Maternal and infant contributions to development following premature deliveries

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Summary of thesis

The focus of this thesis is on the early caregiving environment and social interactions of preterm infants.

Chapter one introduces the topic of premature delivery, including infant outcomes, parent's caregiving role, infant's role in their own development, and dyadic interactions between parents and their premature infants.

Chapter two introduces methodological difficulties in the study of preterm infants. The chapter also provides an overview of the longitudinal study of preterm infants' development that provided the majority of the data for this thesis.

Chapter three introduces a new measure of parenting principles and practices, the Baby Care Questionnaire (BCQ). The BCQ measures how parents approach caring for their infant in three contexts – sleeping, feeding and soothing. The chapter documents the development and psychometric properties of the BCQ.

Chapter four studies the impact of premature birth on maternal cognitions and principles about caregiving. The chapter presents data on the consistency of maternal cognitions about child development and caregiving at an individual and group level.

Chapter five studies the impact of premature birth on infant attention, in particular social attention. The chapter reports data on the style of preterm infants' looking to a novel stimulus, how these infants followed an experimenter's attention to a target and their regulation abilities (as reported by their mother).

Chapter six studies the impact of premature birth on interactions between mothers and their infants. The chapter uses statistical techniques to represent streams of behaviour to examine different responding to person- and object-directed behaviours by mothers and their premature infants.

Chapter seven brings together these findings and discusses future work.

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Chapter 1. General introduction

1.1 Chapter overview

The poor developmental outcomes demonstrated by preterm infants have been well documented. The underlying causes of these deficits and delays, and the role of the parent, are less well understood. The aim of this thesis is to describe the early caregiving environment and social interactions of preterm infants, with a focus on the mother's, infant's and dyadic contributions. The aim of this chapter is to review literature on preterm development and lay out the themes of this thesis. First, I will review the literature documenting outcomes for infants following preterm delivery. Then I will move onto literature focusing on how parents care for a preterm infant both initially in the hospital and once the baby comes home. From here, I will review the literature on specific contributions infants may have to their environment – their attentional abilities, in particular. Finally, I will examine the literature on how parents may respond and encourage their preterm infant's visual explorations before outlining the goals of this thesis.

1.2 Causes and consequences of preterm delivery

Preterm birth is defined as delivery before 37 completed weeks of gestation (Howson, Kinney, & Lawn, 2012). A term gestation is typically 40 weeks and therefore a preterm delivery is a minimum of four weeks before the expected date of birth. Around 7% of live births in England and Wales were premature between 2005 and 2008 (Office for National Statistics, 2011). This rate has remained stable since the Government started producing figures in 1994/5.

Als (1989) described preterm infants as the product of "advances in neonatal medical technology" (p.65). These advances in neonatal and perinatal medicine have led to increasing numbers of infants surviving closer to the point of viability as well as increasing numbers of late preterm births (between 32 and 36 weeks' gestation; Behrman & Butler, 2006; Hintz, Kendrick, Vohr, Poole & Higgins, 2005; Vohr et al., 2000; Vohr, Wright, Poole, McDonald, & for the NICHD Neonatal Research Network Follow-up Study, 2005). With these improvements, concern has shifted from survival to the development of these preterm infants (Goldberg & DiVitto, 1983). Unfortunately, improved survival rates have not coincided with improved developmental outcomes or quality of life for these infants (Hintz et al., 2005; Zwicker & Harris, 2008).

Many investigators have documented poor outcomes in preterm infants in various domains of development, including motor, behavioural, cognitive and sensory. Khan et al. (2006) diagnosed mild impairments in 45% and serious impairments in 23% of their preterm Bangladeshi sample of 30-month-olds, with only 32% of the infants demonstrating normal development. Thirty-seven percent were diagnosed with cognitive developmental delay and 18% with delayed speech. This level of cognitive delay is also representative of Western countries, with estimates ranging from 30 to 40%. Increased risk of internalising and externalising problems has been widely reported in school-aged children, including attention problems, increased withdrawal, thought problems, delinquency and aggression (Bhutta, Cleves, Casey, Cradock, & Anand, 2002). However, some children born preterm do not display any of these impairments (Anderson & Doyle, 2008; Bhutta, Cleves, Casey, Cradock & Anand, 2002; Linnet et al., 2006; Marlow, Wolke, Bracewell & Samara, 2005).

Preterm birth occurs more often among mothers of low socioeconomic status, who are under 15 years old or who have had many pregnancies close together in time (Goldberg & DiVitto, 1983). These demographic factors, without the consideration of premature deliveries, are risk factors for disadvantaged environments. Therefore, preterm delivery potentially combines biological immaturity with environmental risk. Those infants who were born to mothers who had normal pregnancies, and who were physically and emotionally healthy, were believed to have the best opportunity to develop well (Sameroff & Chandler, 1975). Therefore, simple cause-and-effect models that claim preterm birth causes later disorder lack predictive efficiency (Sameroff & Chandler, 1975). Sameroff and Chandler (1975) proposed a transactional model that takes into account a continuum of both reproductive and caretaking casualty, and described the on-going influence that the child and parent have on each other. This model predicts that preterm birth does not cause negative developmental outcomes alone but that the stressful conditions following early delivery place preterm infants at risk from caretaking casualty, which moderates the risk for later developmental difficulties. Therefore, this model also suggests that positive environments may buffer the impact of preterm delivery on later outcomes. There is a growing body of evidence showing that stimulating environments that are sensitive to the infant's abilities can overcome the potentially detrimental effects of preterm delivery (for example, Clark, Woodward, Horwood, & Moor, 2008; Forcada-Guex, Pierrehumbert, Borghini, Moessinger, & Muller-Nix, 2006; Landry, Smith, Miller-Loncar, & Swank, 1997a). The transactional account of development also focuses on the impact children have on their parent's behaviour (Sameroff & Chandler, 1975). This thesis is therefore interested in early caregiving of preterm infants and the impact of the infant – in particular, their attention abilities – have on their interactions with their mother.

1.3 Caring for a preterm baby

1.3.1 During the Neonatal Intensive Care Unit (NICU) stay

Newborns, even those born at term, are born immature and lack cortical regulation to achieve physiological homeostasis and autonomous learning without external support (St James-Roberts, 2007). For all parents, their child's infancy is thus a period of intense caregiving and high dependency, during which they must respond to their infant's needs for food, sleep and emotional attachment while aiding their infant in regulation and learning (Small, 1999; Spera, 2005; St James-Roberts, 2007). However, preterm birth is often coupled with the hospitalisation of the infant (Goldberg & DiVitto, 1983). Therefore parents' early experience of caring for their infant often occurs in the Neonatal Intensive Care Unit (NICU), sometimes for extended periods. During this period of hospitalisation, both the parents and the medical staff on the NICU meet the needs of the newborn.

Parents often report feelings that the medical staff are more capable of caring for their infant than them as well as feelings that they do not have a baby and/or the hospital owns their infant (Cleveland, 2008; Goldberg & DiVitto, 1983). These feelings can be exaggerated given preterm birth is often unexpected, not only introducing the baby to the world before s/he is biologically ready but also suddenly forcing adults into parenthood (Goldberg & DiVitto, 1983). This new parenthood is accompanied with stress and anxieties relating to the delivery and special care needed for their infant that do not tend to be experienced following term deliveries. In addition, these parents are often ill prepared and have not had a chance to go to antenatal classes, read books about parenting and child development, develop principles about how to care for their infant, or more practical aspects such as buying supplies for their newborn.

The level of contact parents are allowed, and even encouraged to have, during the NICU stay has changed dramatically over the last 50 years (Davis, Mohay, & Edwards, 2003; Goldberg & DiVitto, 1983). Pierre Budin, the creator of the incubator, encouraged mothers to be involved in the care of their infants during hospitalisation. Budin (1907) had two reasons for advocating mothers' involvement – he claimed no other individual would monitor the child as carefully, and he also noted that early involvement was crucial in ensuring the mother's sense of responsibility as well as ensuring the mother would be able to nurse her baby upon discharge from hospital. However, by the 1960s, parents' presence in the hospital was minimised to prevent infection and unsettling the fragile babies (Davis et al., 2003). Studies in the 1970s suggested that early contact with their infants did not lead to increased risk of infections but instead improved mother's confidence, commitment to the infant on going home, handling of the baby, and increased the amount of time mothers spent in face-to-face interactions and cuddling their infant (Barnett, Leiderman, Grobstein, & Klaus, 1970; Paludetto, Faggiano-Perfetto, Asprea, de Curtis, & Margara-Paludetto, 1981). Previously a parent who visited two or three times a week was considered a frequent visitor, whereas now infants tend to be visited daily (Goldberg & DiVitto, 2002).

Increased awareness and documentation of the importance of parental involvement during the NICU stay has also lead clinicians to increasingly involve parents in their infant's care (Davis et al., 2003; Goldberg & DiVitto, 2002). The NICU tends to have prescribed schedules for daily caregiving and parents in the UK are often encouraged to be involved with this routine basic care – for example, nappy changes and oral hygiene. Such involvement allows parents to become familiar with their infant, feel important to the baby and prepare for the responsibility of taking exclusive care of their baby (Goldberg & DiVitto, 1983). Although parents can feel like less skilled substitutes for medical staff on the NICU, there are certain activities that only parents can do and, for this reason, involvement in these activities is particularly valued by parents (Cleveland, 2008). For example, breastfeeding or expressing breast milk is an activity that can only be done by mothers. Feldman and Eidelman (2003) found that breastfeeding during the hospital stay was related to cognitive level of preterm infants and affectionate touching by mothers at 6 months. Therefore, Feldman and Eidelman (2003) suggested breast milk directly effected preterm infants through its nutritional value and indirectly through positive maternal behaviours. Additionally, mothers and fathers are encouraged to partake in Kangaroo care. During Kangaroo care, parents support temperature regulation by holding their infants in an upright position to their chest, providing prolonged periods of skin-to-skin contact (Feldman, Eidelman, Sirota, & Weller, 2002; Flacking, Ewald, & Wallin, 2011; Ruiz-Peláez, Charpak, & Cuervo, 2004;

Tessier et al., 1998). One of the benefits of Kangaroo care for mothers is improved milk production and more persistence with breastfeeding (Cleveland, 2008; Flacking et al., 2011; Ruiz-Peláez et al., 2004; Tessier et al., 1998). Kangaroo care was related to mother's sense of competence and sensitivity during feeding (Tessier et al., 1998) and helps prepare the family for discharge (Ruiz-Peláez et al., 2004). Parents are therefore allowed to have important early interactions during hospitalisation, which help parents prepare for their infant going home (Goldberg & DiVitto, 1983, 2002).

1.3.2 At home

For all parents, the first task after taking their infant home revolves around the infant's physiological functioning, along with sleeping and feeding patterns (Goldberg & DiVitto, 1983; Small, 1999). Following birth, the sleeping and waking states of preterm infants develop so that active sleep decreases and quiet waking, active waking and quiet sleep increases (Holditch-Davis & Edwards, 1998). Waking was recorded when the infant's eyes were open (or opening and closing) – waking was quiet when motor activity was low and active when motor activity was mostly high. Sleep was coded when the infant's eyes were closed – quiet sleep was when respiration was relatively regular and motor activity was limited, and active sleep when respiration was uneven and only sporadic motor movements occurred. During the preterm period, the organisation of these sleep states increases. After preterm infants reach term, they have been reported as sleeping more than term infants (Ardura, Andrés, Aldana, & Revilla, 1995). In particular, preterm infants show longer durations of quiet sleep (Watt & Strongman, 1985). However, preterm infants have also been described as less stable than term infants in terms of their state change, shifting from state to state significantly more often (Holditch-Davis & Thoman, 1987; Watt & Strongman, 1985). Parents of preterm infants also reported more feeding problems with their infants and observations of feeding interactions have demonstrated less efficient feeding by preterm infants who fed for longer but spent less time, proportionally, actually feeding (indicated by duration of nipple in mouth; Minde, Perrotta, & Marton, 1985). This disorganisation of behavioural states may therefore make it difficult for parents to introduce or maintain patterns of feeding and sleeping even when such schedules were established in the NICU.

In home observations, preterm infants spent more time alone than term comparators (Holditch-Davis & Thoman, 1987). During the 7 hours of observations, preterm infants spent 5.4 hours, on average, alone compared with 4.6 hours for term infants. During feeding sessions, parents of preterm newborns held their infants further away and stimulated their infants less (DiVitto & Goldberg, 1979). These differences persisted at reduced levels at 4 months. However, other studies have reported that mothers were more active during feeding interactions over the first 3 months following discharge from hospital (Bakeman & Brown, 1980; Minde et al., 1985) as well as later in the first year of life (Stevenson, Roach, ver Hoeve, & Leavitt, 1990). Singer et al. (2003) also reported that parents of one-month-old (corrected for prematurity) very low birthweight (VLBW) infants were more active and stimulating during feeding sessions. However, these differences were no longer evident at 8 and 12 months post-term.

Parents of preterm infants have also been described as more active during play interactions in the first 6 months of life (Field, 1977a; Holditch-Davis, Schwartz, Black, & Scher, 2007). During this high activity and stimulation, preterm infants often gaze avert leading to claims that these preterm infants are being over-stimulated (Field, 1977a; Goldberg & DiVitto, 1983). Gaze aversion is believed to occur when infants cannot process the presented information – the higher levels of gaze aversion in preterm infants have therefore been claimed to reflect their slower rates of information processing (Landry, 1986). The high activity rate of parents paired with preterm infants' gaze aversion could be perceived as maladaptive to observers (Goldberg & DiVitto, 1983).

The implications of early parent-preterm interactions on child outcomes have been studied. Forcada-Guex et al. (2006) observed that preterm infants who were part of mother-infant dyads characterised by a sensitive mother and a cooperative and responsive child (cooperative pattern) showed similar outcomes to term infants in measures of behavioural and developmental outcomes in the second year of life. However, infants in dyads characterised by a controlling mother and a compulsive-compliant infant (controlling pattern) showed significantly fewer positive outcomes than the other two groups. The controlling pattern was present in a larger proportion of the preterm, compared with the term, sample. Forcada-Guex et al. (2006) suggested that positive, cooperative interactions were a protective factor against the risk associated with prematurity, while negative, controlling interactions played a risk-precipitating role. Feldman and Eidelman (2006) found that preterm infants, whose mothers showed more intrusive behaviour that was uncoordinated with the infant's state, infant's looking to mum or the infant's communicative signals, displayed poorer cognitive functioning at 24 months.

Differences in early caregiving do not necessarily reflect negative or maladaptive behaviours (Bakeman & Brown, 1980). Bakeman and Brown (1980) did not find predictive relations between early differences in parenting and cognitive outcomes at 3 years – infant responsiveness was the only significant predictor of social competence. Preterm infants have consistently been described as less responsive, less active and less clear in their cues (Bakeman & Brown, 1980; Brachfeld, Goldberg, & Sloman, 1980; Field, 1977a). The increased activity of parents of preterm infants may therefore reflect an adaptive response to an unresponsive child. Although the increased stimulation has been interpreted as intrusive, insensitive and stimulating, VLBW and preterm infants may require this extra stimulation to elicit responses (Singer et al., 2003).

1.4 Attention in term and preterm infants

Parents do not behave independently of their children – parents and their infants have mutual influence on each other (Bell, 1968; Harper, 1975; Sameroff & Chandler, 1975). Since Bell's (1968) and Harper's (1975) papers on the role of the infant in parent behaviour, researchers have built up a body of work to demonstrate how differences in infants can result in differences in parents. As Sameroff and Chandler (1975) eloquently articulated, "the child alters his environment and in turn is altered by the changed world he has created" (p.234). They claimed that in order to gain predictive validity from the caretaking environment the infant must also be taken into account as the infant is not a passive recipient of their environment or their parent's behaviour. Instead infants seek out and structure their experience of their environment.

Attention is one of the most fundamental contributions infants make to their own experience: infants attend to some aspects of their environment and not other aspects (Ruff & Rothbart, 1996). Given the complex environment with which infants are confronted, this selective attention is necessary to function well when important events occur within the vast amount of stimulation and "chaos" of the environment (van de Weijer-Bergsma, Wijnroks, & Jongmans, 2008). Responding to stimuli increases in the first weeks of life, but responding to repeated stimuli decreases with age (Sigman, 1983; Sigman & Beckwith, 1980). Infant attention shows a u-shaped development – initial fixations need to be long enough for the infant to carefully examine the world but longer fixations reflect slower information processing. When examining attention in infants, researchers therefore need to consider both initial responsiveness and sustained fixations (Sigman, 1983; Sigman & Beckwith, 1980).

Individual differences in the duration of fixation have been found to correlate with concurrent measures of cognition in infancy and intelligence in childhood (Bornstein & Sigman, 1986). Many researchers have divided infants into 'short-lookers' and 'long-lookers' based on the duration of their longest look to a stimulus (for which they have usually accumulated 20s of looking). When infants' looking to a stimulus was examined, short-lookers showed shorter peak look (longest look), shorter average length of look, more looks and more shifts, and somewhat broader inspections than long lookers (Jankowski, Rose, & Feldman, 2001). On familiarisation tasks, short-lookers had novelty preferences significantly above chance at 5 months (while long-lookers did not; Jankowski et al., 2001) and significantly higher novelty preferences than long-lookers at 3.5 months (Courage & Howe, 2001) and showed greater attention to global features after 20s and local features after 30s of familiarisation (long-lookers showed no systematic preference until 50s of familiarisation; Colombo, Freeseman, Coldren, & Frick, 1995). Older children had shorter looks and more shifts than younger ones. A more mature pattern of attention was therefore characterised by shorter durations of fixations and more shifts in attention, thus showing a greater capability to disengage and refixate on either a different stimulus or a different aspect of the same stimulus. This more mature pattern of attention has been shown to be associated with better information processing and better visual recognition memory (Rose, Feldman, & Jankowski, 2003b).

1.4.1 Attention in preterm infants

Individuals born preterm have frequently been described as at risk from attentional difficulties during infancy and during adolescence and later life (for example, Bhutta et al., 2002; Carmody et al., 2006; van de Weijer-Bergsma et al., 2008). Preterm infants showed more immature patterns of looking (during an information processing task; Rose, Feldman, & Jankowski, 2002). A meta-analysis demonstrated that attention problems persisted into childhood, with preterm school-aged children showing less capability in selective attention (Bhutta et al., 2002), which were confirmed with lower ratings for attentional focusing by parents of 5-year-old children born preterm (Nygaard, Smith, & Torgersen, 2002).

Sigman and Parmalee (1974) presented 4-month-olds with stimuli of differing complexity, resemblance to faces or novelty. Both preterm and term infants looked preferentially to more complex stimuli, term infants were more attentive to face-like stimuli than preterm infants, and although preterm infants attended to familiar and novel stimuli as long as term infants, only term infants differentiated between novel and familiar stimuli. Preterm infants demonstrated less mature patterns of attention (at 12, but not 5 and 7 months) in standardised laboratory measures than term infants, with longer looks and slower shift rates (Rose et al., 2002). In play interactions, preterm infants were observed to be less attentive, spending more time looking around and less time playing with toys (Brachfeld et al., 1980; Landry, 1986). Furthermore, preterm infant's focused attention – time spent examining objects – at 7 months predicted later attention and cognitive skills through to preschool (Lawson & Ruff, 2004). A more detailed review about preterm infant's attention abilities can be found in chapter 5.

Preterm infant's attention impacts their interactions with their parents. Female infants who looked longer to a laboratory stimulus at 40 weeks postconceptual age were held and talked to less and spent less time in mutual gaze in home interactions at 1 month postterm (Sigman & Beckwith, 1980). For male preterm infants, those who looked to the laboratory stimulus for longer durations spent more time in stressful holding and less time in responsive holding during home observations. Fixation time to the laboratory stimulus was also related to later cognitive functioning, with longer fixations related to lower scores on the Bayleys mental development index.

1.4.2 Attention sharing

During the prelinguistic period, or infancy, attention plays an important role in communication. Attention allows basic information about objects of interest or desire to be conveyed from the infant to their social partner (Butterworth, 1991). Attention also allows others to communicate information about the environment to the infant. The ability to monitor and exploit the attentional states of other people, or joint attention, emerges in a very brief developmental window between 9 and 12 months (Carpenter, Nagell, & Tomasello, 1998). Before being able to share or direct attention, infants are able to follow another person's attention-directing strategies (points or gaze direction). Therefore, infants' ability to follow another's gaze allows others to demonstrate a wider range of features of the environment to the infant and is therefore a fundamental component of object-focused social interaction and serves an important communication function before the infant can communicate with vocalisations (Moore, 2008; Scaife & Bruner, 1975). This ability to follow gaze or respond to attempts at joint attention (RJA) is the earliest manifestation of the capacity for joint attention (Morales et al., 2000).

Only a few studies have examined joint attention abilities in preterm infants, but those few have found that preterm infants demonstrate lower levels of joint attention skills, in particular in initiating joint attention (DeGroote, Roeyers & Warreyn, 2006; Smith & Ulvund, 2003). Furthermore, Smith and Ulvund (2003) found that preterm infants' ability to initiate joint attention episodes with an experimenter at 13 months (corrected for prematurity) was related with intellectual outcomes at 8 years. Preterm infants' levels of joint attention, however, were consistently lower than those generally shown by term peers. Joint attention was not measured again at a later time to determine whether these lower scores were due to impairments or delays in joint attention.

There is little understanding of this early stage of attention following in preterm infants. Studies that examined preterm infants' ability to respond to joint attention allow some insight into these infants' ability to follow attention. Observations of infants with their mothers demonstrated differences in responding to and initiating attention-directing bids in very low birthweight (VLBW) infants across the first year of life (Landry, Smith, Miller-

Loncar, & Swank, 1997b). VLBW infants with more medical complications showed slower rates and lower levels of initiations in both attentionally demanding (toy-centred play) and less attentionally demanding (daily activities) contexts, whereas those with fewer medical complications only showed slower rates and lower levels of initiations in the more attentionally demanding context compared with term controls. However, there was no difference in the level of responding to parent's request for attention for high- or low-risk VLBW infants (as compared with term infants). Therefore, high-risk infants appear to show broader difficulties with initiating, whereas low-risk infants only appear to have difficulties initiating in attentionally demanding situations. However, preterm infants appeared to have difficulties responding to requests for joint attention. Chapter 5 examines preterm infants' ability to follow the attention of an experimenter at 5 months old.

1.5 Encouraging preterm infants' focus of attention

Responsiveness is the prompt, contingent and appropriate reaction of parents to their infant's behaviour, which occur in everyday interactions across contexts and cultures (Bornstein, Tamis-LeMonda, Hahn, & Haynes, 2008). Parenting is *multidimensional* – different types of engagement are used for different purposes; *modular* – different domains are not related; and *specific* – different domains have different effects on the child. Two parents may therefore be equally responsive but differ in the behaviours they respond to and/or the behaviours they use in response (Bornstein et al., 2008).

Caregiver encouragement of attention has been divided into two domains – social and didactic (Bornstein, Suwalsky, Ludemann, Painter, & Schulthess, 1991). The focus of social interactions, or encouraging attention to self, is within the dyad, involves physical and verbal strategies that parents use to express their feelings to their infant as well as engage their infants in primarily interpersonal exchanges (Bornstein, 1989). Behaviours observed in these types of interactions include rocking, kissing, tactile comforting, nonverbal vocalising and maintaining playful face-to-face contact. The focus of didactic interactions is outside the parent and infant and therefore has an extradyadic locus (Bornstein, 1989). These interactions include parental strategies to stimulate and arouse their infants to the world and encourage attention to properties, objects or events in the environment; such strategies could be physical (pointing, placing, guiding or demonstrating) or verbal (describing, questioning, instructing or labelling).

Mother's use of social and didactic encouragement of attention were not related to each other but were related to their infant's social (to caregiver) and didactic (to object) attention (Bornstein & Tamis-LeMonda, 1990). These results demonstrated that mother's overall use of social encouragement of attention was related to their infant's social attention, and didactic encouragement of attention was related to infant's didactic attention. However, these correlations did not demonstrate whether these behaviours were related in real time and so were contingent. Sequential analysis was used to demonstrate that for both person- and object-directed interactions the mother was significantly more responsive or contingent than their infant (Cote, Bornstein, Haynes, & Bakeman, 2008). These results demonstrate synchronisation and contingency between similar mother and infant behaviours, with mothers taking more of the responsibility in supporting interactions with their 5-month-old infant. Similar conclusions were drawn based on infants' engagement state during interactions between infants and their mother, their peer or alone (Bakeman & Adamson, 1984). Mothers were more capable, than their infants' peers, of structuring interactions so their infant could participate in joint toy engagement.

Parents of all infants therefore appear to play an important role in structuring a young infant's environment, but for parents of preterm infants this may be particularly important. While parents of preterm infants have been described as more intrusive, this may reflect an adaptive strategy to provide a more structured environment for those immature infants that require the support to visually explore (Landry, Garner, Denson, Swank, & et al., 1993; Landry et al., 1997a). Parents' behaviours only provide opportunities for their infant when these behaviours match what the infant is ready and able to do (Goldberg & DiVitto, 1983). Both preterm and term infants showed more exploratory play following attention-directing strategies that maintained their focus of attention (Landry et al., 1993). However, preterm infants were also more likely to respond to structured attention-directing strategies. The structured strategies that provided infants with information about how to use the toy or provided physical assistance resulted in more exploratory play in the preterm infants. Both the maintaining and structured attention-directing strategies were related with later cognitive language ages (Landry et al., 1997a). The authors concluded that maintaining strategies were beneficial, as they reduced demands on the cognitive and attentional abilities of the preterm infants and allowed these infants to organise their behaviour and better signal their interest. Structured strategies used early in development also promoted cognitive language, but it was noted that there needs to be balance between supporting the child's early social development without compromising future autonomous functioning.

Responsiveness is dynamic, which allows children to elicit maternal behaviours (Bornstein et al., 2008). Such dynamism may be most meaningful when the infant's needs change. A differentiated concept of responsiveness promises to provide a better understanding of responding in different populations. For example, parents of infants of differing attention skills and preferences may respond more – or less – to didactic, as compared with social, visual attention of their infants.

1.6 Summary

This chapter served to introduce some of the main issues covered in this thesis. This chapter has reviewed the literature on outcomes following preterm delivery, caring for a preterm infant, preterm infant's contributions to their own development and finally the interactions between preterm infants and their parents. The questions covered in this thesis focus on maternal and infant contributions to development following preterm birth. Specifically, I will investigate the effect of premature deliveries on maternal abilities to cognise about child development in general, and specific maternal principles about how to approach caregiving. The second set of questions focus on the effect of premature birth on infants' looking to faces and responding to shifts of attention by an adult. Finally, I will examine the effect of premature birth on dyadic interactions – specifically how mothers and infants respond to each other.

The next chapter (chapter two) provides an overview of the longitudinal study of preterm development that is central to this thesis as well as summarising some of the main methodological issues in the study of preterm infant development. Chapter three introduces and reports on the psychometric properties of a new measure of early caregiving – the Baby Care Questionnaire (BCQ). The BCQ measures how parents approach caring for their infant in three contexts – sleeping, feeding and soothing. Chapter four studies the impact of premature birth on maternal cognitions and principles about caregiving. The chapter presents data on the consistency – at an individual and group level – of maternal cognitions about child development and caregiving. The goal of chapter three and four was to understand how mothers respond to premature birth – focusing on caretaking casualty as described in Sameroff & Chandler's (1975) transactional model. That is, the goal of chapter four was to understand how the conditions following early delivery may have altered early caregiving. Chapter five studies the impact of premature birth on infant attention, in particular social attention. The chapter reports data on the style of preterm infants' looking to a novel stimulus, how these infants followed an experimenter's attention to a target and their regulation abilities (as reported by their mother). Sameroff and Chandler (1975) claimed that infants must be taken into account to fully understand the caretaking environment as infants seek out and structure their experiences and are not passive recipients of their environment. Therefore, the goal of this chapter was to understand the infant's contribution to their own development. Chapter six examined sequences of maternal and infant behaviours following premature deliveries. Sameroff and Chandler's (1975) transactional model described the on-going influence that the child and parent have on each other. Therefore, the goal of this chapter was to more fully understand the influence mothers and their premature infants have on each other. It is important to understand these transactions as the transactional model proposed that positive environments could buffer the negative effects of premature deliveries. Chapter seven brings together findings and discusses future work.

Chapter 2. Methodological issues

2.1 Chapter overview

This chapter provides an overview of the longitudinal study of preterm development – *Special Delivery* – that is central to this thesis, as well as introducing some key methodological issues in the study of preterm infant development and how these issues were resolved in the Special Delivery study. The first section introduces the Special Delivery study – a longitudinal study of the social and cognitive development of preterm infants. This summary provides an overview of the sample – including recruitment, demographic and medical characteristics – as well as overall procedures of the study. Although the study has four waves – birth, 5 months, 13 months and 18 months – this thesis only reports data from the first two waves of data collection and so this summary primarily focuses on those two data points. The second section introduces methodological issues, including issues about the conceptualisation of development, selection of samples and measuring the age of preterm infants.

2.2 Overview of the Special Delivery study

2.2.1 Aims of the study

The overall aim of the Special Delivery study was to answer questions concerning the social and cognitive development in low-risk moderate- to late-preterm infants (criteria are discussed in section 2.2.2 and discussion of decisions in section 2.3.2.2). Specific aims for the overall study (all four waves) included:

1) To address questions about the nature of the risk for reduced cognitive performance shown in infants born preterm (literature reviewed in chapter 1)
2) To investigate principles and cognitions of mothers of preterm infants
3) To investigate the impact of birth status on infant attention abilities
4) To investigate maternal and preterm infant interactive behaviours

5) To investigate the impact of preterm birth on social-cognitive abilities (including attention following and sharing, imitation and language)

We addressed these questions with a short-term longitudinal design that combined methods, including parent-reports; experimental paradigms; observations – structured with an experimenter and free play with mother; standardised measures – Bayley Scales of Infant Development (Bayley, 2006); and reviews of medical records.

The Special Delivery study is a multi-site, collaborative study made up of researchers based at the School of Psychology, Cardiff University, and the *Eunice Kennedy Shriver* National Institutes of Child Health and Human Development, National Institutes of Health, and clinicians at the University Hospital of Wales. I initially designed the study in my successful Wellcome Trust-National Institutes of Health four year PhD studentship application. I was therefore highly involved in the initial design and set up of the Special Delivery study. I was also involved in finding funding for an additional PhD student to be added to the study. My specific (independent) responsibilities were: to design the birth and 5-month data points – specifically selecting all methodologies for those waves; data collection at birth; running the 5-month visits; management and reduction of data collected at birth and 5 months; and training secondary coders to code birth and 5-month data. I shared responsibility for recruitment of the sample with the second PhD on the project. This second PhD student is responsible for all aspects of the 13- and 18-month visits.

2.2.2 Participants and recruitment

A total of 133 parents were recruited to take part in the Special Delivery study. The majority of participants were recruited during the hospitalisation period following delivery through the Department of Child Health at University Hospital Wales (UHW, n = 116). An additional 17 parents were recruited through the Cardiff city registry office and other community links such as the National Childbirth Trust (NCT). Parents were approached if they delivered their infant between 30 and 42 weeks gestational age and met our inclusion and exclusion criteria.

For this study, we were interested in the development of low-risk (see section 2.3.2.2 for further details) very-preterm and moderate- to late-preterm infants. Very preterm infants are born after 28 weeks but before 32 completed weeks gestation and moderate- to late-preterm infants are born after 32 weeks but before 37 completed weeks gestation (Howson et al., 2012). For the Special Delivery sample, we recruited parents of infants born between 30 and 36 weeks gestational age for the preterm sample and 37 and 42 weeks gestational age for the term sample. Infants were excluded from participating in the study if they had serious medical conditions – beyond prematurity alone – or congenital abnormalities that could affect growth and development, including requiring surgical intervention; severe brain assault – periventricular leukomalacia (PVL) or intraventricular haemorrhage (IVH, grade III or IV); severe sensory impairments; bronchopulmonary dysplasia (BPD) and chronic lung disease (CLD); or necrotizing enterocolitis (NEC). Additionally, multiple births and parents under 16 years old were excluded. Suitable infants were identified as fitting our inclusion and exclusion criteria through discussions with medical staff (either midwife, nurse or doctor) responsible for their care. Trained researchers then provided the parents of these infants with an information sheet about the study and invited them to participate while their infant was still in hospital.

At the time of writing, 29 preterm infants and 60 term infants and their mothers were seen at birth and 5 months and therefore make up the sample for this thesis. Five-month study visits were scheduled based on chronological age with a window of ±15 days (see section 2.3.3 for decisions about age matching). To keep parents motivated to stay in the study, rewards (at or between waves) were items that would be visible day-to–day and were clearly linked to the research group. For example, we sent infants a birthday card on their first birthday or at birth parents were given a smiley face toy that attached to the pram and included the lab email address. I made initial contact about the visit through email or letters notifying the families that the 5-month visit was coming up and providing an opportunity for them to update their contact details. I then made a follow-up phone call to try to schedule the 5-month visit. After trying to call 3 times, I sent a follow-up email or letter to parents asking if they could either schedule the visit through emails, send the best phone number or time for me to call, or to call me. At the same time, I would send a reminder text message trying to get families to schedule the visit. I would continue to call families until the infant was outside of the testing window. However, sometimes phones had been disconnected between testing waves. In this situation, I would text, email and/or write letters to families asking for them to call me or send me a new phone number. Procedures were the same for scheduling 13- and 18-visits. The only difference was the addition of a note in the birthday cards asking parents to update contact details as necessary. Attrition across the birth to 5-month period was 25% and was primarily due to loss of contact with families. Three additional children were excluded, one due to a history of depression in the mother and two other children who were placed on the child in need register as social services had concerns about the social environment of the child – for example, due to exposure to domestic abuse.

Table 2.1 shows demographic information and Table 2.2 medical information for the two groups, with both tables presenting inferential statistics about differences and similarities between groups. The preterm and term samples did not differ on any of the demographic variables – maternal age, maternal parity, maternal ethnicity[1], maternal marital status, maternal education, and family income. However, the samples differed on medical status –

[1] The Chi-squared test to examine relations between birth status and maternal ethnicity included four cells - preterm Caucasian, term Caucasian, preterm other and term other. See the note Table 2.1 for further details.

Table 2.1

Infant and maternal demographic characteristics

				Preterm	Term	Difference
Infant chronological age (days)	*M (SD)*	Newborn		8.62 (8.89)	10.08 (9.83)	$t(87) = -0.32$, $p = .748$, $d = -0.07$
		5 months		152.59 (6.21)	153.58 (6.59)	$t(87) = -0.68$, $p = .496$, $d = -0.15$
Infant gender	*N* (%)	Female		13 (45)	27 (45)	$\chi^2(1) = 0.00$, $p = 1.00$
		Male		16 (55)	33 (55)	
Maternal age (years)	*M* (*SD*)			32.28 (4.82)	32.00 (4.49)	$t(87) = 0.27$, $p = .791$, $d = 0.06$
Maternal parity	*N* (%)	First born		19 (66)	43 (72)	$\chi^2(1) = 0.58$, $p = .447$
		Later born		10 (34)	17 (28)	
Maternal ethnicity	*N* (%)	Caucasian	British	29 (100)	53 (88)	$\chi^2(1) = 1.01$, $p = 1.00$[a, b]
			Non-British	0 (0)	4 (8)	
		Other	Asian	0 (0)	1 (2)	
			Black African	0 (0)	1 (2)	
Marital status	*N* (%)	Single		6 (21)	9 (15)	$\chi^2(2) = 1.18$, $p = .589$
		Co-habiting		3 (10)	10 (17)	
		Married / Engaged		19 / 1 (66 / 3)	39 / 2 (65 / 3)	

Maternal education	*N* (%)	GCSEs	5 (17)	6 (10)	$\chi^2(3) = 1.84$, p =.604
		A-Levels	4 (14)	7 (12)	
		Bachelor's	8 (28)	24 (40)	
		Postgraduate	12 (41)	33 (36)	
		None of above	0 (0)	1 (2)	
Family income	*N* (%)	Less than £14,999	4 (14)	4 (7)	$\chi^2(2) = 1.24$, p =.596
		£15,000 - £39,999	7 (24)	15 (26)	
		Over £40,000	17 (59)	39 (67)	
Language	*N* (%)	English	27 (97)	56 (93)	$\chi^2(1) = 0.38$, p =.665
		Welsh / Other	2 (3)	1 / 3 (2 / 5)	
Second language?	*N* (%)	Yes	11 (38)	31 (52)	$\chi^2(1) = 0.83$, p =.363
		No	18 (62)	29 (48)	

*Note. N*s for the preterm and term sample were 29 and 60, respectively. Data was missing for maternal ethnicity for 1 preterm infant and data for family income was missing for 1 preterm and 2 term infants. Problems with non-normalcy for infant age for birth data collection were resolved with a natural log transformation. Fisher's exact test was used for tests marked with [a] due to small frequencies in some cells. [b] The Chi-square test was run collapsing across Caucasian (British and non-British) and other (Asian and black African) resulting in four cells – preterm Caucasian, term Caucasian, preterm other and term other.

preterm infants were born at significantly lower gestational age and birthweight, and spent significantly longer in the hospital after birth. Infants were divided into birth status group based on their gestational age – infants below 37 completed weeks of gestation were placed in the preterm sample and infants born after 37 completed weeks of gestation were placed in the term sample.

Table 2.2
Infant medical status

	Preterm	Term	Difference
	M (SD)	*M (SD)*	
Gestational age	34.61 (1.80)	39.93 (1.45)	$t(87) = -14.97$, $p < .001$, $d = -3.21$
Birthweight	2206.20 (524.40)	3424.74 (578.66)	$t(87) = -9.49$, $p < .001$, $d = -2.03$
Hospitalisation (days)	14.69 (13.66)	2.68 (3.05)	$t(80) = 7.72$, $p < .001$, $d = 1.73$
Apgar scores (5 min)	9.19 (1.17)	9.52 (0.64)	$U(N = 80) = 787.50$, $p = .320$, $r = .11$

Note. *N*s for the preterm and term sample were 29 and 60, respectively. Data is missing for birthweight for 1 preterm infant, for duration of hospitalisation for 3 preterm and 4 term infants and for 5-minute Apgar scores for 3 preterm and 6 term infants. Problems with non-normalcy for duration of hospitalisation were resolved with a natural log transformation. Apgar scores were negatively skewed and therefore non-parametric tests were used.

2.2.3 Procedures

All study procedures were reviewed by the School of Psychology's research ethics committee, Cardiff University and the NHS's Research & Development and Local Research Ethics Committee. After consenting to participate during the hospitalisation of their infant at University Hospital of Wales (UHW), parents were given the three birth questionnaires to complete. At that time, parents also consented to research assistants accessing their baby's medical records. The Baby Care Questionnaire (Winstanley & Gattis, 2012) asked mothers about their principles with regard to caregiving (see Appendix 1). The development and the psychometric properties of the BCQ are reported in chapter 3, which includes data from three additional samples. The Concepts of Development Questionnaire (CODQ; Sameroff & Feil, 1985) asked mothers about their cognitions about child development (see Appendix 2). The Cardiff Antenatal Inventory requested infant and family demographic information (see Appendix 3). If parents were not able to complete the questionnaires on the day, a freepost envelope was provided so parents could complete and return the questionnaires later. Parents were given 35 days from their infant's date of birth to complete all three questionnaires.

Five-month study visits were scheduled based on the infant's chronological age and at a time that the infant was most likely to be awake and alert. These study visits happened at the School of Psychology, Cardiff University, in a laboratory designed to be baby friendly. Study visits were scheduled based on infant's chronological age to ensure that the interval between waves (birth and 5 months) was equal across parents (particularly across birth status) and because of the focus on the role of mothers in their infant's development (see section 2.3.3 for further information about age matching). The study visit started with an initial period of acclimatisation for the infant. Once the experimenter deemed that the infant was alert and comfortable in the laboratory rooms, data collection began with the two experimental tasks of infant attention (chapter 5), which were followed by a free play session between the mother and infant (chapter 6). The mothers then completed the BCQ and CODQ for a second time. Mothers also completed the Infant Behaviour Questionnaire (IBQ; Gartstein & Rothbart, 2003), which asks parents about their infant's temperament (see Appendix 4). Specific details about the parenting questionnaires are described in chapter 4, including psychometric properties of the measures. All participants completed tasks in this order.

Eleven dyads completed the full 5-month visits as part of piloting – completing both attention tasks, play sessions and questionnaires. Piloting demonstrated that the attention tasks were running smoothly and also demonstrated strategies to regain infants' attention. This process also demonstrated that the infants were very tired after the two tasks measuring infant attention and the play session. Although the play session could adapt to the infant's level of alertness and the questionnaires could be completed while the infant slept, the attention tasks required the infants to be awake and alert. Therefore, the study visits were always ordered attention tasks, play session and then the questionnaires. Gifts were given to infants and parents for participation at each time point.

The sections that follow introduce some of the most common methodological issues in the study of development following preterm birth.

2.3 Methodological issues

2.3.1 Conceptualisation of development

It is not possible to randomly assign premature deliveries and so "cause-and-effect inferences" must take into account confounding variables (Aylward, 2002). Premature delivery does not have one cause or one context. Preterm deliveries can be due to a number of factors – for example, maternal stress, heavy work load, infections, spontaneous labours or medical intervention for reasons such as pre-eclampsia or maternal illness (Steer, 2005). In addition, although preterm birth can occur in families of any socioeconomic status (SES), these premature deliveries are more frequent in mothers of lower SES (Clark et al., 2008; Goldberg & DiVitto, 1983). Therefore, although generally viewed as the source of the difficulty, preterm birth can also be suggestive of previous problems and can therefore be viewed as the complex expression of many conditions, with no one specific cause or fixed outcome (Behrman & Butler, 2006; Goldberg & DiVitto, 1983; Moutquin, 2003; Steer, 2005). Multiple factors are associated with preterm birth. These include medical factors –

for example, length of hospitalisation or birthweight; sociodemographic factors – for example, maternal age or maternal education; environmental exposure to positive and negative experiences – for example, interventions or smoking in household; and subsequent illness of mother and infant – for example, repeat hospitalisations (Aylward, 2002).

