

Attachment during the first year of life: validity and longitudinal associations to 14  
months, of attachment classification at 7 months

Thesis submitted in accordance with the requirements of the University of Liverpool  
for the degree of Doctor of Philosophy by Kate Abbott

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## Abstract

The University of Liverpool,  
Kate Abbott, Doctor of Philosophy (PhD)

Attachment during the first year of life: validity and longitudinal associations to 14 months, of attachment classification at 7 months.

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Attachment status from 12 months onwards has been linked to later psychopathology and cognitive abilities. Although there are many ways of measuring attachment from infancy onwards, none aim to assess attachment security before the age of 12 months. This is despite evidence to suggest that infants as young as 3 months might be in an “attachment in the making” phase and are already beginning to develop some of the necessary cognitive and emotion regulatory skills. There is good reason to suppose that patterns of attachment with parents are acquired over the first weeks or months of life in interaction with caregivers, and that thereafter they show some degree of stability. Establishing whether or not infant attachment security is established before 12 months is potentially important, both to our understanding of early developmental processes, and to refining approaches to early intervention.

**Methods.** As part of a wider longitudinal study, a community-based sample of first-time mothers, stratified by risk, took part in the Still-Face and Strange Situation Paradigms with their infants at 7 and 14 months. A total of 224 mother-infant dyads had complete data at each age. Starting with a consideration of emotion regulatory strategies and building on the methodology of the Strange Situation (Ainsworth, Blehar & Waters, 1978), a hierarchical algorithm was devised to assign infants to attachment categories at 7 months. This used established scales of infant behaviours (Murray, Fiori-Cowley, Hooper, & Cooper, 1996) during the still-face and reunion episodes of the Still-Face. **Results.** Four-way classification from the Still-Face yielded a distribution that was very similar to the distribution of attachment derived independently from the Strange Situation. Validity of the method was supported by significant associations at age 7 months, between attachment security and maternal sensitivity, and disorganised attachment and partner violence, and by a lack of association between attachment status and infant temperament. Stability of attachment classification from 7 to 14 months was similar to that of published findings for stability over the second year of life, and prediction from attachment in the Still-Face to attachment in the Strange Situation was not accounted for by maternal sensitivity at 7 months. **Conclusions.** This study showed evidence to suggest that it is possible to measure attachment status in the Still-Face paradigm at 7 months, indicating that infants differ systematically in the ways they make use of their mothers to solve distress from earlier than previously thought. Further studies are needed to examine the timeline for the establishment of attachment strategies over the first year of life. It is suggested that the Still-Face might be a useful tool for this and for possible clinical interventions as it is robust and can be used from the age of two months.

## **Declaration**

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

## **Dedication**

I would like to dedicate this thesis to Scott and Jonah, whose endless love, patience and support, whilst writing this thesis, has kept me going. Thank you to Scott, for all the cups of tea, snacks and sacrifices that he made when I was too busy to take a break. I hope we'll always make such a fantastic team.

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Special thanks to the mothers and children involved in the WCHADS from which the data for this thesis was derived. I have learned so much more from them than I set out to.

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## **Preface**

This study was conducted whilst I was employed as a full and then part time research assistant on the Wirral Child Health and Development Study. I was responsible for administering 90% of the infant assessments at 7 months and 92% at 14 months. In addition, I was responsible for the data entry of the maternal demographic data, infant IBQ-R data and for making provisions for the secure sharing of Strange Situation interaction videos with the Center for Attachment Research (CAR) team in New York. I also coded 73% of the free-play interactions and 82% of the Still-Face interactions between mothers and their 7 months old infants in this study.

In relation to my research background, since completing an MRes in Psychology in 2007, I have worked as a research assistant with Prof Hill and Dr Sharp on the WCHADS for 8 the past years. As a research assistant, I have also been involved in data collection that was not used in the current study and have collected and coded data from mothers and infants aging from 6 months to 7 years old.

## Chapter 1 Background

Attachment theory, and substantial bodies of attachment research, are based on a paradoxical proposition, namely that early parental behaviours impact on a relatively malleable infant, giving rise to an organisation of infant behaviours that is relatively impermeable to later influences. The terms ‘relatively’ are important here because there is no dispute that infants vary in their responses to parenting, nor that later experiences affect development. Nevertheless, there is good reason to suppose that patterns of attachment with parents are acquired over the first weeks or months of life in interaction with caregivers, and that thereafter they show some degree of stability.

However, most research into the origins of attachment security focuses on parental behaviours over the first year of life (Braungart-Rieker et al., 2014) and patterns of attachment from one year onwards on the assumption that this is likely to track the temporal sequence from parenting quality to attachment. Whilst patterns of infant behaviour predictive of attachment classification from 12 months have been identified, reviewed in Section 1.7.1 (Mesman, van IJzendoorn, & Bakermans-Kranenburg, 2009), aside from two unpublished reviews, the possibility that the acquisition period may be earlier, with attachment-like patterns also established before one year, has not previously been examined. This would require that patterns of infant behaviours with caregivers, that may be characterised in terms of attachment security, can be identified during the first year of life. This thesis examines this possibility, making use of infant responses in the ‘Still-Face Paradigm’ at 7 months.



## **1.1 Structure of the Background and Approach to Reviewing the Research**

### **Literature**

The first part of the thesis briefly examines the reasons why understanding the origins of early attachment security is important. This involves summarising the evidence that later developmental outcomes are predicted, and by implication are influenced, by early attachment status; a large and complex body of work with many questions still to be addressed. It would be beyond the scope of this thesis to do justice to those questions, so the aim is to provide sufficient, albeit not conclusive, justification for the study of the origins of attachment security.

Then, the evidence that attachment status in early life shows significant stability is reviewed. This is important for two main reasons. First, it is core to the idea that attachment status represents something that is internalised by the child and taken forward in development. Second, it provides a background to the analyses presented later. If attachment status shows significant stability, it provides a basis for predicting continuity between attachment status prior to age one and later attachment.

Next, current evidence regarding the developmental origins of attachment security is considered. This is also a large body of work so the emphasis is on studies that have examined the interplay between individual characteristics of infants and quality of parenting over the first year of life, in relation to attachment security between 12 and 18 months. This includes a very small number of studies that have examined infant responding to threat in the Still-Face Paradigm, which is the focus of this thesis. No previous studies have attempted to use the same principles as the

Strange Situation to create a four-category attachment classification based on emotion regulation in the transition from threat (still-face) to parental availability (reunion/re-engagement).

The rationale for the development of a method of generating an attachment classification at 7 months requires a detailed review of the method used in the Strange Situation and the similarities and differences in developmental capabilities and procedures at 7 and 14 months. This is also included in the background and continues into the following chapter.

