		-.148	**.907**	
I will be responsible for feeding my baby	-.185	.178	-.271	**.747**
I will be responsible for deciding how much my baby drinks	.173		.413	**.708**
% of variance	**29.413**	**10.650**	**8.318**	**6.819**
α	**.760**	**.747**	**.876**	**.522**

3E. Factor analysis of attitudes towards breastfeeding

Item	Breastfeeding best for health	Breastfeeding as normal	Negative attitude to formula	Ease of breastfeeding
Breast feeding is best for baby's health	**.855**	.133	.148	.032
Breast feeding is best for the mother's health	**.746**	.265	.246	.148
Health professionals should encourage breast feeding	**.719**	.200	.226	.168
Breast milk is the ideal milk for an baby	**.783**	.246	.129	.024
Mums should be allowed to breastfeed wherever they want in public	.134	**.809**	.110	.012
Breasts are made for breastfeeding	.294	**.657**	.192	.161
I would be happy if someone sitting next to me was breastfeeding	.171	**.812**	.035	.045
Mums should be allowed to breastfeed for as long as they want	.166	**.686**	.229	.192
Formula milk should not be given in hospitals	.234	.140	**.848**	.012
Health professionals should discourage formula feeding	.156	.139	**.832**	.138
Breastfeeding is more convenient than formula feeding	.416	.194	.190	**.794**
Breastfeeding is easier than formula feeding	.431	.155	.168	**.796**
I have heard a lot of positive things about breastfeeding	.422	.153	.253	**.583**
I have heard a lot of negative things about breastfeeding	.184	-.101	.033	**-.591**
% Variance	**40.41**	**9.78**	**8.95**	**8.25**
α	**.864**	**.797**	**.781**	**.752**

3F. Factor analysis of concerns about feeding

Item	Informed about feeding	Anxiety feeding	General anxiety
I feel informed in my decision on how to feed my infant	**.820**	.177	.289
I feel confident in the decision I have made on how to feed my infant	**.831**	.072	.312
I have received enough feeding advice from health professionals	**.587**	.345	.073
I feel confident about feeding my infant	**.675**	.056	.384
I have spent a lot of time finding out about how to feed my infant	**.664**	**.796**	-.184
I feel knowledgeable about feeding my infant	**.635**	.072	.148
I am looking forward to feeding my infant	.273	**-.672**	.068
I think feeding my infant will be easy	-.084	**-.824**	-.025
I am worried about knowing how to feed my infant	-.366	**.573**	**.676**
I am worried I will not get enough support with problems I have feeding my infant	.158	**.568**	.432
I have heard a lot of negative experiences about breast feeding	.349	**.599**	.433
I am anxious about the birth	.165	**.609**	**.762**
I am looking forward to caring for my infant	.031	-.074	**-.780**
I am anxious about caring for my infant	.047	.114	**.799**
I worry I will not know how to care for my infant	.172	.114	**.772**
I am looking forward to the birth	.186	.023	**-.522**
I feel confidence about becoming a mum	.248	.395	**-.583**
% of variance	27.62	11.25	9.2
α	.706	.770	.742

3G. Factor analysis of body image during pregnancy

	Body image concerns	Dieting during pregnancy
Pregnancy makes me feel unattractive	**.566**	.080
I worry that my partner finds me unattractive during pregnancy	**.705**	.116
I worry that my partner will find me unattractive after pregnancy	**.799**	.176
I feel that I am gaining/or have gained too much weight	**.568**	.004
I worry about loosing the weight after pregnancy	**.652**	.266
I am worried about the effect of pregnancy on the appearance of my breasts	**.531**	.118
I compare my body negatively to other pregnant women	**.635**	.123
I worry about getting stretch marks	**.525**	.177
I have dieted during pregnancy because I am worried about my body	.248	**.807**
I have tried to limit my weight gain during pregnancy	.053	**.797**
Other peoples comments about my pregnant body have upset me	.330	**.619**
% of variance explained	**38.29**	**10.10**
α	**.772**	**.638**