When studying the development of preterm infants it is important to distinguish between whether prematurity itself, or the factors associated with prematurity, put some preterm infants at increased risk from a variety of deficits while leaving others relatively unimpaired (Anderson & Doyle, 2008). Confounding variables (or covariates) and mediating variables must therefore be carefully explored (Aylward, 2002). Aylward (2002) advises researchers to have both a conceptual and statistical basis for the selection of control variables. As the preterm and term samples in the Special Delivery study did not differ in terms of demographic factors presented in Table 2.1 (see section 2.2.2), there was no need to control for these variables as potential covariates. Medical factors reported in Table 2.2 did differ between preterm and term infants. Preterm infants were born at younger gestational ages and spent longer in hospital following birth.

2.3.2 The sample

2.3.2.1 Gestational age and birthweight

The concept of prematurity as biological immaturity for extrauterine life emphasises the importance of the maturity of the infant (Als, 1989). Gestational age traditionally has been used as a proxy measure for degree of maturity (Behrman & Butler, 2006; Steer, 2005). In further support of using gestational age, the World Health Organization (Howson et al., 2012) defines preterm birth in terms of weeks of gestation – as delivery before 37 completed weeks of gestation. Birthweight was previously used to group infants and is a strategy that remains in certain countries due to concerns about the accuracy of gestational age estimations (Aylward, 2002; Behrman & Butler, 2006). However, fetal ultrasounds before 12 weeks now provide accurate gestational age estimations and gestational age provides a better indication of organ system maturity than birthweight (Behrman & Butler, 2006). Additionally, using birthweight can lead to groups that vary in terms of degree of prematurity despite having similar birthweights – some infants may be small for gestational age while others are appropriate for gestational age (Aylward, 2002). However, this distinction between small and appropriate for gestational age is also important, as outcomes can vary between these groups of infants. Therefore, both birthweight and gestational age are important variables when studying the development of preterm infants. Although gestational age is used to group infants into preterm and term samples in the Special Delivery study, birthweight was checked as a potential covariate in all analyses examining the effect of birth status.

2.3.2.2 Medical and biological risk

Medical risk is an example of a factor associated with prematurity that may impact infant development. The biological risk and neonatal experience of a sample therefore needs to be characterised (Aylward, 2002). Aylward (2002) focused on the three major sources of morbidity in the neonatal period: intracranial events, pulmonary immaturity and infections. Intracranial events include periventricular leukomalacia (PVL) and intraventricular haemorrhage (IVH). Bhutta and Anand (2001) linked cumulative brain injuries to observed cognitive deficits, while Vohr et al. (2000) found associations between neurodevelopmental morbidity and IVH (Grade III or IV) and PVL. However, Boardman et al. (2007) found that brain injury was only seen in infants with prolonged respiratory illness. Pulmonary immaturity is reflected in Respiratory Distress Syndrome (RDS) initially, and later in BPD and CLD. BPD and CLD have been linked with adverse neuromotor, cognitive and functional outcomes (Hintz et al., 2005; Vohr et al., 2000). Finally, necrotizing enterocolitis (NEC) is an acute injury to the small or large intestine that can cause inflammation and damage to the bowel lining and can lead to infections (Behrman & Butler, 2006) and is associated with poorer neurodevelopmental outcomes in preterm infants (Vohr et al., 2000).

Landry and colleagues have divided preterm infants into a high- and a low-risk group (for example, Landry, 1986; Landry, Chapieski, & Schmidt, 1986; Landry et al., 1993; Landry et al., 1997b). The low-risk group had RDS but did not have severe IVH (Grade III or IVH), whereas the high-risk group had severe IVH (Grade III or IV) or BPD (with or without IVH). Landry et al.'s (1993; 1997) categorisation of infants by medical risk highlighted which domains appeared affected by prematurity alone and those that were only affected in preterm infants with medical complications. For example, high-risk preterm infants had difficulties initiating interactions with others, whereas low-risk infants only had difficulties initiating interactions in attentionally demanding situations (Landry et al., 1997b). In addition, high-risk preterm infants were observed to grab and manipulate objects less, and to turn away from joint engagement episodes more, than low-risk preterm and term infants (who did not differ from each other; Landry, 1986). Level of medical risk at birth has also been implicated in difference in patterns of brain activation performance and current IQ when measured 15 to 16 years later (Carmody et al., 2006). Infants' medical risk status therefore appears to have important effects on outcomes. Accordingly, for the Special Delivery study we focused on low-risk preterm infants to examine the pathways of interest without the confounding medical complications (see section 2.2.2 for inclusion and exclusion criteria).

2.3.2.3 Age matching

Preterm infants' age tends to be defined either from their date of birth (chronological age) or their due date (corrected age). Most research with preterm infants implements some form of age correction in order to disentangle whether the domain of development studied is under maturational control or is susceptible to the effects of the extrauterine experience. Corrected age controls for biological maturity by correcting for the infants' degree of maturity. Term and preterm infants of the same corrected age are thought to be developmentally equivalent (Siegel, 1983). Preterm infant's age is routinely adjusted in this way by clinicians, especially when plotting growth parameters or estimating age to reach developmental milestones (Blasco, 1989; Goldberg & DiVitto, 1983). The justification for using corrected age involves the argument that preterm infants' development proceeds at the same rate as term peers with delay equivalent to the degree of prematurity, and therefore assumes that development proceeds based on biological age (time since conception) regardless of whether the individual's environment is intrauterine or extrauterine (Siegel, 1983). Control for biological maturity is especially important when considering cognitive, motor and brain development studies (examples of use of age correction in these areas include: Boardman et al., 2007; Foster-Cohen, Edgin, Champion, & Woodward, 2007; Gorga, Stern, Ross, & Nagler, 1988; Rose et al., 2002; Sansavini et al., 2006; Woodward, Mogridge, Wells, & Inder, 2004).

However, using corrected age is problematic when studying social development, and in particular the effects of preterm birth on early parent-infant interactions. To ensure equivalent biological maturity by using corrected age, preterm and term infants necessarily differ on the quantity of postnatal and dyadic experience. Corrected age calculates age from the expected date of birth and therefore the weeks or months that follow the premature birth but occur before the expected date of birth are removed when using corrected age. Therefore, samples of preterm and term infants of equivalent corrected age have differing durations of postnatal experience. Use of chronological age ensures that preterm and term groups do not vary on durations of dyadic experiences for both the infant and the mother (Brachfeld et al., 1980). However, some investigators interested in parent-preterm infant interactions have still used corrected age without justification or control for experience (for example, Forcada-Guex et al., 2006; Singer et al., 2003).

The environmental perspective assumes that birth of the infant marks the beginning of extrauterine environmental influence on subsequent development and therefore supports using the preterm infant's chronological age (Siegel, 1983). Guidelines have tended to promote the use of chronological age after the second year of life, when environmental factors are suggested to become more significant in development (Blasco, 1989). However, early social interactions have frequently been reported as foundations for various later skills, therefore it seems possible that the extrauterine environment would start impacting infant's development before such guidelines suggest (see Bornstein, 1985, 1989; Bornstein & Tamis-LeMonda, 1997). A secondary benefit of using chronological age is that it is calculated from the date of birth, which is easily and accurately measured, while date of conception is more difficult to estimate and estimated due dates can be inaccurate (the accuracy of the estimates based on last menstrual period can also be affected by maternal factors, such as socioeconomic status; Behrman & Butler, 2006). However, one concern about the use of chronological age is that it ignores the benefits of extended gestations for parents' preparations for parenthood and discounts the extra preparations and experiences (for example, through antenatal classes) which longer gestations allow. Another unavoidable limitation of using chronological age is that to ensure equal durations of postnatal experience, preterm and term infants must differ on biological maturity. Therefore, there is always the possibility that results demonstrating differences between term and preterm infants reflect the effects of immaturity rather than prematurity (Brachfeld et al., 1980). Immaturity reflects biological development. By measuring age from conception, all infants should be at the same level of biological maturity while still differing in prematurity – their gestational age at birth. By measuring age from birth, infants will differ in their biological maturity – as they have different durations of biological development – and will differ in their prematurity.

Correction of age may overestimate and chronological age may underestimate the child's developmental level (Brachfeld et al., 1980). Siegel (1983) measured aspects of infant development from 4 months to 5 years in two cohorts of preterm and demographically matched term infants (resulting in four groups of infants). Data was collected at equivalent chronological ages in the preterm and term samples. Corrected age estimates of all possible measures were then estimated for the preterm infants. In her conclusions, Siegel (1983) claimed that the use of correction for degree of prematurity may be appropriate in the early months, but no longer necessary after 1 year of age, which was less than the 2 years usually claimed to be necessary. These conclusions were based on findings that in most cases at 1 year of age and after, there were no significant differences between the predictive ability of the corrected and uncorrected scores. However, there were only a couple of examples where there were significant differences before one year. The two cohorts were studied separately due to changes in neonatal intensive care and in survival rates between the two times, therefore the later cohort appears more relevant for research decisions for the Special Delivery study, as well as other studies with samples born in modern NICUs (Siegel, 1983). Additionally, the mean gestational age for both cohorts was 30 weeks, which is lower than the 34 weeks of the Special Delivery study. However, no discussion of the range of gestational ages in her two cohorts is included, so comparisons between the samples are difficult and therefore it is difficult to interpret the importance of age correction for late-preterm (or near term) infants (for definitions of late preterms see section 2.2.2 or see Behrman & Butler, 2006; Howson et al., 2012). Despite suggesting correcting age until the end of the first year of life, Siegel's (1983) final summary of the relative merits of corrected and uncorrected scores was that "probably the most reasonable conclusion is that it does not matter very much which scores are used" (p. 1186).

Blasco (1989) presented a review of a series of papers comparing the appropriateness of no, partial and full correction of age, before ultimately favouring partial correction. Of the studies presented, six favoured full correction, two favoured partial correction and the remaining three favoured no correction. All of the six studies favouring the use of full correction based this conclusion on the finding that term and preterm infants showed similar results when using corrected age. Of the two studies supporting partial correction, one conclusion was based on a the idea of similarity of term and preterm development using this form of correction, while the other study found that partial correction provided scores that were more predictive of later outcomes. All of the studies supporting no age correction based their conclusions on the second argument that uncorrected scores provided the best predictors of later outcomes. Justifying age correction using the argument of similarity of preterm and term infants' development is problematic, as potentially important differences in performance at individual time points may be hidden and developmental progression may be wrongly described. That is, age correction could both provide misleading estimates of preterm infants' abilities and could obscure the genuine path of developmental progress. Studies arguing the use of corrected age due to similar performance between preterm and term infants have generally not provided the appropriate length of follow-up required to determine whether children were truly making normal developmental progress (Blasco, 1989). Longer follow-up studies are required to demonstrate that progressing appropriately for corrected, but not chronological, age does not in itself lead to poor long-term outcomes.

Very few researchers have attempted to heal the limitations of both styles of age calculation by combining methods. When studying what aspects of interactions between preterm infants and their parents were due to prematurity and which were due to immaturity, Brachfeld et al. (1980) matched term infants by chronological age in one control group and corrected age in a second control group. Corrected age was used to control for immaturity and therefore allowed examination of the effect of prematurity alone, whereas using chronological age allowed examination of the effect of immaturity and prematurity together. The inclusion of both forms of age matching allowed the researchers to demonstrate that some aspects of the parent-infant interaction were affected by prematurity (for example, infants' increased fussiness and parent's high level of activity in the preterm sample) while others were affected by biological immaturity (for example, levels of play in the preterm group). Piper and colleagues used both forms of age matching to similar effect and demonstrated the differential impact of biological maturity on gross and fine motor skills (Piper, Byrne, Darrah, & Watt, 1989).

The effect of the extra postnatal experience preterm infants receive at equivalent corrected ages somewhat depends on the domain being studied (Goldberg & DiVitto, 1983). Siegel (1983) used general developmental level, language, and visual-motor integration measures. As previously noted, one would predict that these areas of development would show a stronger relation to biological maturity than extrauterine experience, at least in the first few months of life. However, corrected scores did not always seem to provide more predictive or discriminant scores, especially in the more recent cohort that was included to account for advances in neonatal medicine and improved survival rates of preterm infants (see review above). Although studies have tended to use corrected age (for example, Boardman et al., 2007; Foster-Cohen et al., 2007; Gorga et al., 1988; Rose et al., 2002; Sansavini et al., 2006; Woodward et al., 2004), correcting for prematurity does not always seem to be justified or appear to be the most appropriate method of calculating age for all studies.

The Special Delivery study measured infant's age by date of birth. Wave 1 of data collection occurred following the delivery and wave 2 when the infant was 5 months old. Using chronological age therefore ensured that the spacing between wave 1 and wave 2 was 5 months for all infants and their mothers. In addition, the central questions of the Special Delivery study focused on early social interactions and caregiving and so controlling for extrauterine experience was necessary. Although many of the outcome measures were cognitively focused, mother's response to these skills and abilities was also being explored. Finally, the infants included in the Special Delivery study were healthy, primarily moderate- to late-preterm infants (average gestational age was 34 weeks) who spent an average of 15 days in hospital before going home. Therefore, these infants were often home around a month before their expected due date. Guidelines for age matching in late-preterm infants are scarce but had we used corrected age, mothers of preterm infants could have had up to a month's more experience of caring for their infant at home (not including the time spent learning about their infant in the hospital).

2.4 Summary

This chapter served to introduce the Special Delivery study, including details of the sample, age matching and potential confounding variables as well as some of the main methodological issues in the study of preterm infant development and how these issues were resolved in the Special Delivery study. The next chapter presents the first empirical study in this thesis, which documents the initial validation of a new measure of caregiving – the BCQ – that was designed for the Special Delivery study. Chapter 4 onwards presents data from the Special Delivery study.

Chapter 3: The Baby Care Questionnaire

3.1 Chapter Overview

The overall aim of this chapter is to describe the design and validation of a new measure of parenting practices and principles during infancy. This chapter first reviews current research on caregiving during infancy before introducing a new framework and measure of parenting principles. The Baby Care Questionnaire (BCQ) was designed to measure two key parenting principles during infancy – *structure* and *attunement*. Structure represents parents' support of regularity and routines in their infant's daily life. Attunement represents parents' trust and attention to their infant's cues and support of close physical contact. The BCQ also includes questions about daily parenting practices, such as breastfeeding and holding. The main focus of this chapter is on the design and psychometric properties of the questionnaire and so I report data demonstrating the factor structure, reliability and validity of the BCQ.

3.2 Parenting principles and practices during infancy

Every day, caregivers around the world make decisions about how to care for their infants. These decisions are based in tradition and culture as well as individual decision-making (Small, 1999). As a result, caregiving differs across families and the world, despite all babies' biological similarity. Caregiving decisions are based on principles or personal codes of conduct, and are reflected in practices or specific behaviours parents use to achieve positive outcomes for their offspring. In this chapter, I address the need for empirical investigations of caregiving principles and practices in infancy and introduce a new measure, the Baby Care Questionnaire, to be used in such investigations.

3.2.1 Caregiving during infancy

Infancy is a period of high dependency and intense caregiving in which parents must respond to their infant's need for food, sleep and emotional attachment (Bornstein, 2002;

Small, 1999). Parents differ in their beliefs about the best way to meet these needs as well as their caregiving approach. For example, the Infant Feeding Style Questionnaire (IFSQ; Thompson et al., 2009) measures five caregiving feeding categories: *laissez-faire*, *pressuring/over-feeding*, *restrictive*, *responsive* and *indulgent* feeding. Parents in these different categories differ in the behaviours they use to feed their infants. For example, parents may pressure their infants to finish eating, restrict the amount or type of food or allow their infants to eat junk food. Similar styles have been reported in caregivers of children using measures such as the Caregiver's Feeding Style Questionnaire (CFSQ; Hughes et al., 2012; Hughes, Power, Orlet Fisher, Mueller, & Nicklas, 2005). The CFSQ measures caregiver's *demandingness* and *responsiveness* in the feeding domain. Demandingness reflects how much a caregiver encourages their child to eat, whereas responsiveness reflects how they encourage their child to eat – for example, by responding to their child's satiety or hunger cues. Based on these underlying dimensions of demandingness and responsiveness, caregivers are placed in one of four quadrants – *authoritative*, *authoritarian*, *indulgent* or *uninvolved*. However, behaviours measured by the IFSQ and CFSQ are not necessarily appropriate for newborns. The IFSQ was tested with parents of infants over 3 months. Furthermore, this type of questionnaire is focused within domains of caregiving, whereas this chapter focuses on general caregiving in infancy.

I propose that two key principles that guide caregiving during infancy are structure and attunement. Although structure and attunement have been discussed in various permutations in the developmental literature (for examples, see Legerstee, Markova, & Fisher, 2007; Leve et al., 2009; St James-Roberts, 2007), the terminology and definitions of the principles specific to the BCQ are introduced in this chapter. *Structure* reflects parent's support of, or opposition to, regular routines in their infant's day-to-day lives. *Attunement* reflects parent's trust in, and attention and responsiveness to, infant's cues, and also their support of close physical contact to address both their needs and those of their infants.

Variation in parenting principles exists within cultures. For example, when asked about their plans to establish a sleeping routine, only about half of a UK sample expected they would follow a set pattern; the other half anticipated "playing it by ear" (Ball, Hooker, & Kelly, 1999). These individual differences in principles may be the result of differences in beliefs, caregiving experiences and differences between infants. Caregivers' beliefs about infants and parenting have important effects on choice and effectiveness of parenting behaviours – for example, parents who assign more responsibility to the child than the adult for caregiving failures are more unwavering and directive in their parenting behaviour (Bugental & Johnston, 2000; Guzell & Vernon-Feagans, 2004). Such parents may support structure, as this principle allows parents to have more control and regularity in the caregiving role. Individual differences may also be due to caregiving experience: expectant parents evaluate and develop caregiving principles during pregnancy, but the experiences of caring for an infant may alter or strengthen these principles. Finally, individual differences may also be due to infant characteristics such as age, gender, health and temperament. For example, parents may have differing caregiving principles following a preterm birth (before 37 completed weeks of gestation). Preterm birth often involves hospitalisation of the infant, sometimes for long periods, so parents' early experience of caregiving often occurs in NICUs. NICUs tend to have prescribed schedules for daily caregiving and parents are often urged to be involved with routine basic care, such as provision of breast milk (Cleveland, 2008; Flacking et al., 2011).

Structure and attunement are often considered opposing categories – for example, caregiving experts tend to advocate either infant-demand or scheduled parenting (St James-Roberts, 2007; St James-Roberts et al., 2006). However, the negative relationship between structure and attunement, as well as the approaches advocated, are based on personal experience and popular culture (for example, "huggers" and "schedulers"; Groskop, 2010; O. James, 2008; Williams, 2010) rather than empirical evidence (St James-Roberts, 2007). Middle-class parents in historically interdependent societies, such as Costa Rica, appear to combine scheduled and infant-demand caregiving (Kagitcibasi, 2005; Keller, Borke, Yovsi, Lohaus, & Jensen, 2005). I propose that structure and attunement are orthogonal and so caregiving principles can be considered as one of the four categories depicted in Figure 3.1 – *low* (low structure, low attunement), *structured* (high structure, low attunement), *attuned* (low structure, high attunement) or *attuned structure* (high structure, high attunement).

		Structure	
		Low	**High**
Attunement	**Low**	Low	Structured
	High	Attuned	Attuned structure

Figure 3.1. The four quadrants or categories of parenting principles.

3.2.2 Relations between principles and practices

Parenting principles are related to daily decisions about practices, including where to put infants to sleep, what to feed them and how long to hold them. Identifying relations between parenting principles and practices is needed to help scientists and practitioners understand the independent and joint influence of these principles and practices on infant development. Such insight may be particularly useful in understanding how parents reason about health-related recommendations. For example, although breastfeeding is widely recommended, an NHS survey of infant feeding showed a rapid decline in breastfeeding over the first few weeks and months of life from an initial rate of 70% (Bolling, Grant, Hamlyn, & Thornton, 2007). Similarly, UK parents continue to co-sleep despite warnings against this practice for safety reasons (Wailoo, Ball, Fleming, & Platt, 2004). In one study, no first-time UK parents planned to co-sleep, but three to four months after birth 70% of parents were sharing a bed with their infant either habitually (every night) or occasionally (at least once a week; Ball et al., 1999).

I hypothesised that parents supporting attunement without structure – attuned – would be more likely to choose co-sleeping and breastfeeding as parenting practices and show longer durations of holding. Holding should be related to attunement due to support of close physical contact. Co-sleeping has great historical (Nelson, Schiefenhoevel, & Haimerl, 2000), cultural (Blair, 2010) and functional diversity (McKenna, 1996; Wailoo et al., 2004). When explaining their sleeping practices, new parents often brought up the ease of nocturnal breastfeeding when paired with co-sleeping; night-time observations have also shown this "natural relationship", which exists in a high proportion of the world's societies (McKenna, Mosko, & Richard, 1997; Wailoo et al., 2004). McKenna et al. (1997) observed mothers and their healthy, exclusively breastfed 3- to 4-month-old infants during the night. Infants who routinely co-slept at home breastfed for three times longer in the night than infants who routinely slept apart. McKenna et al. (1997) suggested co-sleeping may allow mothers to sense and attend to subtle sounds and movements infants make with increasing frequency and intensity when approaching breastfeeding episodes (McKenna, 1996; McKenna et al., 1997). When infants were sleeping in a separate room, mothers were only able to sense frank crying. Parents who co-sleep thus appear to be ensuring they can sense and respond to even the most subtle of infants' cues, reflecting attunement.

I hypothesised that parents supporting structure without attunement – structured – would be less likely to co-sleep and breastfeed, and instead would report no co-sleeping and feed infants formula. UK parents are said to value infants sleeping through the night, encouraging regular sleeping times and acclimatisation to sleeping alone (Gantley, Davies, & Murcott, 1993; St James-Roberts et al., 2006). St James-Roberts et al. (2006) reported that at 12 weeks, parents in a more scheduled London sample only averaged one night of co-sleeping per week and only 37% of parents were breastfeeding. These figures are in line with the NHS survey on infant feeding, which reported breastfeeding rates dropping from 48% at 6 weeks to 25% by 6 months (Bolling et al., 2007). Therefore, parents in the UK – a culture where conventional values are consistent with the parenting principle of structure – appear less likely to co-sleep and breastfeed.

Because previous studies have considered structure and attunement as opposing rather than orthogonal dimensions (for example, St James-Roberts et al., 2006), no empirical data is available to base hypotheses about parents who support a combination of structure and attunement, or attuned structure. Previous work suggests combinations of goals lead to combinations of associated parenting behaviours (Kagitcibasi, 1996, 2005; Keller et al., 2005). Thus I tentatively hypothesised that attuned structure parents would show parenting practices between structured and attuned parents – for example, would hold their infants more than structured but less than attuned parents.

3.2.3 The Baby Care Questionnaire

The Baby Care Questionnaire (BCQ) is a parent-report measure of parenting principles and practices during infancy. Parent-report measures offer many advantages, including access to difficult-to-observe situations, such as night-time sleeping practices, and cognitive processes, such as goals and principles (Miller, 2007). Parent-report methods are also cheaper and easier to administer, potentially increasing both sample size and utility.

Parent-report measures have been used successfully to measure goals, expectations and beliefs about development (for example, Harwood, McLean, & Durkin, 2007; Keller et al., 2005; Miller-Loncar, Landry, Smith, & Swank, 2000). St. James-Roberts (2007) identified a need for theoretically-driven studies to examine the measureable effects of various caregiving practices on infant outcomes. To my knowledge, the BCQ is the first comprehensive measure of practices and principles across caregiving domains.

The BCQ contains three sections: *Sleeping*, *Feeding* and *Soothing* (Small, 1999). Parents' support of structure and of attunement are measured in each of these contexts by a series of items, while parents' sleeping, feeding and holding practices are measured through both multiple choice and estimated duration questions. The soothing section is the one section that asks about infant behaviour as well as parenting principles and practices. It seemed key to include reported crying duration due to St James-Roberts et al.'s (2006) report that infant crying is related to caregiving. To ensure the BCQ could be used in longitudinal studies beginning during pregnancy and for comparisons between parents of healthy infants and infants "at risk", the BCQ was designed to be valid for current and expectant parents, and for clinical and non-clinical samples.

Predictions based on the theoretical framework and past findings allowed examination of the psychometric properties of the BCQ subscales. I first hypothesised a two-factor model for the BCQ with the two components representing the parenting principles of structure and attunement. Structure items were specifically designed to measure parents' support of schedules and routines in infants' daily lives and attunement to tap parents' trust and attention to infants' cues and support of close physical contact. These BCQ subscales should show consistency within subscales at one time (internal consistency) and across time (test-retest reliability).

Individual differences in parenting principles were examined for structure and attunement by infant gender and parents' status (current vs. expectant parents). Concurrent validity was tested by examining relations between principles and practices as well as principles and attributions of control over caregiving failures. I hypothesized that principles would be related to practices. Specifically, I hypothesized that attuned parents would be more likely to co-sleep, breastfeed and report longer durations of holding; structured parents would be less likely to co-sleep, more likely to feed their infants formula and report shorter duration of holding; and attuned structure parents would show intermediary practices of structured and attuned parents. For parenting attributions, I hypothesized that principles would be associated with parents' perceptions of caregiving failures. Specifically, I hypothesized that mothers with low perceived control over failure would support structure and oppose attunement more. Although I report data from an initial (version 1) and a refined (version 2) form of the BCQ, all scores for structure and attunement are based on the items making up version 2 – or the final version – of the BCQ (see Appendix 1).

3.3 Method

3.3.1 Participants and procedures

Participants were recruited from a database of families interested in participating in developmental psychology research, and by emails through mailing lists and online postings on parenting websites. Individuals were eligible if they were expecting a baby or had at least one child under 24 months old. Participants were asked to follow a link that led to an overview of the questionnaire(s) and were informed that pressing "next" was deemed as consent to participate. On pressing next, parents were asked if they were expectant or current parents. Parents that selected "my baby is not yet born" were directed to a version of the BCQ that only included items measuring parenting principles. All other parents went to a version of the BCQ that included parenting principles items and questions about parenting practices. Those participants who wanted to participate but did not have internet access completed a paper version of the questionnaire(s) and returned via freepost (n = 22).

Five parents completed the BCQ while thinking aloud in pilot tests – cognitive interviews assessing the readability and appropriateness of questions and items. These tests identified words, concepts, or entire questions that were difficult to understand or had multiple interpretations. Problematic questions were discussed and altered as necessary. A further 647 parents started completing the questionnaire(s). Participants with data missing from more than 30% of items were eliminated from subsequent analyses, resulting in a final sample of 610. There was no association between participants' completion of the BCQ and whether their baby was born, $\chi^2(1, N = 645) = 0.57, p = .494$. For current parents, there were no differences between the infants of participants who completed and did not complete the questionnaire in terms of their age, $t(529) = 0.86, p = .390$, or gender, $\chi^2(1, N = 535) = 3.57, p = .079$. Additionally, there was no association between parents' gender and completion of the BCQ, $\chi^2(1, N = 223) = 3.08, p = .200$.

Infant and caregiver characteristics are summarised in Table 3.1 for the three samples. Sample 1 (N = 346) only completed version 1 of the BCQ. Sample 2 (N = 216) completed version 2 of the BCQ, with a subsample completing the Cardiff Antenatal Inventory prior to the BCQ to provide demographic information (n = 108). The test-retest sample (N = 48) completed version 2 of the BCQ online at two time points separated by 4 to 6 weeks. On completion of the questionnaires for the first time, participants in the test-retest sample were asked to provide a contact email address. An email was sent 4 weeks later to remind participants to complete the questionnaires for a second time. A second reminder was sent if the questionnaires were not completed within one week of the reminder email but were not contacted again after, regardless of whether the questionnaires were completed or not. Sixty-four per cent of participants completed the questionnaires at both times. Completers –

Table 3.1

Caregiver and infant characteristics of respondents in sample 1, sample 2, and test-retest sample

			Sample 1	Sample 2	Test-retest sample
Caregiver gender	Female	*N* (%)	N/A	212 (98)	48 (100)
	Male	*N* (%)	N/A	4 (2)	0 (0)
Caregiver status	Expectant	*N* (%)	48 (14)	8 (4)	0 (0)
	Current	*N* (%)	296 (86)	208 (96)	48 (100)
Infant gender	Female	*N* (%)	142 (48)	97 (47)	23(48)
	Male	*N* (%)	154 (52)	111 (53)	25 (52)
Infant age (months)			0.00 – 23.00 *Mean* = 11.31 (*SEM* = 0.36)	0.00 – 23.00 *Mean* = 9.43 (*SEM* = 0.36)	1.00 – 19.00 *Mean* = 8.71 (*SEM* = 0.73)

Note. *N*s for sample 1, sample 2 and test-retest sample were 344, 216 and 48, respectively. These *N*s are excluding the 37 participants with data missing from more than 30% of items so were treated as missing data.

participants completing at both time points – and non-completers – participants who only completed the questionnaires at time 1 – did not differ in terms of infant age, $t(73) = 1.19$, $p = .240$, structure, $t(73) = 0.87$, $p = .389$, attunement, $t(73) = 0.78$, $p = .439$, ACF, $t(73) = -0.04$, $p = .970$, CCF, $t(73) = 1.77$, $p = .082$ or PCF, $t(73) = -1.13$, $p = .260$. This sample also completed the Parent Attribution Test at both time points. All procedures were approved by the School of Psychology Ethics Committee at Cardiff University.

3.1.1 Principal measures

3.1.1.1 The Baby Care Questionnaire (BCQ) – version 1.

The BCQ measures the parenting principles structure and attunement, and parents' day-to-day practices. Parenting principles are measured by respondents' ratings of 48 items, consisting of two 24-item scales representing structure and attunement. Each section contains eight items designed to measure structure and eight items designed to measure attunement. Half of these items are designed to oppose and half to support the specific parenting principles. Items are rated on a 4-point Likert-type scale ranging from strongly disagree (1) to strongly agree (4). Parents are not given an option to select *not applicable* to prevent parents using this option despite having an opinion. Items can be left if parents truly did not have an opinion.

Parenting practices are measured by quantitative responses to three further items based on St. James-Roberts et al.'s (2006) measure. In the sleeping section, parents are asked to indicate the number of nights, in the past seven, their infant slept in each location option. Options include a cot, a parent's bed, other, or a combination of locations. In the feeding section, parents are asked to indicate what they are feeding their infant from a list of breast milk, formula, expressed breast milk, milk-bank (during hospital stay) and solid food. Parents can indicate as many items as are relevant. The soothing section contains a quantitative question about infant behaviour. Parents are asked to report the estimated duration their infant cried for each day in the previous seven.

3.1.1.2 The Baby Care Questionnaire (BCQ) – version 2.

The second version of the BCQ (see Appendix 1) contains the same items designed to measure structure and attunement. However, 12 items were dropped due to general concerns about singularity and specifically due to restricted responses from participants, low loadings (<.30), high complexity (multiple loadings) and intercorrelations between items (Field, 2005; Tabachnick & Fidell, 2007).

Version 2 includes the same items as version 1 to measure parents' sleeping and feeding practices, and infant crying. However, parents are asked to report only on the previous three days for sleep location and infant cry duration. These items were reduced to the previous three days due to concerns raised by respondents about their accuracy across the past week on these items. In the feeding section, parents are also asked to report estimated duration of feeding for each of the previous three days. In the soothing section, parents are also asked to report estimated duration of holding for each of the previous three days. This holding item is not specific to the context of soothing but asks parents about times they were holding their infant, including times the infant was in a sling.

3.1.1.3 The Cardiff Antenatal Inventory.

The Cardiff Antenatal Inventory is divided into five sections and asks mothers questions about their previous pregnancies, their current or most recent pregnancy and delivery, including the infant's gestational age at birth, their perception of the parenting support available, and demographic questions.

3.1.1.4 The Parent Attribution Test (PAT; Bugental, Johnston, New, & Silvester, 1998).

The PAT (see Appendix 5) assesses parents' attributions about the relative influence of the parent versus the child on caregiving outcomes. Parents are presented with two hypothetical scenarios – they were looking after the neighbour's child for an afternoon and it either did or did not go well. As attributions for success have not been found to predict child or family outcomes (Bugental, 2011), I only focused on attributions for failure. Participants are asked to rate a series of possible reasons for caregiving failures on a 7-point rating scale ranging from 1 (not at all important) to 7 (very important). Items include ways the adult (*whether or not the adult liked children* and *the approach used*) or child (*the extent to which the child was stubborn* and *how little effort the child made)* have control over the outcome.

Attributional categories were calculated for factors that were: controllable by adults; uncontrollable by adults; controllable by child; uncontrollable by child. Participants who assigned high importance to self-controllable and low importance to self-uncontrollable were viewed as attributing high control to self over failure (ACF). The ACF subscale was an average of adult-controllable items and reversely scored adult-uncontrollable items, resulting in a score that could range from 1 to 7. Participants who assigned high importance to child-controllable and low importance to child-uncontrollable were viewed as attributing high control to children over failure (CCF). CCF was scored in the same way as ACF. Bugental (2011) recommended using a continuous perceived control over failure (PCF) variable rather than the traditional categorisation into low and high PCF. This continuous PCF variable is calculated by subtracting CCF from ACF (that is, PCF = ACF – CCF). Higher scores reflect respondents attributing more responsibility to the adult rather than child in caregiving failures. Further details on the scoring of the PAT can be found in Appendix 5.

3.4 Results

3.4.1 Analysis plan

Prior to data analyses, variables were examined for the presence of outliers and normal distributions. Outliers were defined as 3.29 SD above or below the mean (Field, 2005). Any outliers identified were substituted with the value that reflected 3 SD above or below the mean. Normality was determined by examining histograms and by examining whether the skew and kurtosis of variables differed from 0. Non-normality was observed when histograms were non-normal and Z scores for skew and kurtosis (skew or kurtosis value divided by their respective standard error) were greater than 1.96 or less than -1.96 ($p<.05$). Variables were then transformed, for example, using a square root transformation, and normality was examined in the same manner for the new transformed variable. This process was repeated until a normal distribution was found. This procedure for determining normality was used throughout this thesis. For sample 2 (completing version 2), the non-normality of duration of feeding and crying were resolved using a natural log transformation and the non-normality of duration of holding was resolved using a square root transformation. However, the non-normality of infant age was not resolved using transformations and therefore non-parametric tests were used for this variable. For ease of interpretation, all Tables and Figures depicting descriptive data use raw, rather than transformed, data.

The results are presented in four sections. First, I present a Principle Components Analysis (PCA; sample 1) and a Confirmatory Factor Analysis (CFA; sample 2) documenting the factor structure of the BCQ. Both the final PCA and the CFA were run on items that make up version 2 of the BCQ. Second, I present data about the reliability of the BCQ by reporting internal consistency coefficients (sample 1 and sample 2) and test-retest reliability (test-retest sample). This section also reports interrelations between the subscales (overall sample). Third, I present descriptive statistics about the subscales of the BCQ based on the overall sample (sample 1, sample 2 and T1 data for the test-retest sample). The final section presents two sets of analyses focusing on the validity of the BCQ. I explored relations between principles, practices and infant crying for the current parents in sample 2, as I had information about sleeping and feeding practices as well as feeding and holding durations for this sample. As expectant parents do not start using parenting practices until the birth of their child, they did not complete parenting practices items and were not included in analyses focusing on relations between principles and practices. Relations between principles and parents' perceived control over caregiving failure were examined in the test-retest sample.

3.4.2 Factor structure

To examine the factor structure of the BCQ, a PCA and CFA were run. A PCA with varimax rotation was conducted on the items designed to measure structure and attunement using SPSS version 16 (Norusis, 2008). Based on the results of the initial PCA, 12 items were dropped due to general concerns about singularity and specifically due to restricted responses from participants, low loadings (<.30), high complexity (multiple loadings) and intercorrelations between items (Field, 2005; Tabachnick & Fidell, 2007). Therefore, 30 items remained that were designed to measure structure and attunement. All analyses reported in this chapter – factor structure, descriptive statistics, reliability and validity – are based on these 30 items regardless of whether respondents completed version 1 or 2 of the BCQ.

The PCA was re-run with the remaining 30 items (that make up version 2 of the BCQ). The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis; the overall KMO = .89 and KMO values for all individual items were above the acceptable level of .50. Bartlett's test of sphericity, χ^2 (435) = 4001.34, p>.001, indicated that correlations were sufficiently large for PCA. An initial analysis was run to obtain eigenvalues for each component in the data. Seven components had eigenvalues over Kaiser's criterion of 1 and in combination explained 60% of the variance. However, this method is often criticised for retaining too many factors (Hayton, Allen, & Scarpello, 2004; O'Connor, 2000), so I used Horn's (1965) parallel analysis (PA) and Cattell's (1966) scree method to determine the number of components. Figure 3.2 shows the scree plot of component number by eigenvalue for the real data and for random data with the same number of variables and sample size or PA 95th percentile data. This plot shows a clear inflexion at component 3 that justifies retaining component 2. Additionally, around component 3 the eigenvalues for the real data and random data have very similar values. Therefore two factors were retained in the final analysis. The PCA with varimax rotation was re-run specifying a two-factor solution. In combination, these two factors accounted for 37% of the variance. Table 3.2 shows the factor loadings after rotation. The items that cluster onto component 1, accounting for 21% of variance, represented support of structure and component 2, accounting for 16% of variance, represented support of attunement.

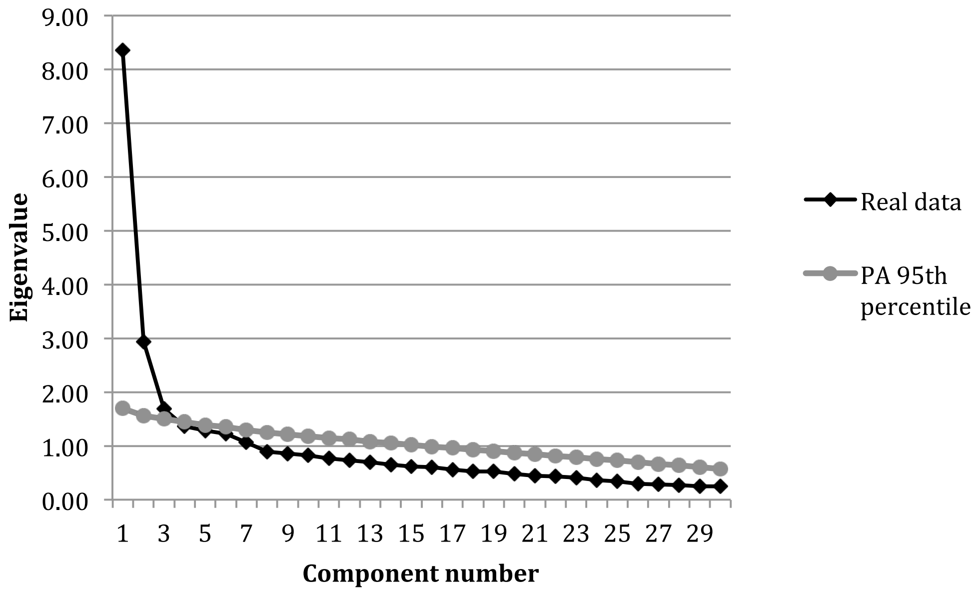


Figure 3.2. Scree plot depicting Eigenvalue against component number for real and random (PA) data.

A CFA was conducted to confirm the two-factor structure of the BCQ using AMOS 18 (Arbuckle, 2010). The confirmatory model was set up so that items were free on their specific factor but restricted all other weights to 1. I used the full information maximum likelihood (FIML) approach to deal with the 3% of items with missing data, to avoid reduction in power or introducing bias through listwise deletion (Arbuckle, 2010; Enders,

Table 3.2

Factor loadings of the Principal Components Analysis (PCA) and Confirmatory Factor Analysis (CFA) of the Baby Care Questionnaire

		Statement	PCA (CFA)	
			Structure	Attunement
Sleeping	1.	Babies can have a good night's sleep regardless of scheduling	**-.47 (-.45)**	.19
	2.	Strict sleeping routines prevent parent(s) from enjoying their child.	**-.68 (-.65)**	.18
	3.	Sleeping schedules make babies unhappy	**-.62 (-.59)**	.09
	4.	It is important to introduce a sleeping schedule as early as possible	**.63 (.72)**	**-.29**
	5.	Babies benefit from a quiet room to sleep	**.34 (.39)**	.11
	6.	Babies benefit from a fixed napping/sleeping schedule	**.66 (.73)**	-.16
	7.	Some days, babies need more or less sleep than other days	-.01	**.32 (.34)**
	8.	Babies benefit from physical contact with parent(s) when they wake during the night	**-.29**	**.58 (.60)**
	9.	When babies cry in the night to check if someone is near, it is best to leave them	.08	**-.71 (-.65)**
Eating	1.	Implementing feeding/eating schedules leads to a calm and content baby	**.64 (.66)**	-.24
	2.	Feeding/eating routines are difficult (easy) to follow	**-.56 (.48)**	.13
	3.	One danger of feeding/eating schedules is that babies might not get enough to eat	**-.57 (.55)**	.21
	6.	Following feeding/eating routines prevents parent(s) from enjoying parenthood to the full	**-.63 (-.70)**	.05
	7.	It is important to introduce a feeding/eating schedule as early as possible	**.51 (.66)**	**-.38**
	10.	Babies will not follow feeding/eating schedules	**-.67 (-.53)**	-.06

	4.	Parent(s) should find a pattern of feeding/eating that suits the baby	-.05	**.48 (.38)**
	5.	Baby-led feeding leads to behavioural and sleep problems	.28	**-.52 (-.54)**
	8.	Offering milk/food to a baby is a good way to test whether she/he is hungry	-.12	**.38** (.28)
	9.	Babies will eat whenever milk/food is offered even if they are not hungry	-.08	**-.46** (-.17)
Crying	1.	Babies with regular schedules spend less time crying	**.66 (.66)**	-.25
	2.	Babies cry no matter what their routines	**-.35** (-.25)	.20
	4.	Routines lead to more crying	**-.71 (-.70)**	.01
	9.	Having a set routine helps an upset baby calm down	**.65 (.62)**	-.20
	10.	Babies with regular schedules cry just as much as babies without regular schedules	**-.53 (-.51)**	.16
	3.	Parent(s) should delay responding to a crying baby	.17	**-.77 (-.58)**
	5.	It is a good idea to have a set time you leave a baby to calm herself/himself down, and increase this amount of time each week	**.30**	**-.61 (-.57)**
	6.	Physical contact such as stroking or rocking helps a baby to be calm	-.05	**.60 (.43)**
	7.	Holding babies frequently during the day makes them more demanding	.20	**-.57 (-.46)**
	8.	Responding quickly to a crying baby leads to less crying in the long run	-.18	**.66 (.64)**
	11.	Leaving a baby to cry can cause emotional insecurity	-.21	**.65 (.55)**

Note. *N*s for sample 1 (PCA) and sample 2 (CFA) were 344 and 216, respectively. These *N*s are excluding the 37 participants with data missing from more than 30% of items. Factor loadings >.29 are in boldface. Factor loadings without parentheses are from the PCA and within parentheses are from the CFA. Item 2 of the eating section read ... *are difficult to follow* in version 1 and ... *are easy to follow* in version 2.