## **1.2 Attachment Theory and Research**

**1.2.1 Overview of attachment theory and research.** Before attachment theory and research is introduced it is important to explain the differences between infant attachment and bonding. Maternal bonding refers to the way in which the mother experiences a sense of connection to the infant before and immediately following their birth, with emphasis on a sensitive period in the first hours of life (Klaus and Kennell, 1976). Attachment, on the other hand, refers to a theory, a body of research, to particular behaviours (attachment behaviours are proximity seeking), and is a way of characterising the relationship between a caregiver and a child. A key proposition of attachment theory is that children seek comfort and protection from caregivers in the face of threat, and attachment research has provided the tools for identifying different ways in which children do this. The specific focus of the current study is on attachment status as assessed in terms of patterns of behaviours shown by infants with mothers in the face of threat and the origins of attachment theory and subsequent relevant research in this area are reviewed in the following section.

There were two main influences on attachment theory as proposed by Bowlby (Bowlby, 1982); psychoanalysis and ethology. Bowlby was a child psychiatrist and psychoanalyst who was particularly influenced by the ‘Object Relations’ theories (Ainsworth, 1969) that proposed that early experiences are internalised and lay the foundations for later relationships. His concept of ‘Internal Working Models’ (IWMs) is similar to the ideas of ‘Internal Objects.’ In common with most schools of psychoanalysis, Bowlby proposed that adverse early experiences would result in vulnerability to psychopathology via disturbances in IWMs. Bowlby was also

influenced by ethologists such as Konrad Lorenz and Robert Hinde, who asked questions about behaviours seen in natural settings (in contrast to the laboratory), and in relation to their evolutionary function. In particular, Lorenz showed that young animals became imprinted on their caregivers as a result of exposure, and not feeding or other kinds of rewards (Lorenz, 1935).

Further evidence for this was drawn from the groundbreaking work of Harlow & Zimmermann (1958) on maternal deprivation in infant macaque monkeys. In these experimental studies, young monkeys taken from their mothers were found to cling to a soft and comfortable dummy mother even when it did not provide food, only choosing the alternative dummy mother, constructed from wire, when this provided food. Likewise, when distressed, these young monkeys would run and cling to the terry cloth mother regardless of whether it was the dummy providing the food or not. These observations support the idea that attachment can occur in the absence of oral gratification and that infants are seeking something other than (or in addition to) having their basic drives satisfied by an attachment figure.

In summary, attachment theory proposes that early experiences with caregivers give rise to IWMs that are taken forward into later close relationships and confer vulnerability or resilience to psychopathology. Bowlby was specific about the patterns of early behaviours seen with caregivers. Based on ethological concepts of 'goal corrected' behaviours he outlined how infants and young children seek proximity to caregivers for comfort under conditions of threat (attachment behaviours), but when threat is absent or removed, caregivers become a 'secure base'

from which children explore the world. Thus, there is a continual interplay between proximity seeking and exploration.

This theory laid the foundations for attachment research, which is now a major area of developmental investigation. Key topics in this field are: 1) the measurement of attachment status, 2) influences on attachment status, 3) stability of attachment during childhood and from childhood to adult life, 4) attachment and social functioning and psychopathology. Each of these will be reviewed at levels of detail in proportion to their importance to the topic of this thesis. The overview of measurement is presented first because the topic is central to the thesis, and because the establishment of a method for assessing early attachment status, the Strange Situation Paradigm (SSP), created the conditions for attachment research. The focus will only be on the general principles, because the details are covered in sections on the development of the method for assessing attachment status in the Still-Face (Chapter 2). Next, the relationship between attachment status, social relationships and psychopathology is summarised. This is a large topic that will not be reviewed in detail. It is relevant because it forms part of the justification for studying early attachment.

Stability of attachment is reviewed in the following section in some detail for two main reasons. First, the theory, as proposed by Bowlby, predicts stability. Second, as outlined later, a key question examined in this thesis is whether or not an attachment-like classification generated at 7 months predicts attachment status in the Strange Situation. It is important therefore, to establish whether current evidence points to there being stability of attachment status in infancy and early childhood,

and if so, how strong that stability might be. Finally, there is a detailed review of influences on attachment status, and in particular on attachment between 12 – 18 months as assessed using the Strange Situation.

**1.2.2 Measurement of attachment status.** Standardised assessments of attachment status have been designed for use from 12 months. The methods vary markedly. Assessments up to around age 5 years often make use of separations from caregivers as the source of threat (Booth, Rubin, & Rose-Krasnor, 1998; Bureau & Moss, 2010; Cohn, 1990; Neyer, Schäfer, & Asendorpf, 1998), and focus on reunion behaviours. Alternatively, naturalistic assessments at home lasting several hours can be carried out to generate an attachment security score without the use of separations, for example, using the Attachment Q-Sort (AQS; Waters & Deane, 1985). Later assessments generally examine representations of attachment processes through the use of doll play ‘story stems’ (Green, Stanley, Smith, & Goldwyn, 2000; Oppenheim, 1997; Torres, Maia, Veríssimo, Fernandes, & Silva, 2012), and interviews about recalled relationships with caregivers such as the Child Attachment Interview (CAI; Target, Fonagy, & Shmueli-Goetz, 2003) or the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1985).

**1.2.3 Measures of attachment and attachment-like behaviours relevant to the current study – introducing the Strange Situation and the Still-Face paradigms.** This section focuses on the Strange Situation, which is the established method between 12 -18 months, as it is the established measure of attachment described in the thesis. The Still-Face Paradigm is also introduced briefly here before being described in more detail in Section 2.2.1 in order to orientate the reader to the

paradigms used in the current study and to provide context for the discussion that follows.

The Still-Face paradigm (Tronick, Als, Adamson, Wise, & Brazelton, 1978) is used with infants from 3 months of age and was developed to examine how passive or active young infants are in their participation in interactions. Whilst administration varies slightly between studies, generally the infant is seated opposite the mother in highchair or car seat and the paradigm follows the pattern of three two minute episodes of engagement, still-face and re-engagement (or reunion). During the engagement and re-engagement episodes, the mother is asked to engage with the infant in the way that she would normally and, when given the signal, is asked to remain silent, adopt a neutral face and look over the infants' head for the two minutes of the still-face episode. The mothers' unresponsiveness during the still-face episode is thought to violate social norms of engagement of which the infant is already aware thus creating a potentially challenging social situation for the infant to navigate.