3H. Factor analysis of moods during pregnancy

	Prepared	Positive	Anxious	Restless
Knowledgeable	**.666**	-.009	.073	.015
Thinking about the baby all the time	**.508**	.350	-.338	-.072
Confident	**.636**	.271	.230	-.062
Overwhelmed by responsibility	**-.515**	.117	.297	.270
Prepared for the future	**.715**	.181	.067	-.122
Content	.469	**.521**	.224	.105
Lucky to be pregnant	.325	**.708**	-.043	.065
Worried about harming the baby	.328	**-.565**	.329	.217
Happy	.186	**.585**	.352	.114
Excited	.302	**.573**	.042	-.108
Subdued	-.029	.329	**.589**	.006
Unable to cope	-.290	.293	**.547**	.137
Stressed	.159	.213	**.690**	.303
Nervous	.083	.126	**.693**	-.052
Anxious	.109	-.012	**.787**	.071
Bored	.002	.123	-.032	**.820**
Impatient	-.044	-.091	.043	**.787**
Restless	.034	-.121	.324	**.678**
α	**.647**	**.718**	**.774**	**.678**

Appendix Four: Study Four

4A. Consent form

Dear Participant

We understand that you are undoubtedly very busy (and tired!) now your little one is here but would very much appreciate it if you had the time to fill in a few more questions about your very early experiences feeding your baby. Please complete all stages.

These questions should only take around 15 minutes to complete and we would like to hear about your experience feeding your baby milk over the last six months.

If there are any questions you would prefer not to answer please leave them blank. If you have any questions please do not hesitate to contact Amy at a.e.brown@swansea.ac.uk or 01792 602518.

Participant consent

Please read through the following statements and circle your response to each one. If you can answer yes to each question please complete the questionnaire.

I have read and understood the above information about the study **YES/NO**

I understand that any information I give will be treated confidentially **YES/NO**

I understand that I am not obliged to take part in the study and that I can withdraw at any time **YES/NO**

I agree to participate in the study **YES/NO**

Signed..... Date.....

Name: (please print) .....

(please note that your name will not be attached to your answers – it is only to match you up with your previous response in the data base which is coded. This sheet will be detached from your response and kept separately)

Thank you again for your time.

4B. Questionnaire

Section One: Some questions about you and your baby

•Baby Date of birth _____

•Birth Weight _____

•Gender _____

•How many weeks pregnant were you when the baby was born? _____

•Was the birth a vaginal delivery or caesarean? _____

•Does your child ever use a dummy/pacifier? _____

•Did you have skin to skin contact with your baby after the birth (your baby being placed naked against your naked chest)? How soon after the birth?

_____

•Did you feel you had a positive birth experience?

Very negative	Negative	Neither positive or negative	Positive	Very positive

•Did you breast or formula feed at birth? _____

•If you started breastfeeding your baby (even for one feed only) how many days old were they when you stopped breastfeeding them? _____

•How soon after the birth did your baby have their first feed? _____

•Did you feed your baby to a schedule (for example every four hours) or on demand ?

_____

•How often approximately did your baby feed?

_____

•How often did you supplement with formula?

More than once a day	Once a day	A few times a week	Once a week	Occasionally	Never

Section Two: Feeding your baby

• As your baby was growing was she/he

Very small for age	Small for age	Average size for age	Large for age	Very large for age

•When your child was at home how often were you responsible for feeding her?

Never	Rarely	Sometimes	Mostly	Always

•How often were you responsible for deciding how much your child drank?

Never	Rarely	Sometimes	Mostly	Always

•How concerned were you about your baby becoming over weight?

Unconcerned	A little concerned	Concerned	Fairly concerned	Very concerned

•How concerned were you about your baby becoming under weight?

Unconcerned	A little concerned	Concerned	Fairly concerned	Very concerned

•How much did you keep track of the amount your baby drank?