2010). Correlations were added to account for shared variance of the shared context. Within the three contexts of the BCQ – sleeping, feeding and soothing – correlations were added between the errors for all items measuring each factor. For example, the errors for all items measuring structure in the sleeping section were correlated. The two-factor model generally demonstrated adequate fit, $\chi2(341) = 616.24$, $p < .001$, $\chi2/df$ ratio = 1.81, root mean square error of approximation (RMSEA) = .06, Comparative fit index (CFI) = .87, Incremental fit index (IFI) = .88. A model was thought to show good fit if the χ^2 test was not significant ($p > .05$), the CFI and IFI were .90 or above (Bentler, 1990; Marsh, Balla, & Hau, 1996) and the RMSEA was .06 or smaller (Hu & Bentler, 1999). Given the χ^2 value is sensitive to small samples (Cheung & Rensvold, 2002) and the size of the correlations in the model (Miles & Shevlin, 2007), I gave greater weight to the incremental fit indices than to χ^2. Factor loadings of items in the model are shown in Table 3.2.

Table 3.3

Intercorrelations, internal consistency and test-retest reliability of the subscales of the Baby Care Questionnaire

	Intercorrelations	Internal consistency		Test-retest
Subscale	2. Attunement	Sample 1	Sample 2	$r_s(48)$
1. Structure	-.47**	.89	.91	.91**
2. Attunement	/	.83	.81	.83**

Note. *N*s for the factor intercorrelation, sample 1, sample 2, and test-retest sample were 608, 344, 216 and 48, respectively. These *N*s are excluding the 37 participants with data missing from more than 30% of items so were treated as missing data. **p*<.05, ***p*<.001.

3.4.3 Reliability and interrelations of the BCQ

Table 3.3 shows the internal consistency (α), test-retest reliability and intercorrelations of the structure and attunement subscales. The α coefficients for both subscales were above the .70 acceptable levels (Anastasi & Urbina, 1997; Kline, 2000). All items making up the structure and attunement subscales appeared worthy of retention. Test-retest reliability coefficients were calculated over a 4- to 6-week period for a sample of 48 mothers. These coefficients were in the acceptable range for both subscales, greater than $r(48) = .70$. There was a negative correlation between structure and attunement, accounting for 17% of the variance.

3.4.4 Descriptive statistics

Table 3.4 shows the means and standard deviations for the subscales of the BCQ for the overall sample as well as male and female infants, and current and expectant parents. Structure and attunement were both normally distributed despite low standard deviations. Inferential statistics did not find any significant differences in the support of the two parenting principles by infant gender or parental status. Infants' age was not related to scores on structure or attunement for current parents, $r_s(564) = .02$, $p = .717$, $r_s(564) = -.01$, $p = .911$, respectively.

Table 3.4

Parenting principles in the Baby Care Questionnaire means and standard deviations for the overall sample, by each gender and by parent's status.

		Infant gender		Parent status	
	Overall	Boys	Girls	Current	Expectant
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Structure	2.74 (0.50)	2.74 (0.53)	2.73 (0.51)	2.74 (0.47)	2.76 (0.38)
Attunement	2.98 (0.50)	2.97 (0.35)	3.00 (0.51)	2.99 (0.47)	2.90 (0.30)

*Note. N*s for the overall sample, boys, girls, current and expectant were 624, 306, 292, 564, 58, respectively. These Ns are excluding the 37 participants with data missing from more than 30% of items so were treated as missing data. Structure and attunement both showed normality despite low standard deviations.

3.4.5 Validity I: Effect of parenting principles on parenting practices and infant crying

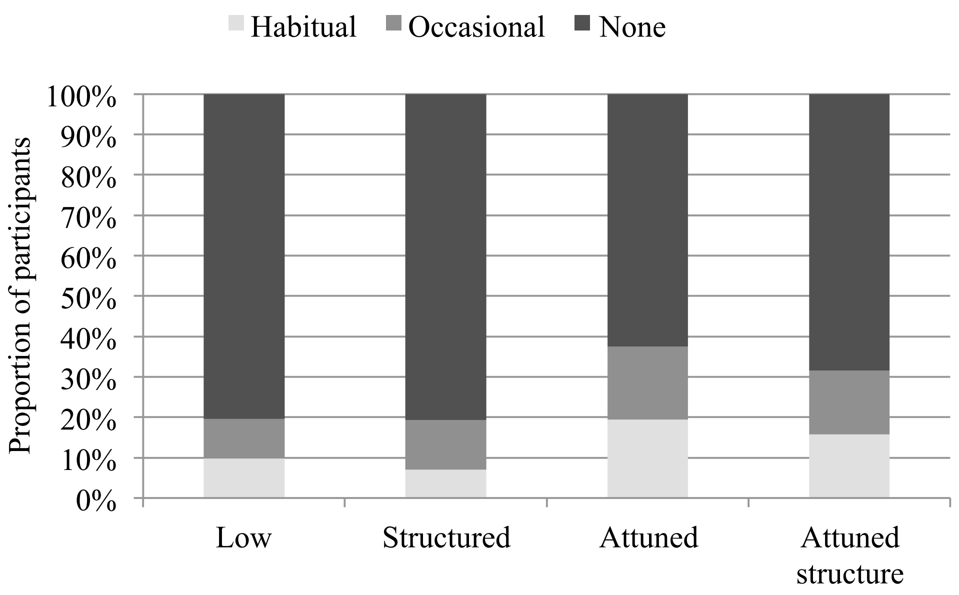
To examine the effect of parenting principles on parenting practices, current parents were labelled as high or low on principles using median splits. Parents were then placed in one of four categories discussed in the introduction – low, structured, attuned or attuned structure. Table 3.5 presents the means and standard deviations of the underlying dimensions – structure and attunement – of the parenting principles categories.

Table 3.5
Means and standard deviations for the underlying parenting principles for each parenting principles category.

	Low	Structured	Attuned	Attuned structure
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*
Structure	2.47 (0.14)	3.03 (0.28)	2.31 (0.28)	3.07 (0.25)
Attunement	2.86 (0.15)	2.79 (0.17)	3.38 (0.22)	3.28 (0.22)

Note. *N*s for low, structured, attuned and attuned structure were 36, 60, 65, 48, *respectively*.

Night-time sleeping practices. Respondents indicated where their infants slept for each night in the three days preceding questionnaire completion. Based on the co-sleeping literature, parents' sleeping practices were categorised as *habitual*, *occasional* or *no co-sleeping* (Ball et al., 1999; McKenna et al., 1997). Co-sleeping items were: slept in a parent's bed all night; moved from parent's bed to a cot; moved from a cot to a parent's bed; and moved from somewhere other than a parent's bed or cot to a parent's bed. Co-sleeping items for each respondent were summed to create an overall number of nights co-sleeping variable. Habitual co-sleeping was defined as infants sleeping in their parent's bed for at least part of all three nights. Participants reporting three nights of co-sleeping were therefore placed into the habitual co-sleeping category. As occasional co-sleeping was defined as infants sleeping in a parent's bed for one or two part- or whole-nights in the past three days, respondents reporting one or two nights of co-sleeping were placed in this category. All other respondents were placed in the no co-sleeping category. Using this categorisation, 28% parents reported some form of co-sleeping.



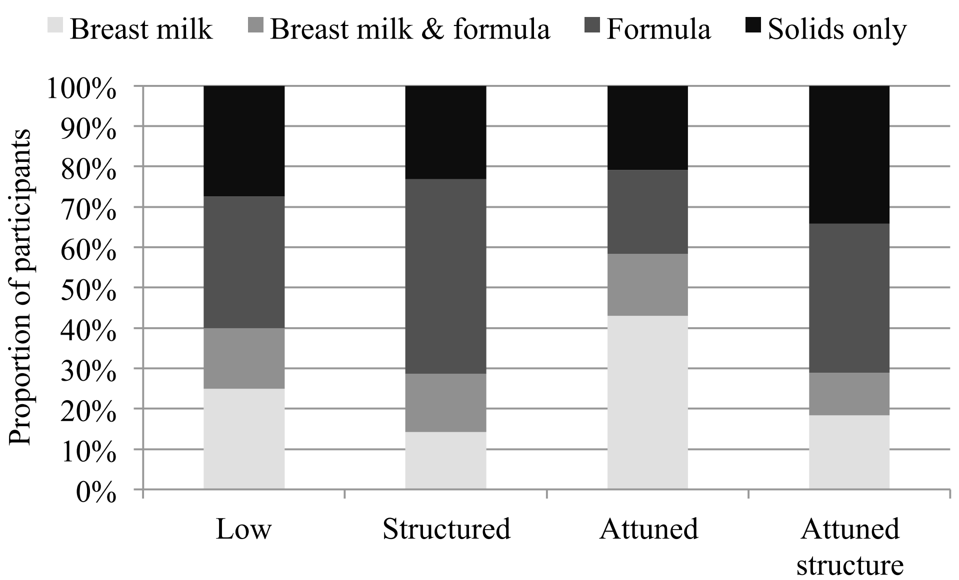


Figure 3.3. Proportion of parents in each sleeping and feeding category for each parenting principle category.

Figure 3.3 documents the proportion of parents in each sleeping category by parenting principle category. A chi-squared test demonstrated no significant relations between parents' sleeping practices and parenting principle category, $\chi^2(6, N = 208) = 7.73, p = .259$.

Feeding practices. Respondents indicated what they were feeding their infant, often reporting feeding their infants more than one food type. Participants were therefore placed in one of four feeding categories: *breast milk*, *formula*, *breast milk and formula,* or *solids only*. Parents reporting breastfeeding – either by breast, expressed breast milk or a combination of the two – with or without solids were placed in the breast milk category. Parents who reported feeding their infants formula with or without solids were placed in the formula category. Parents feeding their infants a combination of breast milk (as above) and formula, with or without solids, were placed in the breast milk and formula category. The final category, solids only, comprised parents feeding their infants only solid food.

Figure 3.3 presents the proportion of parents in each feeding category by parenting principle category. Chi-squared tests demonstrated significant relations between structure and feeding practices, $\chi^2(9, N = 206) = 20.83, p = .013$. One cell produced a significant standard residual, indicating that attuned parents were significantly more likely than chance to feed their infant breast milk, $z = 2.6, p = .009$. Odds ratios demonstrated that attuned parents were 3.59 times more likely than low parents, 5.79 times more likely than attuned structure parents and 8.22 times more likely than structured parents to feed their infants breast milk. A further three cells produced standard residuals indicating trends towards attuned parents being less likely than chance to feed their infants formula, $z = -1.9, p = .057$, and structured parents were less likely than chance to feed their infants breast milk, $z = -1.9$, $p = .057$, and more likely to feed their infants formula, $z = 1.9, p = .057$. Odds ratios demonstrated that structured parents were 2.80 times more likely than low parents, 2.53 times more likely than attuned structure parents and 2.31 times more likely than attuned parents to feed their infants formula.

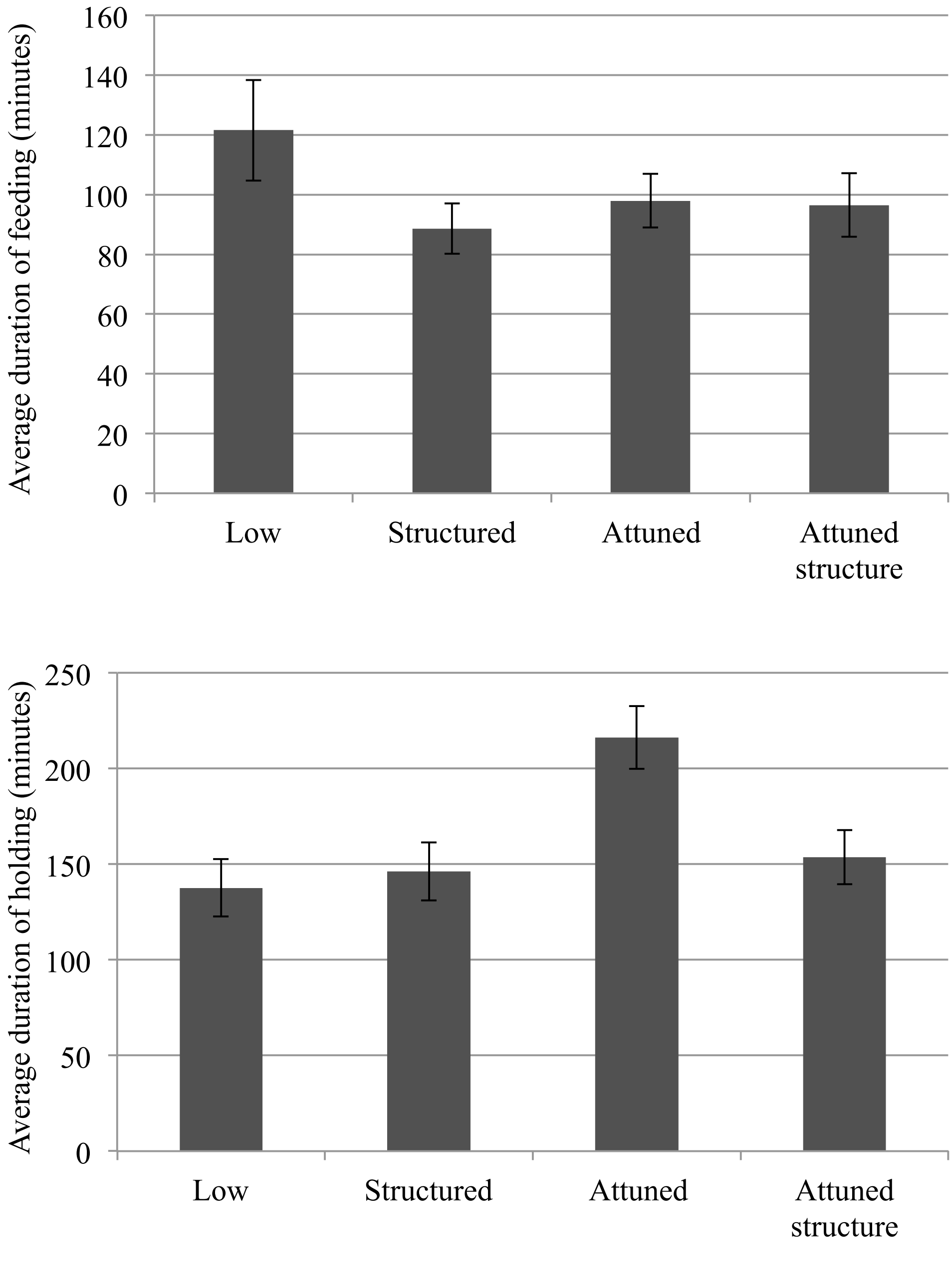


Figure 3.4. Average reported duration of feeding and holding by parenting principle category. Error bars represent ±1 SEM.

Reported duration of feeding and holding. Average durations of feeding and holding were calculated in minutes based on the daily estimates for the preceding three days.

Figure 3.4 shows the reported duration of feeding and holding by parenting principle category. Durations of feeding did not differ by parenting category, $F(3, 196) = 0.50$, $p = .681$. Durations of holding differed significantly by parenting category, $F(3, 196) = 5.24$, $p = .002$. Pairwise comparisons for holding duration indicated that attuned parents reported holding their infants for significantly longer durations than structured parents (mean difference = 2.62, $p = .007$, $d = .56$) and low parents (mean difference = 2.91, $p = .007$, $d = .64$). No other differences were significant.

Reported duration of infant crying. Average duration of crying was calculated in minutes based on the daily estimates for the preceding three days. Duration of infant crying differed by parenting principle category, $F(3, 197) = 3.04$, $p = .030$. Pairwise comparisons for reported duration of crying indicated that structured parents ($M = 25.66$, $SEM = 3.37$) reported shorter durations of crying than low parents ($M = 50.00$, $SEM = 7.82$; mean difference = -0.75, $p = .022$, $d = -.40$) and did not differ from attuned ($M = 31.98$, $SEM = 4.77$) or attuned structure parents ($M = 26.55$, $SEM = 4.57$). No further differences were significant.

3.4.6 Validity II: Perceived control over caregiving failure and parenting principles

Associations between parenting principles and perceived control over caregiving failures, measured by the PAT, were examined in attempts to confirm the validity of the BCQ. Adult control over caregiving failures (ACF), child control over caregiving failures (CCF) and perceived control over failures (PCF) showed test-retest reliability, $r(48) = .35$, $p = .014$, $r(48) = .58$ $p<.001$, $r(48) = .31$, $p = .031$, respectively. Scores on structure, attunement, CCF, ACF and PCF were averaged across the two time points. Table 3.6 presents means and standard deviations of average CCF, ACF and PCF, as well as the correlations between these scales and the parenting principles structure and attunement. PCF was negatively related to structure and positively related to attunement. Higher scores on

PCF reflect attributing more control to the adult than child in caregiving failures. Therefore, respondents who placed more responsibility on the child than the adult in caregiving failures appeared to support structure more and attunement less. When examining the two underlying dimensions of PCF – ACF and CCF – attributions about the child appeared to be related to parenting principles, with structure positively related and attunement negatively related to CCF. Adult attributions were not related to structure or attunement.

Table 3.6

Means and standard deviations for the subscales of the Parent Attribution Test and their associations with parenting principles measured by the Baby Care Questionnaire.

	Mean (SD)	Structure (r)	Attunement (r)
Adult control over failure (ACF)	4.28 (0.49)	.02	.16
Child control over failure (CCF)	3.55 (0.52)	.36*	-.35*
Perceived control over failure (PCF)	0.78 (0.60)	-.36*	.47**

Note. PCF = ACF – CCF. **p*<.05, ***p*<.001.

3.5 Discussion

The BCQ was designed to measure the parenting principles structure and attunement, as well as feeding, holding and night-time sleeping practices. The current report provides evidence of the BCQ's psychometric properties. The BCQ's two-factor structure was confirmed by a principal components analysis and a confirmatory factor analysis. These two subscales showed good internal consistency and test-retest reliability, showing consistency across items of subscales when completed at a single time and for the overall subscales when completed across time.

The validity of the BCQ was also examined. Early piloting, using cognitive interviews, demonstrated the BCQ's content validity by showing that most items were read, processed and answered in the intended way. Minor adjustments were made to problematic items to enhance clarity. Based on a larger sample, structured parents held infants for shorter periods, reported shorter durations of crying (than low parents) and were more likely to feed infants formula (at trend levels). Attuned parents were more likely to feed infants breast milk and hold them for longer durations. Those parents that combined structure and attunement did not differ significantly from structured or attuned parents for their feeding practices and their duration of holding – lying in between the two groups.

Despite hypotheses, relations between parenting principles and co-sleeping were not found. Co-sleeping was only reported by 28% of respondents. This low rate of co-sleeping may be the reason for the lack of associations between co-sleeping and parenting principles. Co-sleeping, among other practices, is an example of a parenting practice that is not always possible given situational and cultural constraints. In the UK, parents are advised against co-sleeping due to concerns about Sudden Infant Death Syndrome and other potentially fatal hazards (Nakamura, Wind, & Danello, 1999; Wailoo et al., 2004). The lack of relations between sleeping practices and principles may therefore be a reflection of the restrictions of the cultural contexts. Accordingly, relations between co-sleeping and parenting principles should be compared in cultures where co-sleeping is necessary and/or expected and in cultures where co-sleeping is neither restricted nor expected.

Individual differences in principles may be due to the parent. For example, parent's attributions of the child's control over caregiving failures were positively related to structure and negatively related to attunement, whereas attributions of the adult's control showed no relations. Therefore, parents that held the child responsible for caregiving failures tended to support structure and oppose attunement. The parent's experience with infants may also explain individual differences in principles. However, there was no significant difference between current and expectant parents on structure or attunement. Infant age was also not related to either principle. Future work could investigate the effect of parental parity on principles.

3.5.1 Implications

The BCQ provides an important new framework and measure to explore the role of parenting principles and practices during infancy. Unlike other measures, the BCQ measures how parents meet their infant's needs across caregiving domains and therefore provides a comprehensive measure of practices and principles. As assessment tools are required for real progress to be made in testing and refining theory (Davies, Forman, Rasi, & Stevens, 2002), I believe this measure is needed in order to start addressing a broad range of significant and neglected questions during infancy.

The BCQ will be a valuable tool, not only in characterising early parenting principles and practices, but also in investigating the influence of infant characteristics, environmental factors and adult cognitions. One environmental factor is culture. This chapter only reports from a UK sample; however, previous work suggests that cultures should differ in the relative importance they ascribe to structure and attunement during infancy (for example, Gantley et al., 1993; Hewlett, Lamb, Shannon, Leyendecker, & Scholmerich, 1998; St James-Roberts et al., 2006). Practices also differ by culture – for example, co-sleeping is common in non-industrialized societies (Blair, 2010; Mosko, McKenna, Dickel, & Hunt, 1993). Thus, once established as a valid tool in other cultures, the BCQ can be used to document cross-cultural variations in principles and improve our understanding of how principles and practices are related within certain cultural contexts.

By providing a measure suitable for infancy, it will allow investigation of the long-term effects of these early principles and practices on child social and cognitive outcomes. Despite fierce debate on the benefits and costs of different caregiving approaches, there is little empirical evidence documenting the long-term outcomes for children (St James-Roberts, 2007). Once the implications of early caregiving principles are better understood, practitioners will be able to give more informed advice to parents on the benefits and costs of different caregiving approaches, which can be tailored to the needs of the parents and their infants.

3.5.2 Limitations and future directions

This chapter reports on the initial development and piloting of a new measure of caregiving, the BCQ. Further development of this measure, however, is needed. For example, 4 items loaded onto both structure and attunement. For the exploratory factor analysis, the two factors accounted for only 37% of the variance. The chi-square test for the confirmatory factor analysis was significant suggesting that the proposed model was different from the data. In addition, not all fitting indices quite reached levels to indicate a good fit. Therefore, a new version of the BCQ with items removed that have multiple loadings and/or poor factor loadings should be developed and further tested.

The cross-sectional data in this chapter cannot demonstrate how consistent these parenting principles and practices are across time. A longitudinal design would also allow a clearer understanding of change over time. Parenting principles did not vary with infant age; however, individual parents' support of different principles may still change over time or in response to infants' behaviours, such as crying. Structured parents reported shorter durations of crying than attuned and low parents. Further research using the BCQ in a longitudinal design would allow a better understanding of changes in principles based on experience with infants as well as infants' age and behaviour.

The final benefit of a longitudinal design would be to understand differences in parenting principles before or at the onset of parenting and then once parents are established in their caregiving role. The question of consistency and change of structure and attunement between delivery and the infant being 5 months old is one of the focuses of the next chapter. The BCQ was designed for current and expectant parents, who did not differ on their support of structure or attunement. The current cross-sectional design does not provide answers to questions about whether principles change once parenting begins, or if principles developed during pregnancy persist throughout infancy. As previous studies have used such decisions to group parents during pregnancy (see St James-Roberts et al., 2006), future work should examine the reliability and validity of expectant parents reporting their principles.

A second limitation is the reliance on parent-report measures. The BCQ was designed as a parent-report measure, as parenting principles and practices are difficult to observe due to their cognitive focus and personal nature. However, a key step in verifying validity is examining the belief-behaviour match. This process would allow us to confirm the BCQ measures the principles and practices reported. Some researchers claim exploring these relations is the most important validation process (for example, Dekovic, Janssens, & Gerris, 1991; Miller, 2007). Holden and Edward (1989) even claimed beliefs must reflect behaviour to have consequences on children.

The final limitation of this study was the sample's diversity. The current report provides initial validation of the BCQ in the UK. UK parents show variation in support of structure and attunement, and choice of parenting practices. However, as this study required internet access – and so not all parents could participate – the BCQ needs further validation in a more diverse UK sample. In addition, the BCQ needs to be validated in a wider number of cultures.

The BCQ, and data collected from such a measure, will be relevant to practitioners interested in promoting healthy practices, such as Kangaroo care for preterm infants or breastfeeding. Although this study aimed to collect normative data from a typical sample, I was able to examine a pilot sample of parents of preterm infants. These parents were equally able to complete the BCQ and the comments given showed that parents of preterm infants had similar thoughts and concerns in response to the BCQ. One mother's description of caring for her preterm infant allows us a glimpse into decisions these parents have to make:

"I think we will have different views on schedules from most parents as with having two prem [sic] babies we spent a lot of time Kangeroo Caring our children. We respond quickly to a crying baby, as when they are really little this takes up calories. We have two very content children who have never had a problem sleeping or feeding by letting them set the routine not us."

This comment shows similar concerns and decisions exist for this mother, such as how often to hold her baby and when to respond to crying. Although parents of preterm infants must consider their infant's immaturity, their principles about the best way to meet their infant's needs are still defined by their position on structure and attunement and reflected in their parenting practices in similar ways to parents of term infants. Future studies should include risk samples at differing stages of development in order, for example, to better our understanding of the early influence of the NICU stay on parenting principles and practices. The next chapter focuses on these questions – specifically, how mothers approach caregiving following a premature delivery and once their infant is home and the caregiving role is established.

Chapter 4. Maternal cognitions

4.1 Chapter overview

The overall aim of this chapter is to explore whether parenting principles and cognitions differ between mothers of preterm and term infants both following delivery and once the parenting role is established. To achieve this aim, this chapter focuses on four specific questions. First, to examine whether there were differences in principles and cognitions between mothers who had experienced a preterm, compared with term, delivery. The second question focuses on the consistency or change of these principles and cognitions from delivery to the infant turning 5 months at a group (continuity) and individual (stability) level. The third aim is to explore whether changes, or consistency, over time were different in mothers of preterm, as compared with term, infants. The final aim is to examine relations between maternal principles and cognitions, and demographic and medical factors.

4.2 Caring for preterm infants

The transactional model of parenting describes how parents can both buffer and exasperate early difficulties associated with prematurity (Sameroff & Chandler, 1975). Researchers have described the important role parents have to play in supporting their premature and immature infant's development (for example, Forcada-Guex et al., 2006; Landry et al., 1997a; Landry, Smith, Swank, & Miller-Loncar, 2000). However, others have noted that in the early months, mothers and their preterm infants need help to learn to communicate with each other (Bozzette, 2007). These studies have primarily focused on how parents interact with their infants rather than examining how parents approach caring for their premature infant.

Little is known about how parents approach caring for their newborn following a premature delivery. In the previous chapter, I introduced two key parenting principles during infancy. Structure reflects parent's support of schedules and routines in their infant's daily life. Attunement reflects parent's trust of, and attention and responsiveness to, the cues of their infants. This chapter therefore aims to understand how parents approach caring for their newborn following a preterm delivery in relation to their support of structure and attunement. In addition to specific principles about caregiving, this chapter presents data on general cognitions about child development and caregiving. Differences between mothers of preterm and term infants may have been present before birth and be more a reflection of risk factors associated with preterm birth rather than the actual premature delivery. Therefore, a measure of the level of cognising allows indication of how mothers think generally rather than in response to specific behaviours or caregiving decisions.

4.2.1 Principles about caregiving

Chapter 3 described the early caregiving of term infants. All infants are born immature and highly dependent on others for survival (Bornstein, 2002; Small, 1999; St James-Roberts, 2007). This dependence is especially true for preterm infants who often require extended periods of hospitalisation to ensure survival following their birth (Goldberg & DiVitto, 1983). Parent's early experiences of caring for their infant therefore occur in the NICU, where they must share responsibility for their infant's care with trained medical staff. Parents often report feelings that the medical staff are more capable of caring for their infant than them and feelings that they do not have a baby and/or the hospital owns their infant (Cleveland, 2008; Goldberg & DiVitto, 1983). In addition, preterm birth is often unexpected and so parents are suddenly forced into parenthood (Goldberg & DiVitto, 1983). These parents are thus often ill-prepared and have not had a chance to go to antenatal classes, read books about parenting and child development, develop principles about how to care for their infant, or more practical aspects such as buy supplies for their newborn. During this time, mother's principles about caregiving may reflect those imposed by the hospital. For example, parents may establish set times to visit their infant around regular feeding and ‘cares’ (nappy changes and washes) schedules.

Parents are often encouraged to be involved with activities that only parents can do – for example, breastfeeding or expressing breast milk (Cleveland, 2008). In addition, both mothers and fathers are encouraged to partake in Kangaroo care (Feldman et al., 2002; Flacking et al., 2011; Ruiz-Peláez et al., 2004; Tessier et al., 1998). Such involvement allows parents close physical contact with their infant; to become familiar with their infant; to feel important to the baby; and prepare for the responsibility of taking exclusive care of their baby (Goldberg & DiVitto, 1983). The goal of these activities, and NICU-based interventions, is often to help parents learn about their infant’s unique characteristics, temperament and cues (for example, Browne & Talmi, 2005; Kaaresen, Ronning, Ulvund, & Dahl, 2006; Landry, Smith, Swank, & Guttentag, 2008). This goal is based on research demonstrating that parents of preterm infants who attend to the behavioural cues of their infants to provide supportive early interactions have infants, and later children, with more positive outcomes (Bozzette, 2007; Landry et al., 1997a).

NICUs therefore appear to combine structure and attunement in the care of newborn infants. However, preterm infants often display less stable state changes – shifting between states frequently – and less efficient feeding (Watt & Strongman, 1985). In addition, preterm infants have been observed to provide less clear cues and be less attentive and responsive (Goldberg & DiVitto, 2002). Therefore, enforcing schedules into preterm infant’s lives may be difficult due to the instable state changes but trusting and responding to their infant’s cues may be equally tricky. Understanding parent’s underlying principles about caregiving, regardless of how difficult the practice is, will aid understanding of how parents approach caring for their newborn. Therefore the current study examines parents’ principles about caregiving at birth and then again 5 months later.

4.2.2 Complexity of maternal cognitions

Newberger (1980) likened patterns of parental thinking to the various cognitive-structural stages of children's understanding of others' perspectives, as defined by researchers such as Piaget (1950). Newberger (1980) observed that parents' conceptions could be placed into one of four hierarchically ordered levels of thinking; levels were increasingly flexible, with individuals becoming more capable of acknowledging and utilising a more comprehensive range of information. The levels ranged from *egoistic (self) orientation* – the child is conceived as a projection of the parent and so only the needs and experiences of the parent are considered – to *process (system) orientation* – parents understand that different perspectives are part of an interacting system of mutual relational influence. These levels therefore reflected the level at which parents organised their awareness of the child and the parenting role. Entry into a new level of thinking opens up a perspective not available at the preceding level. However, Newberger (1980) clarified that parents would not always use their highest level of reasoning – some situations (for example, stressful situations) would modify the level of thinking.

The complexity at which parents can consider development in general, and their own child specifically, describes *how* rather than *what* parents are thinking. Deković and Gerris (1992) compared parent's level of thinking to behaviours seen in a problem-solving task. Parents at lower levels of thinking with fewer conceptual resources and perspectives to draw on tended to show a more rigid and authoritarian behavioural style (Deković & Gerris, 1992).

The Concepts of Development Questionnaire (Sameroff & Feil, 1985) measures the level of complexity that parents can conceptualise development. Complex levels of thinking, as measured by the CODQ, reflect flexible thinking that involves multiple perspectives and takes into account reciprocal influences and transactional accounts of development. Categorical thinking, in comparison, reflects thinking that attributes behaviour to a single cause and views the child as an extension of parents who do not have individual needs. Parents that were rated higher on complexity on the CODQ when their child was 1 years old showed more sensitive and warm parenting at 2 years, and their infants in turn showed better social responsiveness at 4.5 years (Miller-Loncar et al., 2000).

Differences were not found between mothers of preterm and term 4.5-year-olds on the level of complexity that parents could conceptualise development (measured using the CODQ; Pearl & Donahue, 1995). However, mothers of preterm children did score higher on the categorical subscale, demonstrating that these parents were more likely to assign child outcomes to a single cause. Therefore, although parents of preterm children were as capable of thinking complexly about child development, these parents would also rank higher in categorical thinking than parents of term children. Newberger (1980) stated that parents do not always cognise at their highest ability. In stressful contexts, for example, a parent may start relying more heavily on lower levels of thinking. Caring for a child born prematurely therefore may have altered the level at which the parents in Pearl and Donahue's (1995) sample were thinking about child development – that is, despite being able to take into account multiple perspectives, the stress of caring for a premature child may have resulted in parents relying more on categorical thinking. A study that measure parent's ability to cognise about child development soon after a preterm delivery and later once parents have experienced caring for their preterm infant would be able to further examine this potential change across time in parents' level of cognising about child development.

Complexity of thinking about child development is different from attitudes, as they provide an overall view of how a parent cognises about development, rather than specific attitudes or principles about a specific parenting practice. Complexity of thought therefore provides a broader framework to understand the cause and effect of parenting behaviour on child outcomes (Miller-Loncar et al., 2000). This chapter reports data from the CODQ to examine at what level parents cognise about child development and the parental role following delivery and 5 months later once the caregiving role is established.

4.2.3 Consistency and change across time

Developmental research aims to understand the developmental function (Wohlwill, 1970) and individual differences (Bates & Novosad, 2006) of constructs. Wohlwill (1970) defined *developmental* variables as those constructs that changed with age in a generally consistent way across individuals and environments. Developmental research therefore aims to understand change across time. Continuity is defined as consistency in group level performance across time (Bornstein, 2002). A continuous construct is therefore one in which group means do not differ from one time point to a later time point, whereas changes in mean group performance across time would demonstrate that a construct was not continuous.

Individual differences focus instead on variation around the mean. Such individual differences can be seen on a variety of psychological constructs (Bates & Novosad, 2006). Individual differences on a construct could be stable across time or merely be fleeting differences between individuals. Stability in individual variation is defined as consistency in the relative rank or standing of individuals within a group across time (Bornstein, 2002). A stable construct is therefore one that some individuals rank at relatively high levels at one point in time and again display at equally high levels at a later point in time, whereas other individuals display lower levels at both times. An instable construct is one in which individuals do not maintain their rank order across time. Psychological constructs are generally required to show stability across time for the construct to be assumed to be meaningful. Holden and Edwards (1989) emphasised the need for stability in parents' beliefs in order for such cognitions to affect children.

4.2.4 Summary

Parents of preterm infants often have to learn about their parenting role and their infant in the hospital, and in particular in the NICU. Many interventions used with parents of premature infants encourage parents to learn about and respond to their infant's cues. However, the NICU provides a structured environment where parents are involved in scheduled caregiving. In addition, on arrival home parents have infants with less cues and signals as well as difficulties establishing feeding and sleeping patterns. Despite these difficulties being documented, little is known about how parents actually plan to care for their infant, both soon after delivering their infant and later in the first year when they have exclusive responsibility for the care of their infant. Therefore, this chapter reports data about parents' support of structure – routines and regularity – and attunement – trusting, attending and responding to infants' cues – in mothers following the preterm or term delivery of their infant and then 5 months later. Structure and attunement represent specific principles about caregiving. The cognitive ability of the mother was also measured to provide an overall view of how parents think about child development and caregiving. Based on the findings of Pearl and Donahue (1995), I expected mothers of preterm infants would show similar levels of complexity of thought but higher levels of categorical thinking than mothers of term infants. Analyses of the stability and continuity of parenting principles and cognitions provided information about the developmental course for these maternal cognitions from hospitalisation to the establishment of the parenting role.

4.3 Method

4.3.1 Participants

Eighty-nine infants participated in the 5-month visit of the longitudinal study of preterm (*n* = 29) and term (*n* = 60) infants' development. Demographic information about these infants and their mothers was presented in chapter 2, as well as sampling procedures.

4.3.2 Procedure

The overall procedure for the 5-month visit was described in chapter 2. Specific details about the questionnaires used at birth and the 5-month visits are described below.

4.3.3 Principal measures

4.3.3.1 The Cardiff Antenatal Inventory

The Cardiff Antenatal Inventory is divided into five sections and collects demographic information as well as asking about mothers' previous pregnancies, and about their current or most recent pregnancy and delivery. Mothers are also asked about their perception of the parenting support available (see Appendix 3). Mothers completed this questionnaire at birth only.

4.3.3.2 The Baby Care Questionnaire (Winstanley & Gattis, 2012)

The BCQ (see chapter 3) measures the parenting principles structure and attunement and day-to-day practices. The BCQ contains three sections – sleeping, feeding and soothing. Structure and attunement were calculated as the average rating of 45 items. Scores could range from strongly disagree (1) to strongly agree (4). Parent's response to parenting practices question were used to assign parents into co-sleeping category (none, occasional or habitual), and feeding category (breast milk, formula, breast milk and formula, or solids only). Additionally, reported duration of feeding, holding and infant crying were calculated in minutes as the average for the previous three days (see Appendix 1). Mothers completed this questionnaire at birth and 5 months.

4.3.3.3 Concepts of Development Questionnaire (CODQ; Sameroff & Feil, 1985)

The CODQ asks parents to rate 20 statements about child development on a 4-point Likert scale ranging from strongly disagree (0) to strongly agree (3). The CODQ measures parents' cognitions about child development, in particular, parents' ability to think complexly about children. The CODQ contains two subscales – categorical and perspectivist – and a final summary scale – complexity. For each subscale an average score is calculated, which can range from 0 to 3. At the categorical level, parents' cognitions are restricted to single determinants and single outcomes. For example, *parents must keep to their standards and rules no matter what their child is like*. At the perspectivist level, child development is viewed from multiple perspectives, with parents understanding that they are also dynamic factors that can become better or worse partners in this growth process. For example, *parents change in response to their children*. Cognising at the perspectivist level allows parents to view and evaluate a large range of developmental possibilities.

A third score – labelled complexity – is calculated, which represents the balance between perspectivist and categorical and can also range from 0 to 3. To ensure the BCQ and CODQ used equivalent scales, after calculating the complexity subscale all subscales of the CODQ were transformed to range from 1 to 4 (by adding 1 to all scores). Therefore, a complexity score of 4 reflects that parents strongly agree with items related to the perspectivist subscale and strongly disagree with items related to the categorical subscale. In contrast, a complexity score of 1 reflects that parents strongly disagree with items related to the perspectivist subscale and strongly agree with items related to the categorical subscale (see Appendix 2). The internal consistency (.67) and construct validity was demonstrated by Landry and colleagues (Landry, Garner, Swank, & Baldwin, 1996). Mothers completed this questionnaire at birth and 5 months.

4.3.4 Design

The design was within-subjects. Data was collected for all mothers for all measures, resulting in five variables. Two variables came from the BCQ – structure and attunement. Mothers received a score on structure and attunement that reflected an average rating across items for each subscale. These scores ranged from 1 to 4. One reflected that the mothers always strongly disagreed with the principle and scores of around 4 reflected that mothers always strongly agreed. Three variables came from the CODQ – categorical, perspectivist and complexity. Mothers received a score on categorical and perspectivist that reflected the average rating across items for each subscale. Complexity scores were calculated by subtracting categorical scores from perspectivist scores, adding 3 and then dividing by 2. Complexity therefore reflects mothers' balance between categorical and perspectivist thinking. One was added to CODQ scores to make the scoring of the BCQ and CODQ equivalent. Therefore, all variables could range from 1 to 4.

4.4 Results

4.4.1 Analysis plan

Prior to data analysis, distributions of parental cognitions at both time points – structure, attunement, perspectivist, categorical and complexity – were examined for normalcy, homogeneity of variance and influential outliers. All these variables met assumptions for parametric tests.

First, descriptive statistics and stability estimates are reported across ages for parental cognitions by birth status (preterm vs. term). Next, the effects of child age (birth vs. 5 months), and birth status (preterm vs. term) are tested using Repeated-Measures Analysis of (Co)Variance (RM-AN(C)OVA). Child age is treated as a within-subjects variable and birth status is treated as a between-subjects variable. Finally, predictors of maternal principles and cognitions are investigated using correlations and multiple regressions.

4.4.2 Stability and continuity by birth status

Maternal caregiving principles. Table 4.1 presents means and standard deviations for structure and attunement by infant age and infant birth status. These descriptive statistics indicate that parents who had a preterm infant supported structure more and attunement less at both times. However, a Pillai's trace demonstrated that there was not a significant main effect of birth status, $V = 0.03$, $F(2, 86) = 1.50$, $p = .230$, or infant age, $V = 0.03$, $F(2, 86) =$

1.09, p = .340, or interaction between infant age and birth status, V = 0.00, F(2, 86) = 0.08, p = .921, on factor scores for structure and attunement.