In the Strange Situation however, the key features of the paradigm are that the child is presented with a threat which is likely to lead to distress, in the form of separation from a caregiver, and with the possibility of receiving comfort for that distress, both from a stranger and from the caregiver (Ainsworth & Bell, 1970). Not all children of this age are distressed by the separation, however, the assumption is made that it is sufficiently threatening to most children that its significance will need to be acknowledged. This is assessed in relation to the way the child, who may or may not have been distressed, greets the caregiver on reunion. The separation is

introduced as part of a series of episodes during which the mother and infant are placed together in an unfamiliar room and the mother is given instructions to settle the child to play and then, when given a signal, leave the room for up to 3 minutes on two occasions. During the second separation, a friendly stranger enters the room and makes efforts to engage the child in play before the mother returns for the second reunion episode. A more detailed description of the Strange Situation Paradigm can be found in Section 2.1, the description given here is to provide a sufficient orientation to the paradigm to support the discussion of the attachment classifications that can be obtained through its use in the following section.

The Strange Situation assesses multiple aspects of the child's interactions with the caregiver, including their emotional expression, emotional signalling, indications of needs for comfort, proximity seeking, response to caregiver vocalisations and gestures, emotion regulation in relation to caregiver comfort, and move to exploration. Here, the term emotion regulation is used to describe the way in which the infant maintains or modifies the frequency, intensity, or duration of their emotions (both positive and negative) and the physiological and behavioural processes that accompany them in order to support their response to threat and achieve an optimum state of arousal (Eisenberg, 2000). The current study only reports on the behavioural processes involved in emotion regulation although other publications using this sample have also examined physiological processes. The Strange Situation is used to identify 4 main categories of attachment, each of which can be divided into further subdivisions (Ainsworth & Bell, 1970). Brief outlines of child behaviours seen in each category are provided here, and more detailed descriptions can be found in Section 2.1.1. For the purpose of this study, because all



caregivers included in the sample are mothers, the term mother is used to mean caregiver.

As outlined later in Section 2.3, the Still-Face paradigm at 7 months assesses behaviours that differ in several respects to those in the Strange Situation, and so consideration of the emotion regulatory process of each attachment category was central to the creation of the four attachment-like categories at that age. These emotion regulatory processes are outlined here and in Section 2.1.1 for the Strange Situation and in Section 2.2.3 with respect to Still-Face behaviours.

#### ***1.2.3.1 The four attachment categories derived from the Strange Situation.***

Dimensional and categorical ratings are made and, in broad terms, infant coping styles can be characterised as secure (effective emotion regulation, B) or insecure (ineffective regulation; which can be further categorised as avoidant; A, resistant/ambivalent; C or disorganised; D). Markers of disorganisation can be fleeting so infants classified as disorganised are also given a secondary, organised, classification. Each classification represents a different emotion regulatory process employed by the infant in order to deal with the separation from the mother.

#### ***1.2.3.2 Attachment and emotion regulatory processes.***

The emotion regulatory process of a secure child in the Strange Separation reunion involves eliciting support from the mother, usually in the form of physical comfort, in order to relieve distress and enable a return to exploration. This process involves seeking and maintaining contact with the mother until distress is resolved and contact can be reduced. Where distress is not evident, an openness to making use of the mother, as

evidenced by a warm greeting on reunion, will be observed. Avoidant infants do not typically use the mother as a form of support and will largely ignore her on reunion and show little distress throughout. The emotion regulatory process of resistant infants involves seeking contact with the mother whilst simultaneously showing angry distress behaviours, struggling or pushing away. Comfort seeking is often not directly associated with distress and contact may be terminated by the infant before distress is reduced. Disorganised infants often appear to use either ineffective strategies or two or more contradictory strategies when regulating emotion, for example both seeking and turning away from comfort from the mother.

**1.2.4 Typical distribution of attachment status.** Systematic reviews have found approximately two thirds of any population to be in the securely attached category (Ahnert, Pinquart, & Lamb, 2006; Lamb, Hwang, Frodi, & Frodi, 1982; van IJzendoorn & Kroonenberg, 1988), 15% avoidant, 10% resistant and 15% disorganised (van IJzendoorn, Scheungel, & Bakermans–Kranenburg, 1999).

Patterns of insecure subdivisions have been found to vary cross-culturally. A study of attachment in German infants found the majority of insecurely attached infants to be avoidant (Grossmann, Grossmann, Huber, & Wartner, 1981) whereas similar studies in Japan, Israel and Indonesia report higher levels of resistant attachment in their insecurely attached infant cohorts (Takahashi, 1986; van IJzendoorn & Sagi-Schwartz, 2008; Zevalkink, Riksen-Walraven, & Van Lieshout, 1999).

The majority of studies of infant attachment status have relatively small sample sizes of fewer than 100, meaning that cell sizes in the separate insecure organised and disorganised categories are often too low for analysis. Commonly, this is solved by collapsing all insecure groups for comparison with secure attachment, or by contrasting disorganised and organised attachment groups (De Wolff & van IJzendoorn, 1997).

**1.2.4.1 Risk and population rates of disorganisation.** Whilst the rates of disorganisation in normal population samples are low, prevalence of disorganisation has been found to increase with risk, going from 28% of infants from multi-problem families receiving supportive services (Spieker & Booth, 1988), to 54% of infants of low income mothers with serious depressive symptoms and no services (Lyons-Ruth, Connell, Grunebaum, & Botein, 1990), and as high as 82% of infants from maltreating families (Carlson, Cicchetti, Barnett, & Braunwald, 1989). Furthermore, there appears to be an association between risk status and the secondary attachment classification of disorganised infants, with those from higher risk or clinical samples tending to be classified more often as disorganised-insecure than disorganised-secure, compared to disorganised infants from community samples (Lyons-Ruth, Bronfman, & Parsons, 1999).

**1.2.4.2 Disorganisation and fear.** Disorganised infants have been found to have mothers with significantly higher frightening behaviour scores than their non-disorganised peers (Schuengel, Bakermans-Kranenburg, & van IJzendoorn, 1999). This association is thought to be due to infant fear of mother, which has significant consequences for the developing attachment relationship. When an infant who

experiences their mother as frightening is met with a stressor, they experience a catch situation as the person who is there to protect them from such stressors is also viewed as frightening (Main & Hesse, 1990). In support of this are findings that ratings of maternal frightened or frightening behaviours explained higher amounts of variance in infant attachment status than maternal sensitivity alone. Indeed, adding this variable led to a highly significant effect, whereas the effect of maternal sensitivity alone was non-significant (True, Pisani, & Oumar, 2001).

**1.2.4.3 Disorganisation and partner violence.** Disorganised attachment in infancy has also been found to be associated with concurrent maternal reporting of partner violence, with mothers who report more serious violence with a current partner being more likely to have infants classified as disorganised (Zeanah et al., 1999). Authors propose that the mechanism for this may be the child witnessing the attachment figure (mother) being frightened and unable to protect herself or the child when faced with threat. This further supports the above proposal that the mechanism involved in the development of a disorganised attachment is fear (Main & Hesse, 1990).