Never	Rarely	Sometimes	Mostly	Always

"I offered milk to my baby as a comfort"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I offered milk to my baby to calm her behaviour (if she wasn't hungry)"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"If I did not guide my baby's feeding she would feed too much"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I had to be especially careful to make sure my baby drank enough"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I fed my baby whenever he/she wanted feeding"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I tried to stretch out my babies feeds so I was feeding him/her less often"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I tried to get my baby into a feeding routine"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I let my baby take control of how much milk he/she drank"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"If my baby did not want to feed when I thought he/she should I tried to get her to feed anyway"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"If I did not guide or regulate my baby's intake of milk he/she would drink less than she should"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I thought my baby should always finish the bottle or breastfeed for a certain length of time"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

"I limited my baby's feeding"

Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree

Section Three: Attitudes towards breastfeeding

Please consider how strongly you agree with the following statements using the scale below:

1	2	3	4	5
Disagree	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**

	D	SD	NAD	SA	A
Mums should be allowed to breast feed wherever they want in public	1	2	3	4	5
Breastfeeding is what breasts were made for	1	2	3	4	5
I would be happy if someone breast fed sitting next to me	1	2	3	4	5
Breast feeding should continue for as long as mum and child are happy	1	2	3	4	5
Formula milk should not be advertised	1	2	3	4	5
Formula milk should not be give in hospitals	1	2	3	4	5
Breast feeding is best for baby's health	1	2	3	4	5
Breast feeding is best for the mother's health	1	2	3	4	5
Health professionals should encourage breast feeding	1	2	3	4	5
Health professionals should discourage formula feeding	1	2	3	4	5
Breast milk is the ideal milk for an baby	1	2	3	4	5
Breastfeeding is more convenient than formula feeding	1	2	3	4	5

Section four: Your experiences feeding your baby

Please think about the last few months breastfeeding your baby and rate how strongly you agree with the statements below using the following key

1	2	3	4	5
Disagree	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**

	D	SD	NAD	SA	A
"I felt confident breastfeeding my baby"	1	2	3	4	5
"Feeding my baby was easy"	1	2	3	4	5
"Feeding my baby was more difficult than I thought it would be"	1	2	3	4	5
"I had a lot of problems feeding my baby"	1	2	3	4	5
"I am happy with the decision I made on how to feed my baby"	1	2	3	4	5
"I received enough professional support in feeding my baby"	1	2	3	4	5
"Feeding my baby has been very stressful"	1	2	3	4	5
"I feel like I spent a lot of time feeding my baby"	1	2	3	4	5
"I feel that I have done a good job of feeding my baby"	1	2	3	4	5
"Feeding my baby has been a very demanding job"	1	2	3	4	5
"I feel I was well prepared to feed my baby"	1	2	3	4	5
"I loved feeding my baby"	1	2	3	4	5
"Breastfeeding was a really enjoyable experience"	1	2	3	4	5

This is the end of the questionnaire. Thank you very much for taking the time to complete it. Please remember all responses will be treated confidentially.

4C. Factor analysis of the Modified Child Feeding Questionnaire

Item	Scheduling feeds	Encouraging feeds	Use of milk for comfort	Monitoring feeds
How concerned were you about your baby becoming over weight?	**.431**	.438	.357	-.111
If I did not guide my baby's feeding she would feed too much	**.663**	.384	.011	.054
I tried to stretch out my baby's feeds so I was feeding him/her less often	**.742**	.201	.022	.134
I limited my baby's feeding	**.610**	.244	.395	.002
I kept track of the amount my baby drank	**.107**	.577	.074	-.142
I tried to get my baby into a feeding routine	**.692**	.194	-.359	-.054
I let my baby take control of the amount they drank	-.775	-.054	.179	.176
How concerned were you about your baby becoming under weight?	.081	**.534**	.540	-.159
If my baby did not want to feed when I thought he/she should I tried to get her to feed anyway	.070	**.720**	.115	-.064
I had to be especially careful to make sure my baby drank enough	.157	**.543**	.280	-.132
If I did not guide or regulate my baby's intake of milk he/she would drink less than she should	.223	**.573**	.223	-.052
I thought my baby should always finish the bottle or breastfeed for a certain length of time	.392	**.513**	.356	.011
I offered milk to my baby as a comfort	-.144	-.108	**-.028**	.881
I offered milk to my baby to calm her behaviour (if she wasn't hungry)	-.042	-.123	**.028**	.898
When your child was at home how often were you responsible for feeding her?	-.144	-.108	-.028	**.881**
How often were you responsible for deciding how much your child drank?	-.042	-.123	.028	**.898**
% of variance explained	**31.30**	**10.62**	**7.15**	**7.13**
α	**.727**	**.756**	**.791**	**.598**