Table 4.1
Descriptive statistics and correlations of maternal principles and cognition

	Preterm infants			Term infants		
	Birth *M (SD)*	5 months *M (SD)*	*r*	Birth *M (SD)*	5 months *M (SD)*	*r*
BCQ						
Structure	2.75 (0.25)	2.75 (0.28)	.08	2.64 (0.34)	2.67 (0.37)	.61**
Attunement	2.85 (0.22)	2.90 (0.30)	.47*	2.95 (0.30)	2.98 (0.32)	.59**
CODQ						
Categorical	1.90 (0.28)	2.12 (0.25)	.38*	1.95 (0.30)	1.98 (0.23)	.42**
Perspectivist	2.82 (0.30)	2.92 (0.33)	.47*	2.94 (0.33)	3.01 (0.30)	.58**
Complexity	2.96 (0.21)	2.90 (0.19)	.36[a]	2.99 (0.25)	3.02 (0.20)	.53**

Note. *N*s for the preterm and term sample were 29 and 60, respectively. **p*<.05, ***p*<.001, [a]*p* = .053.

Table 4.1 presents correlations between parenting principles following delivery and 5 months later by infant birth status. Stability, consistency in relative ranks for individuals, was found for attunement for mothers of preterm and term infants. However, stability for structure was only found for mothers of term infants – structure at birth was not related to structure at 5 months for mothers of preterm infants.

Maternal complexity of thought. Table 4.1 presents means and standard deviations for categorical, perspectivist and complexity variables by infant age and birth status. Using Pillai's trace, there was a significant main effect of infant age, V = 0.21, F(2, 86) = 11.32, p<.001, and interaction between infant age and birth status, V = 0.10, F(2, 86) = 4.90, p = .010, but no main effect of birth status, V = 0.04, F(2, 86) = 1.56, p = .217, on categorical, perspectivist and complexity scores. Separate univariate ANOVAs indicated a significant main effect of infant age on categorical, $F(1, 87) = 12.78$, $p = .001$, and perspectivist, $F(1, 87) = 6.55$, $p = .012$, scores and a significant interaction between infant age and birth status for categorical scores, $F(1, 87) = 8.83$, $p = .004$. Simple effects analyses were run to examine the significant interaction between birth status and infant age on categorical scores. Mothers of preterm and term infants did not differ in their categorical scores following delivery, $F (1, 87) = 0.73$, $p = .396$, , *partial* $\eta^2 = .01$, but did differ when their infants were 5 months old, $F (1, 87) = 6.84$, $p = .010$, *partial* $\eta^2 = .07$. The simple effects analysis also demonstrated that while mothers of preterm infants significantly increased in their categorical scores from birth to 5 months, $F (1, 87) = 15.88$, $p<.001$, *partial* $\eta^2 = .15$, categorical scores of term mothers did not differ between the two time points, $F (1, 87) = 0.28$, $p = .601$, *partial* $\eta^2 = .00$. Mothers of preterm and term infants therefore showed similar levels of categorical thinking following the birth of their child, but by the time their infant was 5 months old, mothers of preterm infants scored significantly higher on the categorical subscale than mothers of term infants.

Correlations between categorical, perspectivist and complexity scores following delivery and when the infant was 5 months are presented in Table 4.1 by infant birth status. Stability was found for all three variables in mothers of term infants. However, for mothers of preterm infants stability was only found for perspectivist and categorical scores – complexity was only stable at trend levels, $r = .36$, $p = .053$.

4.4.3 Relations between maternal cognitions, demographic and health factors

Table 4.2 presents correlations between the maternal self-reported measures. Negative relations were found between structure and attunement for mothers of both preterm and term infants. Structure and attunement were only related at 5 months for mothers of preterm infants, whereas structure and attunement were related at both age points for mothers of term infants and structure at birth was also negatively related to attunement at 5 months. Complexity and attunement were positively related in mothers of both preterm and term infants. The only combination of attunement and complexity that were not related was at birth for preterm infants.

Table 4.2

Interrelations between maternal principles and cognition by birth status

		1.	2.	3.	4.	5.	6.	
Structure	1. Birth		.61**	-.36*	-.44**	-.21	-.16	
	2. 5 months	.08		-.13	-.41**	.07	.02	
Attunement	3. Birth	-.16	-.12		.59**	.51**	.43**	Term
	4. 5 months	-.11	-.34	.47*		.37*	.33*	
Complexity	5. Birth	-.19	-.15	.29	.43*		.53**	
	6. 5 months	-.18	-.33	.50*	.62**	.36[a]		
					Preterm			

Note. *N*s for the preterm and term sample were 29 and 60, respectively. Correlations for preterm infants are in bold. Correlations in italics are stability measures reported in previous table. *p<.05, **p<.001, [a]p = .053.

Table 4.3 presents correlations between mother self-report measures, demographic and medical factors. Correlations between parenting principles and cognitions, and demographic and medical factors, were used to determine predictors to include in regression analyses, including 5-month parenting principles and complexity as the criterion variable. Multiple regressions were used to assess predictors of structure, attunement and complexity. The Enter method was used in this and subsequent chapters. The Enter method – or forced entry – forces all predictors into the model simultaneously (Field, 2005). Table 4.4 gives information about the predictor variables entered into these models, as well as the unstandardised regression coefficients (*B*), the standard error of the mean (*SE B*), and the standardised regression coefficients (β).

Table 4.3

Correlations among maternal principles and cognitions, and demographic and medical risk factors

	Structure		Attunement		Complexity	
	Birth	5 months	Birth	5 months	Birth	5 months
Infant age	-.15	.09	-.01	-.12	.09	-.06
Demographic factors						
Maternal age	.17	.12	.08	.04	.12	.02
Number of siblings (r_s)	-.01	-.04	.12	-.03	.04	-.24*
Maternal education (r_s)	-.14	-.05	.26*	.15	.39*	.28*
Medical status						
Hospitalisation duration	.21[a]	.14	-.39*	-.18	-.17	-.23*
Gestational age	-.15	-.12	.28*	.09	.05	.27*
Birthweight	-.19	-.12	.31*	.13	.12	.28*
Apgar (5 mins) (r_s)	.04	-.11	.16	.17	.10	.18

*Note. N*s for the preterm and term sample were 29 and 60, respectively. Data is missing for: birthweight for 1 preterm infant; hospitalisation duration for 3 preterm and 4 term infants; and 5-minute Apgar scores for 3 preterm and 6 term infants. Problems with non-normalcy for duration of hospitalisation were resolved with a natural log transformation. Number of siblings, maternal education and Apgar scores (5 mins) were all negatively skewed so non-parametric tests were run with these variables. $^{*}p$ <.05, ^{a}p <.10.

Structure. Using the enter method, a significant model for structure at birth emerged, R^2 = .22, F(2, 72) = 10.03, p <.001. This model explained 22% of variance in scores on structure at birth, with attunement at birth negatively predicting structure at birth. Therefore, mothers that were higher on attunement were more likely to be lower on structure at birth. At trend levels, mothers who had infants with longer durations of hospitalisation scored higher on structure at birth (β = .20, p = .073).

Using the enter method, a significant model for structure at 5 months emerged, R^2 = .34, $F(3, 85) = 14.29$, p <.001. This model explained 34% of variance in scores on structure at 5 months, with structure at birth and attunement at 5 months predicting structure at 5 months. Therefore, mothers who scored higher on structure at birth and lower on attunement at 5 months scored higher on structure at 5 months. At trend levels, mothers who scored higher on attunement at birth scored higher on structure at 5 months (β = .20, p = .064).

Attunement. Using the enter method, a significant model for attunement at birth emerged, R^2 = .38, $F(6, 68) = 6.92$, p <.001. This model explained 38% of variance in scores on attunement at 5 months, with structure negatively and complexity positively predicting attunement at birth. Therefore, mothers who scored lower on structure and higher on complexity were more likely to score higher on attunement.

Using the enter method, a significant model for attunement at 5 months emerged, R^2 = .47, $F(5, 83) = 14.41$, p <.001. This model explained 47% of variance in scores on attunement at 5 months, with attunement at birth positively and structure at 5 months negatively predicting attunement at 5 months. Therefore, mothers who scored higher on attunement at birth and lower on structure at birth scored higher on attunement at 5 months.

Complexity. Using the enter method, a significant model for complexity at birth emerged, R^2 = .27, $F(2, 86) = 16.21$, p <.001. This model explained 27% of variance in scores on complexity at birth, with attunement at birth and maternal education positively predicting complexity at birth. Therefore, mothers that who scored higher on attunement at birth and were more highly educated scored higher on complexity.

Using the enter method, a significant model for complexity at 5 months emerged, R^2 = .47, $F(8, 66) = 7.37$, p <.001. This model explained 47% of variance in scores on complexity at 5 months, with complexity at birth positively predicting complexity at 5 months. At trend

Table 4.4

Predictors of parenting principles and cognitions

	B	*SE B*	*β*	*t*
Predictors of structure at birth				
Attunement at birth	-0.39	0.12	-.36	$t(72) = -3.20$, $p = .002$, $d = -0.75$
Hospitalisation duration	0.06	0.03	.20	$t(72) = 1.82$, $p = .073$, $d = 0.43$
Predictors of structure at 5 months				
Structure at birth	0.49	0.11	.45	$t(85) = 4.67$, $p <.001$, $d = 1.01$
Attunement at birth	0.25	0.13	.20	$t(85) = 1.88$, $p = .064$, $d = 0.41$
Attunement at 5 months	-0.38	0.12	-.35	$t(85) = -3.15$, $p = .002$, $d = -0.68$
Predictors of attunement at birth				
Structure at birth	-0.24	0.09	-.26	$t(67) = -2.54$, $p = .013$, $d = -0.62$
Complexity at birth	0.41	0.12	.36	$t(67) = 3.29$, $p = .002$, $d = 0.80$
Maternal education	0.02	0.03	.08	$t(67) = 0.72$, $p = .476$, $d = 0.18$
Hospitalisation duration	-0.05	0.04	-.17	$t(67) = -1.11$, $p = .270$, $d = -0.27$
Gestational age	-0.01	0.02	-.09	$t(67) = -0.46$, $p = .651$, $d = -0.11$
Birthweight	0.00	0.00	.11	$t(67) = 0.58$, $p = .562$, $d = 0.14$
Predictors of attunement at 5 months				
Attunement at birth	0.42	0.11	.38	$t(83) = 3.85$, $p <.001$, $d = 0.85$
Structure at birth	-0.01	0.10	-.01	$t(83) = -0.13$, $p = .897$, $d = -0.03$

Structure at 5 months	-0.29	0.09	-.32	$t(83) = -3.40$, $p = .001$, $d = -0.75$
Complexity at birth	0.19	0.13	.15	$t(83) = 1.51$, $p = .134$, $d = 0.33$
Complexity at 5 months	0.22	0.15	.15	$t(83) = 1.50$, $p = .137$, $d = 0.33$
Predictors of complexity at birth				
Attunement at birth	0.35	0.08	.40	$t(86) = 4.25$, $p <.001$, $d = 0.92$
Maternal education	0.06	0.02	.25	$t(86) = 2.68$, $p = .009$, $d = 0.58$
Predictors of complexity at 5 months				
Complexity at birth	0.34	0.10	.39	$t(67) = 3.48$, $p = .001$, $d = 0.85$
Attunement at birth	0.15	0.09	.20	$t(67) = 1.63$, $p = .108$, $d = 0.40$
Attunement at 5 months	0.10	0.08	.15	$t(67) = 1.31$, $p = .194$, $d = 0.32$
Number of siblings	-0.03	0.03	-.11	$t(67) = -1.09$, $p = .281$, $d = -0.27$
Maternal education	0.01	0.02	.04	$t(67) = 0.40$, $p = .688$, $d = 0.10$
Hospitalisation duration	0.06	0.03	.28	$t(67) = 1.90$, $p = .062$, $d = 0.46$
Gestational age	0.02	0.01	.20	$t(67) = 1.11$, $p = .272$, $d = 0.27$
Birthweight	0.00	0.00	.20	$t(67) = 1.18$, $p = .242$, $d = 0.29$

*Note. N*s for the preterm and term sample were 29 and 60, respectively. Data is missing for: birthweight for 1 preterm infant; hospitalisation duration for 3 preterm and 4 term infants; and 5-minute Apgar scores for 3 preterm and 6 term infants. Problems with non-normalcy for duration of hospitalisation were resolved with a natural log transformation

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levels, mothers with infants who spent longer durations in hospital scored higher on complexity at 5 months (β = .28, p = .062).

Parenting practices. Multiple regressions were used to assess predictors of parenting practices: co-sleeping, breastfeeding, duration of feeding and duration of holding. Table 4.4 gives information about the predictor variables entered into these models, as well as the unstandardised regression coefficients (*B*), the standard error of the mean (*SE B*) and the standardised regression coefficients (β).

Co-sleeping was scored as the number of nights, over the previous three, the infant slept in the parent's bed for part or all of the night. Scores ranged from 0 to 3. Using the enter method, a significant model for co-sleeping at 5 months emerged, R^2 = .28, $F(5, 83)$ = 6.36, p<.001. This model explained 28% of variance in co-sleeping at 5 months, with structure at 5 months negatively and attunement at 5 months positively predicting co-sleeping at 5 months.

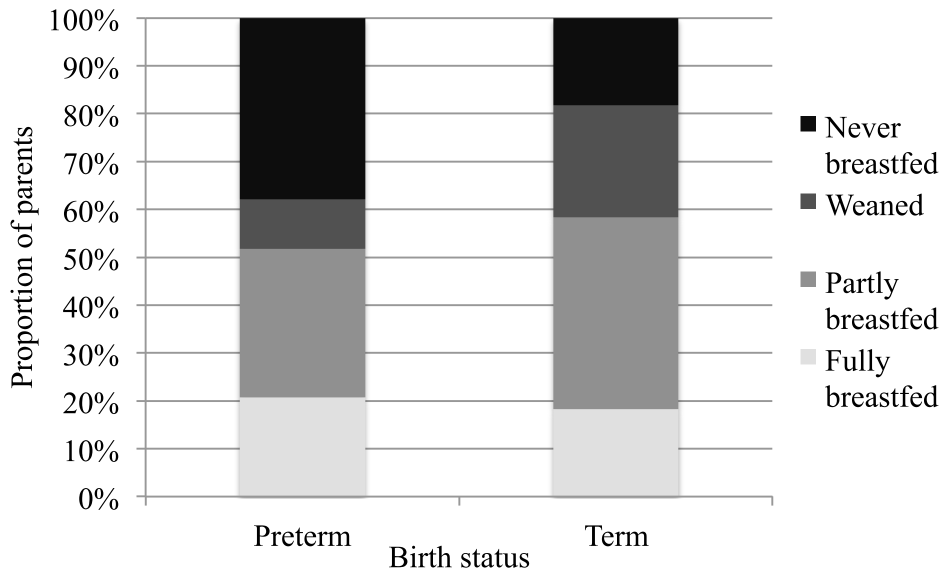

Figure 4.1. Proportion of parents in each longitudinal breastfeeding category by birth status.

Table 4.5

Predictors of parenting practices

	B	*SE B*	*β*	*t*
Predictors of co-sleeping at 5 months				
Breastfeeding	0.15	0.12	.13	$t(83) = 1.33, p = .186, d = 0.29$
Attunement at birth	-0.12	0.52	-.03	$t(83) = -0.22, p = .823, d = -0.05$
Attunement at 5 months	1.30	0.49	.33	$t(83) = 2.64, p = .010, d = 0.58$
Structure at 5 months	-0.75	0.36	-.21	$t(83) = -2.06, p = .042, d = -0.45$
Complexity at 5 months	0.38	0.65	.07	$t(83) = 0.59, p = .556, d = 0.13$
Predictors of breastfeeding at 5 months				
Co-sleeping (number of nights)	0.15	0.10	.17	$t(84) = 1.47, p = .145, d = 0.32$
Attunement at birth	0.59	0.49	.15	$t(84) = 1.21, p = .231, d = 0.26$
Attunement at 5 months	0.13	0.46	.04	$t(84) = 0.29, p = .774, d = 0.06$
Complexity at 5 months	0.84	0.60	.16	$t(84) = 1.39, p = .168, d = 0.30$
Predictors of duration of feeding at 5 months				
Cry duration at 5 months	0.18	0.06	.30	$t(83) = 2.81, p = .006, d = 0.62$
Predictors of duration of holding at 5 months				
Hold duration at birth	0.01	0.12	.00	$t(63) = 0.01, p = .990, d = 0.00$
Feed duration at birth	-0.09	0.11	-.14	$t(63) = -0.80, p = .427, d = -0.20$

Cry duration at birth	-0.14	0.43	.06	$t(63) = 0.33, p = .739, d = 0.08$
Structure at birth	0.61	2.06	.04	$t(63) = 0.30, p = .768, d = 0.08$
Attunement at birth	2.24	2.69	.14	$t(63) = 0.83, p = .409, d = 0.21$
Complexity at birth	3.42	3.00	.19	$t(63) = 1.14, p = .258, d = 0.29$
Complexity at 5 months	-4.86	3.37	-.23	$t(63) = -1.44, p = .154, d = -0.36$
Duration of hospitalisation	-0.29	0.89	-.06	$t(63) = -0.32, p = .749, d = -0.08$
Gestational age	-0.20	0.31	-.13	$t(63) = -0.66, p = .515, d = -0.17$

Note. Data is missing for: hospitalisation duration for 3 preterm and 4 term infants; feeding duration at 5 months for 1 preterm infant; holding duration at 5 months for 1 preterm and 1 term infant; and crying duration at 5 months for 2 preterm and 3 term infants. Transformations were used to resolve problems with non-normalcy for hospitalisation duration and cry duration at birth and 5 months (natural log) and for feeding and holding duration at birth and 5 months (square root).

Breastfeeding scores ranged from 1 to 4 – scoring was based on definitions of longitudinal breastfeeding by Wolke and colleagues (Wolke, Söhne, Riegel, Ohrt, & Österlund, 1998). One was scored for *never breastfed*, 2 for *weaned*, 3 for *partly breastfed* and 4 for *fully breastfed*. Therefore, 1 was assigned if the mother did not breastfeed at birth or 5 months; 2 was assigned if the mother breastfed at birth but not 5 months; 3 was assigned if the mother breastfed at birth and 5 months but supplemented this with other food (formula or solids); and 4 was assigned if the mother exclusively breastfed at birth and 5 months. Figure 4.1 presents the proportion of parents in each breastfeeding category by birth status. No relations were found between breastfeeding categories and birth status, $\chi^2(3, N = 89) = 5.25, p = .155$. Using the enter method, a significant model for breastfeeding emerged, $R^2 = .15$, $F(4, 84) = 3.67$, $p = .008$. This model explained 15% of variance in breastfeeding. However, no variables independently predicted breastfeeding.

Average duration of feeding was calculated based on mothers' reports for the previous three days. Average duration of feeding was transformed using a natural log transformation to resolve problems with non-normalcy. Using the enter method, a significant model for feeding duration emerged, $R^2 = .09$, $F(1, 82) = 7.90$, $p = .006$. This model explained 9% of variance in feeding duration at 5 months, with crying duration at 5 months positively predicting feeding duration at 5 months. Therefore, mothers who reported that their infants cried for longer durations also reported feeding their infants for longer durations.

Average duration of holding at birth was calculated based on mothers' reports for the previous three days. Average duration of holding was transformed using a square roottransformation to resolve problems with non-normalcy. Using the enter method, a significant model for holding duration at 5 months did not emerge, $R^2 = .09$, $F(9, 63) = 0.68$, $p = .729$.

4.5 Discussion

Preterm birth, it has been argued, places infants at risk not solely due to their prematurity but also through parents' reaction to their immature infant (Sameroff & Chandler, 1975). For example, parents may react to the early birth and NICU stay by not providing sufficient nurturance and stimulation. Alternatively, such reactions may be a result of underlying risk factors associated with preterm birth – for example, maternal education. Therefore, mothers' principles about caregiving and ability to think complexly about child development were measured following the delivery of their newborn and again after 5 months of caring for their infant. Additionally, demographic information and health status of the infant were collected after the delivery to control for possible confounding variables.

Structure and attunement showed continuity from birth to 5 months for mothers of both preterm and term infants, with no differences between birth status group found on either parenting principle at either age. Therefore, the level of structure and attunement do not seem to differ in response to experience with their infant or experiences of preterm delivery. For mothers of term infants, these principles were also stable across time. However, mothers of preterm infants did not show stability in structure but did show stability for attunement. Therefore, attunement appears stable regardless of early experience of premature delivery. Attunement was related to complexity of thought – mothers who were more capable of thinking at complex levels supported attunement more. These results may suggest that attunement is a stable principle in mothers and is more a reflection of cognitive abilities, or other internal characteristic, than the context in which the mother and infant find themselves. In comparison, although mothers of preterm infants did not change at a group level in their support of structure, individual mother's support of structure changed over time. Some mothers increased and others decreased in their support of structure, while others showed similar levels of support across time. These results may demonstrate that the early structure of the NICU is not necessarily recreated once parents have sole responsibility for the care of their infants following discharge from hospital. Therefore, structure may reflect the current caregiving context rather than a stable characteristic of the mother.

For complexity of maternal cognitions about child development, mothers of preterm infants became more categorical – for example, supporting single cause-and-effect pathways in development – in their thinking between birth and 5 months, whereas mothers of term infants did not differ between these two time points. Furthermore, although mothers of preterm and term infants did not differ on the categorical subscale following the delivery of their infant, 5 months later mothers of preterm infants had scores on the categorical subscale that were significantly higher than mothers of term infants. These results are similar to those of Pearl and Donahue (1995) but with mothers of infants rather than school-aged children. In addition, I have extended these results by demonstrating that the increase in categorical thinking occurs between birth and 5 months. Five months of caring for a preterm infant appears to have increased mother's reliance on categorical thought despite scoring as highly as mothers of term infants on overall complexity of thought. This increased reliance on categorical thinking – despite being able to cognise at a higher level – may support Newberger's (1980) suggestion that under situations of high stress parents cognise at levels below their capability (see section 4.5.1 for further discussion).

4.5.1 Implications

Given parents' principles and cognitions are important motivators and organisers of behaviour (for example, Bornstein & Cote, 2004; Bugental, 1992; Bugental & Shennum, 1984; Crockenberg & Smith, 1982) these results may have important implications for the interactions preterm infants are experiencing with their mothers – and for their own outcomes. Sameroff and Feil (1985) claimed that parents of at-risk infants need to understand that their role is to find the best route for their child to the ideal outcome, while understanding that different children can reach the same outcome through very different routes. Such perspectivist thought, or complexity, allows parents to view child behaviour more flexibly and has been related to a number of positive child outcomes (Hortaçsu, 1995; Miller-Loncar et al., 2000; Watson, Kirby, Kelleher, & Bradley, 1996). Accordingly, the longitudinal effect of these differences on maternal principles, and of cognitions on parenting behaviours and infant outcomes, will be further explored in the coming chapters.

In the Special Delivery study, mothers of preterm infants were able to cognise at the same level of complexity as mothers of term infants. However, these mothers ranked higher on categorical thought at 5 months but not birth. These findings replicate the findings of Pearl and Donahue (1995), who reported that mothers of 4.5-year-olds born preterm showed similar levels of complexity but higher levels of categorical thinking than mothers of term children. However, the Special Delivery study demonstrated these differences were not present following the premature delivery but appeared after experience of caring for their preterm infant. Experience of caring for a preterm infant appears to have increased mothers' levels of categorical thinking. Newberger (1980) claimed that certain situations, particularly stressful ones, could lead parents to think at levels below their ability. The results from the Special Delivery study seem to support this assertion – despite showing similar levels of complexity of thought, mothers of preterm infants rank higher on categorical thinking than term mothers. Therefore, higher levels of categorical thinking appear to reflect experiences rather than abilities within the mother.

Mothers' support of structure following a premature delivery was not predictive of their support of structure 5 months later – once the parenting role had been established. However, attunement was stable from birth to 5 months. In addition, attunement – at least at birth – showed relations with mothers' ability to think complexly about child development. Attunement therefore appears to reflect an enduring principle that is related to cognitive abilities and potentially more general internal characteristics of the mother, whereas structure seems to be more changeable with context.

4.5.2 Limitations and future work

The findings of this chapter suggest that mothers of preterm infants show differences in consistency and continuity of their parenting principles soon after their early delivery. However, these differences are not reflected in overall group levels of most principle and cognition variables. To understand whether these results are reflective of differences that occur prior to delivery or as a result of the premature delivery, data collection should occur during pregnancy. The ideal design would utilise a group known to be at-risk of premature delivery, a group with spontaneous and unexpected premature delivery, and a final control group. Around 7% of live births are premature, therefore such a design would require a very large sample to ensure numbers of preterm deliveries were large enough.

The regression models of parenting principles and cognitions did not help to uncover potential pathways. At 5 months, parenting principles and cognitions were mostly predicted by the same construct measured at birth. Duration of hospitalisation was found to predict complexity at 5 months but was the only demographic or medical variable to predict any of the parenting principles and cognitions. Regression models of parenting practices were either non-significant – average duration of holding – or tended to only explain a relatively small amount of variance (breastfeeding and duration of feeding explained 15% or less of the variance). Therefore, more work is needed to understand predictors of maternal principles, cognitions and practices.

The long-term importance of early differences in parenting principles needs to be explored. For example, the instability of structure in preterm infants could be positive by ensuring parents are able to develop principles about schedules and routines that suit themselves and their infants after leaving the hospital, or could provide an unpredictable environment for preterm infants who already show difficulties establishing successful feeding and sleeping patterns. Preterm infants have been described as unpredictable, unreadable and unresponsive (Brachfeld et al., 1980). That is, with preterm infants it was difficult to predict the optimal time for infants to be alert, to know which soothing strategy would be the most successful, and the infants often would not change in response to activities intended to hold their interest (Brachfeld et al., 1980; Field, Hallock, Dempsey, & Shuman, 1978). These infants are also less attentive and demanding of attention (through crying) and so mothers of preterm infants have more of the interactive burden (Goldberg, 1978). Structure may therefore be an adaptive strategy to care for an infant that does not provide clear signals and shows state disorganisation. However, previous work has demonstrated that parents of preterm infants have more difficulty scaffolding interactions around the cues from their children and providing well-timed support (Clark et al., 2008). Parenting that is sensitively attuned to the infant's abilities has been shown to promote valued developmental outcomes, such as intellectual achievement and behavioural independence (Belsky, 1984). Therefore, structure may be adaptive in caring for preterm infants and lack of attunement may be maladaptive. To be able to test this hypothesis, further work needs to examine child later outcomes.

We were able to access the medical records of the 17 infants who spent any significant amount of time in the NICU. Nurses on the NICU keep records of the infant's daily care, including parents' visits and caretaking activities. Therefore, as a pilot study, date of first record and frequency were recorded for parents' activities and average frequency per day the infant was on the NICU were calculated for *hospital contact* – average frequency of visits and phone updates; *physical contact* – average frequency of Kangaroo care, cuddles and attempts on breast (for mothers who were attempting to breastfeed); and *caretaking activities* – average frequency of cares (nappy changes and oral hygiene), bathing and bottle-feeding. Appendix 6 contains a table with descriptive statistics for these three variables and relations with the main variables reported in this thesis. Amount of physical contact the mother had with their infant in the NICU was related to complexity at 5 months and, at trend levels, to structure (negatively) and attunement (positively) at birth. Potentially important relations therefore exist between activities that mothers take part in during the NICU stay and their parenting cognitions. We were fortunate to be able to use records already routinely kept by nursing staff on the NICU. However, these daily records are kept by the nurse in charge of the infant's care during each shift and so each infant's records involve a range of nurses. The level of detail provided, therefore, somewhat depended on the nurse keeping the records. The records also rarely provide information about the duration of activities. Accordingly, future work should utilise diary methods where parents or nurses keep a log of parental activities while in the hospital. This method would also allow inclusion of activities such as talking with baby. Alternatively, interventions that increase one or more of these activities, such as physical contact, could be used to examine whether such interventions alter later principles and level of thinking of the mother. Such studies could add to the growing body of work demonstrating which activities need to be encouraged during the hospitalisation of the infant to ensure the best outcomes for the mother and baby.

In summary, mothers who have delivered prematurely do not differ in their support of structure or attunement from mothers who delivered at term. However, mothers of preterm infants did not show stable levels of structure across the first 5 months of life. Therefore, mothers' level of structure soon after delivering their infant was not reflective of their support of structure later once the parenting role had been established. For mothers of term infants, level of structure did not differ across time at an individual or group level. In addition, these mothers do not differ in the level of complexity that they can cognise about child development in the early days. Differences were apparent after 5 months of caring for their infants, with mothers of preterm infants showing higher levels of categorical thinking despite not differing on complexity of thought. Infants impact their parents (Bell & Harper, 1977) and therefore caregiving cannot be examined without considering the infant's contribution to their development. The next chapter therefore focuses on the abilities that preterm infants bring into daily interactions with their mothers.

Chapter 5. Infant attention

5.1 Chapter overview

The overall aim of this chapter is to explore preterm infants' contributions to their early experiences, specifically through their early attention abilities. To achieve this aim, the focus of the current chapter is on five questions. The first question looks at infant social attention control and examines whether preterm and term 5-month-olds show different looking to an unfamiliar face. The second examines attention following in these infants to test whether preterm infants are capable of proximal attention following and checking back behaviours (D'Entremont, Hains, & Muir, 1997; Perra & Gattis, 2010). The third focuses on parent-reports of preterm infants' attention regulation through maternal responses on the Infant Behaviour Questionnaire (IBQ; Gartstein & Rothbart, 2003). After examining these attention capabilities in preterm and term infants, I will investigate interrelations between performance on the tasks. Finally, infant and parent characteristics were examined as predictors of performance on these tasks.

5.2 Infants' attention abilities

"My experience is what I agree to attend to. Only those items which I notice shape my mind – without selective interest, experience is an utter chaos."

(James, 1890/2007, p. 402)

5.2.1 Selective attention

William James described attention as "taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought... it implies withdrawal from some things in order to deal effectively with others" (James, 1890/2007, pp. 403-404). This description emphasises the dynamic nature of attention – attention occurs in time and can be maintained or shifted to meet the ever-changing demands of life (Ruff & Rothbart, 1996). Current definitions describe attention as the ability to orient to, to shift between and to maintain focus on events, objects, tasks and problems in the external world (van de Weijer-Bergsma et al., 2008). Therefore, attention requires infants not only to attend but also switch their focus of attention between objects or different aspects of a single object.

Attention is one of the most fundamental contributions infants have to their own experience. As James alludes to in the quote above, infants attend to some aspects of their environment and not to others. Given the complex environment with which infants are confronted, this selective attention is necessary to function well when important events occur within the vast amount of stimulation and "chaos" of the environment (van de Weijer-Bergsma et al., 2008). While a specific focus of attention is crucial, the object of attention can be external or internal (Ruff & Rothbart, 1996).

Individuals born preterm have been reported to have poorer attention during infancy, adolescence and into later life, with individuals born preterm at increased risk of disorders such as hyperkinetic and attention deficit disorders (for example, Bhutta et al., 2002; Carmody et al., 2006; van de Weijer-Bergsma et al., 2008). Across tasks, preterm individuals demonstrate less active involvement and attention, which is still observable in infancy and later childhood (Goldberg & DiVitto, 1983; Nadeau, Tessier, Boivin, Lefebvre, & Robaey, 2003). Additionally, preterm infants demonstrated less capability in selective attention and more immature patterns of attention (Bhutta et al., 2002; Rose et al., 2002). Anderson and Doyle (2008) even suggested that inattention was probably the most frequent problem in preterm children.

The effect of these attention difficulties in infancy on later outcomes for preterm children is starting to be understood. The focused attention of preterm infants to objects during independent play at 7 months corrected age was predictive of cognitive abilities and problems in hyperactivity and impulsivity at 4 to 5 years corrected age (Lawson & Ruff, 2004). A review of attention development in the first four years following a preterm delivery indicated that individual differences in orienting and sustained attention were related to later attentional, cognitive and behavioural functioning in children born preterm (van de Weijer-Bergsma et al., 2008).

5.2.2 Infant looking

The distribution of visual attention has long been assumed to provide a window to infant cognitive abilities, with infant looking in infancy related to measures of cognition in infancy and intelligence in childhood (Bornstein & Sigman, 1986; Colombo & Mitchell, 1990) – so much so that infant looking has provided the foundation for the study of perceptual and cognitive development (Jankowski et al., 2001). However, Sigman (1983) questioned whether infants that looked for long periods of time were carefully examining their world or were slow to process and regulate their attention processes. Sigman (1983) proposed a curvilinear model where infants need to spend certain amounts of time looking at a stimulus in order to learn about the environment but long looking indicated slow processing of the stimulus. For example, preterm infants who spent long durations looking to moderately salient stimuli had poorer cognitive functioning at school age (Sigman, 1983).

The key variables for measuring infant looking are *characteristic look duration* – mean duration of looks or length of longest look, and *shift rate* – frequency with which infants shift gaze (Rose, Feldman, & Jankowski, 2003a). Both of these variables show clear developmental changes, with decreasing characteristic look duration and increasing shift rate across time, but only show moderate stability over a 1- to 2-month period in term samples (Rose et al., 2003a; Wilcox, Nadel, & Rosser, 1996). Although both variables show moderate stability, measures of duration of fixation are the most reliable measures across time (Colombo & Mitchell, 1990). More mature patterns of attention have been described as having shorter durations and more changes in fixation, showing a greater capability of disengaging and re-fixating on either a different stimulus or a different aspect of the same stimulus (Jankowski et al., 2001). This more mature pattern of looking was associated with better information processing and better visual recognition memory (Courage & Howe, 2001; Courage, Howe, & Squires, 2004; Rose et al., 2003a).

Characteristic look duration and shift rate reliably differentiate between preterm and term infants (Rose et al., 2003a). Preterm infants are slower to visually inspect and manipulate objects, and are more likely to use immature strategies of exploration and to respond to local features of a stimulus instead of the total pattern or configuration (see Rose & Feldman, 1990, for a review). Preterm infants showed less mature patterns of attention (at 12, but not 5 and 7 months) than term infants, with longer looks and slower shift rates (Rose et al., 2002). Total fixation time negatively related to cognitive scores in early and middle childhood in infants born preterm (Rose, Feldman, Jankowski, & Van Rossem, 2005) and term (Sigman, 1983). Preterm infants should therefore show longer characteristic look duration and fewer changes in fixation. However, Rose et al. (2002) only found these differences emerging towards the end of the first year of life.

Researchers have divided infants into *short-lookers* and *long-lookers* based on the duration of their longest look to a stimulus that they have accumulated a fixed amount of looking (for example, Colombo, Mitchell, Coldren, & Freeseman, 1991; Courage & Howe, 2001; Courage et al., 2004; Jankowski et al., 2001). For example, infants were shown an image of a baby’s face until 20 seconds of accumulated looking had occurred and a median split was then used to divide infants by longest single look (Courage & Howe, 2001). When infants' looking to a stimulus was examined, short-lookers showed shorter peak look (longest look), shorter average length of look, more looks and more shifts, and somewhat broader inspections than long-lookers (Jankowski et al., 2001). Short-lookers at 3.5 and 5 months were better information processors at the time of categorisation as well as towards the end of the first year of life (Courage & Howe, 2001; Courage et al., 2004; Jankowski et al., 2001). Therefore, the attention style of short-lookers, or the more mature pattern of attention, appears to have benefits for their cognitive development. However, it is important to note that Courage et al. (2004) found that attention style showed low stability from 3.5 months to 8 to 12 months. Sigman and Beckwith (1980) found that short-lookers were born at younger gestational ages, whereas long-lookers had been born at older gestational ages.

5.2.3 Attention following

Infants become increasingly in control of their social attention throughout the first year of life (Perra & Gattis, 2010). From birth, infants look preferentially to faces and in particular faces engaged in mutual gaze – or looking towards the infant – over averted gaze (Farroni, Csibra, Simion, & Johnson, 2002; Farroni, Johnson, Brockbank, & Simion, 2000). However, preterm infants may not show this same preference for faces. Sigman and Parmelee (1974) presented 4-month-olds with stimuli of differing complexity, resemblance to faces or novelty. Preterm infants were less attentive to face-like stimuli than term infants, despite both preterm and term infants looking preferentially to more complex stimuli. Masi and Scott (1983) observed that preterm 3- to 4-week-olds were slower to look, and looked for shorter durations, to their mother's and a stranger's face than term infants. However, these preterm infants did still look preferentially to their mother's face over a stranger's face. With slightly older infants – 2-month-olds – Hsu and Jeng (2008) did not find a difference between preterm and term infants duration of social gaze with their mother (looking at their mother's face). Therefore, preterm infants appear to respond to their mother's face but do not look for as long to faces generally.

Although neonates respond to faces and prefer mutual gaze, many claim it is not until the end of the first year that infants can follow and monitor the attention of a social partner (Carpenter et al., 1998; Corkum & Moore, 1998). Attention allows basic information about objects of interest or desire to be conveyed from the infant to their social partner (Butterworth, 1991). Attention also allows others to communicate information about the environment to the infant. The ability to monitor and exploit the attention states of other people is known as *joint attention*. Infant's ability to follow another's gaze allows others to demonstrate a wider range of features of the environment to the infant and therefore plays an important communicative function as well as being a fundamental component of object-focused social interactions (Moore, 2008; Scaife & Bruner, 1975; Michael Tomasello & Todd, 1983). Bruner (1995) went so far as to claim "at its most sophisticated level, joint attention is, in effect, a "meeting of the minds" (J. Bruner, 1995, p. 6).

In observations of infants either alone, with their mother or with a peer, a developmental increase was shown in the time the infant spent actively coordinating their attention between their social partner and the object that person was involved with – coordinated joint attention, and declines were found for time spent unengaged or looking to their social partner. From 6 to 18 months, no developmental changes were apparent in time on-looking to their social partner's activity, engagement with objects or engagement with the same object as their social partner without showing awareness of their involvement or presence – passive joint engagement (Bakeman & Adamson, 1984). At 18 months, all infants had at least one episode of coordinated joint engagement. Bakeman and Adamson (1984) concluded that coordinated joint engagement was not routine until several months after the end of the first year of life.

Landry and colleagues (Landry et al., 1997b) described the expansion of two spheres of social competence in infants – the ability to respond to requests and the ability to initiate social interactions. Responding to social requests is easier, as it occurs with greater structure from social partners, whereas initiating social exchanges requires the infant to formulate goals and understand how to signal their interests without such external structure. These joint attention skills emerge in a very brief developmental window between 9 and 12 months with a consistent developmental ordering – attention sharing develops first, then attention following and finally attention directing (Carpenter et al., 1998). The ability to follow gaze or respond to attempts at joint attention is the earliest manifestation of the capacity for joint attention (Morales et al., 2000).

In a seminal paper, Scaife and Bruner (1975) described infant's ability to follow another's gaze based on a simple paradigm, which has provided the basic format for most future research on gaze following. Thirty-four infants, aged between 2 and 14 months, were placed in a high chair facing an experimenter. The experimenter made eye contact with the infant and then silently turned his or her head through 90 degrees to fixate on a concealed light, once to the left and once to the right. Infants were coded as having followed gaze if they looked in the same direction within 7 seconds, without an intervening look elsewhere, at least once. Using this definition of gaze following, the proportion of infants showing gaze following increased with age. By 11 to 14 months, all infants were following gaze.

Scaife and Bruner's (1975) paradigm has been replicated and adapted many times, including replications with and without visible targets. With the addition of targets Corkum and Moore (1995) demonstrated that a large proportion of infants appeared to spontaneously follow attention at around 9 to 10 months. However, at 6 months infants shifted gaze to a target but fixated on the first target encountered during turning (Butterworth & Jarrett, 1991). By 12 months, infants looked past a distractor to follow another's gaze. In another study, while the 6-month-olds reliably followed their mother's attention to the left and right target, they did not follow their attention to the target behind the infant (Morales, Mundy, & Rojas, 1998).

Absent targets or distal targets could be particularly detrimental for young infants, given the relatively narrow effective binocular visual field of infants for the first 6 months of life (D'Entremont et al., 1997). Therefore, in an attempt to optimise conditions for eliciting gaze following in young infants, D'Entremont et al. (1997) presented targets close to the experimenter. Given infants' sensitivity to changes in adult behaviour during face-to-face interactions, the second change to the traditional paradigm was that the experimenter continued to interact with the target they were fixating on rather than stopping talking during the head turn. Therefore, the experimenter held two puppets on both sides and interacted with the infant. When the infant was engaged, the experimenter turned her/his head 90 degrees to the target while continuing to talk in infant-directed speech. With these modifications, 73% of first eye turns in the horizontal plane were in the correct direction for a group of 3- to 6-month-old infants. These results remained whether incorrect was defined as looks to the opposite target (the difference score approach of Corkum & Moore, 1995) or the sum of no turn, looks away and looks to opposite target (the more conservative definition; D'Entremont, 2000).

In an adaptation of this paradigm, Perra and Gattis (2010) defined two criteria in their studies into the control of social attention. *Proximal attention following* was defined as following the experimenter's head turn to a target within the infant's visual field. *Checking back* was defined as shifting between the target and experimenter following proximal attention following. From 3 months, infants that demonstrated proximal attention following also started showing subsequent flexible switching between target and experimenter. Perra and Gattis (2010) claimed that some form of control of social attention was present as early as 3 months and that such results contribute to the growing body of work suggesting that under conditions devised to reduce the load on processing and visual abilities, infants are capable of demonstrating some form of attention following. In a series of studies, Farroni et al. (2000) demonstrated that the direction of motion in the gaze following paradigm could produce a cueing effect, suggesting early attention following is exogenously controlled.

Perra and Gattis (2010) claimed the more complex checking back behaviour shared characteristics with endogenous attention control, but also stated that attention following and checking back are unlikely to reflect an understanding of others' mental states assumed to underlie joint attention skills seen at the beginning of the second year of life.