**1.2.5 Attachment status with different caregivers.** It is important to note that attachment security is parent (attachment figure) specific so it is possible to be rated as secure with one parent and insecure organised or disorganised with another. There is some debate over the importance of paternal attachment relative to maternal attachment, with some arguing the primacy of the mother as an attachment figure (Main & Weston, 1981; Suess, Grossmann, & Sroufe, 1992). However, there is some evidence to suggest that this is not the case and that attachment with the father is of

equal importance for optimal development (Kochanska & Kim, 2013; Lamb et al., 1982; Verschueren & Marcoen, 1999). The reasons for these differences are unclear, but it has been suggested that this may be reflective of paternal involvement in caregiving increasing over time (Pleck & Lamb, 1997) or of the differential effects of maternal attachment security across age groups, with maternal security proving more central to infants than older children (Kerns, Tomich, Aspelmeier, & Contreras, 2000). However, there are far fewer studies that include paternal attachment information using the observational measure of the Strange Situation in addition to maternal attachment data, so more work is needed in this area. For the purposes of this thesis, the term infant attachment will be synonymous with attachment classification with mother, as neither paternal attachment nor paternal sensitivity data was available from the current study sample.

### **1.3 Attachment and Psychopathology**

Infant attachment security has been found to have important implications for both short and longer term developmental outcomes. This next section outlines the current research in this area with the purpose of illustrating how each attachment category might have different implications in distinct areas of social, emotional or cognitive development.

Disorganised attachment in the Strange Situation has been found to be associated with increased display of negative behaviours during the toddler, preschool and early school years (Kochanska & Kim, 2013; Lyons-Ruth, Alpern, & Repacholi, 1993). Furthermore, research has found that, where poorer outcomes are significantly associated with insecure attachment, the insecure disorganised infants are performing significantly worse than both the insecure avoidant and insecure resistant infants (Fearon, Bakermans-Kranenburg, van IJzendoorn, Lapsley, & Roisman, 2010; van IJzendoorn et al., 1999). Disorganised attachment therefore, may be of particular interest with regards to long term outcomes as there is evidence to indicate that disorganisation is more strongly predictive of later maladaptation than forms of organised insecurity.

**1.3.1 Externalising and Internalising behaviours.** Externalising is a broad characterisation of aggressive, disruptive, oppositional, antisocial and hyperactivity-inattentiveness behaviours. On the other hand, Internalising is a broad characterisation of less visible behaviours such as withdrawal, worry, sadness or fearfulness or somatisation.

**1.3.1.1 Externalising behaviours.** The largest study to date to examine attachment status in infancy and later externalising behaviours (using the National Institute of Child Health and Human Development Study of Early Child Care (NICHD SECC) sample with over 1000 participants), found no main effects of secure or insecure attachment on externalising behaviours when indicators of socioeconomic status were controlled for (Belsky & Fearon, 2002). However, a meta-analysis of secure versus insecure attachment and externalising behaviours, that included this study in the 69 examined ( $N = 5947$ ), found that insecure attachment was significantly associated with later child externalising behaviours (effect size  $d = .31$ ; Fearon et al, 2010). As predicted, and consistent with previous research, this effect was only found to be significant in studies of boys ( $d = .35$ ) and mixed samples ( $d = .36$ ), whilst no significant effect size was found in studies of girls only ( $d = -.03$ ). Although there was an overall significant effect in boys, there was substantial heterogeneity in sampling, ages of participants, and methods of assessing attachment status, and effect sizes varied considerably across studies. When insecure and disorganised attachment were explored separately, disorganised children were found to be at increased risk of later externalising problems ( $d = .34$ ) compared to either avoidant or resistant infants ( $d = .12$ ,  $d = .11$  respectively). Sample sizes of the majority of studies included in this analysis were very small and only 16 of these had more than 100 participants.

In a follow up study using teacher reported externalising symptoms up to age 12 in this sample, avoidant attachment was found to be associated with externalising problems, as was disorganised attachment but only in interaction with contextual risk (Fearon & Belsky, 2011). In this study, contextual risk was a cumulative measure of

four social risk factors including economic risk, father absence risk and maternal education and age risk. Each child then had a contextual risk score of 0-4 depending on whether they met the assigned criteria for each of the risk factors. Using latent growth curve modelling, this risk by disorganised attachment effect on externalising problems was found to be significant and to increase over time (from grades 1 to 6) in boys with high contextual risk status only. No significant risk by attachment effects were found for girls or for boys with low risk status.

Kochanska and Kim (2013) measured attachment security with both parents in the Strange Situation at 15 months and found that infants categorised as insecure with both their mother and father had significantly higher levels of teacher reported externalising behaviour problems at age 6½ than their secure-secure peers. Again, boys were reported to have significantly higher levels of externalising behaviours than girls at this age.

**1.3.1.2 Internalising behaviours.** A meta-analysis of 60 studies of infant attachment and early childhood internalising behaviours ( $N = 5236$ ), found a small to moderate, yet significant, effect size ( $d = .37$ ) between insecure attachment and internalising (Madigan, Atkinson, Laurin, & Benoit, 2013). Both avoidant and disorganised attachment were found to be separately associated with later internalising behaviours. Effect sizes did however, vary with gender. That is, proportion of males in the sample was found to be a significant moderator to the relationship between attachment and internalising, with studies of only girls showing a non-significant overall effect size ( $d = .26$ ) whilst those with only boys showed a significant overall effect size ( $d = .71$ ). Risk status was not found to be associated



with changes in effect sizes. Also, the attachment – internalising effect size was higher in samples with similarly high effect sizes between attachment and externalising.

In an earlier meta-analytic study, 42 independent samples ( $N = 4614$ ) were examined to explore the association between attachment security and internalising behaviours (Groh, Roisman, van IJzendoorn, Bakermans-Kranenburg, & Fearon, 2012). Avoidance was found to have a small significant association with internalising symptoms whilst a non-significant result was found between resistant attachment and internalising symptoms. However, no significant difference was found between the effect sizes of studies that reported separately for boys and girls, nor did it find an association between disorganisation and internalising behaviours.

*1.3.1.3 Summary of evidence for an association between attachment status and child externalising and internalising symptoms.* Many questions regarding the role of attachment status in child psychopathology remain to be answered, including whether there is an association only in boys, and if so why, how large the effect is, and whether disorganised attachment, often found in high risk samples, makes a distinctive contribution (Belsky & Fearon, 2002; Fearon et al., 2010; Madigan et al., 2013). On balance, the evidence is stronger in relation to externalising, compared to internalising symptoms (Fearon et al., 2010; Groh et al., 2012). A crucial question that requires further study is whether there are main effects of attachment status, or whether attachment contributes in interaction with other processes. Notwithstanding these considerations, overall the evidence suggests that it is likely that early attachment status is associated with later child symptoms.