4D. Factor analysis of attitudes towards breastfeeding

Item	Breastfeeding best for health	Breastfeeding as normal	Negative attitude to formula	Ease of breastfeeding
Breast feeding is best for baby's health	**.855**	.323	.186	.142
Breast feeding is best for the mother's health	**.858**	.116	.259	.053
Health professionals should encourage breast feeding	**.715**	.461	.265	.112
Breast milk is the ideal milk for an baby	**.839**	.289	.221	.086
Mums should be allowed to breastfeed wherever they want in public	.185	**.851**	.116	.123
Breasts are made for breastfeeding	.455	**.518**	.342	.145
I would be happy if someone sitting next to me was breastfeeding	.330	**.766**	.053	.058
Mums should be allowed to breastfeed for as long as they want	.177	**.766**	.198	.234
Formula milk should not be given in hospitals	.153	.185	**.868**	.198
Formula milk should not be advertised	.253	.160	**.853**	.153
Health professionals should discourage formula feeding	.253	.289	**.853**	.058
Breastfeeding is more convenient than formula feeding	.245	.058	.342	**.856**
Breastfeeding is easier than formula feeding	.044	.121	.253	**.875**
% Variance	**53.49**	**13.95**	**9.51**	**5.12**
α	**.860**	**.756**	**.877**	**.900**

4E. Factor analysis of experience of feeding

	Positive experience	Difficult experience	Demanding experience
I felt confidence feeding my baby	**.702**	-.560	.015
I am happy with the decision of how I chose to feed my baby	**.628**	.098	.225
I got enough professional support when feeding	**.697**	.056	.003
I feel that I did a good job feeding my baby	**.788**	.290	.052
I felt I was well prepared for feeding	**.664**	**-.514**	.068
I loved feeding my baby	**.683**	**-.514**	.047
I am happy with the decision I made on how to feed my baby	**.788**	.165	-.020
Feeding my baby was an enjoyable experience	**.653**	**-.618**	.014
I had lots of problems feeding my baby	.271	**.820**	-.056
Feeding my baby was more difficult than I thought it would be	.114	**.759**	-.087
Feeding my baby was stressful	.302	**.674**	.217
Feeding my baby was a demanding experience	.050	.143	**.830**
Feeding my baby took up a lot of time	.004	.076	**.854**
% of variance explained	**51.57**	**11.15**	**7.11**
α	**.900**	**.830**	**.742**

3C. Modified Child Feeding Questionnaire

CFQ Factor	CFQ Question	Modified Question and / or additional questions	Response options
Perceived Responsibility	When your child is at home how often are you responsible for feeding her? How often are you responsible for deciding what your child's portion sizes are?	When your baby was at home how often will you be responsible for feeding her? How often will you be responsible for deciding how much your baby drinks?	1. Never 2. Seldom 3. Half of the time 4. Most of the time 5. Always
Concern about Child Weight	How concerned are you about your child being over weight?	How concerned are you about your baby becoming over weight? How concerned are you about your baby becoming under weight?	1. Unconcerned 2.. A little concerned 3. Concerned 4. Fairly concerned 6. Very concerned
Monitoring	How much do you keep track of the food your child eats (three questions in original CFQ targeting sweet, snack and high fat food)	I will keep track of the amount my baby drinks I think my baby should always finish the bottle or breastfeed for a certain length of time I will let my baby take control of how much milk he/she drinks	1. Disagree 2. Slightly disagree 3. Neutral 4. Slightly agree 5. Agree
Reward (subset of Restriction)	I offer sweets to my child as a reward for good behaviour	I will offer milk to my baby as a comfort I will offer milk to my baby to calm her behaviour (if she isn't hungry)	
Restriction	If I did not guide or regulate my child's eating she would eat too much (junk food or favourite food) I have to be sure that my child does not eat too much (sweets, high fat or favourite foods)	If I do not guide my baby's feeding she will feed too much I will schedule my baby's feeding I will feed my baby whenever he/she wants feeding (reverse scored)	
Pressure to eat	I have to be especially careful my child eats enough If my child says "Im not hungry I try to get her to eat anyway If I did not guide or regulate my child's eating she would eat less than she should	I will have to be especially careful to make sure my baby drinks enough If my baby does not want to feed when I think he/she should I will try to get her to feed anyway If I do not guide or regulate my baby's intake of milk he/she will drink less than she should	