Those studies that have examined joint attention abilities in preterm infants have found that preterm infants demonstrate lower levels of joint attention skills, though these deficits tend to be in initiating rather than responding to joint attention (De Groote, Roeyers, & Warreyn, 2006; Smith & Ulvund, 2003). Observational data with preterm or very low birthweight (VLBW) infants demonstrate differences in initiations of and responses to attention-directing strategies (Landry et al., 1997b). VLBW infants with more medical complications showed slower rates and lower levels of initiations in both the attentionally demanding (toy-centred play) and less attentionally demanding (daily activities) contexts. VLBW infants with fewer medical complications only showed slower rates and lower levels of initiations in the more attentionally demanding context compared with term controls. However, there was no difference in the level of responding to a parent's request for attention between high- or low-risk VLBW infants and term control infants. Therefore, high-risk infants appear to show broad difficulties with initiating, whereas low-risk infants only appear to have difficulties initiating in attentionally demanding situations. Preterm infants appear to not have difficulties responding to joint attention episodes but instead initiating joint attention bids (see Landry, 1995, for a review).

Smith and Ulvund (2003) measured joint attention in 13-month-old preterm infants using the Early Social Communication Scales (ESCS; Mundy et al., 2003). The ESCS is a structured observation with an experimenter that measures infant's ability to respond to joint attention (RJA) and initiate joint attention (IJA) bids and behavioural requests. The levels of joint attention for the preterm infants were consistently lower than the highest level possible for the ESCS (Smith & Ulvund, 2003). However, no distinction between levels of IJA and RJA was provided and no control group was included for direct comparison of performance levels. Furthermore, joint attention was not measured again at a later time to determine whether these lower scores were due to impairments or delays in joint attention. The most informative result from this study was the demonstration that IJA, but not RJA, was associated with intellectual outcomes at 8 years.

These studies demonstrate that preterm infants do not appear to show deficits with RJA but instead have difficulties in IJA. Additionally, RJA in preterm infants does not appear to predict later functioning. However, RJA has been seen in term infants in the first half of the first year of life (for example, Landry et al., 1997b). The preterm infants in the studies described above are either older – around the beginning of the second year of life – or were observed in interactions with their mothers. Consequently, we cannot determine whether preterm infants – under standard conditions – start responding to joint attention at the same time and in the same manner. This chapter reports data from 5-month-olds in an attempt to start answering these questions. A recent study by De Schuymer and colleagues (De Schuymer, De Groote, Beyers, Striano, & Roeyers, 2011) demonstrated that 9-month-old preterm infants showed less reliable RJA than term peers. However, this finding is difficult to interpret, as RJA was measured as the difference in duration between infants looking to the target and looking to the non-target, with higher values representing proportionally more time spent looking to the target. Preterm infants could have looked for similar durations to the target and non-target yet still have made their first eye turn to the target and so followed the experimenter's attention. However, these findings could also reflect that the infant did not follow the experimenter's attention. This chapter presents data from a standardised proximal attention following paradigm to ensure all infants had equal opportunity to demonstrate attention following, with analyses based on direction of first eye turns of the infant.

5.2.4 Attention regulation

Infant's contributions to their own development can be direct through their actual abilities and indirect through their parent's perceptions of their abilities. Therefore, a measure of parent's perceptions of their infant's regulation, and temperament more generally, was included in this chapter. A consensual definition for the term "temperament" does not exist. At its broadest, the concept of temperament involves individual differences in emotionality, activity and attention (Larroque et al., 2005; Rothbart, 2007; Rothbart, Ellis, Rosario Rueda, & Posner, 2003; M.K. Rothbart & Mauro, 1990). Rothbart (2005) describes individual differences in reactivity and self-regulation, which are observed through children's emotionality, activity and attention that exist before many of the more cognitive aspects of personality have developed. 2005) lists positive affectivity, activity level, fearfulness, anger/frustration, attentional orienting and later effortful control (the capacity to inhibit a dominant response in order to perform a subdominant response) as temperamental dimensions in infancy and early childhood.

The Infant Behaviour Questionnaire (IBQ; Gartstein & Rothbart, 2003) asks parents about their infant's behaviour in the last week. Scores on three factors – extraversion/surgency, negative affectivity and regulation/orienting – are derived from parent's responses. For this chapter, I will focus on one factor: regulation/orienting, which is made up of the soothability, duration of orienting and positive affect subscales. Soothability reflects how easily infant crying can be reduced through various parental behaviours. Duration of orienting reflects the infant's "attention to and/or interaction with a single object for extended periods of time". Preterm infants were rated as lower on attentional focussing than the control group and preterm girls were rated higher on attentional shifting than preterm boys (Nygaard et al., 2002). However, others have not found differences in temperament and claim it is not prematurity itself that is the risk factor but medical complications, such as neurologic insults, that place the infants at risk (Larroque et al., 2005; Oberklaid, Sewell, Sanson, & Prior, 1991).

Important relations have been found between joint attention and temperament in term infants. Morales and colleagues demonstrated that responding to joint attention was positively related to duration of orienting and soothability (Morales et al., 1998) and that both parent-reports of infant's duration of orienting and observations of responding to joint attention predicted parent-reports of their infant's receptive language (Morales et al., 2000). Temperament and caregiver scaffolding at 9 months were significantly related to infant's IJA but not RJA behaviours (Vaughan et al., 2003). For example, emotional reactivity at 9 months was related to IJA at both 9 and 12 months and caregiver scaffolding at 9 months was related to IJA at 12 months only. I will therefore also focus on the duration of orienting and soothability subscale of the IBQ to examine maternal perceptions of the attentional abilities of their infant.

5.2.5 Summary

Healthy, low-risk preterm infants appear to have poorer attention control with longer durations of fixation and fewer changes in fixation in experimental tasks. However, these differences were not apparent when measured in early infancy and only became apparent towards the end of the first year of life. Furthermore, these infants seem to be capable of following the experimenter's head turn in the structured and less attentionally demanding attention-following paradigm. Research does not exist to see if late, low-risk preterm infants' proximal attention following differs from term peers early in the first year of life, and more importantly whether they will show flexible checking back after proximal attention following, therefore study visits were scheduled at 5 months to explore this question. Visits were scheduled when the infant turned 5 months, as term infants' scope of apperception has spread past the dyad – infants look to as well as manipulate the environment through grasping

– and term infants are more actively involved in turn-taking exchanges by this time (Bornstein & Tamis-LeMonda, 1990). In addition, term infants show both proximal attention following and checking behaviours in response to an experimenter's head turn at this age (Perra & Gattis, 2010). Current research suggests preterm infants should be able to at least follow an experimenter's proximal attention at this time. Finally, most studies with preterm infants with few medical complications do not seem to find significant differences in attention regulation when reported by their mother. However, in term samples infant's duration of orienting and soothability has been linked to their ability in RJA. Although Rose et al. (2002) only found differences in attentional profile between preterm and term infants towards the end of the first year and not at 5 months, the infants' attention profile was measured at 5 months for two reasons. First, Sigman and Beckwith (1980) found differences in gestational age between short- and long-lookers. Second, differences in infants' attention have been documented in observations with their parents around this age and so a baseline attention measured would allow distinction between what the infant is capable of under standard conditions and what they tend to do or are given the opportunity to do in a more naturalistic interaction with their mother.

I therefore expected preterm infants to look for longer bouts and show fewer changes of fixation when looking to a standard face stimulus. In the standardised attention-following task, I expected preterm infants to be able to shift their attention to the target and thus be capable of attention following. Finally, although I did not expect preterm and term infants to differ on their attention regulation, I did expect the maternal reports of duration of orienting and soothability in these infants to predict performance on the attention-following task.

5.3 Method

5.3.1 Participants

Eighty-nine infants participated in the 5-month visit of the longitudinal study of preterm (*n* = 29) and term (*n* = 60) infants' development. Demographic information about these infants and their mothers was presented in chapter 2, as well as sampling procedures. Data is missing for the attention style task due to technical problems with the recording equipment (4 term infants) and for the attention-following tasks due to technical problems with the recording equipment (1 term infant) and due to the infant moving out of the camera shot for half of the trials (1 term infant).

5.3.2 Procedure

The overall procedure for the 5-month visit was described in chapter 2. Specific details about the experimental tasks used in the 5-month visits are described below.

5.3.3 Principal measures

5.3.3.1 Attention style

Procedure. The infant was placed in an infant seat directly facing a Samsung SyncMaster 231T 21.3-inch LCD monitor that was approximately 40cm away. Both the monitor and the infant seat were located in a dark room with no visible stimuli. An infrared light was used in combination with a Sony Mini DV DCR-PR110E videocamera on nightsetting to record the infant's face in the dark room. The feed from the camera was displayed on a TV monitor in an adjoining room where the experimenter was located. The monitor in the dark room also fed into the TV monitor through a Panasonic Quadsystem WJ-MS424 that allowed simultaneous recording of the infant's face and stimuli displayed on the monitor. The infant's vocalisations were recorded using a beyerdynamic MPC 66V SW boundary microphone, which was fed through a Phonic MM1202a sound mixer. The video and audio feeds were simultaneously recorded through a Sony DHR-1000UX Digital Video Cassette Recorder.

Figure 5.1. The attention-getting and face stimuli for the attention style task.

The attention task was run using the Lincoln Infant Lab Software Package (Woodford, 2006). This software was run from a Toshiba Satellite Pro A205 laptop that was connected to the infant's monitor using a VGA cable. The task started with the presentation of the attention-getting stimulus, which had a white background and pink, yellow, blue and green-coloured squiggly lines. Once the experimenter was satisfied that the infant was looking towards the monitor, the experimenter started the trial by pressing A. The face stimulus appeared on the screen and the experimenter held down E while the infant was looking to the face. When the infant looked away the experimenter released the E key. Trials terminated when the infant had looked away for 2s or restarted if the infant looked away within the first 1s of the trial. When the face disappeared from the display, the experimenter would start a new trial with the attention-getting stimulus. The task ended when the infant had either 10 trials or the average looking for 3 consecutive trials was 50% of the first 3 trials. The attention-getting and face stimuli are presented in Figure 5.1.

Scoring. The time and duration of stimulus presentation and the infant's gaze were coded separately. Only the quadrant of interest was visible during coding. For example, the infant display was covered during the coding of stimulus presentation. The sound was turned off throughout coding. The onset and offset of stimulus presentation were coded as events. The infant's looking was continuously coded from the start of the first trial for the first 30 seconds[2] of looking to stimulus using exhaustive and mutually exclusive codes. These codes included: looks at stimulus, looks away or not visible. Videos were coded using Interact software (Mangold, 2010). Reliability coefficients, κ, for the two groups and the two codes ranged from .61 to .94 (mean = .79) and percentage agreements ranged from 80% to 97% (mean = 90%).

Following coding, the stimulus and infant codes were brought together to examine the infant's looking during the presentation of the face stimulus. The following dependent variables were then calculated for each infant: peak duration on looking (seconds – longest duration of a single look), average duration of looking (seconds), and number of changes in fixation.

5.3.3.2 Proximal attention following (D'Entremont et al., 1997; Perra & Gattis, 2010)

Procedure. The attention-following procedure happened in a room with beige curtains covering all walls to remove all stimuli and measured approximately 350cm by 430cm. The infant sat on the lap of their mother approximately 100cm from the experimenter. The experimenter and infant sat face to face. The experimenter had two identical frog puppets on either side of her face, with both frogs facing the infant. Two cameras (Sony Mini DV DCR-PR110E) recorded the main experiment, with one camera focused on the infant's face and the second camera focused on the experimenter and the puppets. A further two cameras (Sony HQ1 500 TVL vari-focal bullet cameras) were focused on the side views. The four cameras fed into a XVision 4 Channel Colour Quad that

[2] 30s of looking was decided based on a review of the literature and piloting

allowed simultaneous recording of infant and experimenter behaviour. Audio feed came from a beyerdynamic MPC 66 VC SW boundary microphone into the Phonic MM1202a sound mixer (as above). The video and audio feeds were simultaneously recorded through the Sony DHR-1000UX Digital Video Cassette Recorder (as above).

The experimenter interacted with the infant, smiling and vocalising, until the experimenter decided the infant was looking to the experimenter's face. The experimenter then turned 90 degrees to face one of the two puppets. Throughout the trial, the experimenter continued to talk in infant-directed speech following a script. Each trial lasted approximately 8 seconds. At the end of a trial the experimenter turned back and re-engaged the infant. When the experimenter was satisfied that the infant was looking to her face, the next trial began. This procedure was replicated for a total of 4 trials (2 to left and 2 to right). The direction of the head turn was counterbalanced across trials so infants either experienced the experimenter looking L–R–R–L or R–L–L–R.

Scoring. The time and direction of the experimenter's head turns and the infant's looking were coded separately. Only the section of interest was visible during coding. For example, while coding the experimenter the quadrant with the infant displayed was covered and the sound was turned off throughout coding. The onset and offset of experimenter's head turns and direction were coded as events. The infant's looking was continuously coded from the start of the first head turn until the end of the fourth head turn using exhaustive and mutually exclusive codes. These codes were: looking at experimenter, looks away, looks to left puppet, looks to right puppet, or not visible. Videos were coded using Interact software (Mangold, 2010). Intercoder agreement was calculated using approximately 20% of interactions. Reliability coefficients, κ, for the two groups and the two codes ranged from .62 to 1.00 (mean = .81) and percentage agreements ranged from 75% to 100% (mean = 88%).

Following coding, the experimenter and infant codes were brought together to determine whether the infant was looking to the correct or incorrect puppet and to record the infant's attention following. First eye turn within 7s of the start of the experimenter's head turn was categorised as *same target*, *opposite target*, *no turn* or *look away*. For trials that were categorised as same target the next three eye turns were categorised. The first eye turn was categorised as looks to *experimenter*, *other* or *no further turn*; the second as looks to *same target*, *other* or *no further turn*; and the third turn as looks to *experimenter*, *other* or *no further turn.* These three eye turns were categorised as *no further turn* (no further turn scored on first eye turn), *other* (infant looked away or looked to opposite puppet from the correct puppet), *checking back* (infant looks back to experimenter from the correct puppet), and *multiple checking back* (infants showed the following stream of categories from the correct puppet: experimenter – same target – experimenter). An attention-following score was then calculated. One point was assigned for no proximal attention following, two points for proximal attention following and three points for multiple checking back. Score was averaged across trials so infants were given an average attention-following score that could range from 1 to 3.

5.3.3.3 Infant temperament (Gartstein & Rothbart, 2003)

The Infant Behaviour Questionnaire – Revised (IBQ-R) Short Form asks parents about their infant's behaviour. The IBQ-R Short Form has 91 items that ask parents whether specific behaviours occurred in the last week on a 7-point scale from never (1) to always (7). The IBQ-R includes three factors: surgency/extraversion (approach, vocal reactivity, high-intensity pleasure, smiling and laughter, activity level, perceptual sensitivity), negative affectivity (sadness, distress to limitations, fear and negatively loading for falling reactivity) and orienting/regulation (low-intensity pleasure, cuddliness/affiliation, duration of orienting and soothability). Gartstein and Rothbart (2003) reported the psychometric properties of the

IBQ-R demonstrating that subscales showed good internal consistency (α <.70) and factors showed inter-rater reliability (r<.30).

Although parents provided responses to all items making up the IBQ Short Form, this chapter will only report on the duration of orienting subscale, soothability and the orienting/regulation factor given the specific hypotheses being tested. Duration of orienting asks parents about their infant's ability to focus on one object for an extended period of time. The duration of orienting subscale is made up of six items. Parents are asked, for example, how often in the past week their infant played "with one toy or object for 5-10 minutes?" Soothability reflects infant's reduction in fussing, crying or distress in response to caregiver's soothing techniques. The soothability subscale is made up of seven items. Parents are asked, for example, "when rocking your baby, how often did s/he take more than 10 minutes to soothe?"

5.3.4 Design

The design was within-subjects. Data was collected for all participants for all measures, resulting in 15 variables. For the attention style task, three dependent variables were calculated: peak duration of looking (seconds), number of fixations, and average duration of looking (seconds). For the proximal attention-following task, eight dependent variables were calculated: number of first eye turns to same target, opposite target, no turn or look away (proximal attention-following variables), and number of trials with no further turn, other, checking back and multiple checking back (checking back variables), as well as the average proximal attention-following score that was an average level of proximal attention following and checking back behaviour shown across tasks. From the IBQ, infants had duration of orienting, soothability and orienting/regulation scores that could range from 1 to 7.

5.4 Results

5.4.1 Analysis plan

Prior to data analysis, the 15 infant variables were examined for normalcy, homogeneity of variance, and influential outliers. The non-normality of peak look and average duration of looking for the attention style task were resolved with a natural log transformation.

First, descriptive and inferential statistics are reported for infant attentional style, following and maternal reports of regulation by birth status (preterm vs. term). Next, relations between infant variables are reported by birth status. Finally, the infant and maternal predictors of infant variables are examined using correlations and multiple regressions.

5.4.2 Infant attention by birth status

Descriptive statistics for peak look, average look and number of fixations are presented by birth status in Table 5.1. At group levels, preterm and term infants did not differ in any of these variables.

Table 5.1
Descriptive statistics for looking behaviour during the attention control task by birth status

	Preterm	Term	Difference
	M (SD)	*M (SD)*	
Peak look duration (s)	11.38 (5.26)	10.68 (5.95)	$t(83) = 0.73, p = .469, d = 0.16$
Average look duration (s)	6.04 (3.84)	6.05 (5.46)	$t(83) = 0.27, p = .791, d = 0.06$
Number of fixations	6.00 (3.68)	6.30 (3.18)	$t(78) = -0.40, p = .694, d = -0.09$

Note. Data is missing for: attention style for 4 term infants; and attention following for 2 term infants.

Figure 5.2 depicts gestational age against average look duration and appears to demonstrate a curvilinear relation between these two variables. Hierarchical regression analysis was used to test the linear and curvilinear components of relations between gestational age and infant looking variables. Analysis of average look duration did not find a significant linear trend, R^2 = .024, F(1, 78) = 1.93, p = .169, but did find a significant quadratic trend, ΔR^2 = .073, F(1, 77) = 4.02, p = .048.

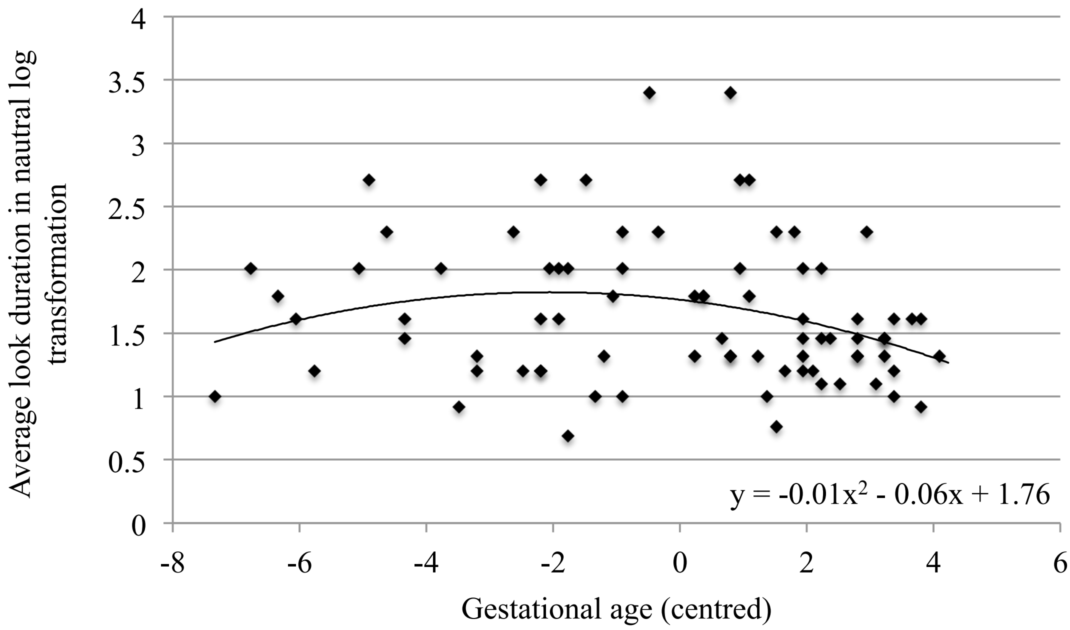

Figure 5.2. Gestational age (centred) by average look duration (with a natural log transformation).

Table 5.2 gives information about the predictor variables entered into these models, as well as the unstandardised regression coefficients (B), the standard error of the mean (SE B) and the standardised regression coefficients (β). The resultant regression equation was $\hat{Y}$ = - $0.06X - 0.01X^2 + 1.77$ and the point of inflection – calculated using the equation $X = -b_1/2b_2$ – was -2.07, reflecting a gestational age of 36^{+1} weeks. Analysis of peak look duration did not find a significant linear trend, R^2 = .008, F(1, 83) = 1.70, p = .196, or quadratic trend, ΔR^2 = .040, F(1, 82) = 3.77, p = .056. Analysis of number of fixations did not find a significant linear trend, R^2 = .008, F(1, 78) = 1.62, p = .206, or quadratic trend, ΔR^2 = .024, F(1, 77) = 2.29, p = .134.

Table 5.2

Linear and curvilinear trends in relations between gestational age and average look duration

	B	*SE B*	*β*	*t*
Average duration of looking (model 2)				
Gestational age (linear)	-0.06	0.03	-.31	*t* (76) = -2.29, *p* = .025, *d* = -0.53
Gestational age2 (curvilinear)	-0.01	0.01	-.27	*t* (76) = -2.01, *p* = .048, *d* = -0.46

Note. Gestational age and duration of looking were both centred before being entered into the analyses. Data is missing for: attention style for 4 term infants; and attention following for 2 term infants.

5.4.3 Infant proximal attention following by birth status

Proportion and latency of turns to the correct puppet for left and right turns did not meet the assumptions for parametric tests. A Wilcoxon signed ranks test was used to demonstrate that accuracy, z = -0.75, p = .455, r = -.08, and latency, z = -0.25, p = .801, r = -.03, to correct puppet did not differ by side and so side was collapsed across for all further analyses.

Proportion of responses to head turn is shown by birth status in Figure 5.3. Of the 337 trials across infants, 58% of infant's first eye turns were towards the same target as the experimenter. Removing trials where the infant either looked away or did not do an eye turn, on 76% of those 255 trials the infant's first eye turn was to the same target as the experimenter. At a group level, infant's ability to follow attention to a proximal target was examined by comparing infant's first eye turns. Both preterm and term infants turned to the same target as the experimenter significantly more than would be expected by chance (25% given four possible eye turn categories), t(28) = 4.82, p<.001, d = 0.89, t(58) = 7.99, p<.001, d = 1.04, *respectively*.

A Chi-squared Goodness of Fit test demonstrated that there was a significant difference in the frequency of response type, $\chi^2(3, N = 337) = 197.83$, $p<.001$[3]. Odds ratios demonstrated that infants were 1.37 times more likely to turn to the correct puppet than any other response and 3.25 times more likely to look to the correct puppet than the incorrect puppet. Significant relations were found between birth status and response type, $\chi^2(3, N = 337) = 14.00$, $p = .003$. One cell produced a significant standardised residual, $z = 2.60$, $p = .009$, $r = .14$, and the associated odds ratios demonstrated that preterm infants were 3.24 times more likely than term infants to show a *no turn* response (that is, continued to look at the experimenter throughout the trial). No other differences between preterm and term infants were found.

Given increased rates of no turn responses in preterm infants, post hoc analyses were run to examine whether preterm infants spent longer looking to the experimenter for the task as a whole[4]. Duration of looking to experimenter, same target, opposite target and look away were calculated as a proportion of the trial (from the start of the first head turn to the end of the fourth head turn). One outlier was found for duration of looking to opposite target and was substituted with the value that reflected 3 *SD* above the mean. Problems with non-normalcy were resolved using natural log transformations for duration of looks to opposite target and look away.

[3] The chi-squared test was run assuming that response options – same target, opposite target, look away and no turn – were equally likely. However, look away could reflect a number of response options (for example, looks to own feet, looks to curtain, looks at ceiling etc.) and therefore these response options are unlikely to be equally unlikely.

[4] Further post hoc analyses included correlations between number of no turn responses and all three attention style variables and three attention regulation variables. No correlations were significant (*r*s ranged from -.16 to -.02 for the sample as a whole and -.25 to -.13 for the preterm sample).

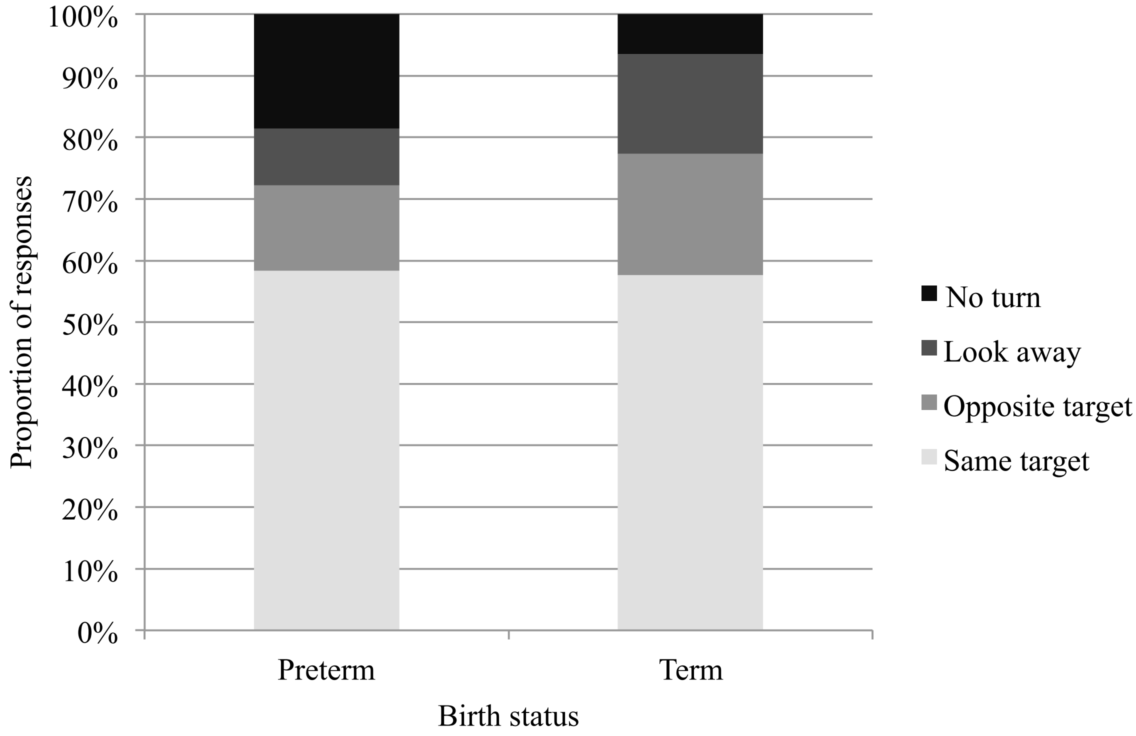

Figure 5.3. Responses for preterm and term infants to experimenter's head turn as a percentage of trials.

Although preterm infants were more likely to show no turn than term infants, preterm and term infants did not differ in the duration they looked to the experimenter during the experiment, $t(83) = 1.55$, $p = .125$, $d = .34$ (preterm: $m = .57$, $SD = .22$; term: $m = .49$, $SD = .19$). Further preterm and term infants did not differ in the duration looking to the same target, $t(83) = -0.82$, $p = .413$, $d = -0.18$ (preterm: $m = .20$, $SD = .12$; term: $m = .22$, $SD = .13$), opposite target, $t(83) = -1.14$, $p = .258$, $d = -0.25$ (preterm: $m = .09$, $SD = .08$; term: $m = .12$, $SD = .09$), or looking away, $t(83) = -0.62$, $p = .905$, $d = -0.14$ (preterm: $m = .14$, $SD = .21$; term: $m = .17$, $SD = .19$).

At an individual level, infants passed the proximal attention following task if their first eye turn was to the correct puppet at least once to each side (based on Perra & Gattis, 2010). Using this definition, 57% of term infants and 55% of preterm infants passed this task.

Figure 5.4 shows the checking back behaviours as a proportion of trials. A Chi-squared Goodness of Fit test demonstrated that there was a significant difference in the frequency of no further turn, other, checking back and multiple checking back, $\chi^2(3, N = 197) = 69.87, p<.001$. Odds ratios demonstrated that infants were 12.43 times more likely to check back than show no further turn and 2.12 times more likely to check back than receive other. Infants were also 8.86 times more likely to show multiple checking back than no turn and 1.51 times more likely to show multiple checking back than other. Finally, infants were 5.86 times more likely to show other than no further turn. No relations were found between birth status and response type, $\chi^2(3, N = 197) = 0.74, p = .864$, with no response type differing between preterm and term infants.

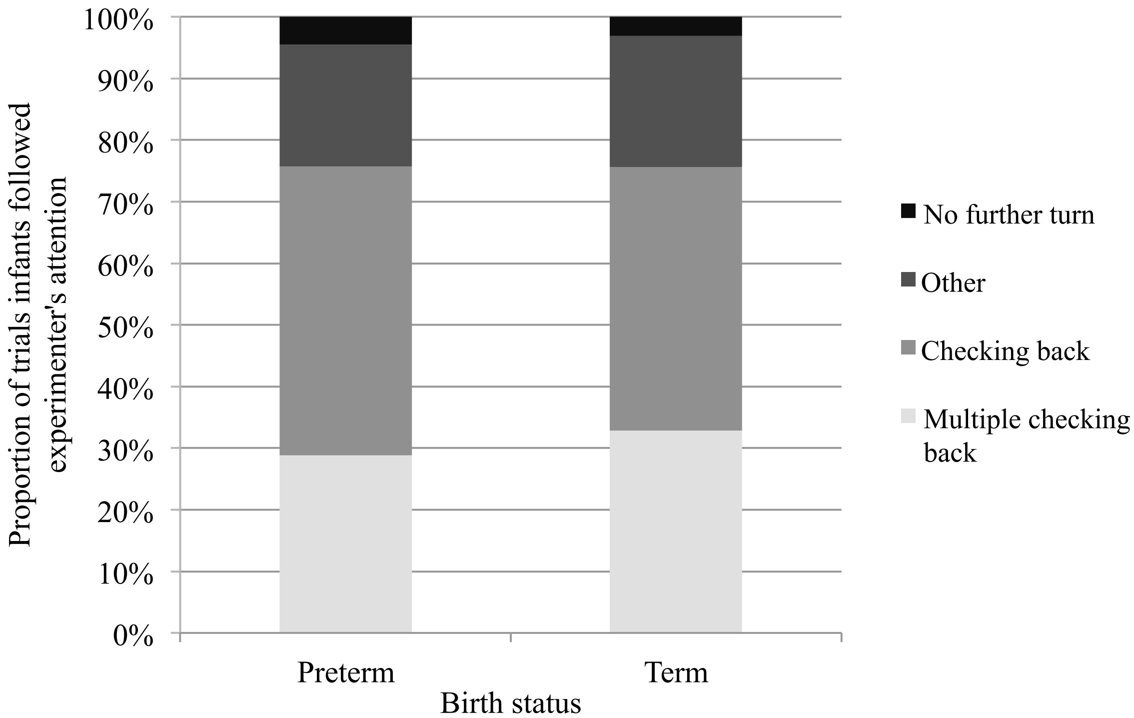

Figure 5.4. Checking back responses for preterm and term infants following shifts to correct puppet.

Average attention-following scores were 1.63 (*SD* = 0.65) for preterm infants and 1.77 (*SD* = 0.48) for term infants. A *t*-test confirmed this difference was not significant, $t(85) = -1.14$, $p = .259$, $d = -0.25$.

5.4.4 Infant orienting/regulation

Preterm infants did not differ from term infants on their scores on the duration of orienting, $t(87) = -0.69$, $p = .494$, $d = -0.15$ ($m = 3.74$, $SE = .23$; $m = 3.92$, $SE = .15$, *respectively*), or soothability subscale $t(87) = 0.08$, $p = .940$, $d = .02$ ($m = 5.64$, $SE = .72$; $m = 5.62$, $SE = .75$, *respectively*), or regulation factor, t (87) = -0.14, $p = .890$, $d = -.03$ ($m = 5.09$, $SE = .12$; $m = 5.11$, $SE = .07$, *respectively*). Preterm infants did not differ from term infants on any of the other subscales or factors either.

5.4.5 Independence of infant attention abilities

Table 5.3 documents correlations between attention measures for preterm (bold text) and term (regular text) infants. Variables within measures were highly related but variables across measures were not related for preterm or term infants. Trend relations with medium effect sizes (.30; Cohen, 1988) were found for preterm infants between attention-following measures and maternal reports of attention regulation. Preterm infants who showed more shifts to the correct puppet and had high attention-following scores (the highest scores on the attention-following variable indicate the infant not only followed the experimenter's head turn but also showed checking back between the target and the experimenter) were rated by their mothers as showing higher durations of orienting and higher regulation. For effect sizes between .27 and .31, you would need a sample size between 80 and 100 to give you sufficient power with correlations (calculated using GPower; Faul, Erdfelder, Lang, & Buchner, 2007). For term infants, these relations were not apparent but there were trend relations in the opposite direction. Infants who shifted to the correct puppet more often and who had higher attention-following scores were rated as lower on the duration of orienting subscale of the IBQ. The regulation factor was not related to either attention-following variable.

Table 5.3
Interrelations between measures of attention by birth status

	Style			Following		Regulation			
	1.	2.	3.	4.	5.	6.	7.	8.	
1. Peak look (s)		.88**	-.48**	-.14	-.09	-.01	.05	.13	
2. Average look (s)	**.88****		-.94**	-.17	-.09	-.13	.05	.10	
3. Fixations (frequency)	**-.54***	**-.96****		.11	.06	.18	-.03	-.03	
4. Correct turns (frequency)	**.02**	**-.08**	**.20**		.87**	-.19	.15	-.11	
5. Attention-following score	**.11**	**.04**	**.07**	**.89****		-.20[a]	.15	-.10	Term
6. Duration of orienting	**-.01**	**-.12**	**.10**	**.31[a]**	**.27[a]**		-.03	.72**	
7. Soothability	**-.11**	**-.02**	**-.01**	**.04**	**.11**	**.14**		.49**	
8. Regulation	**-.06**	**-.20**	**.14**	**.27[a]**	**.30[a]**	**.71****	**.63****		
				Preterm					

Note. Data is missing for: attention style for 4 term infants and attention following for 2 term infants. Correlations for preterm infants are in bold. **p*<.05, ***p*<.001, [a]*p*<.15

5.4.6 Predictors of infant attention abilities

Table 5.4 presents correlations between infant variables and attention variables and Table 5.5 presents correlations between maternal variables and attention variables. It is important to note that given the probability level was set so that only 5% of the time a result could have occurred by chance alone, of the 64 correlations presented in Table 5.5 one would expect 3.2 of the correlations to be significant by chance alone. This concern should be considered for all the tables presenting correlations between demographic/medical factors and outcome variables. Correlations between attention variables and parenting principles and cognitions, and demographic and medical factors were used to determine predictors to include in regression analyses, including 5-month attention variables as the criterion variable. One criterion variable per task was used in these analyses. Multiple regressions were used to assess predictors of: average look duration (attention style task), average attention-following score (attention-following task) and regulation scale score (IBQ). Table 5.6 gives information about the predictor variables entered into these models as well as the unstandardised regression coefficients (*B*), the standard error of the mean (*SE B*) and the standardised regression coefficients (β).

Table 5.4

Correlations among infant variables and attention variables

	Style		Following	Regulation
	Duration	Fixations		
Infant age (5 mns)	-.12	.05	.21*	.04
Duration of hospitalisation	.14	-.16	-.13	.08
Gestational age	-.16	.14	.10	-.04
Birthweight	.21[a]	-.13	-.08	-.09
Apgar (5 mins) (r_s)	.02	.07	.03	-.15

Note. Data is missing for: attention style for 4 term infants; attention following for 2 term infants; birthweight for 1 preterm infant; hospitalisation duration for 3 preterm and 4 term infants; and 5-minute Apgar scores for 3 preterm and 6 term infants. Transformations were used to resolve problems with non-normalcy for hospitalisation duration and average duration of looking in the attention style task (natural log). Apgar scores were negatively skewed and therefore non-parametric tests were used. *p <.05, [a]p = 0.61.

Table 5.5

Correlations among maternal variables and attention variables

		Style		Following	Regulation
		Duration	Fixations		
Demographic factors					
Maternal age		.12	.03	-.02	.18
Number of siblings (r_s)		.07	-.15	-.08	-.06
Maternal education (r_s)		.12	-.06	-.02	-.11
Cognitions and principles					
Structure	Birth	.05	-.03	-.03	.13
	5 mns	.00	.04	.05	.21[a]
Attunement	Birth	.03	-.02	.00	.05
	5 mns	.10	-.09	.00	-.03
Complexity	Birth	.24*	-.13	-.11	-.01
	5 mns	.09	-.07	-.09	-.14
Parenting practices					
Co-sleeping (nights)	Birth	.02	.01	-.17	-.08
	5 mns	.19[b]	-.21	-.17	-.18
Breastfeeding		.11	-.10	.13	.01
Feeding (mins)	Birth	.08	.02	-.10	-.09
	5 mns	-.09	-.20[a]	-.10	-.07
Holding (mins)	Birth	.04	.04	-.03	-.12
	5 mns	.02	-.21[a]	-.10	-.07

Note. Data is missing for: attention style for 4 term infants; attention following for 2 term infants; duration of feeding at 5 months for 1 preterm infant; and duration of holding at 5 months for 1 preterm and 1 term infant. Transformations were used to resolve problems with non-normalcy for feeding and holding duration (square root) and average look duration (natural log). Non-parametric tests were used for number of siblings (problems of non-normalcy could not be resolved) and maternal education (as negatively skewed). $*p < .05$, $^{a}p < .10$.

Table 5.6

Predictors of infant attention variables

	B	*SE B*	*β*	*t*
Predictors of average look duration				
Birthweight (g)	0.00	0.00	.20	*t*(77) = 1.82, *p* = .073, *d* = 0.42
Complexity at birth	0.51	0.25	.22	*t*(77) = 2.06, *p* = .043, *d* = 0.47
Predictors of attention following				
Infant's age (5-month visit)	0.02	0.01	.21	*t*(83) = 1.96, *p* = .053, *d* = 0.43
Duration of orienting	0.00	0.07	.00	*t*(83) = -0.03, *p* = .450, *d* = 0.00
Regulation	0.08	0.15	.08	*t*(83) = 0.51, *p* = .451, *d* = 0.11
Predictors of regulation				
Structure at 5 months	0.35	0.18	.21	*t*(84) = 1.95, *p* = .055, *d* = 0.43
Average attention-following score	0.08	0.11	.08	*t*(84) = 0.71, *p* = .480, *d* = 0.15

Note. Data is missing for: average look duration for 4 term infants; attention following for 2 term infants; and birthweight for 1 preterm infant. Transformations were used to resolve problems with non-normalcy for average look duration (natural log).

Average duration of looking. Using the enter method, a significant model for average duration of looking did emerge, $R^2 = .10$, $F(2, 77) = 4.00$, $p = .022$. This model accounted for 10% of variance in duration of looking, with maternal complexity at birth positively predicting duration of looking. Therefore, mothers that scored higher on complexity of thought following delivery were more likely to have infants who had longer average bouts of looking to an unfamiliar face. At trend levels, infants that were born at heavier weights were more likely to look for longer bouts, on average, during the attention style task ($\beta = .20$, $p = .073$).

Hierarchical regression analysis was used to test the linear and curvilinear components of relations between the average look duration variable and complexity at 5 months, as well as examining the scatterplot of these two variables. Although a very small curvilinear trend could be detected on the scatterplot, this trend was not statistically significant. Analysis of average look duration did find a significant linear trend, $R^2 = .04$, $F(1, 83) = 4.91$, $p = .029$, but did not find a significant quadratic trend, $\Delta R^2 = .016$, $F(1, 82) = 1.39$, $p = .241$.

Attention following. Using the enter method, a significant model for attention following did not emerge, $R^2 = .05$, $F(3, 83) = 1.50$, $p = .221$. At trend levels, infants that were older at the 5-month visit scored higher on the attention-following task, indicating more attention following and subsequent checking back ($\beta = .21$, $p = .053$).

Regulation. Using the enter method, a significant model for regulation at 5 months did not emerge, $R^2 = .05$, $F(2, 84) = 2.22$, $p = .115$. At trend levels, mothers that scored higher on structure at 5 months rated their infants higher on regulation at this visit ($\beta = .21$, $p = .055$).

5.5 Discussion

Preterm and term infants did not differ on their overall attention style, following or regulation. However, prematurity or gestational age and average looking to a novel face showed curvilinear trend or relations. Before around 36 weeks of gestation, gestational age was positively related to duration of looking, while after this point gestational age and looking were negatively related. During the attention-following task, preterm and term infants were equally likely to follow the experimenter's attention to a target puppet. However, on trials in which preterm infants did not follow attention, these infants were more likely to continue looking to the experimenter. Preterm infants did not differ from term infants on their mother's ratings of their duration of orienting, soothability or overall regulation/orienting.

The only significant predictor of average duration of looking to a novel face was maternal complexity of thought at birth. However, the overall model was not significant. Therefore, mothers' ability to conceptualise development at a higher level early in their infants' lives appears to impact their infants' attention style. Future work should focus on potential pathways between early maternal complexity of thought and later looking to faces and/or novel stimuli. No predictors of attention following or regulation were found.

5.5.1 Implications

The curvilinear trends found between gestational age and average duration of looking, with the point of inflection at around the definition for prematurity, may reflect that duration of looking reflects different things for preterm and term infants. Sigman and Beckwith (1980) found that infants in their brief fixation group were born at younger gestational ages, whereas those in the long fixation group had been born at older gestational ages. The data from the attention style task, when looking at only the preterm infants, replicates this finding of Sigman and Beckwith (1980). These results provide an interesting insight into the distinction between preterm, term and postterm infants, with postterm infants and earlier preterm infants showing similar levels of short looking, and near term and term infants showing similar levels of long looking. However, a larger sample with a more diverse range of gestational ages and medical risks is required to understand these findings.