**1.3.2 Cognitive and language skills.** Associations between infant attachment and later childhood outcomes are not limited to psychopathology. Avoidant attachment has been found to be associated with poorer performance on social competence and expressive language assessments, with infants classified as avoidant scoring lower than their secure or disorganised peers. Language comprehension scores followed a similar pattern with infants classified as avoidant scoring significantly lower than secure infants (Belsky & Fearon, 2002).

Attachment has also been found to be associated with later academic performance, with secure attachment at 24 and 36 months (but not 15 months) being associated with higher IQ and academic performance scores based on both a standardised measure and teacher report at ages 9 and 10 years (West, Mathews, & Kerns, 2013). Disorganised infants have been found to have significantly lower infant mental development scores using the Bayleys Scales of Infant Development, even after controlling for maternal IQ (Lyons-Ruth, Repacholi, McLeod, & Silva, 1991).

**1.3.3 Attachment and peer relations.** Groh et al (2014) conducted a meta-analysis to explore the relationship between infant attachment security and social competence with peers later in childhood. This meta-analysis included 80 studies ( $N = 4441$ ) and found insecure and disorganised attachment to be associated with lower peer competence. Research has indicated that attachment status may be associated with more specific aspects of peer functioning such as sharing behaviours, as evidenced by the finding that securely attached children are more likely to engage in generous sharing behaviours that are costly to themselves, even when this involves

sharing with a disliked peer (Paulus, Becker, Scheub, & König, 2016). Attachment status may also be linked to closeness in peer relationships. Schneider, Atkinson, & Tardif, (2001) found stronger associations between secure attachment in infancy and children's friendships than between attachment and relationships with classmates or acquaintances, echoing the importance of early attachment relationships in the development of future close and supportive relationships.

## **1.4 Stability of attachment**

**1.4.1 Stability of attachment, overview.** Based on his early work in sanatoriums, Bowlby suggested that attachment security was a relatively stable construct, with insecure mother-child relationships resulting from an institutional separation, where the child had suffered maternal deprivation due to either party being hospitalised for a substantial period, often lasting many years (Bowlby, Ainsworth, Boston, & Rosenbluth, 1956). Bowlby contended that relatively few of these mother-child dyads were able to repair the damage done to their attachment relationship after being reunited, although it must be noted that little was known about how these relationships functioned prior to institutionalisation. These findings led Bowlby to conclude that the child's internal working model, and resulting attachment style, becomes less flexible over time.

This idea has since been challenged. It has been suggested that these early IWMs are constantly updated as new experiences conflict with or contradict existing ideas of how the world, and those in it, operate. Kagan is an advocate of this idea, and has suggested that too much emphasis has been placed on the importance of early experiences in relation to the long lasting stability of its effects (Kagan, 1996). He gives examples of both children and animals experiencing great early adversity, yet going on to lead typically normal lives and questions how this fits with the idea of early attachment being a stable construct. An example of this is the work that Suomi & Harlow have undertaken with infant macaques. They were able to show that the bizarre behaviour of 6 month old macaque monkeys reared in isolation could

be altered following their reintroduction to younger female monkeys over a further 6 month period (Suomi & Harlow, 1972).

Other theories of infant attachment development and stability include the prototype and revisionist perspectives. The revisionist perspective (Fraley, 2002) builds on Bowlby's theories by suggesting that the early IWMs in infancy are modified by subsequent experiences of maternal response following threat-provoked attachment behaviours. This means that these models are flexible enough to accommodate new experiences that differ from those already encountered. Changes in maternal attachment behaviours or emotional responses may be due to a number of factors such as life events, mental ill health and psycho-social risk. However, risk is difficult to judge objectively in terms of how an individual (or their subsequent functioning) may be affected by it. To consider risk, one must also consider protective factors such as social support, coping and other factors that confer resilience.

On the other hand, the prototype perspective (Fraley, 2002) argues that early attachment representations are held rigidly from infancy and continuously influence subsequent attachment relationships whilst also allowing new experiences to contribute to the updating of the IWMs. This perspective fits well with the idea of attachment being stable over time. However, studies have yet to find evidence of strong stability of attachment at two different time points. In a meta-analysis of studies that had assessed attachment at two time points, Fraley, (2002) used a mathematical model to assess goodness of fit of the prototype and revisionist model. Interestingly, the prototype model was found to be a better fit to the data although it

was noted that this model was far from perfect. These findings support the idea that there is (at least some) continuity in attachment representations and behaviours and suggests that there is some merit in the study of attachment stability and its predictive validity over time.

**1.4.1.1 Stability of A, B, and C attachment classifications.** Although stability of attachment has been assessed over periods of up to 20 years, the focus here will be on studies of stability in infancy and early childhood. Studies of attachment stability have reported mixed results with attachment classification agreement over intervals of 6 to 10 months varying from chance levels where secure/insecure variables were used (50 and 55%; Belsky, Campbell, Cohn, & Moore, 1996) to 64% and even 96% using A, B, C classifications (Bar-Haim, Sutton, Fox, & Marvin, 2000 and Waters, 1978). However, the sample sizes used in these studies were small so have reduced power.

Fraley (2002) conducted a meta-analysis of studies that had measured attachment at two different time points using a binary secure versus insecure variable. He broke the results down in terms of age at which the second measure of attachment was administered and so derived five temporal groups. The group measuring attachment at 12 and 18-20 months (a similar age gap to that explored within this thesis) included 15 studies and an  $N = 891$ . The average weighted stability coefficient from these 15 studies (derived with Fisher's r-to-z transformations of study Pearson product moment correlations) provided evidence for moderate stability of attachment from 12 to 18-20 months ( $r = .32$ ). It is important to note that for the purposes of this meta-analysis the author used the distinction between secure versus

insecure attachment, rather than the three or four-way attachment classifications that were generated in the individual studies. A more recent meta-analysis of studies of attachment stability has found moderate-average stability of attachment classifications across 6 month periods in infancy with an effect size of  $r = .36$  with an interval of 0-6 months ( $N = 2039$ ) and  $r = .33$  with an interval of 7-12 months between attachment ratings ( $N = 1363$ ; Pinquart, Feussner, & Ahnert, 2013). Again, this meta-analysis did not take disorganisation into account and simply focussed on the stability of secure versus insecure attachment.