The preterm infants' ability to follow the attention of an experimenter is one of the first demonstrations of this ability at such a young age in preterm infants. These findings add to a growing body of work demonstrating preterm infants' ability to respond to joint attention bids while extending this work to younger ages. Given preterm infants are at greater risk of an Autism Spectrum Disorder (ASD) and show similar patterns of early deficits, these results could be important in understanding social attention difficulties in ASD (Johnson et al., 2010; Leekam, Lopez, & Moore, 2000; Leekam & Ramsden, 2006). On trials where preterm infants did not follow attention, a no turn category was more likely than chance to be assigned. This finding could show preterm infants look longer to faces, were slower at processing information, were less capable of disengaging or may reflect sticky fixation to direct gaze. Preterm and term infants did not differ in the amount of looking to the experimenter's face in the task as a whole, so the increased frequency of no turn responses in preterm infants does not appear to be due to these infants preferring to look to faces in general. Furthermore, post hoc analyses demonstrated that the number of trials in which infants did not turn away from the experimenter was not related to duration of looking or number of fixations in the attention style task, which does not support hypotheses about disengagement or information processing. More direct measurement of these skills or processes – information processing, disengagement and sticky fixation – is needed to compare these differing hypotheses. The increased tendency of preterm infants to not look away from the experimenter appears to be at odds with those results showing increased gaze aversion in social contexts by preterm infants (De Schuymer et al., 2011). However, De

Schuymer et al. (2011) linked gaze aversion to less mature attention abilities in preterm infants. Perhaps gaze aversion was not apparent in this sample of low-risk preterm infants, as they also did not show less mature styles of attention.

Once preterm infants had shifted their attention from the experimenter to the target, the behaviour that followed did not differ from their term peers. Preterm infants were equally likely to check back to the experiment (at rates higher than expected by chance) and even demonstrated multiple checking back where they switched attention between the target and the experimenter and therefore were able to disengage from both the target puppet and the experimenter's face.

The findings from the IBQ Short Form – showing no difference between preterm and term infants on any subscale or factor – replicate previous work showing no differences in parent's reports of their low-risk, preterm infant's temperament. Mothers of preterm infants appeared to have as positive appraisals of their infant's attention as term counterparts. Whether this reflects the reality of infant's abilities or not, such positive appraisals may prove protective by ensuring infants grow up in a stimulating environment. Further work exploring this hypothesis is necessary.

5.5.2 Limitations and future work

As far as possible the experimenter was blind to birth status. However, there were several reasons why this was not always possible. First, the experimenter was also responsible for recruiting participants and therefore sometimes remembered families from the hospital. Second, the preterm infants were sometimes visibly smaller than the term infants at the 5-month visit. However, there were also a number of term infants that could have been mistakenly taken for preterm infants due to their size at the 5-month visit. Finally, the early delivery and hospitalisation of an infant is a significant event for new parents and therefore many parents discussed the NICU stay or explicitly stated the degree of prematurity to the experimenter. Future studies should therefore replicate these methods but with a 2-researcher design. One researcher should meet the families in the hospital and be responsible for the collection and briefing of the families during the 5-month visit and the second experimenter should be solely responsible for running the experimental tasks.

Study visits were scheduled based on a time the mother believed the infant would be “awake and ready to play”. Most visits therefore occurred between 10am and 11am, and 1pm and 2pm. Visits therefore differed on the time of day they occurred. However, mothers’ decisions mostly revolved around normal sleeping and feeding routines and so study visits tended to occur directly following one of the infant’s daily naps and feeds. Principles about caregiving may also therefore predict how accurately mothers were able to select appropriate time for the study visit – that is, mothers who supported regularity and structure may have been able to better predict a time their infant would be awake and alert around fixed feeding and sleeping schedules, whereas those mothers who opposed such rigidity may not have been able to predict suitable times for the visit. However, parenting principles were not related to performance on either attention task. Level of arousal or alertness could be coded from the videos to allow control of infant’s state.

The attention style task only included one face stimulus. Future work should include multiple stimuli including faces, objects and geometric patterns. In this battery of looking time procedures, tasks measuring information processing and disengagement should be included in order to start asking questions about the higher number of no turns for preterm infants in the attention-following task. Differences in looking to direct vs. averted gaze should also be included to examine the role of direct gaze on attention following in preterm infants.

The IBQ Short Form was used as the measure of regulation and orienting. This questionnaire asks parents about behaviours they may have seen in their infant in the previous week. Parents are asked to rate how often these behaviours have occurred. Parent-report measures allow access to a variety of behaviours that experimenters cannot see during short study visits. However, these measures also tap into parent's perceptions of their infant as well as their memory for a variety of behaviours that will have varying salience for different parents. Parent's attention to different behaviours of their infant, as well as their perception of their infant, can be as important as objective measures of infant's temperament in organising parent's behaviour towards their infant. It is important to note, however, that the lack of difference between ratings of preterm and term infants may reflect one of two possibilities. First, there was not a difference in the temperament of preterm and term infants in the Special Delivery sample. Second, maternal perceptions about the temperament of their preterm and term infants do not differ in this sample. Therefore, future work should focus on combining laboratory tasks and parent-report measures of temperament. Parent-report methods could also include diary methods, such as the CUE diary method (Ellis-Davies, Sakkalou, Fowler, Hilbrink, & Gattis, in press) that do not rely on parents reporting their infant's behaviour retrospectively but instead allow parents to report behaviours in real time.

The analyses reported in this chapter do not shed much light on what predicts performance on these attention tasks. There were only small, if any, relations in performance across tasks on the attention measures. The regression models for both attention following and regulation (measured by the IBQ) were non-significant and the model for average look duration only accounted for 10% of the variance. This lack of prediction in the models occurred despite having a wealth of information about the participants – for example, demographic, medical, and maternal cognitions and practices – and running many analyses with these variables. Further work should focus on understanding the predictors of performance on these attention tasks and measures. All participants were entered into one regression model so perhaps a more valid approach would have been to examine interactions with prematurity in these models. Therefore, future work should examine factors that may particularly important in predicting attention abilities following a premature delivery.

The data reported in this chapter was collected at one time point – when the infants turned 5 months. We therefore do not know how these attentional abilities change over time. The Special Delivery sample will visit the School of Psychology again at 13 and 18 months. During these two visits the Early Social Communication Scale (ESCS; Mundy et al., 2003) – a structured observation with an experimenter – are run with the infants to measure RJA and IJA. We will therefore be able to ask questions about the stability and continuity of infant's ability to respond to attention-directing bids, as well as understand the longitudinal importance of early attentional abilities on later child outcomes – in particular, infant's ability to initiate joint attention episodes. Such questions are particularly important when you consider Bruner's (1995) suggestion that early joint attention provides foundations for later joint attention behaviours. An additional attention-following task is also included in the 13- and 18-month visits – the head vs. gaze task (M. Tomasello, Hare, Lehmann, & Call, 2007). In this task, the experimenter looks to the ceiling with their eyes only, head only (eyes closed), head and eyes or neither. M. Tomasello et al. (2007) observed that 12- and 18-month-old infants were most sensitive to eye cues when following attention. Colombo et al. (1995) demonstrated that 4-month-old short-lookers moved from looking to global features to local features of a stimulus when looking time to a stimulus increased, whereas long-lookers did not show a preference. Therefore, looking time in the attention style task may be rated to different looking to the head (global features) and the eyes (local features) of the experimenter. The longitudinal analyses of the Special Delivery will allow us to examine this hypothesis.

Finally, infants do not attend to their world unaided; parents and other social partners scaffold their early experiences. Accordingly, it is important to understand how parents respond to their infant's attentional abilities. The next chapter focuses on the interactions between mothers and their term and preterm infants – specifically the durations, relations and contingencies of mother and infant person- and object-directed behaviours by birth status. The overall aim of the following chapter is to understand whether mothers and their infants respond contingently to each other's behaviour.

In summary, preterm and term infants did not differ in their duration of looking to a novel stimulus, their ability to follow an experimenter's attention or on their mother's reports of their soothability, duration of orienting or regulation/orienting. However, gestational age and average looking to a novel face showed curvilinear trend or relations – gestational age was positively related to duration of looking up to 36 weeks of gestation, at which point gestational age and looking became negatively related. Additionally, the behaviour preterm infants were most likely to show when not attention following was sustained looking to the experimenter's face and therefore showing no eye turn at all. Further work is needed to understand the role of disengagement, information processing and sticky fixation in response to direct gaze in the increased rates of no turns in preterm infants. Finally, infants do not interact with the world without support from others and so the next question must focus on how mothers respond to their infant's attention and how these infants respond to their mother's encouragement of attention.

Chapter 6. Contingent behaviours of preterm infants and their mothers

6.1 Chapter overview

The overall aim of this chapter is to examine how mothers of preterm infants respond to their infant's attention and in turn, how these infants respond to their mother's attempts and strategies to direct their attention. This goal was achieved through focusing on four specific questions. The first asked whether there were differences between preterm and term infants in terms of the frequency and duration of their and their mother's social (person-directed) and didactic (object-directed) behaviour. The second questioned whether these behaviours were related within individuals – whether social and didactic behaviours were related for mothers and for infants, individually. The third question focused on whether behaviours were matched within the preterm and term dyads at two levels. At an overall level, correlations examined whether mothers' behaviour was related to their infant's behaviour, for example, whether maternal social and infant social behaviour were associated. To examine sequences of behaviour, sequential analysis examined whether mothers respond to their infant's behaviour and conversely whether infants respond to their mother's encouragement of attention. Finally, infant and parent characteristics were examined as predictors of infant and maternal contingent behaviour.

6.2 Parent-infant interaction

Infant learning and development occurs in a social context (Vygotskiĭ, 1962, 1978). More experienced and expert social partners support and scaffold interactions for more immature participants with fewer skills (Bruner, 1974; Wood, Bruner, & Ross, 1976). Mothers and infants therefore enter interactions with different but complementary roles. An example of this maternal *scaffolding* is holding an object to aid their infant's exploration. When the immature skills of the infant are supported in this way, infant learning should be more successful (Bruner, 1974). Due to their immaturity and attentional differences, preterm infants may be particularly in need of this scaffolding.

The previous chapter demonstrated that preterm infants were as capable as term infants at following attention but appeared to fail to follow attention for a different reason than term infants. On trials when attention following did not occur, preterm infants were more likely than term infants to continue looking to the experimenter and not make an eye turn, whereas term infants tended (non-significantly) to look away from the experimenter and both puppets. Preterm infants thus seemed unable to disengage (or processed information more slowly) on these trials, while the term infants appeared to fully disengage. This attention-directing paradigm provides all infants with equal opportunity to demonstrate both proximal attention following and checking back. However, infants do not all receive the same environmental stimulation outside the experimental setting. Accordingly, this chapter will examine a more "naturalistic" situation to explore early differences in the duration, relations and contingencies of mother and infant behaviour for preterm and term dyads in order to examine whether parents of preterm infants adapt or maladapt to their infant's early attentional differences. Therefore, this chapter reports durations, relations and contingencies of maternal and infant person- and object-directed behaviours observed in a free play setting by birth status.

6.1.1 Social vs. didactic encouragement of attention

Caregiver encouragement of attention has been divided into two domains – social and didactic (Bornstein et al., 1991). The focus of social interactions – or encouraging attention to self – is within the dyad and involves physical and verbal strategies that parents use to express their feelings and engage their infants in primarily interpersonal exchanges (Bornstein, 1989). Behaviours observed in these types of interactions include rocking, kissing, tactile comforting, non-verbal vocalising and maintaining playful face-to-face contact. Social behaviours of the parents related to social, but not didactic, behaviours of the infant (Bornstein & Tamis-LeMonda, 1988).

The focus of didactic interactions is outside the parent and infant and therefore has an extradyadic locus (Bornstein, 1989). These interactions include parental strategies to stimulate and arouse their infants to the world and encourage attention to properties, objects, or events in the environment, as well as providing chances for the infant to watch, copy behaviours and learn (Bornstein, 2002). These strategies could be physical – pointing, placing, guiding or demonstrating; or verbal – describing, questioning, instructing or labelling. Didactic encouragement of attention was related to, for example, infant language at 1 year (Bornstein, 1985) representational competence (language comprehension and play competence; Tamis-LeMonda & Bornstein, 1990).

Social and didactic behaviour are two coherent yet distinct categories (Bornstein, 1989). Bornstein (1989) reports on the psychometric properties of these categories of caregiving demonstrating that these categories provide orthogonal and reliable constructs. Therefore, although levels of social and didactic behaviour were stable across time, these behaviours were not related to each other. That is, parents who engage in high levels of didactic behaviour did not necessarily engage in high, or low, levels of social behaviour (for example, Bornstein, 1989; Bornstein & Tamis-LeMonda, 1990).

Mother's use of social encouragement of attention and their use of didactic encouragement of attention were not related to each other but were related to their infant's social and didactic behaviour (Bornstein & Tamis-LeMonda, 1990). These results demonstrated that mother's overall use of social encouragement of attention was related to their infant's social attention and didactic encouragement of attention was related to infants' didactic attention. However, these correlations did not demonstrate whether these behaviours were related in real time and were, therefore, contingent. Sequential analysis was used to demonstrate that for both person-directed (social) and object-directed (didactic) interactions the mother was significantly more responsive to the infant than the infant was to their mother (Cote et al., 2008). These results demonstrate synchronisation and contingency between similar mother and infant behaviours, with mothers taking more of the responsibility in supporting interactions with their 5-month-old infant. Similar conclusions about the mother's role in supporting their infant's attention were based on examinations of infant engagement state during interactions between infants and their mother, their peer or alone (Bakeman & Adamson, 1984). Infants were more likely to be coded as passive joint engagement – infants engaged with the same object as their interactive partner without showing any awareness of their interactive partner – when interacting with their mother rather than a peer. This increased rate of passive joint engagement is believed to show the skill of the mother, compared to their infant's peer, in responding to her infant's cues and maintaining shared attention (Bakeman & Adamson, 1984).

With all caretaking, timing of behaviours is crucial. Parents do not show equivalent levels of social and didactic behaviours throughout the life course (Bornstein, 1989). The effectiveness of modes of interaction, at least in part, is modulated by the expertise and abilities of the child. Around 5 months, infants show a movement from equal social and didactic behaviour towards more time spent in didactic behaviours (Bakeman & Adamson, 1984; Bornstein & Tamis-LeMonda, 1990). Parents appear to respond to this change – parental social behaviours appeared to decrease over the first year at a time when didactic behaviours increased (Bornstein & Tamis-LeMonda, 1990). Even within modes of interacting, behaviours used change with time. For example, verbal behaviours start dominating physical ones during didactic interactions as their child becomes older and more competent (Bornstein & Tamis-LeMonda, 1990). Therefore, the fit between a child and their environment is not static but instead the effectiveness of specific caretaking behaviours change over time and in response to the infant's capabilities (Bornstein, 1989).

6.1.2 Maintaining and structuring infant attention

Parents appear to play an important role in structuring a young infant's environment, but for parents of preterm infants this may be particularly important. Parents of preterm infants were observed to provide more stimulation to their infant (Brachfeld et al., 1980; Holditch-Davis et al., 2007). However, parents of preterm infants have also been described as more intrusive. For example, controlling patterns of interaction – the mother was controlling and the infant compulsive and compliant – were more frequent in the preterm sample than the term control sample (Forcada-Guex et al., 2006) and parents of preterm 2-year-olds had more difficulty scaffolding interactions around their child's cues, providing well timed support and were generally more intrusive in their behaviour during a problem-solving task (Clark et al., 2008). However, this "intrusiveness" may reflect an adaptive strategy to provide a more structured environment for those immature infants that require the support to visually explore (Landry et al., 1993; Landry et al., 1997a). A less structured approach may not be sufficient to support preterm infant explorations if such behaviours do not match what the infant is ready and able to do (Goldberg & DiVitto, 1983).

Landry (1986) noted that mothers often determined where their infant was looking and then manipulated this object of interest when attempting to involve their infants in shared attention. Landry and colleagues labelled this attention-directing strategy *maintaining* attention (for example, Landry et al., 1993; Landry et al., 2000; Miller-Loncar et al., 2000), while Tomasello (1992) used the label *attention following*. Alternatively, mothers could *redirect* or use an *attention switching* interactional style whereby mothers divert their infant's attention from their target of fixation to a new object (for example, Landry et al., 1993; Landry et al., 2000; Miller-Loncar et al., 2000; Tomasello, 1992). This maintaining strategy is less attentionally demanding for infants because maintaining attention does not require the infant to switch their attention, whereas episodes that require the infant to attend to a new object of interest places further information processing demands on infants (Saxon, Frick, & Colombo, 1997).

All infants, both preterm and term, showed more exploratory play following attention-directing strategies that maintained their focus of attention (Landry et al., 1993). However, preterm infants were also more likely to respond to structured attention-directing strategies. The structured strategies that provided infants with information about how to use the toy or provided physical assistance resulted in more exploratory play in the preterm infants. Both the maintaining and structured attention-directing strategies were related with later cognitive language ages (Landry et al., 1997a). Landry et al. (1997a) concluded that maintaining strategies were beneficial, as they reduced demands on the cognitive and attentional abilities of the preterm infants and allowed these infants to organise their behaviour and better signal their interest. Structured strategies used early in development also promoted cognitive language, but it was noted that there needs to be balance between supporting the child's early social development and future autonomous functioning.

6.1.3 Responsiveness

Responsiveness is the prompt, contingent and appropriate reaction of parents to their infant's behaviour, which occur in everyday interactions (Bornstein et al., 2008). Responsiveness requires synchronous mutual exchanges or expressions between the caregiver and their infant, with contingent responding being vital (Bozzette, 2007). This characteristic of parenting is common around the world and occurs across contexts. Parenting is *multidimensional* – different types of engagement are used for different purposes, *modular* – different domains are not related, and *specific* – different domains have different effects on the child. Parents' contingent responsiveness can therefore be seen in multiple domains

(Landry, Smith, Swank, Assel, & Vellet, 2001) and so two parents may be equally responsive but differ in the behaviours they respond to and/or the behaviours they use in response. Tamis-LeMonda and Bornstein (1990) have also demonstrated that domains are not related in infants either – ability in one area does not necessarily indicate abilities in all areas.

Responsiveness and synchronicity between mothers and their preterm infants serves a regulatory function in interactions and allows coordination of attention within the dyad (Bozzte, 2007). Responsiveness provides infants with experiences of their needs being responded to in a predictable and supportive manner (Landry et al., 2001). Preterm infants in dyads characterised by responsiveness and synchronicity at 6 months showed similar behavioural outcomes and general developmental level to term peers at 18 months (Forcada-Guex et al., 2006). Additionally, mothers of children with an Autism Spectrum Disorder (ASD) diagnosis who showed more synchronisation in early play interactions had children with better joint attention and language skills up to 16 years later (Siller & Sigman, 2002).

Individual differences in maternal attention directing are, in part, a response to her infant. Mothers of long-lookers appeared to be less active in their interactions, spending more time observing their infants and less time encouraging their infants' attention (Saxon et al., 1997). In a different study, infants' scores on the Mental Development Index (MDI) of the Bayley Scales of Infant Development at 1 year predicted mothers' use of maintaining attention a year later (Miller-Loncar et al., 2000). Therefore, mothers affect infants and infants affect mothers (Bell, 1968; Bell & Harper, 1977; Harper, 1975) and so maternal responsiveness cannot be considered in the absence of infant responsiveness (Field, 1977b). Specific maternal and infant characteristics may also play an important role in interactive behaviours. For example, maternal responsiveness and sensitivity at 9 months was related to infant's negative reactivity measured from an earlier lab visit at 4 months (Ghera, Hane, Malesa, & Fox, 2006). However, the direction of this association was dependent on mother's perceptions of their infant's soothability. Mothers of irritable infants who perceived that their infants were soothable were more sensitive, whereas those who viewed their infants as difficult to soothe showed less positive parenting. Maternal perceptions of infant soothability, therefore, moderated relations between early infant negative reactivity and later parenting.

Responsiveness is dynamic, allowing children to elicit maternal behaviours (Bornstein et al., 2008). Such dynamism may be most meaningful in the face of differing infant needs. Infant needs may change in response to the typical developmental course of infants, or additional needs may occur due to risk such as premature delivery. A differentiated concept of responsiveness promises to provide a better understanding of responding in different populations. For example, parents may respond more to social, as compared to didactic, visual attention if their infants have difficulties initiating or maintaining social attention.

6.1.4 Summary

Mothers of preterm infants seem to provide more stimulation for their infants. Many have labelled such behaviour as intrusive but this behaviour may provide preterm infants with the structure they need to explore and learn from their environment. The previous chapter demonstrated that preterm infants were as capable as term infants at following the attention of an experimenter to an object (puppet) but were more likely to fail to disengage from the experimenter's face in order to shift to the target. Longer attention-directing events may thus be necessary for preterm infants to make use of such attempts to direct attention by disengaging and reengaging their attention. Contingencies between behaviours were calculated to examine the responsiveness of mothers and their infants. If maternal behaviour is in response to infants' behaviours and provides support for preterm infant's attentional differences, infant-initiated behaviour should show contingent responding to their infant. Successful maternal attention directing will be reflected in significant contingencies for mother-initiated behaviours. Based on previous findings, I expected mothers to contingently respond to their infants' behaviour and based on the previous chapter I expected infants to be able to respond contingently to their mothers.

6.2 Method

6.2.1 Participants

Eighty-nine infants participated in the 5-month visit of the longitudinal study of preterm (n = 29) and term (n = 60) infants' development. Demographic information about these infants and their mothers was presented in chapter 2, as well as sampling procedures.

6.2.2 Procedure

The overall procedure for the 5-month visit was described in chapter 2. Specific details about the observational situation used in the 5-month visits are described below.

In the centre of the room, there was a dark rectangular sheet placed on the floor measuring 130cm by 190cm. Three toy bins were placed on the corner of the mat. These toy bins contained a selection of 15 toys that were appropriate for infants aged 2 to 18 months, but were not grouped by age group (see Appendix 7 for a list of the toys included). A selection of infant seating options ('Bumbo' chair; 'bouncy' chair; 'U-shaped' support cushion; cushion) were left in the corner of the room and mothers were told to bring the seat or pillow onto the dark area if they wanted to use any of them. Mothers were instructed to play with their infant 'as you would normally do so at home' with the only restriction to remain within the dark area. The interactions lasted 15 minutes but mothers were told that the session could be terminated at any time if the infant became upset or distressed or the mother felt uncomfortable. Three mothers terminated early after 11, 13 and 14 minutes (rounded to the nearest minute) due to infant crying followed by sleepiness.

6.2.3 Principal measures

All videotapes were coded using the mutually exclusive and exhaustive coding schemes created by Bornstein et al. (1991). Onsets and offsets of these mother and infant behaviours were recorded to the nearest frame (or 0.04 second) to ensure time event-sequential data that could be used in sequential analysis (Bakeman & Quera, 2011). Videos were coded using Interact software (Mangold, 2010). Coders were trained to reliability (i.e., Cohen, 1960, kappa: $\kappa > .60$) on a standard set of videotapes before they coded the videotapes for this study. Coders' reliability was checked every 6 interactions to protect against coding drift. Intercoder agreement was calculated using approximately 20% of interactions. Reliability coefficients, κ, for the two groups and the four codes ranged from .50 to .80 (mean = .62) and percentage agreements ranged from 70% to 90% (mean = 77%).

The four codes relevant to the present study were defined as follows:

6.2.3.1 Maternal social behaviour

The mother tries to lead the infant into face-to-face interaction with herself. Physical attempts include intentionally moving her face towards the infant or moving the infant towards her face. Verbal attempts include making very specific comments about herself that are clearly designed to capture the infant's attention. Offset of an on-going behaviour is coded for pauses of 2 seconds or longer.

6.2.3.2 Infant social behaviour

The infant looks at the mother's face or head, regardless of whether the mother returns the infant's gaze. Focused fixation must be evident. An active behaviour component often accompanies clear and focused fixation (for example, brightening of the face, widening of the eyes, stilling, increased motor excitement, positive vocalizations, or reaching). Brief, fleeting or passing looks – less than 1 second – are not coded. A change in fixation is coded after the infant has looked away from the target for 1 second.

6.2.3.3 Mother didactic behaviour

The mother stimulates her infant's attention physically or verbally to a property, object, or event in the environment other than herself. This can involve the mother physically moving the infant or an object so that the infant can see or touch it, or the mother verbally referring to an object or an object- related event or activity that is no more than 12 feet from the infant. Offset of an on-going behaviour is coded for pauses of 2 seconds or longer or when the mother changed objects. For each event, the object or event of focus was noted.

6.2.3.4 Infant didactic behaviour

The infant looks at any discrete object or body part other than a face that is in the environment. Focused fixation must be evident. An active behaviour component often accompanies clear and focused fixation (for example, brightening of the face, widening of the eyes, stilling, increased motor excitement, positive vocalizations, or reaching). Brief, fleeting or passing looks – less than 1 second – are not coded. A change in fixation is coded after the infant has looked away from target for 1 second or when the target of fixation changed (unless for a brief glance). For each event, the object or event of focus was noted.

6.2.3.5 Sequential interaction variables

Sequential analysis was used to create 4 sequential interaction variables that summarised behavioural streams and described sequential aspects of the play interaction following procedures described by Bakeman and Quera (2011). These variables assessed the odds of: (a) the infant looking to the mother given the mother was encouraging the infant to look at her; (b) the mother encouraging attention to self given infant was looking to caregiver; (c) the infant looking to an object given the mother was encouraging attention to an object; and (d) the mother encouraging attention to an object given the infant was looking at an object. A time window of 3s was set so that target behaviours had to occur within 3s of the onset of the given behaviour to be counted (as Cote et al., 2008). This decision about the time window was based on the demonstration by Van Egeren, Barratt, and Roach (2001) that contingencies between mother and infant behaviour from naturalistic interactions were best captured using a 3s time window. For each individual dyad, time units were tallied in four 2 by 2 tables (see Figure 6.1), one for each of the interactive variables, and an odds ratio (OR) was computed for each table. Each time unit was only represented once – in only one cell – and therefore units were independent. However, mothers and infants could be considered paired dyads and this non-independence was not controlled. The OR is a descriptive measure of effect size (Bakeman, Deckner, & Quera, 2005). An OR of more than 1 reflects that the target behaviour – for example, infant looks to mother – was more likely to occur within 3s of the onset of the given behaviour – for example, mother encourages infant to look at herself, whereas a value between 0 and 1 reflects the target behaviour was less likely to occur.

For some dyads and interactive behaviours, I did not compute an OR due to insufficient data. The value of the OR was regarded as missing if fewer than five onsets of the target behaviour and less than 30s of the given behaviour were coded. Interact data files were converted to SDIS files using the ActSds software (Bakeman & Quera, 2008) so values for ORs could be computed using the Generalized Sequential Querier program (GSEQ version 5; Bakeman, Quera, & Gnisci, 2009).

		Target	
		Yes	**No**
Given	**Yes**	A	B
	No	C	D

Figure 6.1. 2x2 contingency table used in sequential analysis. The formula for the odds ratio is: OR = (A/B)/(C/D)

6.2.4 Design

The design was within-subjects. Data was collected for all participants for all 4 behaviours – maternal social, maternal didactic, infant social and infant didactic behaviour. Two variables were calculated for each variable – overall duration (as a proportion of the interaction) and average duration of each individual event (in seconds), resulting in 8 variables. Overall duration of behaviours provides an indication of the overall amount of a specific behaviour. However, such a variable could represent that mothers or infants displayed one long behaviour or many shorter behaviours. Average duration variables were calculated by dividing overall duration (in seconds) by the frequency of that behaviour and therefore reflect the balance of duration and frequency of behaviours. These variables were analysed separately to understand whether any differences by birth status were related to the overall amount of behaviour or how long individual bouts lasted, on average. An additional 4 sequential interaction variables were calculated – mother- and infant-initiated interactions and person- and object-directed interactions.

6.3 Results

6.3.1 Analysis plan

Prior to data analysis, mother and infant behaviour variables – overall duration and average duration of maternal social, maternal didactic, infant social and infant didactic and the 4 sequential interaction variables – were examined for normalcy, homogeneity of variance and influential outliers. Outliers were defined as 3.29 SD above or below the mean (Field, 2005). Thirteen outliers were found for maternal and infant behaviours – 2 each for duration of maternal social and infant social, 1 and 3 for average duration of maternal didactic and infant didactic respectively, and 3 and 2 for average duration of maternal social and infant social respectively. A further 5 were found for the interactive variables – 1 for infant-initiated object-directed and 2 each for mother-initiated object- and person-directed.

These outliers were substituted with the value that reflected 3 SD above or below the mean. The non-normality of duration of maternal social and infant social and average duration of all four variables – maternal social, maternal didactic, infant social and infant didactic – were resolved using a natural log transformation. The non-normality of all ORs was resolved using a cube root transformation. For ease of interpretation, all Tables and Figures depicting descriptive data use raw, rather than transformed, data.

First, descriptive statistics are reported for maternal and infant behaviour variables by birth status (preterm vs. term) and the effects of birth status were tested using Analysis of (Co)Variance (AN(C)OVA). Relations between types of behaviour are reported by birth status in two phases. Relations between overall levels of infant and mother variables (correlations) are first examined and then relations within behaviour streams (sequential analysis) are examined. Finally, the role of infant and maternal characteristics on interaction variables are explored using correlations and multiple regressions.

Table 6.1
Descriptive statistics for duration of mother and infant behaviours

	Preterm		Term	
	M	*SD*	*M*	*SD*
Person-directed behaviour				
Mother	.12	.10	.12	.10
Infant	.09	.09	.08	.07
Object-directed behaviour				
Mother	.64	.16	.53	.16
Infant	.62	.18	.67	.14

*Note. N*s for the preterm and term sample were 29 and 60, respectively. Scores for duration were calculated as the proportion of the free play interaction. Data presented in this table is from the raw data. Analyses of (co)variance were performed separately for each dependent variable.

6.3.2 Duration of mother and infant behaviours

One 2 (birth status: preterm vs. term) x 2 (gender) AN(C)OVA was performed for each behaviour to investigate mean differences in the duration of mothers' and infants' behaviours by birth status. Table 6.1 contains descriptive statistics for duration of mother and infant behaviours and Table 6.2 contains average duration of mother and infant behaviours.

6.3.2.1 Mother person-directed behaviour

Mothers of preterm and term infants did not differ in their overall duration, $F(1, 87) = 0.01$, $p = .913$, $r = -.01$, or average duration, $F(1, 85) = 0.04$, $p = .786$, $r = -.03$, of person-directed behaviour.

6.3.2.2 Infant person-directed behaviour

Preterm and term infants did not differ in their overall duration, $F(1, 87) = 0.48$, $p = .491$, $r = .08$, or average duration, $F(1, 84) = 0.03$, $p = .871$, $r = -.02$, of person-directed behaviour.

Table 6.2

Descriptive statistics for average duration (in seconds) of mother and infant behaviours

	Preterm		Term	
	M	*SD*	*M*	*SD*
Person-directed behaviour				
Mother	10.65	9.10	11.46	9.54
Infant	4.53	2.86	4.61	2.81
Object-directed behaviour				
Mother	20.42	8.64	13.83	6.87
Infant	16.42	7.89	11.60	4.25

*Note. N*s for the preterm and term sample were 29 and 60, respectively. Scores for average duration (seconds) were calculated by dividing the total duration of looking (seconds) by the frequency of behaviour. Data presented in this table is from the raw data. Analyses of (co)variance were performed separately for each dependent variable.

6.1.1.1 Mother object-directed behaviour

Mothers of preterm infants had higher durations of didactic behaviours for the interaction as a whole, $F(1, 87) = 8.60$, $p = .004$, $r = .32$, and for the average attention-directing event, $F(1, 87) = 15.98$, $p < .001$, $r = .40$.

6.1.1.2 Infant object-directed behaviour

Preterm and term infants did not differ in the overall time spent looking at objects throughout the interaction, $F(1, 87) = 2.34$, $p = .130$, $r = -.16$, but preterm infants spent significantly longer looking, on average, during individual attention-directing events, $F(1, 87) = 13.04$, $p = .001$, $r = .36$.

6.1.2 Correlations between infant and maternal behaviours by birth status

6.1.2.1 Within individuals

Pearson correlations were run for preterm and term infants individually to explore whether social and didactic behaviours were related for mothers and infants individually. *Z* tests were used to determine whether relations between social and didactic behaviours were significantly different between preterm and term infants. Table 6.3 illustrates how mothers' social and didactic behaviours were significantly negatively correlated for mothers of preterm and term infants. *Z* tests indicated that correlations for duration of maternal social and didactic behaviour were not significantly different between mothers of preterm and term infants ($z = 0.52$, $p = .603$, two-tailed test). Table 6.3 demonstrates that infants' social and didactic behaviours were significantly negatively correlated for both preterm and term infants. *Z* tests indicated that correlations for the duration of infant social and didactic behaviour were not significantly different between preterm and term infants ($z = 0.05$, $p = .960$, two-tailed test).

Table 6.3

Relations between durations of social and didactic behaviours

	Preterm	Term
Infant behaviour	-.60**	-.61**
Maternal behaviour	-.50*	-.58**

*Note. N*s for the preterm and term sample were 29 and 60, respectively. Correlations represent relations between duration of social and didactic behaviour for mothers and infants separately. All tests are two-tailed. *$p < .05$. **$p < .001$

6.1.2.2 Within dyads

Pearson correlations were run for preterm and term infants individually to explore whether mother and infant behaviours were associated. *Z* tests were used to determine whether relations between infant and mother behaviours were significantly different between preterm and term infants. Table 6.4 demonstrates that mothers' and infants' social behaviours were significantly positively correlated for all groups. *Z* tests indicated that correlations for the durations of mothers' and infants' social behaviours were not significantly different between preterm and term infants ($z = -0.18$, $p = .857$, two-tailed test). The durations of mothers' and infants' didactic behaviours were significantly positively correlated for term infants but did not quite reach significance for preterm infants. However, *Z* tests indicated that correlations for the duration of mothers' and infants' didactic behaviour were not significantly different between preterm and term infants ($z = -0.54$, $p = .589$, two-tailed test).

Table 6.4

Relations between duration of maternal and infant behaviours

	Preterm infants		Term infants	
	Person-directed	Object-directed	Person-directed	Object-directed
Maternal behaviour				
Person-directed	.71**	-.63**	.73**	-.68**
Object-directed	-.08	.35[a]	-.48**	.46**

*Note. N*s for the preterm and term sample were 29 and 60, respectively. All tests are two-tailed. *$p < .05$, **$p < .001$, [a]$p = .060$.

6.1.3 Contingency of mother and infant behaviours

ORs larger than 1 indicate that target behaviour events are more likely to begin within the target window (3s) than at other times, whereas values between 0 and 1 indicate less likelihood. *T* tests were performed separately for each birth status group to determine whether pairs of behaviours were significantly contingent (that is, whether ORs differed significantly from 1; Wickens, 1993). Other than the two mother-initiated variables for preterm mothers – mother-initiated person-directed, $t(21) = 1.66$, $p = .112$, $d = 0.35$, and object-directed interactions, $t(28) = -0.80$, $p = .432$, $d = -0.15$ – all pairs of behaviours were contingent ($p<.001$) with medium to large effect sizes ($d \geq 0.54$).

Table 6.5 documents descriptive statistics for the sequential interaction behaviours. Repeated measures MAN(C)OVAs with one between-subject factors (birth status: preterm vs. term) and one within-dyad factor (initiator: mother vs. infant) were performed to investigate birth status differences in interactional partners' contingent responses to each other's behaviours. The birth status × initiator interaction was the *a priori* focus of this analysis, so simple effects were examined even if the omnibus interaction effect was not significant (Keppel, 1991).

6.1.3.1 Person-directed interactions

The birth status × initiator interaction was not significant, $F(1, 53) = 0.72$, $p < .399$. Simple effects analyses confirmed that mothers and their infants did not differ in their responsiveness in both birth status groups: preterm, $F(1, 53) = 0.00$, $p = .977$, $d = 0.01$; term, $F(1, 53) = 2.41$, $p = .122$, $d = 0.27$. Furthermore, neither mothers, $F(1, 53) = 0.35$, $p = .558$, $d = 0.18$, nor their infants, $F(1, 53) = 0.14$, $p = .709$, $d = -0.11$, differed in their responsiveness by birth status.

Table 6.5

Descriptive statistics for sequential interaction variables

	Preterm		Term	
	M	*SD*	*M*	*SD*
Person-directed				
Mother-initiated	14.98	39.56	8.49	10.79
Infant-initiated	11.80	13.10	13.17	18.57
Object-directed				
Mother-initiated	0.88	0.80	1.54	0.98
Infant-initiated	3.36	3.11	1.95	1.21

*Note. N*s for the preterm and term sample were 29 and 60, respectively. Untransformed ORs appear in the table. However, transformed scores were used in the analyses. Multivariate analyses of variance were followed by analysis of simple effects. Data is missing from 7 preterm and 15 term infants for infant-initiated person-directed and 7 preterm and 18 term infants for mother-initiated person-directed behaviour.

6.1.3.2 Object-directed interactions

The birth status × initiator interaction was significant, $F(1, 89) = 20.64$, $p <.001$. Simple effects analyses demonstrated that infants were significantly more responsive than their mothers in the preterm sample, but this difference did not quite reach significance in the term sample: preterm, $F(1, 87) = 47.56$, $p<.001$, $d = 1.37$; term, $F(1, 87) = 3.84$, $p = .053$, $d = 0.41$. Furthermore, mothers of term infants were more responsive than mothers of preterm infants, whereas preterm infants were more responsive than term infants: mothers, $F(1, 87) = 12.75$, $p = .001$, $d = -0.83$; infants, $F(1, 87) = 8.24$, $p = .005$, $d = 0.58$.

Table 6.6
Proportion of responses to the same object for mothers and their infants

	Preterm		Term	
	M	*SD*	*M*	*SD*
Object-directed				
Maternal responses	.49	.32	.51	.26
Infant responses	.94	.07	.85	.11

Note. *N*s for the preterm and term sample were 29 and 60, respectively. Maternal didactic behaviour that occurred within 3s of the onset of infant didactic behaviour was considered a maternal response and infant didactic behaviour that occurred within 3s of the onset of maternal didactic behaviour was considered an infant response. Responses were same if the mother and infant were focused on the same object and different if objects were different. Data reported in this table reflects proportion of responses that were to the same object.

Contingency for mother-initiated object-directed behaviours reflects that infants responded to maternal attempts to encourage attention to an object by looking to an object. However, infant attention could be to the same object as their mother or an alternative object. Maternal and infant responses to attention bids were therefore categorised as to the *same* or a *different* object. Proportion of same responses by mothers and their infants is reported in Table 6.6. The same analysis strategy was used with these variables as the sequential interaction variables. The birth status × initiator interaction was not significant, $F(1, 87) = 2.18$, $p = .144$. However, simple effects analyses demonstrated that preterm infants had proportionally more same responses than term infants, $F(1, 87) = 14.02$, $p<.001$, $d = 0.91$. Infants had proportionally more same responses than their mothers in both birth status groups: preterm infants, $F(1, 87) = 67.84$, $p<.001$, $d = -1.91$; term infants $F(1, 87) = 85.78$, *p*<.001, *d* = -1.74. There was no difference in the percentage of same responses between mothers of preterm and term infants, *F*(1, 87) = 0.05, *p* = .829, *d* = -0.05.

6.1.3.3 Predictors of sequential interactions

Table 6.7 presents correlations between infant variables and sequential interaction variables and Table 6.8 presents correlations between maternal variables and sequential interaction variables. Correlations between sequential interaction variables and infant characteristics, infant attention variables, demographic variables, and parenting principles and cognitions were used to determine predictors to include in regression analyses including 5-month sequential interaction variables as the criterion variable. Multiple regressions were used to assess predictors of: mother- and infant-initiated person- and object-directed interactions, and proportion of same responses by the mother and infant. Table 6.9 gives information about the predictor variables entered into these models, as well as the unstandardised regression coefficients (B), the standard error of the mean (SE B) and the standardised regression coefficients (β).

Person-directed mother-initiated. Using the enter method, a significant model for person-directed mother-initiated behaviour emerged, R^2 = .09, *F*(2, 78) = 3.79, *p* = .027. Neither predictor was significant. At trend levels, infants were more likely to look to their mother following maternal attempts to encourage social attention if they showed fewer changes in fixation during the attention profile task (*β* = -.21, *p* = .064) and were reportedly held for longer at 5 months (*β* = .20, *p* = .076).

Person-directed infant-initiated. Using the enter method, a significant model for person-directed infant-initiated behaviour emerged, R^2 = .18, *F*(5, 73) = 3.13, *p* = .013. However, no predictors were significant. At trend levels, mothers were more likely to respond to infant social attention if their infant was younger at the 5-month visit (*β* = -.19, *p* =

.092) and showed fewer changes in fixation during the attention profile task (β = -.20, p = .071).

Table 6.7

Correlations among infant variables, attention variables and sequential interaction variables

	Person-directed		Object-directed		Same response (%)	
	Mother-initiated	Infant-initiated	Mother-initiated	Infant-initiated	Mother	Infant
Infant age (5 mns)	-.06	-.22*	.06	.00	-.03	-.06
Health status						
Hospitalisation duration	-.04	-.15	-.31*	.31*	.01	.34**
Gestational age	-.03	.09	.40*	-.44**	-.02	-.48**
Birthweight	.04	.06	.38*	-.39**	-.01	-.43**
Apgar (5 mins) (r_s)	.04	.13	.09	-.02	.05	-.17
Infant attention						
Profile Duration	.10	.15	-.02	.07	.07	-.03
Fixation	-.22*	-.24*	.04	-.06	-.04	.03
Following	-.03	-.08	-.02	-.10	.17	-.10
Regulation	.00	.06	-.16	-.22*	.00	.04

Note. Data is missing for: infant-initiated person-directed for 7 preterm and 15 term infants; mother-initiated person-directed behaviour for 7 preterm and 18 term infants; birthweight for 1 preterm infant; hospitalisation duration for 3 preterm and 4 term infants; 5 minute Apgar scores for 3 preterm and 6 term infants; attention profile for 4 term infants; and attention following for 2 term infants. Transformations were used to resolve problems with non-normalcy for hospitalisation duration and average duration of looking in the attention profile task (natural log) and all 4 sequential interaction behaviours (cube root). Apgar scores were negatively skewed and therefore non-parametric tests were used. *p <.05, **p<.001.

Table 6.8

Correlations between maternal variables and sequential interaction variables

		Person-directed		Object-directed		Same response (%)	
		Mother-initiated	Infant-initiated	Mother-initiated	Infant-initiated	Mother	Infant
Demographic factors							
Maternal age		-.20[a]	-.06	.05	.02	.00	.04
Number siblings (r_s)		-.07	.11	.09	-.10	-.08	-.03
Maternal education (r_s)		.11	.14	.03	.26*	.16	.08
Maternal cognitions							
Structure	Birth	-.03	.02	-.05	-.02	.04	-.09
	5 mns	-.10	-.18	-.10	.06	-.11	-.08
Attunement	Birth	.05	.14	.20	-.22*	.03	-.15
	5 mns	.12	.26*	-.05	-.17	.04	-.06
Complexity	Birth	-.01	-.01	.22*	.05	.05	.01
	5 mns	.12	.16	.10	-.26*	.05	-.15
Parenting practices							
Co-sleeping (nights)	Birth	.07	.24*	.16	.07	.15	.09
	5 mns	.15	.24*	.00	-.14	.09	-.18
Breastfeeding		.16	.03	.15	-.22*	.18	.08
Feeding (mins)	Birth	-.13	-.18	.29*	-.09	.16	.05
	5 mns	-.18	-.14	-.09	.02	.00	.27*
Holding (mins)	Birth	-.13	-.10	.25*	-.02	.24*	.03
	5 mns	.22*	.14	-.06	.13	-.06	.04

Note. Data is missing for: infant-initiated person-directed for 7 preterm and 15 term infants; mother-initiated person-directed behaviour for 7 preterm and 18 term infants; duration of feeding at 5 months for 1 preterm infant; and duration of holding at 5 months for 1 preterm and 1 term infant. Transformations were used to resolve problems with non-normalcy for feeding and holding duration (square root) and all 4 sequential interaction behaviours (cube root). Non-parametric tests were used for number of siblings (problems of non-normalcy could not be resolved) and maternal education (as negatively skewed). $*p < .05$, $^{a}p = .069$.

Object-directed mother-initiated. Using the enter method, a significant model for object-directed mother-initiated behaviour emerged, $R^2 = .20$, $F(6, 79) = 3.36$, $p = .005$.

However, no predictors were significant. At trend levels, infants were more likely to look to an object following maternal attempts to encourage didactic attention if their mother had higher scores on complexity at birth ($\beta = .18$, $p = .076$).

Object-directed infant-initiated. Using the enter method, a significant model for object-directed infant-initiated behaviour emerged, $R^2 = .31$, $F(8, 79) = 4.44$, $p<.001$. Two significant predictors emerged – gestational age and infant regulation (measured by the Infant Behaviour Questionnaire, IBQ) negatively predicted object-directed infant-initiated behaviour. Therefore, mothers were more likely to respond to infant didactic attention if their infant was born at younger gestational ages and if they rated their infant as lower on regulation. At trend levels, mothers were likely to respond to infant didactic attention if they breastfed across the first 5 months with increasing exclusivity ($\beta = -.18$, $p = .086$).

Proportion of maternal same responses. Using the enter method, a significant model for maternal same responses emerged, $R^2 = .06$, $F(1, 87) = 5.12$, $p = .026$. Maternal reports of holding duration at birth positively predicted the proportion of same responses by the mother at 5 months. Mothers who reported holding their infant for longer durations following the delivery of their infant were thus more likely to maintain their infants' attention to the object of infant engagement rather than redirecting to a new object.

Proportion of infant same responses. Using the enter method, a significant model for infant same responses emerged, $R^2 = .26$, $F(4, 82) = 7.12$, $p<.001$. Gestational age negatively predicted and feeding duration at 5 months positively predicted the proportion of same responses by the infant at 5 months. Therefore, infants that were born at lower gestational ages and were fed for longer durations at 5 months (as reported by their mother) were more likely to follow the attention-directing bids of their mothers towards the selected object.

Table 6.9

Predictors of sequential interaction behaviours

	B	*SE B*	*β*	*t*
Predictors of person-directed mother-initiated				
Attention profile – number of fixations	-0.07	0.04	-.21	$t(76) = -1.88$, $p = .064$, $d = -0.43$
Holding duration at 5 months	0.05	0.03	.20	$t(76) = 1.80$, $p = .076$, $d = 0.41$
Predictors of person-directed infant-initiated				
Infant's age (5 month visit)	-0.03	0.02	-.18	$t(73) = -1.71$, $p = .092$, $d = -0.40$
Attention profile – number of fixations	-0.06	0.03	-.20	$t(73) = -1.83$, $p = .071$, $d = -0.43$
Attunement at 5 months	0.46	0.36	.16	$t(73) = 1.30$, $p = .198$, $d = 0.30$
Nights co-sleeping at birth	0.16	0.13	.16	$t(73) = 1.31$, $p = .195$, $d = 0.31$
Nights co-sleeping at 5 months	0.03	0.11	.04	$t(73) = 0.27$, $p = .792$, $d = 0.06$
Predictors of object-directed mother-initiated				
Hospitalisation duration	-0.01	0.03	-.07	$t(79) = -0.46$, $p = .649$, $d = -0.10$
Gestational age	0.02	0.01	.27	$t(79) = 1.39$, $p = .169$, $d = 0.31$
Birthweight	0.00	0.00	.09	$t(79) = 0.51$, $p = .615$, $d = 0.11$
Complexity at birth	0.13	0.07	.18	$t(79) = 1.80$, $p = .076$, $d = 0.41$
Feeding duration at 5 months	0.00	0.01	.02	$t(79) = 0.20$, $p = .845$, $d = 0.05$
Holding duration at 5 months	0.00	0.00	-.02	$t(79) = -0.13$, $p = .895$, $d = -0.03$

Predictors of object-directed infant-initiated				
Hospitalisation duration	-0.01	0.04	-.04	*t*(79) = -0.31, *p* = .756, *d* = -0.07
Gestational age	-0.03	0.02	-.39	*t*(79) = -2.08, *p* = .040, *d* = -0.47
Birthweight	0.00	0.00	-.07	*t*(79) = -0.39, *p* = .696, *d* = -0.09
Regulation	-0.11	0.04	-.25	*t*(79) = -2.61, *p* = .011, *d* = -0.59
Maternal education	0.01	0.02	.04	*t*(79) = 0.39, *p* = .700, *d* = 0.09
Attunement at birth	0.01	0.10	.02	*t*(79) = 0.13, *p* = .895, *d* = 0.03
Complexity at 5 months	-0.16	0.14	-.14	*t*(79) = -1.20, *p* = .234, *d* = -0.27
Longitudinal breastfeeding	-0.04	0.02	-.18	*t*(79) = -1.74, *p* = .087, *d* = -0.39
Predictors of maternal same response (%)				
Holding duration at birth	0.01	0.00	.24	*t*(87) = 2.26, *p* = .026, *d* = 0.49
Predictors of infant same response (%)				
Hospitalisation duration	0.00	0.02	-.03	*t*(82) = -0.21, *p* = .833, *d* = -0.05
Gestational age	-0.02	0.01	-.44	*t*(82) = -2.39, *p* = .019, *d* = -0.53
Birthweight	0.00	0.00	-.01	*t*(82) = -0.08, *p* = .940, *d* = -0.02
Feeding duration at 5 months	0.01	0.00	.20	*t*(82) = 1.99, *p* = .050, *d* = 0.44

Note. Data is missing for: infant-initiated person-directed for 7 preterm and 15 term infants; mother-initiated person-directed for 7 preterm and 18 term infants; number of fixations for 4 term infants; hospitalisation duration for 3 preterm and 4 term infants; feeding duration at 5 months for 1 preterm infant; and holding duration at 5 months for 1 preterm and 1 term infant. Transformations were used to resolve problems with non-normalcy for feeding and holding duration (square root), hospitalisation duration (natural log) and all sequential interaction variables (cube root).

6.2 Discussion

Mothers of preterm infants did not differ from those of term infants in their amount of social behaviour but did spend significantly longer throughout the interaction encouraging their infants to look to objects. Specifically, these attention-directing events were not significantly more frequent but the events were, on average, significantly longer for mothers of preterm infants than term infants. Similarly, preterm and term infants did not differ in their amount of social behaviour. Preterm infants did spend longer in individual didactic bouts, on average, despite not spending significantly longer looking to objects during the interaction as a whole.

Maternal and infant behaviours were related at an overall level – maternal and infant social behaviours were positively related, as were maternal and infant didactic behaviours. These relations did not differ significantly between preterm and term infants – relations between maternal and infant social behaviours and relations between maternal and infant didactic behaviours were not stronger or weaker for preterm infants compared with term infants.

When examining relations in real time, or sequences of behaviour, mothers of preterm infants were less contingent in responding to didactic behaviours than mothers of term infants. However, preterm infants were more responsive to their mother's didactic attention than term infants. Additionally, infants were more responsive than their mothers. This responsiveness was seen in higher odds ratios between maternal and infant didactic behaviour as well as higher frequencies of responding to the same object as their social partner. Cote et al. (2008) found that mothers were more contingent than their infants in interactions. The difference in these results may reflect the different context of the interactions. Cote et al. (2008) measured social and didactic behaviours from a home observation where mothers were left to proceed with their daily activities, whereas mothers in this chapter were interacting with their infants in a free play situation in a lab setting. Further work should examine the effect of the context of the interaction on contingent responding in mothers and their infants.

Contingency in object-directed behaviours was higher for mothers of infants born at younger gestational ages and who perceived their infants as lower on regulation, and mothers were more likely to follow into their infants' attention if they held their infant for longer following the delivery (as reported by the mother). Infants were more likely to follow their mothers' attention directing to the correct object if they were born at younger gestational ages and were fed for longer at 5 months (as reported by their mother). However, performance on the standardised attention-following task was not related to responding to mother's attention-directing bids. This ability to respond to attention-directing bids by the mother and following an experimenter's head turn do not appear to tap into the same overall ability. Mothers and their infants contingently responded to each other's social attention (with the exception of mothers of preterm infants) with no difference in contingency for social interactions by birth status or initiator of the interaction.

6.2.1 Implications

Other researchers have shown the importance of mothers maintaining their infant's attention on later outcomes for their infants (Landry et al., 1997a). However, these studies have tended to focus on times in the interactions that the mother encouraged attention and then determined the timing of these attention-directing strategies. In this chapter, we have examined the behavioural stream of both the mother and their infant. We were therefore able to examine how likely mothers were to respond to their infant's visual attention and, conversely, how likely infants were to respond to their mother's attempts to direct attention. Sequential analysis allows a clearer picture of the contingent behaviour of both mother and infant. Such clarity is particularly important when working with at-risk groups to allow delineation of behaviours into those behaviours that are *adaptive* and those that are *maladaptive* behaviours, as well as providing a picture of maternal and infant roles and responses. In this chapter, by using sequential analysis we were able to demonstrate the different contingencies in responding to social and didactic behaviours by mothers and their infants.

Preterm infants showed contingent responding to the social and didactic behaviour of their mother. This demonstration of responsiveness to maternal attention-directing strategies furthers the results from the previous chapter demonstrating that preterm infants were able to follow the experimenter's head turn to a target as well as extending previous demonstrations that preterm infants appear to be capable of responding to attention bids (see Landry, 1995, for a review of such work).

Mothers of preterm infants did not show contingent responding to the social and didactic behaviours of their infants. For example, mothers of preterm infants did not respond to their infants' social attention by encouraging social attention or their infants' didactic attention by encouraging didactic attention. However, when responding to the didactic behaviours of their infants, mothers of preterm infants did not differ from term infants in their levels of maintaining (same object as infant) or redirecting (different object as infant) behaviours. Although mothers of preterm infants are not redirecting the attention of their infant more than the term control group, mothers of preterm infants do not appear to be responsive to the behaviours of their infants. Singer et al. (2003) observed that preterm infants had less clear cues and so the mothers of preterm infants in this chapter may not have contingently responded to their infants due to the clarity of infant cues. An alternative hypothesis is that reduced contingent responding by the mother to object-directed directed behaviours is a reflection of the previously documented difficulties preterm infants have with initiating joint attention episodes (for a review see Landry, 1995). Further work is needed to examine the reasons for the lack of contingent responding observed in the mothers of preterm infants in the current sample.

6.2.2 Limitations and future work

In line with previous chapters, very little was uncovered about predictors of maternal and infant contingent behaviour. No predictors were significant for either mother- or infant-initiated person-directed behaviour, or mother-initiated object-directed behaviour. A model accounting for 31% of the variance in infant-initiated object-directed behaviour was found, with regulation (measured by the IBQ) and gestational age both independently predicting mothers contingent responding to didactic behaviour. Results for proportion of responses to the same object for mother and infant were mixed – 26% of the variance for infants and only 6% for mothers was accounted for. As with chapter 5, this lack of significant results occurred despite running many analyses. Similar problems, such as combining preterm and term infants into the regression, may be present. However, further work is needed to understand the predictors of interactive behaviours between mothers and their infants. Concerns about the number of analyses and level of significant results arising from chance should also be noted here (for more information see concerns from analyses reported in Table 5.5).

Parents naturally engage in a number of different behaviours with their infants (Bornstein, 1989, 2002). Observational data therefore provides a rich resource for examining many questions about the role of parents and infants in development. A behaviour not considered in the current chapter is vocalisations. Future work should examine durations, relations and contingencies between mother and infant vocalisations in the same way as reported in this chapter. An alternative way to examine vocalisations would be to examine differences in maternal mind-mindedness between mothers of preterm and term infants. In previous studies, maternal mind-mindedness comments included those where they had appropriately interpreted observed behaviour in their infant with reference to mental statements such as thoughts, desires, intentions and memories (Laranjo, Bernier, Meins, & Carlson, 2010; Meins et al., 2003; Meins et al., 2002). Mind-mindedness, or use of appropriate mind-related comments, at 6 months was one of only two independent predictors of a composite measure of Theory of Mind performance tested at 45 and 48 months, with receptive verbal intelligence at 48 months as the other predictor (Meins et al., 2002). Maternal education, maternal sensitivity, number of older siblings and attachment security did not independently predict Theory of Mind performance.

Bakeman and Quera (2011) suggested that different researchers should code different modes. That is, one researcher should code the mother and the other code the infant. Due to staff levels in the research group, I coded both the mother and infant. In an attempt to ensure independence in the coding of maternal and infant behaviours within dyads, I coded all mothers and then after a break of a month started to code the infants. Bakeman and Quera (2011) noted that when a single researcher codes the two behaviours brought together in sequential analysis, a skeptic could claim that any patterns of behavior could be as much in the eyes of the researcher as in the sequences of events. The reliability coder coded different dyads for maternal and infant behaviour. The coding of maternal and infant behaviours were equally reliable. Therefore, both coders were using the coding scheme in the same way regardless of whether they coded both social partners or just one individual from dyads. Future work where maternal and infant behavior were coded separately by two researchers is necessary to confirm that these patterns of responding does reflect the sequences of events.

The data reported in this chapter was collected at one time point: when the infants turned 5 months, therefore we do not know how these person- and object-directed behaviours change over time. The Special Delivery sample will visit the School of Psychology again at 13 and 18 months. Identical free play interactions will be recorded at both times. We will then be able to ask questions about the stability and continuity of these person- and object-directed behaviours, as well as how mothers and infants change and adapt over time.

Another limitation of the single time point occurs when attempting to understand the longitudinal importance of these results. During the 13- and 18-month visits, data is also collected using experimental paradigms, structured observations, standardised testing and parent-reports. These methods will provide a detailed account of the infant's behavioural (for example, temperament), and cognitive (imitative, communicative and attentional) development, as well as general cognitive developmental level (Bayley Scales of Infant Development; Bayley, 2006), thus allowing examination of the longitudinal impact of these early interactive behaviours on later child outcomes as well as the impact of maternal and infant characteristics on later interactive behaviours.

Additional future studies should extend these findings to a wider group of parents and infants. The current chapter only examines maternal behaviour. However, fathers and secondary caregivers are also involved in caregiving, and have potential effects on the infant either directly or through maternal behaviours. For example, when fathers were involved in more caregiving activities for their preterm infant – regardless of whether he lived with the mother of his child – the use of negative control by the mother reduced (Holditch-Davis et al., 2007). Additionally, the sample reported in this thesis is a relatively homogenous group of low-risk preterm infants and therefore replication of this method with high-risk preterm infants is necessary. The effect of different risk groups on mother and infant contingent responding should be explored to further understand the value of conceptualising responsiveness as dynamic and domain-specific. Recent work observed that infants with an older sibling diagnosed with ASD (ASD-siblings) appeared less lively, and their mothers more directive and less sensitively responsive, in interactions (Wan et al., 2012). These observations with ASD-siblings show similar profiles to observations of preterm infants interacting with their mother. Using the methodology applied in this chapter to a sample of ASD-siblings would provide a clear picture of how mothers and their infants were contingently responding to one another. Finally, preterm delivery occurs around the world; however, the majority of developmental work has documented the development of Western infants and their parents. Accordingly, extension of these findings to different cultural groups with differing parenting beliefs, goals, principles, practices and behaviours as well as early neonatal care experiences is necessary.

In summary, responsiveness was measured in mothers and their preterm or term infant. Parents of preterm infants spent longer encouraging their infant to look to objects – this longer duration appeared to result from longer, rather than more frequent, attention-directing events. Their preterm infants also showed longer but not more frequent didactic attention events, with overall level of didactic behaviour for mothers and their infants being related. However, mothers of preterm infants were less contingent in their didactic behaviours than mothers of term infants, whereas their preterm infants were more contingent in their didactic behaviour than their term peers. Preterm infants also followed their mother's attention-directing bids to the correct or same object more than term infants. Finally, both preterm and term infants were more responsive than their mothers in didactic behaviours. No differences were found between preterm and term dyads in levels or contingencies of social behaviours. Examining levels and contingencies of specific behaviours allowed clear and complex representation of the behavioural streams within the free play situations of preterm and term infants with their mothers. Future longitudinal analyses will shed light on the importance of these patterns of behaviour.

Chapter 7. General discussion

7.1 Chapter overview

The aim of this chapter is to review the findings of the previous chapters and to discuss their importance and implications. I will then outline follow-up studies before coming to final conclusions.

7.2 Review of main findings

7.2.1 Maternal cognitions and principles following preterm birth

Continuity – consistency at a group level – and stability – consistency at an individual level – were found for structure and attunement from birth to 5 months for mothers of term infants. For mothers of preterm infants, both structure and attunement showed continuity but only attunement showed stability. However, there was no difference in support of structure or attunement between mothers of preterm and term infants at either age. Therefore, mother's principles about how she will approach the caregiving role shortly following the preterm or term delivery of their infant seem to remain consistent across their first half year of life. The only exception is mother's support of structure following a preterm delivery. The group level of structure did not change from birth to 5 months for mothers of preterm infants demonstrating that as a group mothers did not generally decrease or increase in their support of structure. However, rank ordering of the structure variable within the preterm sample did vary across the first five months of life. Some mothers did not change, while others either increased or decreased in their support of structure. In chapter 4, I discussed the possibility that structure reflects the situations parents find themselves in whereas attunement reflects a more enduring internal principle about caregiving.

Complexity of thought – the balance between categorical and perspectivist thinking – also showed continuity and stability from birth to 5 months, except for mothers of preterm infants who did not quite reach significance for stability. However, scores on the categorical subscale did not show continuity for mothers of preterm infants. Mothers of preterm infants scored significantly higher than mothers of term infants on the categorical subscale at 5 months despite not differing at birth. This difference at 5 months reflected that mothers of preterm infants had increased their scores on the categorical subscale between birth and 5 months, whereas mothers of term infants demonstrated continuity across the same time period. This increase in categorical thinking extends previous findings that parents of school-aged children born preterm were higher on the categorical subscale than parents of term children despite being equally capable of cognising complexly about development (Pearl & Donahue, 1995). The increased categorical thinking in the Special Delivery sample lends support to the idea that parents increasingly rely on categorical thinking following the birth, and subsequent caregiving, of their premature infant.

Structure at birth predicted attunement at birth. Furthermore, attunement (but not structure) at birth and maternal education predicted complexity at birth. Therefore mothers who were lower on structure supported attunement more following the delivery of their baby, and mothers that were more highly educated and supported attunement more were higher on complexity at birth. Mothers who supported structure less at birth and attunement more at 5 months were more likely to strongly support structure at 5 months. Mothers who supported attunement more at birth and structure less at 5 months were more likely to strongly support attunement at 5 months. Finally, complexity at birth was the only significant predictor of complexity at 5 months.

7.2.2 Infant attentional abilities following preterm birth

Preterm and term infants did not differ on their looking to a novel face or their ability to follow an experimenter's attention to a target puppet. However, gestational age and average look duration to the novel face stimulus showed curvilinear relations, with an inverted u-shaped function. The peak of the U was around 36 weeks gestational age –

gestational age and average look duration were positively related before and negatively related after 36 weeks. The results of infants born before 36 weeks of gestation replicated findings by Sigman and Beckwith (1980) that infants in their short-looking group were born after short durations.

Preterm infants shifted their attention to the same target as the experimenter at equivalent rates to term infants, with both groups demonstrating levels of responding higher than would be expected by chance alone. For preterm infants, however, no turn responses were significantly higher than for term infants. Preterm infants were therefore more likely to not follow attention due to extended fixations to the experimenter's face. Rates of no turns (attention-following task) were not related to duration of looking and number of fixations (attention style task) in the preterm group or the overall sample. In addition, preterm infants did not look to the experimenter for a greater proportion of the attention-following task's duration. Therefore, increased rates of no turns do not appear to reflect looking more to faces than term infants, nor does it appear to reflect the attentional style of the infant. Further work should explore the role of disengagement, information processing and responses to direct gaze in the increased rates of no turns in the attention-following task for preterm infants in chapter 5.

Finally, mothers' rating of their infants did not differ by birth status – preterm and term infants did not differ on reported duration of orienting, soothability or regulation/orienting. This similarity in maternal reports of the regulation of their healthy, low-risk preterm infants replicates previous studies (for example, Larroque et al., 2005; Oberklaid et al., 1991). However, differences with existing literature appeared when examining relations between infants' regulation and their attention following. Duration of orienting and soothability were not related to attention following – number of correct head turns or overall attention-following score – in term or preterm infants (these relations were found in term infants by Morales et al., 2000; Morales et al., 1998).

7.2.3 Mother-infant interactions following preterm birth

Mothers of preterm and term infants did not differ in the amount of social behaviour but did spend significantly longer, both as a proportion of the interaction and as an average duration per event, encouraging their infant to look to objects. Similarly, preterm and term infants did not differ in their amount of social behaviour and although these infants did spend similar proportions of the interactions looking to objects, preterm infants spent significantly longer in didactic bouts (based on average durations of bouts).

Overall levels of mothers' and infants' behaviours were related – mothers' and infants' social behaviours were positively related, as were mothers' and infants' didactic behaviours. The strength of relations between mothers' and infants' social behaviours and relations between their didactic behaviours did not differ between preterm and term infant dyads.

Sequential analysis was used to examine behavioural streams between mothers and their infants. This analysis allowed four variables to be calculated, each capturing the level that individuals responded to their interactive partner's behaviour. Responding to social behaviour did not differ by birth status – preterm vs. term infant; or by initiator – mother vs. infant. However, differences in responding to didactic behaviour were found. Mothers of preterm infants were less responsive to their infant's object-directed behaviours than mothers of term infants, whereas preterm infants were more responsive to their mother's object-directed behaviours. Overall, infants were more responsive than mothers in object-directed interactions. These findings appeared to confirm that preterm infants are capable of responding to joint attention bids and extend the findings of chapter 5 to a naturalistic free play interaction. However, these results show that mothers of preterm infants were less responsive to their infant's object-directed behaviours than mothers of term infants. The poorer responsiveness of mothers of preterm infants needs to be further examined to understand if the result is a reflection of the mother, the infant or the dyad. For example, mothers may be less responsive because they do not understand their infant's cues or alternatively they may have decided to not follow into their infant's attention and instead prefer to redirect their infant's attention to a new object. Alternatively, mothers may be less able to organise their behaviour around their infant's behaviour if their infant provides poorer signals and cues or is less capable of eliciting joint attention bids.

Mothers of infants born at younger gestational ages and who perceived their infant as lower on regulation were more contingent in their responses to their infant's object-directed behaviour. These mothers were also more likely to respond by following their infant's attention to the same object if they had reported holding their infant for longer durations following delivery. Infants were more likely to follow their mother's attention-directing bid to the same object if they were born at younger gestational ages and were fed for longer at 5 months (as reported by their mother).

Landry et al. (1997a) observed that mothers who used proportionally more maintaining-attention strategies in their interactions with their infants had children who showed faster growth in cognitive-language skills – a composite measure of mental age (measured by the Bayley Scales of Infant Development; Bayley, 2006) and expressive and receptive language. These relations between maintaining strategies and later cognitive-language skills were particularly evident for high-risk preterm infants. Landry et al. (1997a) therefore suggested maintaining strategies provided specialised support for high-risk infants' less mature attentional and organisational skills. Similar results were found with a sample of mothers of infants with Autism Spectrum Disorder (ASD) – mothers who were more responsive to their infants with ASD had children with better joint attention and language skills (Siller & Sigman, 2002). Therefore, following into infant's attention was particularly important for infants with difficulties regulating and switching their attention. In the Special Delivery study, mothers who believed their infant was poorer at regulating and orienting were more contingent in their responding to their infant's object-directed behaviour. Gestational age was also negatively predictive of contingency in object-directed interactions. However, mothers of preterm infants were lower in this form responding generally. Higher levels of contingent responding may be a response by mothers to specific behaviours or perceptions of their infant's abilities, rather than risk status alone.

7.3 Future studies

7.3.1 Activities in the hospital

Preterm birth is often followed by the hospitalisation of the infant (Goldberg & DiVitto, 1983) meaning parents' early experience of caring for their infant often takes place in the NICU, sometimes for long periods of time. The degree of contact parents are permitted, indeed, encouraged to have with their infant during this period in the NICU has altered significantly in the past 50 years (Clarke-Stewart, 1998; Goldberg & DiVitto, 1983). Budin (1907) provided two reasons to include mothers in their infant's care. First, he believed no other person would monitor the child as vigilantly as the mother and second, he claimed early involvement not only ensured mothers felt responsible for the care of their infant but also meant they were able to nurse their infant upon leaving hospital. Although parent's contact with their infant during hospitalisation was reduced to minimise infection and unsettling the vulnerable infants, since the 1980s parents have been encouraged to be involved in the care of their infants (Clarke-Stewart, 1998). This degree of involvement benefits parents for many reasons, including allowing them to become accustomed to their infant, recognise their value as the infant's carer, and ready themselves for the demands of taking sole care of their infant (Goldberg & DiVitto, 1983). Involvement in activities that only parents can do – such as breastfeeding and Kangaroo care – are particularly encouraged (Cleveland, 2008). One of the benefits of Kangaroo care for mothers is greater milk production and increased persistence with breastfeeding (Cleveland, 2008; Flacking et al., 2011; Ruiz-Peláez et al., 2004; Tessier et al., 1998). Kangaroo care was linked to mothers' perception of their levels of competence and sensitivity when feeding (Tessier et al., 1998) and prepared parents to leave hospital (Ruiz-Peláez et al., 2004).

Nurses on the NICU at University Hospital of Wales keep daily records about the infant's care including feeds, changes and visits by parents. Activities that parents were involved in are also reported, such as breastfeeding, nappy changes and baths. I was able to access the medical records of the 17 infants who spent any amount of time in the NICU (regardless of birth status). Accordingly, as a pilot study, date of first record and frequency were recorded for parent's activities. Average frequency per day the infant was on the NICU was then calculated for three maternal variables. *Hospital contact* reflected level of mother's contact with medical staff, particularly the frequency of phone calls and visits to the hospital on an average day. *Physical contact* reflects level of physical contact mother had with their infant on a regular day through activities such as Kangaroo care, cuddles and attempts on breast (for mothers who were attempting to breastfeed). Finally, *caretaking activities* reflect the level of involvement mothers had in caring for their infant on an average day in the NICU through activities such as nappy changes, oral hygiene, bathing and bottle-feeding. Appendix 6 presents correlations between these three maternal hospital variables and the key variables presented in this thesis. Amount of physical contact the mother had with their infant in the NICU was positively related with complexity at 5 months and, at trend levels, to structure (negatively) and attunement (positively) at birth. Mothers who had more hospital contact during the NICU stay had infants who would follow attention-directing bids less successfully in free play interactions, but at trend levels these mothers would be more responsive to their infant's object-directed behaviours.

Potentially important relations therefore exist between activities that mothers take part in during the NICU stay and their parenting cognitions and later behaviours with their infant. In addition, these visiting activities may also be related to infant outcomes. Although increased hospital contact was related to poorer responding to attention-directing bids in infants, the increased hospital contact may be a reflection of more medical complications during the NICU, which in turn was related to infant outcomes. These findings need to be explored and replicated.

I was able to run this pilot study as I was allowed access to records already routinely kept by nurses on the NICU. The nurse in charge of the baby's care for the shift is responsible for keeping a record of the baby's care during that period. Each infant therefore has records reported by a variety of nurses and each nurse tends to vary on the level of detail they report. The records also rarely provide information about the duration of activities. To address this, future work should utilise diary methods where parents or nurses keep a log of parental activities during the period of hospitalisation. This method would also allow extension of activities reported, including activities such as talking with baby and mother's touching of the infant during painful procedures. Alternatively, interventions that increase one or more of these activities could be used to examine whether such interventions alter later parenting principles, cognitions and behaviours. Such studies could add to the growing body of work demonstrating which activities need to be encouraged to ensure optimal outcomes for parents and their infants during the hospitalisation of the infant.

7.3.2 Information processing vs. disengagement in preterm infants

Preterm infants have frequently been observed to be capable of perceiving, storing and retrieving information about visual stimuli. However, the processing stage tends to be slower for preterm, as compared with term, infants (Sigman, 1983). Although preterm infants attended to familiar and novel stimuli as long as term infants, only term infants differentiated between novel and familiar stimuli (Sigman & Parmelee, 1974). Rose (1983) replicated these findings, demonstrating that while younger infants (5 months vs. 12 months) required longer familiarisation periods, preterm infants at both ages required longer durations of familiarisation to show a preference for a novel stimulus over a repeatedly exposed familiar stimulus. Preterm, compared with term, infants required longer exposure times, spent more time off-target and displayed less comparison behaviour through fewer shifts in gaze between paired targets (Rose & Feldman, 1990). Preterm infants' slower information processing has been replicated (for example, Ortiz-Mantilla, Choudhury, Leevers, & Benasich, 2008; Rose et al., 2002).

At 10 weeks, preterm infants appeared slightly better at disengaging from stimuli than term infants (Butcher, Kalverboer, Geuze, & Stremmelaar, 2002). However, subtle differences in disengagement performance between preterm and term infants after 16 weeks led Butcher et al. (2002) to claim that the fine-tuning of disengagement, which occurs after its initial development, was slower for preterm infants than for their term peers. At 4 months, preterm infants were slower to disengage from a central stimulus to look to a peripheral stimulus (De Schuymer, De Groote, Desoete, & Roeyers, 2012). However, these preterm and term infants did not differ in their disengagement at 6 months. Preterm infants therefore appear to be less capable of disengaging at around 4 months but this difference is no longer present by 6 months. Accordingly, future work should attempt to understand the individual roles of difficulties with information processing and disengagement in the increased rates of no turns in the attention-following task and the prolonged didactic bouts in the free play interactions.

7.3.3 Stability and continuity of maternal principles, cognitions and behaviours

The parenting principles and cognitions measured in chapter 4 mostly showed consistency from birth to 5 months at both a group and individual level. However, the mother's role starts changing towards the end of the first year of life as the infant becomes more communicative and independent (Stevenson et al., 1990). Therefore, future work should investigate how parents approach caregiving towards the end of the first year of life when the child becomes more independent, locomotive and better at demonstrating their preferences and intentions. Such studies should explore whether these behaviours change with time or whether early caregiving principles and cognitions predict later cognitions and principles.

7.3.4 Infant outcome

This thesis has described the early caregiving and play environment of the preterm and term infants in the Special Delivery study. Characterising the early social interactions of preterm infants and their attention abilities is important to understand pathways to positive and negative later outcomes. Accordingly, a crucial next step is to document later social environments as well as infants' cognitive outcomes.

The Special Delivery study has four waves of data collection. The first two waves have been reported in the current thesis. Infants are also seen at 13 and 18 months. During these lab visits, we collect information about infants and their mothers from parent-reports; experimental paradigms; observations – structured with an experimenter and free play with mother; and standardised measures – the Bayley Scales of Infant Development (Bayley, 2006). These visits are designed to measure infants' socio-cognitive abilities as well as observe interactions between mothers and their infants. Experimental paradigms include measures of imitation – one measure of copying intentional actions (Carpenter, Call, & Tomasello, 2005) and one measure of copying necessary vs. unnecessary actions (Brugger, Lariviere, Mumme, & Bushnell, 2007); and attention sharing – differential responding to eye vs. head turns (Tomasello et al., 2007). The Early Social Communication Scale (ESCS; Mundy et al., 2003) is run with the infants to measure responding to joint attention (RJA) and initiating joint attention (IJA). Identical free play interactions to those used in chapter 6 will be observed between mothers and their 13- and 18-month-olds. Parent-reports are also collected about caregiving principles (BCQ; Winstanley & Gattis, 2012); receptive and productive language (Communicative Development Inventory; Hamilton, Plunkett, & Schafer, 2000); and temperament (Early Childhood Behaviour Questionnaire; Putnam, Gartstein, & Rothbart, 2006).

The Special Delivery study will therefore be able to ask questions about the stability and continuity of parenting principles, infant attention – their ability to respond to and initiate shared attention – and person- and object-directed behaviours between mothers and infants in play situations. In addition, the longitudinal importance of the cognitions, behaviours and abilities seen following delivery and at 5 months can be examined for their prediction of infant cognitive abilities in the second year of life. For example, in term infants, looking to a parent's eyes in 3-month-olds predicted coordinated attention in 10-month-olds but only in dyads in which mothers showed high levels of maintaining attention at 10 months (Legerstee et al., 2007). Therefore, one question that could be asked of the Special Delivery study is whether preterm infants' early social attention in free play interactions with their mother predicts later joint attention skills and the role of maternal behaviours on such an association.

7.3.5 The role of fathers following preterm birth

Despite the stress and difficulties associated with preterm birth and the subsequent hospitalisation, some have claimed that the 'silver lining' to preterm delivery is the resultant strengthening and pulling together of the parents once the baby has left the hospital (Behrman & Butler, 2006). Fathers of premature infants were involved in the care of their infant from an early age, especially when the mother was not capable for health reasons (Miles & Holditch-Davis, 1997; Paludetto et al., 1981). Furthermore, fathers of preterm infants were both more involved in caregiving activities and had more positive interactions with their infants than fathers of term infants (for a review, see Miles & Holditch-Davis, 1997). This increased paternal involvement in caregiving has an effect on maternal behaviours. For example, increased involvement by fathers in caregiving activities, even when living outside of the family unit, was related to decreased use of negative control by the infant's mother (Holditch-Davis et al., 2007).

Future studies should therefore examine the caregiving principles and cognitions of fathers of preterm and term infants. In addition, these studies should investigate whether the level of agreement between mothers and fathers about how to approach caregiving differs between parents of preterm and term infants. Finally, these studies should examine interactions between the father and their preterm infant, as well as triadic interactions between the preterm infant and their mother and father.

7.4 Conclusions

Sameroff and Chandler's (1975) transactional model states that prematurity alone does not place infants at risk of later negative outcomes, rather the pathway is through the effect prematurity has on parents' caregiving and the responses the preterm infant elicits. This thesis focused on preterm infants in the first half year of life. This thesis reported that preterm infants in the Special Delivery study were not raised in different caregiving environments – mothers of preterm infants held very similar principles to mothers of term infants. However, structure did appear to change with changing contexts. Although mothers of preterm infants did not differ in their support of structure at birth or 5 months, support of structure was not consistent across these time points for individual mothers of preterm infants. Mothers' support of schedules and routines in their infants' daily care soon after delivering their premature baby did not predict structure once their baby was home and the mother – and parents more generally – had exclusive responsibility for caregiving. These mothers were caring for preterm infants who had similar attention styles and following to their term peers. However, these preterm infants were more likely to fixate on the experimenter's face during the attention-following task and on objects during free play interactions with their mothers. Their mothers, in turn, spent longer encouraging attention to objects but did not respond contingently to their infant's object-direct behaviour.

This thesis has demonstrated that at 5 months preterm infants are capable of following an adult's head turn to the correct target and their mother's attention-directing bids to the correct object. In addition, this thesis demonstrated that mothers of preterm and term infants generally showed similar early caregiving but mothers of preterm infants increased in their categorical thinking across the first 5 months of their infant's life and were less responsive to their infant's attention and interest. The next two waves of the Special Delivery study will be able to build upon these findings by exploring the longitudinal importance.

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Appendix 1. The Baby Care Questionnaire

Baby Care Questionnaire

Your baby's date of birth: ________ Today's Date: ______

Your baby's initials: ________

Gender (please circle): Your baby: male/female You: male/female

This questionnaire asks for your opinions about different aspects of child rearing. Please give your own opinions and do not worry about what others may think. You will probably agree with some statements and disagree with others. There are no right or wrong answers. Your opinions may have changed over time. Please answer based on your feelings now. You will be given an opportunity to comment on questions at the end of questionnaire.

A. When and where your baby sleeps

1. How many nights in the last 3 days do the following descriptions apply? Please write a number between 0 and 3 next to each item based on where your baby was when they were sleeping.

		Number of nights
a)	My baby is not yet born	________
b)	My baby is currently in hospital	________
c)	My baby slept in a cot	________
d)	My baby slept in a cot and then in my bed	________
e)	My baby slept in my bed and then in a cot	________
f)	My baby slept in my bed	________
g)	My baby slept somewhere other than a bedroom and then slept in a cot	________
h)	My baby slept somewhere other than a bedroom and then slept in my bed	________
i)	My baby slept somewhere other than a cot or my bed	
	Total nights (should equal 3)	

2. Please read each statement carefully. Circle the item that most expresses your feelings about the statement: strongly agree (SA), agree (A), disagree (D), or strongly disagree (SD).

It is difficult to judge when babies need to sleep	SA	A	D	SD
Babies can have a good night's sleep regardless of scheduling	SA	A	D	SD
Strict sleeping routines prevent parent(s) from enjoying their child.	SA	A	D	SD
Babies wake and return to sleep during the night regardless of what parent(s) do	SA	A	D	SD
I should be able to hear my baby during the night	SA	A	D	SD
Sleeping schedules make babies unhappy	SA	A	D	SD
It is important to introduce a sleeping schedule as early as possible	SA	A	D	SD
Babies benefit from a quiet room to sleep	SA	A	D	SD
Babies benefit from a fixed napping/sleeping schedule	SA	A	D	SD
Some days, babies need more or less sleep than other days	SA	A	D	SD
Babies benefit from physical contact with parent(s) when they wake during the night	SA	A	D	SD
When babies cry in the night to check if someone is near, it is best to leave them	SA	A	D	SD

B. When and what your baby eats

1. i) How are you feeding your baby? Please tick <u>all</u> that apply.

My baby is not yet born	________	Expressed breast milk	________
My baby is in hospital	________	Milk-bank	________
Breast	________	Solid food	________
Formula	________		

ii) For each day in the last 3 days, please estimate how long you fed your baby for in total when you were around (do not include times when your baby was at, for example, childcare).

	Estimated time
My baby is not yet born	________________
My baby is in hospital	________________
Day 1 (yesterday)	________________
Day 2 (2 days ago)	________________
Day 3 (3 days ago)	________________
Units (please circle)	minutes/hours

2. Please read each statement carefully. Circle the item that most expresses your feelings about the statement: strongly agree (SA), agree (A), disagree (D), or strongly disagree (SD).

Babies' feeding/eating patterns change naturally with age	SA	A	D	SD
Implementing feeding/eating schedules leads to a calm and content baby	SA	A	D	SD
Feeding/eating routines are difficult to follow	SA	A	D	SD
One danger of feeding/eating schedules is that babies might not get enough to eat	SA	A	D	SD
Parent(s) should find a pattern of feeding/eating that suits the baby	SA	A	D	SD
Baby-led feeding leads to behavioural and sleep problems	SA	A	D	SD
Following feeding/eating routines prevents parent(s) from enjoying parenthood to the full	SA	A	D	SD
It is important to introduce a feeding/eating schedule as early as possible	SA	A	D	SD
Offering milk/food to a baby is a good way to test whether she/he is hungry	SA	A	D	SD
Babies don't know when they are hungry	SA	A	D	SD
Babies will eat whenever milk/food is offered even if they are not hungry	SA	A	D	SD

Babies will not follow feeding/eating schedules	SA	A	D	SD

C. When and why your baby cries

1. i) For each day in the last 3 days, please estimate how long your baby cried for in total when you were around (do not include times when your baby was at, for example, childcare).

	Estimated time
My baby is not yet born	________________
My baby is in hospital	________________
Day 1 (yesterday)	________________
Day 2 (2 days ago)	________________
Day 3 (3 days ago)	________________
Units (please circle)	minutes/hours

ii) For each day in the last 3 days, please estimate how long you held/carried your baby for in total when you were around (do not include times when your baby was at, for example, childcare).

	Estimated time
My baby is not yet born	________________
My baby is in hospital	________________
Day 1 (yesterday)	________________
Day 2 (2 days ago)	________________
Day 3 (3 days ago)	________________
Units (please circle)	minutes/hours

2. Please read each statement carefully. Circle the item that most expresses your feelings about the statement: strongly agree (SA), agree (A), disagree (D), or strongly disagree (SD).