Table 1.4.1.1 shows a list of studies, taken from this meta-analysis, that have measured attachment security with the mother, using the Strange Situation at multiple time points (Pinquart et al., 2013). Only the studies measuring attachment stability up to age two with sample sizes of over 100 were included in order to explore those studies that have used a similar sample and assessment interval as the current study. Another reason for restricting the studies to this age range is that the Strange Situation is not a valid tool for assessing attachment security after 20 months of age (George & Solomon, 1999). This means that any studies of attachment stability involving children below and above 20 months of age would involve the use of two different methods of attachment classification. Each of the 5 studies in the table measures attachment at or around 12 months at time 1 and then 6-7 months later at time 2; equivalent to the intervals used in this thesis. Using the online Average Correlation Coefficients calculator (Stat-helpcom; DeCoster & Iselin, 2005), the mean weighted correlation coefficient for these five studies was calculated as  $r = .27$ . An effect of this size is considered small to moderate (Cohen, 1988).

In summary, attachment stability over time periods similar to those observed in the current study has been found to be moderate for secure versus insecure attachment classifications. The current study seeks to examine whether it is possible to identify an attachment-like pattern at 7 months and one of the tests for this is its prediction of attachment at 14 months. From this attachment stability data, one could conclude that prediction from 7 to 14 months might also be in the small to moderate range echoing the prediction from 12 months to 18 ( $r = .27$ ). However, it would appear that there is existing evidence for prediction from secure versus insecure but not secure, insecure, disorganised. The current study, having data across all four attachment classifications, could potentially expand on this exploration of stability and provide data on the prediction of secure, avoidant, resistant and disorganised attachment.



Table 1.4.1.1

*Studies with measures of attachment in the Strange Situation at two time points with 6-7 month intervals and a sample size of 100 or over.*

<b>Author</b>	<b>N</b>	<b>Age in months (T1)</b>	<b>Method (T1)</b>	<b>Interval in months</b>	<b>Method (T2)</b>	<b>R</b>
Vaughn, Egeland, Sroufe, & Waters (1979).	100	12	SS	6	SS	.37
Egeland & Farber (1984).	189	12	SS	6	SS	.32
Belsky, Campbell, Cohn, & Moore (1996).	125	12	SS	6	SS	.04
Vondra, Shaw, Swearingen, Cohen, & Owens (2001).	195	12	SS	6	SS	.31
Edwards, Eiden, & Leonard (2004).	217	12	SS	6	SS	.26

**1.4.1.2 Stability in disorganisation.** Many general population samples have very small numbers of disorganised infants either due to a lack of observation or small sample sizes with low risk community groups. Older studies, such as those using longitudinal data over many years, have been unable to include disorganisation

in their analyses as their Strange Situation data was gathered prior to the disorganised category being introduced and before it became common practice to film the paradigm.

A meta-analysis of 14 studies ( $N = 840$ ) of stability of disorganised attachment across intervals of 1-60 months was significant but moderate ( $r = .34$ ; van Ijzendoorn et al., 1999). Effect sizes across the studies were heterogeneous and ranged from .12 to .73. The interval between measurements of disorganised attachment at time one and time two was not significantly associated with stability, nor was socioeconomic status. Likewise, no overall association was found between gender and disorganisation stability although results were again heterogeneous across samples. It is argued that this heterogeneity is a result of the differences in cutoff guidelines for disorganised attachment and differences in methodology across studies as some employed an intervention between times 1 and 2 (Moss, Cyr, Bureau, Tarabulsy, & Dubois-Comtois, 2005).

Since this meta-analysis, studies have continued to report conflicting findings as to the stability of disorganised attachment from infancy to the preschool period. In a study of one of the largest infant samples, stability of disorganisation from infancy to three years was only 20% (NICHD Early Child Care Research Network, 2001). Stability of the organised attachment categories from 15 to 36 months varied (10% for A, 64% for B and 26% for C) and a kappa statistic revealed overall significant but modest stability of attachment. However, the authors state that the high levels of stability for secure attachment could be due to chance as around 62% of the sample was rated secure at each age. Other smaller studies ( $N = 13$  disorganised infants)

have found moderate stability of disorganised attachment from 3.5 to 5.5 years with no children moving from disorganised to secure (Moss et al., 2005).

**1.4.2 Attachment stability and risk.** Fraley (2002) conducted a meta-analysis of studies with repeated measures of the Strange Situation in order to explore the relationship between attachment stability and risk factors such as family instability, marital discord and abuse. Attachment security was found to be less stable in higher risk than in lower risk samples. In a study of the effects of perinatal risk on infant attachment, Easterbrooks (1989) explored the attachment of pre-term and full-term infants with both their mothers and fathers and found no association between perinatal risk and later infant attachment. This supports the idea that not all risks are predictive of attachment issues and that the effects of certain forms of adversity can be repaired by subsequent protective factors such as parental sensitivity and an absence of further risk factors. A number of studies have found evidence to support the notion that attachment security should be thought of as an interactive risk factor that is more significant when other psychosocial stressors are present in the family ecology (Belsky & Fearon, 2002; Fearon & Belsky, 2004).

**1.4.3 Attachment stability and maternal sensitivity.** This next section discusses the link between attachment stability and maternal sensitivity on account of maternal sensitivity being thought of as the main contributor to attachment security with mother. This thesis includes maternal sensitivity data from two paradigms at age 7 months so it is of interest to consider how these measures might contribute to attachment security stability (or a lack of) from 7 to 14 months. That is, it is hypothesised that an infant showing a secure pattern of attachment behaviours at 7

months and an insecure or disorganised pattern at 14 months may be, at least in part, a result of less sensitive parenting by the mother.

Beijersbergen, Juffer, Bakermans-Kranenburg, & van IJzendoorn (2012), looked at stability of attachment classification from 12 months to 14 years and found that discontinuities could be explained, at least in part, by maternal sensitivity. Children who were categorised as secure at both time points had more sensitive mothers at 12 months of age and were more likely to have mothers with higher sensitive support at 14 years than those children who changed from secure to insecure. Maternal sensitivity and maternal support also predicted attachment stability of children who remained insecure at each time point and those who changed from insecure to secure. This finding is important in highlighting the importance of the reciprocity of the mother-infant relationship as attachment stability can be affected by maternal behaviours and feedback that allow the child to continuously update their internal working model.

## **1.5 Influences on Attachment Status in the Strange Situation Paradigm**

**1.5.1 Maternal sensitivity.** Caregiver sensitivity, and in the overwhelming number of instances, maternal sensitivity, has received most attention in relation to influences on attachment status by the end of the first year and the early part of the second year of life. Sensitivity here refers to the ability of a mother to accurately read and respond to her infant's cues in a warm, supportive and prompt manner (De Wolff & van Ijzendoorn, 1997).

Many questions remain to be answered regarding stability of attachment status from infancy onwards and the relative contributions of subsequent environmental influences, the origins of attachment security are therefore of great interest. From Ainsworth onwards, the main focus of interest has been on the role of parental sensitivity and the possibility that sensitive responding by the parent, especially to infant distress (Leerkes, 2011; McElwain & Booth-LaForce, 2006), supports secure attachment. Most studies have focused on maternal sensitivity, and the role of fathers and other caregivers is relatively neglected.

**1.5.1.1 Maternal sensitivity and attachment.** The relationship between maternal sensitivity and infant attachment status has been studied widely since Ainsworth's seminal work. Findings indicate that mothers rating high in maternal sensitivity are more likely to have offspring who are rated as securely attached compared with their less sensitive counterparts (Atkinson, Paglia et al., 2000; Braungart-Rieker, Garwood, Powers, & Wang, 2001; De Wolff & van Ijzendoorn,

1997; Goldsmith & Alansky, 1987; Jin, Jacobvitz, Hazen, & Jung, 2012; Pederson, Moran, Sitko, & Campbell, 1990).

Although many studies have reported associations between maternal sensitivity and infant attachment status, meta-analyses have not been able to demonstrate large effects. In a meta-analysis of 30 studies involving 1,666 mother-infant dyads, De Wolff & van IJzendoorn (1997) found an effect size of .22 for the association between maternal sensitivity and infant attachment classification. A similar effect size ( $r = .27$ ) for the relationship between maternal sensitivity and attachment was found in a later meta-analysis including 41 studies and 2243 dyads (Atkinson, Paglia et al., 2000).

There are probably several reasons for the modest effect sizes for the role of maternal sensitivity in attachment status. These include variations in sampling and measurement. The case has been made that a mother's awareness of her infant's state of mind is more important than how she behaves, and associations between maternal mind mindedness and attachment security have been cited in favour of this view. The findings of these meta-analyses may also reflect the way in which modern measures of maternal sensitivity deviate from Ainsworth's original work in terms of the duration of observation and the definition, and subsequent measurement, of maternal sensitivity. Interestingly, when studies have used Ainsworth's ratings (acceptance, cooperation, accessibility and sensitivity) within a Q-Sort methodology in 2 hour semi-structured home observations, correlation between maternal sensitivity and attachment in the Strange Situation was found to range from .51 to .65 (Pederson,

Bailey, Tarabulsy, Bento, & Moran, 2014; Pederson, Gleason, Moran, & Bento, 1998; Pederson & Moran, 1996).

Most research into maternal sensitivity regards low sensitivity as the risk, however, studies focusing on the origins of disorganised attachment in particular, have examined the role of specific potential risk behaviours. Such behaviours include contradictory cues, nonresponse or inappropriate response to attachment bids (Goldberg, Benoit, Blokland, & Madigan, 2003; Lyons-Ruth et al., 1999).

**1.5.1.2 Timing of maternal sensitivity and attachment.** The interval between measures of maternal sensitivity and infant attachment has been found to have an inverse relationship with the resultant effect size between the two variables (Atkinson et al., 2000; De Wolff & van IJzendoorn, 1997; Goldsmith & Alansky, 1987). Meta-analytic data from 41 studies and 2243 mother-infant dyads has found “a large and robust association” between the interval separating measures of maternal sensitivity and attachment and effect size (Atkinson et al., 2000). Namely, the greater the period between measurement of maternal sensitivity and attachment, the lower the association between the two and this effect could not be accounted for by age of infant at assessment. This effect occurs quite quickly with mean effect size decreasing by 22% from concurrent measures to a time interval of 2.5 months. However, this effect levels off over time and a mean effect size decrease of only 7% was found from 12.5 to 15 months.

**1.5.1.3 Maternal sensitivity to distress and non-distress.** Maternal sensitivity has been found to be important to the development of effective emotion regulation in

infants (Wolff & Ijzendoorn, 1997). As infant attachment behaviours are activated by threat, it follows that maternal sensitivity to distress might be especially important in the development of a secure attachment relationship. McElwain & BoothLaForce (2006) examined the relationship between maternal sensitivity to distress and non-distress in semi-structured free play and infant attachment in the Strange Situation (secure versus insecure) in a study of 357 infant-mother dyads from the NICHD Study of Early Child Care (SECC) sample. Maternal sensitivity was measured at 6 and 15 months using the NICHD SECC scales (Owen, 1992) and the Strange Situation was administered at 15 months. The authors reported that sensitivity to distress at 6 months made a significant contribution to the prediction of attachment security, although the effect was marginally significant. The contribution of sensitivity to non-distress was entirely non-significant. No significant relationships were found between concurrent maternal sensitivity and attachment security. Authors argue that this discrepancy in findings may be due to earlier maternal behaviour having a predictive effect on attachment whilst contemporaneous maternal behaviour may not have yet had the opportunity to exert effects on the infant and the attachment relationship. A further important point here is that the infants who gave full data, so were included in this study, were reported to have higher levels of difficult temperament than those infants who were not included, leading some to question whether this significant result is generalisable to populations with less difficult temperaments. However, these results do point towards the importance of exploring the different facets of maternal sensitivity (especially sensitivity to distress) when considering its associations with later attachment and suggests that these two aspects of maternal functioning are operating at different levels.



Leerkes (2011) added to these findings by observing maternal sensitivity in contexts that result in different levels of infant arousal rather than using different measures of maternal sensitivity to distress and non-distress. This was done with the hypothesis that maternal sensitivity in emotion eliciting or high negative arousal contexts would be more predictive of later attachment security than sensitivity observed in neutral or pleasant conditions. In the emotionally eliciting tasks, infants were exposed to noisy, age inappropriate toys that were thought to provoke a fearful response and to an arm restraint task that was thought to provoke frustration. In the low arousal condition, mother and infant engaged in free-play with a number of age appropriate toys. All but four of the 70 infants became distressed during the fear and frustration tasks demonstrating that these tasks were typically emotion eliciting for this group of infants. In standalone regression analyses, and when both sensitivity measures were included, significant associations were found only between sensitivity during the emotion eliciting tasks at 6 months and attachment security at 16 months (secure versus insecure) with those infants whose mothers were more sensitive in the distressing tasks being more likely to be securely attached ten months later. For every one point increase in maternal sensitivity in the distress task, infants were 2.58 times more likely to be rated secure than insecure in the Strange Situation. There was no evidence of indirect effects of mother reported temperament on attachment security. Again, this study supports the idea that there is something special about the way in which mothers respond to infant distress or exposure to threat in terms of the mother-infant relationship and later attachment and more work is needed in this area.