Babies with regular schedules spend less time crying	SA	A	D	SD

Babies cry no matter what their routines	SA	A	D	SD
Parent(s) should delay responding to a crying baby	SA	A	D	SD
Routines lead to more crying	SA	A	D	SD
It is not possible to know why a baby is crying	SA	A	D	SD
It is a good idea to have a set time you leave a baby to calm herself/himself down, and increase this amount of time each week	SA	A	D	SD
Physical contact such as stroking or rocking helps a baby to be calm	SA	A	D	SD
Holding babies frequently during the day makes them more demanding	SA	A	D	SD
Responding quickly to a crying baby leads to less crying in the long run	SA	A	D	SD
Having a set routine helps an upset baby calm down	SA	A	D	SD
Babies with regular schedules cry just as much as babies without regular schedules	SA	A	D	SD
Leaving a baby to cry can cause emotional insecurity	SA	A	D	SD

D. Some additional information

1. Have you read any books about parenting?

(Yes/No)

2. If yes, what one book do you most rely on? ________________________

E. Comments?

Do you have any comments about this questionnaire, in general, or any individual questions?

Scoring procedure

Scale scores for the Baby Care Questionnaire represent the mean score of all scale items. Scales' scores are to be computed by the following method:

1. Assign all ratings a numerical response:
   SD – 1 D – 2 A – 3 SA – 4
2. Sum all numerical item responses for a given scale. Note that:
   a. If caregiver omitted an item, that item receives no numerical score;
   b. Items indicated with an R are reverse items and must be scored in the following way:

   4 becomes 1 3 becomes 2 2 becomes 3 1 becomes 4
3. Divide the total by the number of items receiving a numerical response. Do not include items receiving no response in determining the number of items.

   For example, given a sum of 47 for a scale of 18 items, with 3 items receiving no response and 15 items receiving a numerical response, 47/15 = 3.13 for the scale score.

Users of SPSS can copy the following commands into a syntax file to reverse items and calculate scale scores. The syntax assumes that items are titled “S1”, “S2”, etc. for sleeping items, “E1”, “E2”, etc. for feeding items, and “So1”, “So2”, etc. for soothing items. <u>It is also assumed that no score was entered when caregivers omitted an item.</u>

```
COMPUTE S1r = (5-S1).
COMPUTE S2r = (5-S2).
COMPUTE S3r = (5-S3).
COMPUTE S6r = (5-S6).
COMPUTE S12r = (5-S12).
COMPUTE E6r = (5-E6).
COMPUTE E10r = (5-E10).
COMPUTE E11r = (5-E11).
COMPUTE E4r = (5-E4).
COMPUTE E7r = (5-E7).
COMPUTE E12r = (5-E12).
COMPUTE So7r = (5-So7).
COMPUTE So9r = (5-So9).
COMPUTE So12r = (5-So12).
COMPUTE So6r = (5-So6).
COMPUTE So8r = (5-So8).
COMPUTE So10r = (5-So10).
COMPUTE So15r = (5-So15).

COMPUTE structure = mean (S7, S8, S9, S1r, S2r, S3r, S6r, E2, E3, E8, E4r, E7r,
E12r, So5, So14, So6r, So8r, So15r).
COMPUTE attunement = mean (S5, S10, S11, S12r, E1, E5, E9, E6r, E10r, E11r,
So11, So13, So16, So7r, So9r, So10r, So12r).

EXECUTE.
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Appendix 2. The Concepts of Development Questionnaire

Arnold J. Sameroff and Leslie A. Feil
University of Michigan

This questionnaire asks for your opinions about different aspects of child rearing. Please give your own opinions and do not worry about what others may think. You will probably agree with some statements and disagree with others. There are no right or wrong answers to these questions since they are all matters of opinion.

Read each item carefully and, when you are sure you understand it, place a tick in the space which best expresses your feelings about the statement. Do not spend much time on any item. Try to answer every question.

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Children have to be treated differently as they grow older.	[ ]	[ ]	[ ]	[ ]
2. Parents must keep to their standards and rules no matter what their child is like.	[ ]	[ ]	[ ]	[ ]
3. It is not easy to define a good home because it is made up of many different things.	[ ]	[ ]	[ ]	[ ]
4. Fathers cannot raise their children as well as mothers.	[ ]	[ ]	[ ]	[ ]
5. The mischief that 2-year-olds get into is part of a passing stage they'll grow out of.	[ ]	[ ]	[ ]	[ ]
6. A child who isn't toilet trained by 3-years-old must have something wrong with him.	[ ]	[ ]	[ ]	[ ]
7. Parents need to be sensitive to the needs of their children.	[ ]	[ ]	[ ]	[ ]
8. Girls tend to be easier babies to take care of than boys.	[ ]	[ ]	[ ]	[ ]
9. Difficult babies will grow out of it.	[ ]	[ ]	[ ]	[ ]

		Strongly Disagree	Disagree	Agree	Strongly Agree
10.	There is not much anyone can do to help children who have emotional problems.	[ ]	[ ]	[ ]	[ ]
11.	Children's problems seldom have a single cause.	[ ]	[ ]	[ ]	[ ]
12.	The father's role is to provide the discipline in the family and the mother's role is to give love and attention to the children.	[ ]	[ ]	[ ]	[ ]
13.	Parents can be irritated by a fussy child so that they are unable to be as nice as they would like to be.	[ ]	[ ]	[ ]	[ ]
14.	Children's success at school depends on how much their parent(s) teach them at home.	[ ]	[ ]	[ ]	[ ]
15.	There is no one right way to raise children.	[ ]	[ ]	[ ]	[ ]
16.	Boy babies are less affectionate than girl babies.	[ ]	[ ]	[ ]	[ ]
17.	First-born children are usually treated differently than later-born children.	[ ]	[ ]	[ ]	[ ]
18.	An easy baby will grow up to be a good child.	[ ]	[ ]	[ ]	[ ]
19.	Parents change in response to their children.	[ ]	[ ]	[ ]	[ ]
20.	Babies have to be taught to behave themselves or they will be naughty later on.	[ ]	[ ]	[ ]	[ ]

Scoring procedure

Scale scores for the Concepts of Development represent the mean score of all scale items. Scales' scores are to be computed by the following method:

1. Assign all ratings a numerical response:
   SD – 1 D – 2 A – 3 SA – 4
2. Sum all numerical item responses for a given scale. Note that if caregiver omitted an item, that item receives no numerical score;
3. Divide the total by the number of items receiving a numerical response. Do not include items receiving no response in determining the number of items.

   For example, given a sum of 47 for a scale of 20 items, with 5 items receiving no response and 15 items receiving a numerical response, 47/15 = 3.13 for the scale score.

Users of SPSS can copy the following commands into a syntax file to calculate scale scores. The syntax assumes that items are titled "P1_CODQ", "P3_CODQ", etc. for perspectivist items, "C2_CODQ", "C4_CODQ", etc. for categorical items. <u>It is also assumed that no score was entered when caregivers omitted an item.</u>

```
COMPUTE perspectivist = mean (P1_CODQ, P3_CODQ, P5_CODQ, P7_CODQ,
P9_CODQ, P11_CODQ, P13_CODQ, P15_CODQ, P17_CODQ, P19_CODQ).
COMPUTE categorical = mean (C2_CODQ, C4_CODQ, C6_CODQ, C8_CODQ,
C10_CODQ, C12_CODQ, C14_CODQ, C16_CODQ, C18_CODQ, C20_CODQ).

COMPUTE complexity = (perspectivist - categorical + 3.0) /     2

EXECUTE.
```

Appendix 3. The Cardiff Antenatal Inventory

Your Details

Baby's name: ______________________________ Male/Female

Name: ____

Address: ____

____

____

_______________ Postcode: _______________

Telephone: ____

E-mail: ____

Date: ____

This sheet will be detached; this means that your answers to the inventory will be anonymous. Your child's initials and date of birth will not be used to trace your answers but will be used to generate an anonymity code for you.

Your initials: __________ Your child's initials: __________

This Pregnancy

1) Standard prenatal care includes one introductory appointment, two scans in the hospital, and 10 appointments with a midwife in a GP surgery. During this pregnancy, was the prenatal care you received:

   (Please circle one)

   a. Standard

   b. More than standard

   c. Less than standard

   If you circled b or c, please provide a brief description of how and why your prenatal care differed from the standard prenatal care.

   ____

   ____

2) Did you experience any problems or complications during this pregnancy? Yes/No

   If yes, please circle any of the following relevant items:

   Uterine cramping, vaginal bleeding (spotting), or vaginal leakage of fluid; infections, rashes, fever over 101 degrees; ultrasound abnormalities detected; exposure to occupational, chemical, or other hazards; a serious accident such as a road traffic accident.

3) During this pregnancy, how often did you (please tick the most relevant box for each trimester: 1 – never, 2 – occasionally, 3 – usually, 4 - always):

	First Trimester				Second Trimester				Third Trimester			
	1	2	3	4	1	2	3	4	1	2	3	4
Eat a diet with a range of foods from each food group (including 5 portions of fruit and veg a day)	□	□	□	□	□	□	□	□	□	□	□	□
Drink caffeinated drinks in excess of three mugs of coffee, or six cups of teas, or eight cans of coke, or a combination of these	□	□	□	□	□	□	□	□	□	□	□	□
Drink more than two units of alcohol in one day	□	□	□	□	□	□	□	□	□	□	□	□
Smoke cigarettes	□	□	□	□	□	□	□	□	□	□	□	□
Have someone else in your household	□	□	□	□	□	□	□	□	□	□	□	□

smoke cigarettes			
Use recreational drugs	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐

The Delivery

4) Did you experience any problems or complications during labour and delivery? Yes/No

If yes, please explain: ____

____

____

The information required to answer the next two questions will be included in the documents given to you when you were discharged from hospital.

5) At birth, what was your baby's:
   a. Gestational age? ____________ weeks
   b. Due date: __________________ Delivery Date: _________________
   c. Weight? ___________________ grams
   d. Length? ___________________ cm

6) What were your baby's Apgar scores?
   a. 5 mins: ______________
   b. 10 mins: _____________

Previous Pregnancies

7) How many previous pregnancies have you had? _____________________

8) How many of those were:
   a. Full-term births (delivered after 37 completed weeks of gestation)? ___________
   b. Preterm births (delivered before 37 completed weeks of gestation)? ___________
   c. Stillbirths or miscarriages? ______________
   d. Elective abortions? ______________

9) How many siblings does your new baby have? ________________

10) What are the age and gender of these siblings?

Sibling 1:	Male/female	Age: ______	Sibling 4:	Male/female	Age: ______
Sibling 2:	Male/female	Age: ______	Sibling 5:	Male/female	Age: ______
Sibling 3:	Male/female	Age: ______	Sibling 6:	Male/female	Age: ______

11) Do you have any reason to believe that your child may be at genetic risk for any physical or psychological difficulties (please circle one)?

Yes/No

If yes, please provide details: ____

____

____

Parenting Support

12) Have you taken any antenatal education classes?

Yes/No

If yes, which class? ____

____

13) Do you feel you were getting the support and help you need as a parent?

□ Never □ Rarely □ Sometimes □ Usually □ Always

14) What are your plans for your baby's childcare over the coming year? Please provide an estimate of the number of days per week for each type of childcare you are anticipating using.

At home with one or both parents	__________	Half Day(s)	__________	Full Day(s)
At a childminder's house	__________	Half Day(s)	__________	Full Day(s)
At nursery or crèche	__________	Half Day(s)	__________	Full Day(s)

15) Using the 5-point scale below, rate the support you currently receive by each group of people/resources. For categories that include more than one person (for example, friends and neighbours) enter the number that best represents the average helpfulness of that resource.

	Not used	Of little or no help		Moderately or occasionally helpful		Very helpful
	0	1	2	3	4	5
The child's father	◻	◻	◻	◻	◻	◻
My family and relatives	◻	◻	◻	◻	◻	◻
The family and relatives of the child's father	◻	◻	◻	◻	◻	◻
Health visitor/midwife/ services at your local surgery	◻	◻	◻	◻	◻	◻
Friends or neighbours	◻	◻	◻	◻	◻	◻
Organised groups including childcare, playgroups and classes	◻	◻	◻	◻	◻	◻
Books, magazines, newspapers	◻	◻	◻	◻	◻	◻

Demographic Information

	You	Baby's father
Age	____________________	____________________
Occupation	____________________	____________________
Marital Status	____________________	____________________
Ethnicity	____________________	____________________

16) What is your postcode? ____________________

17) Please check the item below that accurately describes the level of education currently attained (or equivalent) for you and the baby's father:

	You	Baby's Father
GCSE/key skills level 1 or 2/ NVQ level 1 or 2	◻	◻
A-level/key skills level 3/ NVQ level 3 or 4	◻	◻
Bachelors degree	◻	◻
Postgraduate qualification	◻	◻

18) Please circle the item below that accurately describes your family income.

a. Less than £14,999
b. £15,000 to £39,999
c. Over £40,000

19) Which language is spoken most of the time in your house? ___________________

20) Which other languages will you or other caregivers speak with your child? ______

____

Appendix 4. The Infant Behaviour Questionnaire

Mary K. Rothbart

Maria A. Gartstein

Infant Behavior Questionnaire – Revised

Subject No. ________________ Date of Baby's Birth ______ ____ _____

month. day year

Today's Date ________________ Age of Child _____ _____

mos. weeks

Sex of Child ________________

INSTRUCTIONS:

Please read carefully before starting:

As you read each description of the baby's behavior below, please indicate how often the baby did this during the LAST WEEK (the past seven days) by circling one of the numbers in the left column. These numbers indicate how often you observed the behavior described during the last week.

(1) Never	(2) Very Rarely	(3) Less Than Half the Time	(4) About Half the Time	(5) More Than Half the Time	(6) Almost Always	(7) Always	(X) Does Not Apply

The "Does Not Apply" (X) column is used when you did not see the baby in the situation described during the last week. For example, if the situation mentions the baby having to wait for food or liquids and there was no time during the last week when the baby had to wait, circle the (X) column. "Does Not Apply" is different from "Never" (1). "Never" is used when you saw the baby in the situation but the baby never engaged in the behavior listed during the last week. For example, if the baby did have to wait for food or liquids at least once but never cried loudly while waiting, circle the (1) column.

Please be sure to circle a number for <u>every</u> item.

(1) Never	(2) Very Rarely	(3) Less Than Half the Time	(4) About Half the Time	(5) More Than Half the Time	(6) Almost Always	(7) Always	(X) Does Not Apply

One Week Time Span

How often did your baby:

1 2 3 4 5 6 7 X . . . . (1) make talking sounds when s/he was ready for more food?

1 2 3 4 5 6 7 X . . . . (2) seem angry (crying and fussing) when you left her/him in the crib?

1 2 3 4 5 6 7 X . . . . (3) seem contented when left in the crib?

1 2 3 4 5 6 7 X . . . . (4) cry or fuss before going to sleep for naps?

1 2 3 4 5 6 7 X . . . . (5) look at pictures in books and/or magazines for 5 minutes or longer at a time?

1 2 3 4 5 6 7 X . . . . (6) stare at a mobile, crib bumper or picture for 5 minutes or longer?

1 2 3 4 5 6 7 X . . . . (7) play with one toy or object for 5-10 minutes?

1 2 3 4 5 6 7 X . . . . (8) play with one toy or object for 10 minutes or longer?

1 2 3 4 5 6 7 X . . . . (9) laugh aloud in play?

1 2 3 4 5 6 7 X . . . . (10) repeat the same movement with an object for 2 minutes or longer (e.g., putting a block in a cup, kicking or hitting a mobile)?

1 2 3 4 5 6 7 X . . . . (11) smile or laugh after accomplishing something (e.g., stacking blocks, etc.)?

1 2 3 4 5 6 7 X . . . . (12) smile or laugh when given a toy?

1 2 3 4 5 6 7 X . . . . (13) enjoy being read to?

1 2 3 4 5 6 7 X . . . . (14) enjoy hearing the sound of words, as in nursery rhymes?

1 2 3 4 5 6 7 X . . . . (15) enjoy gentle rhythmic activities, such as rocking or swaying?

1 2 3 4 5 6 7 X . . . . (16) enjoy being tickled by you or someone else in your family?

1 2 3 4 5 6 7 X . . . . (17) enjoy the feel of soft blankets ?

1 2 3 4 5 6 7 X . . . . (18) enjoy being rolled up in a warm blanket?

1 2 3 4 5 6 7 X . . . . (19) enjoy listening to a musical toy in a crib?

1 2 3 4 5 6 7 X . . . . (20) look up from playing when the telephone rang?

1 2 3 4 5 6 7 X . . . . (21) protest being placed in a confining place (infant seat, play pen, car seat, etc.)?

1 2 3 4 5 6 7 X . . . . (22) startle at a sudden change in body position (for example, when moved suddenly)?

1 2 3 4 5 6 7 X . . . . (23) move quickly toward new objects?

1 2 3 4 5 6 7 X . . . . (24) show a strong desire for something s/he wanted?

1 2 3 4 5 6 7 X . . . . (25) watch adults performing household activities (e.g., cooking, etc.) for more than 5 minutes?

1 2 3 4 5 6 7 X . . . . (26) squeal or shout when excited?

1 2 3 4 5 6 7 X . . . . (27) notice low-pitched noises (e.g. air conditioner, heating system, or refrigerator running or starting up)?

1 2 3 4 5 6 7 X . . . . (28) notice a change in light when a cloud passed over the sun?

1 2 3 4 5 6 7 X . . . . (29) notice the sound of an airplane passing overhead?

1 2 3 4 5 6 7 X . . . . (30) notice a bird or a squirrel up in a tree?

1 2 3 4 5 6 7 X . . . . (31) notice fabrics with scratchy texture (e.g., wool)?

1 2 3 4 5 6 7 X . . . . (32) appear sad for no apparent reason?

<u>During feeding, how often did the baby:</u>

1 2 3 4 5 6 7 X . . . . (33) lie or sit quietly?

1 2 3 4 5 6 7 X . . . . (34) squirm or kick?

1 2 3 4 5 6 7 X . . . . (35) wave his/her arms?

<u>When going to sleep at night, how often did your baby:</u>

1 2 3 4 5 6 7 X . . . . (36) fall asleep within 10 minutes?

1 2 3 4 5 6 7 X . . . . (37) have a hard time settling down to sleep?

1 2 3 4 5 6 7 X . . . . (38) settle down to sleep easily?

<u>When being dressed or undressed during the last week, how often did the baby:</u>

1 2 3 4 5 6 7 X . . . . (39) squirm and/or try to roll away?

1 2 3 4 5 6 7 X . . . . (40) smile or laugh?

1 2 3 4 5 6 7 X . . . . (41) coo or vocalize?

When put into the bath water, how often did the baby:

1 2 3 4 5 6 7 X . . . . (42) smile?

1 2 3 4 5 6 7 X . . . . (43) laugh?

When tossed around playfully how often did the baby:

1 2 3 4 5 6 7 X . . . . (44) smile?

1 2 3 4 5 6 7 X . . . . (45) laugh?

During a peekaboo game, how often did the baby:

1 2 3 4 5 6 7 X . . . . (46) smile?

1 2 3 4 5 6 7 X . . . . (47) laugh?

How often did your baby enjoy bouncing up and down:

1 2 3 4 5 6 7 X . . . . (48) while on your lap?

1 2 3 4 5 6 7 X . . . . (49) on an object, such as a bed, bouncer chair, or toy?

When being held, how often did the baby:

1 2 3 4 5 6 7 X . . . . (50) pull away or kick?

1 2 3 4 5 6 7 X . . . . (51) seem to enjoy him/herself?

When the baby wanted something, how often did s/he:

1 2 3 4 5 6 7 X . . . . (52) become upset when s/he could not get what s/he wanted?

1 2 3 4 5 6 7 X . . . . (53) have tantrums (crying, screaming, face red, etc.) when s/he did not get what s/he wanted?

When placed in an infant seat or car seat, how often did the baby:

1 2 3 4 5 6 7 X . . . . (54) wave arms and kick?

1 2 3 4 5 6 7 X . . . . (55) squirm and turn body?

How often did your baby make talking sounds when:

1 2 3 4 5 6 7 X . . . . (56) riding in a car?

1 2 3 4 5 6 7 X . . . . (57) riding in a shopping cart?

1 2 3 4 5 6 7 X . . . . (58) you talked to her/him?

When rocked or hugged, in the last week, how often did your baby:

1 2 3 4 5 6 7 X . . . . (59) seem to enjoy her/himself?

1 2 3 4 5 6 7 X . . . . (60) seem eager to get away?

1 2 3 4 5 6 7 X . . . . (61) While being fed in your lap, how often did the baby seem eager to get away as soon as the feeding was over?

1 2 3 4 5 6 7 X . . . . (62) After sleeping, how often did the baby cry if someone didn't come within a few minutes?

1 2 3 4 5 6 7 X . . . . (63) When put down for a nap, how often did your baby settle down quickly?

1 2 3 4 5 6 7 X . . . . (64) When it was time for bed or a nap and your baby did not want to go, how often did s/he whimper or sob?

1 2 3 4 5 6 7 X . . . . (65) When face was washed, how often did the baby smile or laugh?

1 2 3 4 5 6 7 X . . . . (66) When hair was washed, how often did the baby vocalize?

1 2 3 4 5 6 7 X . . . . (67) When playing quietly with one of her/his favorite toys, how often did your baby enjoy lying in the crib for more than 5 minutes?

1 2 3 4 5 6 7 X . . . . (68) When your baby saw a toy s/he wanted, how often did s/he get very excited about getting it?

1 2 3 4 5 6 7 X . . . . (69) When given a new toy, how often did your baby immediately go after it?

1 2 3 4 5 6 7 X . . . . (70) When placed on his/her back, how often did the baby squirm and/or turn body?

1 2 3 4 5 6 7 X . . . . (71) When frustrated with something, how often did your baby calm down within 5 minutes?

1 2 3 4 5 6 7 X . . . . (72) When your baby was upset about something, how often did s/he stay upset for up to 20 minutes or longer?

1 2 3 4 5 6 7 X . . . . (73) When being carried, how often did your baby push against you until put down?

1 2 3 4 5 6 7 X . . . . (74) When tired, how often did your baby show distress?

1 2 3 4 5 6 7 X . . . . (75) At the end of an exciting day, how often did your baby become tearful?

Two Week Time Span

When introduced to an unfamiliar adult, how often did the baby:

1 2 3 4 5 6 7 X . . . . (76) cling to a parent?

1 2 3 4 5 6 7 X . . . . (77) refuse to go to the unfamiliar person?

1 2 3 4 5 6 7 X . . . . (78) never "warm up" to the unfamiliar adult?

When you were busy with another activity and your baby was not able to get your attention, how often did s/he:

1 2 3 4 5 6 7 X . . . . (79) become sad?

1 2 3 4 5 6 7 X . . . . (80) cry?

When singing or talking to your baby, how often did s/he:

1 2 3 4 5 6 7 X . . . . (81) soothe immediately?

1 2 3 4 5 6 7 X . . . . (82) take more than 10 minutes to soothe?

When showing the baby something to look at, how often did s/he:

1 2 3 4 5 6 7 X . . . . (83) soothe immediately?

1 2 3 4 5 6 7 X . . . . (84) take more than 10 minutes to soothe?

When patting or gently rubbing some part of the baby's body, how often did s/he:

1 2 3 4 5 6 7 X . . . . (85) soothe immediately?

1 2 3 4 5 6 7 X . . . . (86) take more than 10 minutes to soothe?

1 2 3 4 5 6 7 X . . . . (87) When in the presence of several unfamiliar adults, how often did the baby continue to be upset for 10 minutes or longer?

1 2 3 4 5 6 7 X . . . . (88) When visiting a new place, how often did the baby get excited about exploring new surroundings?

1 2 3 4 5 6 7 X . . . . (89) When an unfamiliar adult came to your home or apartment, how often did your baby cry when the visitor attempted to pick her/him up?

1 2 3 4 5 6 7 X . . . . (90) When familiar relatives/friends came to visit, how often did your baby get excited?

1 2 3 4 5 6 7 X . . . . (91) When rocking your baby, how often did s/he take more than 10 minutes to soothe?

Scoring procedure

INFANT BEHAVIOR QUESTIONNAIRE - REVISED - SHORT FORM

Scale scores for the Infant Behavior Questionnaire - Revised - Short From represent the mean score of all scale items applicable to the child, as judged by the caregiver. Scales' scores are to be computed by the following method:

1. Sum all numerical item responses for a given scale. Note that:

a) If caregiver omitted an item, that item receives no numerical score;

b) If caregiver checked the "does not apply" response option for an item, that item receives no numerical score;

c) Items indicated with an R are reverse items and must be scored in the following way:

7 becomes 1	3 becomes 5
6 becomes 2	2 becomes 6
5 becomes 3	1 becomes 7
4 remains 4	

2. Divide the total by the number of items receiving a numerical response. Do not include items marked "does not apply (N/A)" or items receiving no response in determining the number of items.

For example, given a sum of 47 for a scale of 12 items, with one item receiving no response, two items marked "does not apply," and 9 items receiving a numerical response, the sum of 47 would be divided by 9 to yield a mean of 5.22 for the scale score.

Note: Most statistics programs will carry out these steps for you. Users of SPSS can copy the following commands into a syntax file to reverse items and calculate scale scores. The syntax assumes that items are titled “ibq1”, “ibq2”, “ibq3”, etc. It is also assumed that no score was entered when caregivers omitted an item or checked “Does not apply”.

```
COMPUTE ibq33r = (8-ibq33).
COMPUTE ibq3r = (8-ibq3).
COMPUTE ibq82r = (8-ibq82).
COMPUTE ibq84r = (8-ibq84).
COMPUTE ibq86r = (8-ibq86).
COMPUTE ibq91r = (8-ibq91).
COMPUTE ibq37r = (8-ibq37).
COMPUTE ibq72r = (8-ibq72).
```

```
COMPUTE ibq61r = (8-ibq61).
COMPUTE ibq50r = (8-ibq50).
COMPUTE ibq60r = (8-ibq60).
COMPUTE ibq73r = (8-ibq73).

COMPUTE act = mean (ibq33r, ibq34, ibq35, ibq39, ibq54, ibq55, ibq70).
COMPUTE dist = mean (ibq2, ibq3r, ibq4, ibq21, ibq52, ibq53, ibq62).
COMPUTE fear = mean (ibq22, ibq76, ibq77, ibq78, ibq87, ibq89).
COMPUTE dura = mean (ibq5, ibq6, ibq7, ibq8, ibq10, ibq25).
COMPUTE smil = mean (ibq9, ibq11, ibq12, ibq40, ibq42, ibq43, ibq65).
COMPUTE hip = mean (ibq16, ibq44, ibq45, ibq46, ibq47, ibq48, ibq49).
COMPUTE lip = mean (ibq13, ibq14, ibq15, ibq17, ibq18, ibq19, ibq67).
COMPUTE soot = mean (ibq81, ibq82r, ibq83, ibq84r, ibq85, ibq86r, ibq91r).
COMPUTE fall = mean (ibq36, ibq37r, ibq38, ibq63, ibq71, ibq72r).
COMPUTE cudd = mean (ibq61r, ibq50r, ibq51, ibq59, ibq60r, ibq73r).
COMPUTE perc = mean (ibq20, ibq27, ibq28, ibq29, ibq30, ibq31).
COMPUTE sad = mean (ibq64, ibq74, ibq75, ibq32, ibq79, ibq80).
COMPUTE app = mean (ibq23, ibq24, ibq68, ibq69, ibq88, ibq90).
COMPUTE voc = mean (ibq1, ibq26, ibq41, ibq56, ibq57, ibq58, ibq66).

COMPUTE SUR = mean (app, voc, hip, smil, act, perc).
COMPUTE NEG = mean (sad, dist, fear, (8-fall)).
COMPUTE REG = mean (lip, cudd, dura, soot).

EXECUTE.
```

Infant Behavior Questionnaire - Revised - Short Form:

Items by Scale

<u>I. Activity Level</u>

Definition: Baby's gross motor activity, including movement of arms and legs, squirming, and locomotor activity.

Feeding: <u>During feeding, how often did the baby:</u>

33R lie or sit quietly?

34 squirm or kick?

35 wave arms?

Bathing and Dressing: When being dressed or undressed during the last week, how often did the baby:

39 squirm and/or try to roll away?

Daily Activities: When placed in an infant seat or car seat, how often did the baby:

54 wave arms and kick?

55 squirm and turn body?

When placed on his/her back, how often did the baby:

70 squirm and/or turn body?

II. Distress to Limitations

Definition: Baby's fussing, crying or showing distress while a) in a confining place or position; b) involved in caretaking activities; c) unable to perform a desired action.

How often did the baby:

2 seem angry (crying and fussing) when you left her/him in the crib?

3R seem contented when left in the crib?

4 cry or fuss before going to sleep for naps?

Daily Activities: How often during the last week did the baby:

21 protest being placed in a confining place (infant seat, play pen, car seat, etc.)?

When the baby wanted something, how often did s/he:

52 become upset when s/he could not get what s/he wanted?

53 have tantrums (crying, screaming, face red, etc.) when s/he did not get what s/he wanted?

Sleeping: After sleeping, how often did the baby:

62 cry if someone doesn't come within a few minutes?

III. Fear

Definition: The baby's startle or distress to sudden changes in stimulation, novel physical objects or social stimuli; inhibited approach to novelty.

Daily Activities: How often during the last week did the baby:

22 startle at a sudden change in body position (e.g., when moved suddenly)?

Two Week Time Span

When introduced to an unfamiliar adult, how often did the baby:

76 cling to a parent?

77 refuse to go to the unfamiliar person?

78 never "warm up" to the unfamiliar adult?

When in the presence of several unfamiliar adults, how often did the baby:

87 continue to be upset for 10 minutes or longer?

When an unfamiliar person came to your home or apartment, how often did your baby:

89 cry when the visitor attempted to pick her/him up?

IV. Duration of Orienting

Definition: The baby's attention to and/or interaction with a single object for extended periods of time.

Play: How often during the last week did the baby:

5 look at pictures in books and/or magazines for 5 minutes or longer at a time?

6 stare at a mobile, crib bumper or picture for 5 minutes or longer?

7 play with one toy or object for 5-10 minutes?

8 play with one toy or object for 10 minutes or longer?

10 repeat the same movement with an object for 2 minutes or longer (e.g., putting a block in a cup, kicking or hitting a mobile)?

Daily Activities: How often during the last week did the baby:

25 watch adults performing household activities (e.g., cooking, etc.) for more than 5 minutes?

V. Smiling and Laughter

Definition: Smiling or laughter from the child in general caretaking and play situations.

Play: How often during the last week did the baby:

9 laugh aloud in play?

11 smile or laugh after accomplishing something (e.g., stacking blocks, etc.)?

12 smile or laugh when given a toy?

Bathing and Dressing: When being dressed or undressed during the last week, how often did the baby:

40 smile or laugh?

When put into the bath water, how often did the baby:

42 smile?

43 laugh?

When face was washed, how often did the baby:

65 smile or laugh?

VI. High Pleasure

Definition: Amount of pleasure or enjoyment related to high stimulus intensity, rate, complexity, novelty, and incongruity.

Two Week Time Span

How often during the last week did your baby enjoy:

16 being tickled by you or someone else in your family?

When tossed around playfully how often did the baby:

44 smile?

45 laugh?

During a peekaboo game, how often did the baby:

46 smile?

47 laugh?

How often did your baby enjoy bouncing up and down:

48 while on your lap?

49 on an object, such as a bed, bouncer chair, or toy?

VII. Low Pleasure

Definition: Amount of pleasure or enjoyment related to low stimulus intensity, rate, complexity, novelty, and incongruity.

Play: How often during the last week did the baby enjoy:

13 being read to?

14 hearing the sound of words, as in nursery rhymes?

15 gentle rhythmic activities, such as rocking or swaying?

17 the feel of soft blankets?

18 being rolled up in a warm blanket?

19 listening to a musical toy in a crib?

When playing quietly with one of her/his favorite toys, how often did your baby:

67 enjoyed lying in the crib for more than 5 minutes?

VIII. Soothability

Definition: Baby's reduction of fussing, crying, or distress when soothing techniques are used by the caretaker.

Two Week Time Span

When singing or talking to your baby, how often did s/he:

81 soothe immediately?

82R take more than 10 minutes to soothe?

When showing the baby something to look at, how often did s/he:

83 soothe immediately?

84R take more than 10 minutes to soothe?

When patting or gently rubbing some part of the baby’s body, how often did s/he:

85 soothe immediately?

86R take more than 10 minutes to soothe?

When rocking your baby, how often did s/he:

91R take more than 10 minutes to soothe?

IX. Falling Reactivity/Rate of Recovery from Distress

Definition: Rate of recovery from peak distress, excitement, or general arousal; ease of falling asleep.

Sleep: When going to bed at night, how often does your baby:

36 fall asleep within 10 minutes?

37R have a hard time settling down to sleep?

38 settle down to sleep easily?

When put down for a nap, how often did your baby:

63 settle down quickly?

Daily Activities: When frustrated with something, how often did your baby:

71 calm down within 5 minutes?

When your baby was upset about something, how often did s/he:

72R stay upset for up to 20 minutes or longer?

X. Cuddliness

Definition: The baby's expression of enjoyment and molding of the body to being held by a caregiver.

Feeding: In the last week, while being fed in your lap, how often did the baby:

61R seem eager to get away as soon as the feeding was over?

Daily Activities: When being held, how often did the baby:

50R pull away or kick?

51 seem to enjoy him/herself?

When rocked or hugged, in the last week, did your baby:

59 seem to enjoy him/herself?

60R seemed eager to get away?

When being carried, in the last week, how often did the baby:

73R push against you until put down?

XI. Perceptual Sensitivity

Definition: Amount of detection of slight, low intensity stimuli from the external environment.

Play: How often does the infant look up from playing:

20 when the telephone rang?

How often did your baby notice:

27 low-pitched noises (e.g., air conditioner, heating system, or refrigerator running or starting up)?

28 a change in light when a cloud passed over the sun?

29 sound of an airplane passing overhead?

30 a bird or squirrel up in a tree?

31 fabrics with scratchy texture (e.g., wool)?

XII. Sadness

New Definition: General low mood; lowered mood and activity specifically related to personal suffering, physical state, object loss, or inability to perform a desired action.

Sleeping: When it was time for bed or a nap and your baby did not want to go, how often did s/he:

64 whimper or sob?

Daily Activities: When tired, how often was your baby:

74 show distress?

At the end of an exciting day, how often did your baby:

75 become tearful?

For no apparent reason, how often did your baby:

32 appear sad?

Two Week Time Span

When you were busy with another activity, and your baby was not able to get your attention, how often did s/he:

79 become sad?

80 cry?

XIII. Approach

Definition: Rapid approach, excitement, and positive anticipation of pleasurable activities.

Daily Activities: How often during the week did your baby:

23 move quickly toward new objects?

24 show a strong desire for something s/he wanted?

Play: When your baby saw a toy s/he wanted, how often did s/he:

68 get very excited about getting it?

When given a new toy, how often did the baby:

69 immediately go after it?

Two Week Time Span

When visiting a new place, how often did your baby:

88 get excited about exploring new surroundings?

When familiar relatives/friends visited, how often did the baby:

90 get excited?

XIV. Vocal Reactivity

Definition: amount of vocalization exhibited by the baby in daily activities.

Feeding: How often did your baby make talking sounds:

1 when s/he was ready for more food?

Daily Activities: How often during the last week did the baby:

26 squeal or shout when excited?

Bathing and Dressing: When being dressed or undressed during the last week, how often did the baby:

41 coo or vocalize?

How often did your baby make talking sounds when:

56 riding in a car?

57 riding in a shopping cart?

58 you talked to him/her?

When hair was washed, how often did the baby:

66 vocalize

Appendix 5. The Parent Attribution Test

Child Interaction Survey

In this questionnaire, we want to know how important you believe different factors might be as potential causes of successful and unsuccessful interaction with children. We are interested in discovering the way people think about children--there are no right or wrong answers.

Example: If you were teaching a child an outdoor game and he or she caught on very quickly, how important do you believe these possible causes would be?

Place a circle around a number. Pick one of the bigger numbers if you think this factor is important, and a smaller number if you think it is not important

	Not at all important						Very important
a. How good he or she is in sports in general.	1	2	3	4	5	6	7
b. How good a teacher you are.	1	2	3	4	5	6	7
c. How easy the game is.	1	2	3	4	5	6	7

Answer the following questions by making ratings in the same way as shown above.

1. Suppose you took care of a neighbor's child one afternoon, and the two of you had a really good time together. How important do you believe the following factors would be as reasons for such an experience?

	Not at all important						Very important
a. Whether or not this was a "good day" for the child, e.g., whether there was a TV show s/he particularly wanted to see (or some other special thing to do).	1	2	3	4	5	6	7
b. How lucky you were in just having everything work out well.	1	2	3	4	5	6	7
c. How much the child enjoys being with adults.	1	2	3	4	5	6	7
d. How pleasant a disposition the child had.	1	2	3	4	5	6	7
e. How well the neighbor had set things up for you in advance.	1	2	3	4	5	6	7

f. Whether the child was rested.	1	2	3	4	5	6	7

The next question asks about BAD experiences with children. Reasons for good interactions are not necessarily the same as those for unsuccessful ones. So please think about this situation without regard for the way you answered the first question.

2. Suppose you took care of a neighbor's child one afternoon, and the two of you did not get along well. How important do you believe the following factors would be as reasons for such an experience?

	Not at all important					Very important	
a. How unpleasant a disposition a disposition the child had.	1	2	3	4	5	6	7
b. Whether the child was tired or not feeling well.	1	2	3	4	5	6	7
c. Whether or not you really enjoy children that much.	1	2	3	4	5	6	7
d. Whether or not this was a bad day for the child, e.g., whether there was nothing good on TV, whether it was raining and he or she couldn't go outside.	1	2	3	4	5	6	7
e. Whether you used the wrong approach for this child.	1	2	3	4	5	6	7
f. The extent to which the child was stubborn and resisted your efforts.	1	2	3	4	5	6	7
g. How you get along with children in general.	1	2	3	4	5	6	7
h. What kind of mood you were in that day.	1	2	3	4	5	6	7
i. How hungry the child was.	1	2	3	4	5	6	7
j. How little effort the child made to take an interest in what you said or did.	1	2	3	4	5	6	7
k. The extent to which you were not feeling well that day.	1	2	3	4	5	6	7
l. Whether or not this was a bad day for you in general.	1	2	3	4	5	6	7

Scoring procedure

Scale scores for the Parent Attribution Test represent the mean score of all scale items. Scales' scores are to be computed by the following method:

4. Sum all numerical item responses for a given scale. Note that:
    a. If caregiver omitted an item, that item receives no numerical score;
    b. Reverse items must be scored in the following way:

7 becomes 1		3 becomes 5
6 becomes 2	4 stays as 4	2 becomes 6
5 becomes 3		1 becomes 7

5. Divide the total by the number of items receiving a numerical response. Do not include items receiving no response in determining the number of items.

   For example, given a sum of 47 for a scale of 18 items, with 3 items receiving no response and 15 items receiving a numerical response, 47/15 = 3.13 for the scale score.

Users of SPSS can copy the following commands into a syntax file to reverse items and calculate scale scores. The syntax assumes that items are titled "1a", "1b", etc for question 1 items, "2a", "2b", etc for question 2 items. It is also assumed that no score was entered when caregivers omitted an item.

```
COMPUTE 2hr = (8-2h).
COMPUTE 2kr = (8-2k).
COMPUTE 2lr = (8-2l).
COMPUTE 2br = (8-2b).
COMPUTE 2dr = (8-2d).
COMPUTE 2ir = (8-2i).

COMPUTE ACF = mean (2c, 2e, 2g, 2hr, 2kr, 2lr).
COMPUTE CCF = mean (2a, 2br, 2dr, 2f, 2ir, 2j).
COMPUTE PCF = ACF – CCF.
EXECUTE.
```

Appendix 6. Parent's visiting data

Average frequencies per day baby spent on the NICU were calculated for:

1. **Amount of hospital contact per day**: hospital visits and phone updates
2. **Amount of physical contact per day**: Kangaroo care, cuddles and attempts on breast (for breastfeeding)
3. **Amount of caretaking activities per day**: cares (nappy changes and oral hygiene), bathing and bottle-feeding

Visiting patterns for the 17 families with infants who spent time on the NICU.

		Hospital	Physical	Caretaking
Mean (SD)		0.32 (0.30)	0.15 (0.25)	0.88 (1.64)
Parenting cognitions (r_s)				
Structure	Birth	.04	-.47[a]	.04
	5 months	-.09	-.09	-.41
Attunement	Birth	-.30	.32	.06
	5 months	-.16	.28	.05
Complexity	Birth	-.01	-.11	.20
	5 months	-.26	.53*	.04
Infant attention (r_s)				
Duration of looking		-.04	-.19	.24
Attention following		.09	-.13	.28
Regulation		.28	.05	.26
Interactive variables (r_s)				
Mother-initiated person-directed		-.26	-.20	.29
Infant-initiated person-directed		-.05	.14	.20
Mother-initiated object-directed		.40[a]	.03	.00
Infant-initiated object -directed		.02	-.10	-.26
Maternal same response (%)		-.35	-.08	.24
Infant same response (%)		-.48*	-.28	.09

Note. Visiting pattern data was not normally distributed so correlations are r_s. Data is missing for 2 parent-initiated and 3 mother-initiated person-directed behaviours. **p* <.05, ****p*<.001, [a]*p*<.10.

Appendix 7. Toys in the free play observation

1. Soft play blocks
2. Wooden ring with bell in centre
3. Wooden clacker
4. Happy safari soft book with ring
5. Big soft ball with bell inside
6. Cuddly lamb with “baa” sound maker inside
7. Hammer rattle
8. Colourful “octopus” with two smiley and colourful faces in centre
9. “That’s not my puppy” book
10. Fire engine with lights and noises
11. Wooden dragon
12. Shape sorter
13. Ring stacker
14. Farm animal puzzle