***1.5.1.4 Stability of maternal sensitivity.*** It is assumed that maternal sensitivity plays a role in the development of precursors to attachment behaviours

and in the interactive model between mother and infant that fosters an attachment relationship. Changes in maternal sensitivity and responding could potentially lead to changes in the expectations of how a mother might respond to attachment bids and subsequent shifts in threat management practices on the part of the infant. As a result, the temporal stability of maternal sensitivity may be an essential component to the prediction of attachment from one time point to another. This section reviews the literature surrounding the temporal stability of maternal sensitivity across both short and longer time periods.

In a study using maternal sensitivity rating scales devised by Ainsworth (Ainsworth, Bell, & Stayton, 1974), stability of maternal sensitivity in 60 mothers with infants from 3 to 12 months was found to be low with only 5 of 25 correlation coefficients reaching statistical significance (Lohaus, Keller, Ball, Voelker, & Elben, 2004). The authors suggested that this instability could be either a result of changes in maternal behaviour or in the meaning of maternal sensitivity as infants grow and develop. That is, elements of maternal behaviour considered sensitive at three months may no longer be appropriate at 12, so it may be difficult to make direct comparisons through time without using distinct age appropriate measures. However, there is evidence for the stability of maternal sensitivity over time. Meier, Wolke, Gutbrod, & Rust (2003) found maternal sensitivity to be stable from 0-3 months in a group of 38 premature infants. Stability of maternal sensitivity over a three month period was also examined in a study of 73 mothers and their infants at 3 and 6 months across different contexts including bath time, sitting on the mother's lap and during the Still-Face (Joosen, Mesman, Bakermans-Kranenburg, & van IJzendoorn, 2012). Analyses revealed significant correlations between sensitivity measures at 3

and 6 months across all but one context. Maternal sensitivity has also been found to show temporal stability across similar intervals in older infants observed at 10 and 12 months (Behrens, Hart, & Parker, 2012), with mothers with symptoms of anxiety and/or depression and their infants at 4, 8 and 12 months (Pauli-Pott, 2008) and over time periods from 6 weeks to 24 months (Kemppinen, Kumpulainen, RaitaHasu, Moilanen, & Ebeling, 2006).

Stability of maternal sensitivity has also been examined in the Still-Face paradigm with 115 mothers and their infants aged 3 and 6 months, finding significant temporal stability across both the engagement and reunion phases (Mesman, Linting, Joosen, Bakermans-Kranenburg, & van IJzendoorn, 2013).

**1.5.2 The infant contribution – temperament.** The focus of this thesis is the individual infant’s contribution to attachment processes before age 12 months, and so this section briefly reviews the main area of individual contribution studies so far, infant temperament.

*1.5.2.1 Defining infant temperament.* Rothbart & Derryberry (1981) defined temperament as “individual differences in reactivity and self-regulation assumed to have a constitutional basis”. The term *constitutional* was further defined as “the relatively enduring biological makeup of the organism, influenced over time by heredity, maturation, and experience”. This definition ensures that the concept of temperament, although in place at a very early age, remains fluid and can alter with the development of new processes and experiences. That is, young infants are very reactive and appear to have little control over their emotions and impulsive behaviours. As the infant matures and gains skills that allow them to exert self-control and cognitive appraisal, they may be less likely to respond in this manner and, consequently, may appear to have a less difficult or irritable temperament.

In general, temperament is regarded as a constitutionally based predisposition that is stable across time and generalisable across situations (Buss & Plomin, 1984; Rothbart & Derryberry, 1981). The temperamental dimension of irritability, or a low threshold to the expression of negative affect, has been shown to influence the quality of mother infant interaction. Associations between infant irritability and maternal behaviour have been investigated using different kinds of measures of irritability. Some studies used measures of infant irritability that are independent of caregiving behaviour (Crockenberg & Acredolo, 1983; Crockenberg & Smith, 1982;

Fish & Crockenberg, 1981; Linn & Horowitz, 1983; Gunning, Halligan, & Murray, 2013; Osofsky & Danzger, 1974; van den Boom, Dymphna, 1989), whilst others used parent report measures ( Bates et al., 1982; Bates, Olson, Pettit, & Bayles, 1982; Campbell, 1979; Gunning et al., 2013; Pickles et al., 2013).

#### ***1.5.2.2 The potential relevance of infant temperament to attachment***

***development.*** Temperament is considered here because it represents the most studied dimension of infant behaviours that might influence attachment over the first year of life. It should be noted that, historically, attachment and temperament were viewed as competing constructs with arguments made that attachment status simply reflects temperament (Kagan, 1982) and others arguing that they are distinct. Sroufe (1985) argued that temperament has little effect on attachment outcomes as the two fundamentally different constructs “operate at different levels of analysis.” He went on to emphasise the importance of recognising that it would be imprudent to attempt to reduce qualitative dimensions of dyadic attachment relationships to individual behavioural traits. Following this, one cannot underestimate the impact of infant experience and dyadic behavioural repertoire in separation and reunion behaviours that operate above and beyond trait or temperament behaviours.

It has been argued that behavioural variations in the reunion episodes of the Strange Situation are a result of infant temperament only and so reflect the infant’s ability to recognise and manage threat rather than the attachment relationship between mother and child (Buss & Plomin, 1986). This idea focuses on infant behaviour as the most important predictor of attachment outcome when using the Strange Situation paradigm to measure attachment and serves to shift the emphasis

from mother to child behaviour. An irritable child, for example, may display more overt and extreme signs of distress on separation resulting in them being less able to regulate their emotion on reunion with the mother within the three minute time frame of the paradigm. Following this example, a highly irritable child or one with negative emotionality or low soothability could be more likely to be rated as insecure-resistant as they have further to go to return to baseline state after distress than their less irritable counterparts. It is argued that in these cases, behaviours relating to infant temperament (or trait behaviours) are mistakenly interpreted as behaviours pertaining, specifically, to attachment threats and repair with a primary caregiver. Attachment theorists would argue that whilst these highly irritable children may respond differently to separation from their mother (as a result of their temperament), their reunion behaviours should not be affected as the Strange Situation is a robust and valid measure of attachment. That is, whilst a highly irritable infant may become extremely distressed following separation, a secure attachment relationship would serve to support the child to repair and regulate their behaviour on reunion with the help of the mother regardless of temperamental variations. Similarly, a highly irritable child who remains distressed and angrily fretful on reunion may be categorised as insecure-resistant because their attachment relationship with the primary caregiver is not secure and does not foster a swift and harmonious repair to the distress experienced on separation. Results of studies investigating the relationship between temperament and attachment are mixed.

There is also a body of research that has found that infant temperament does not predict secure versus insecure attachment (Crockenberg, 1981; Gartstein & Iverson, 2014; Marshall & Fox, 2005; Pauli-Pott, Haverkock, Pott, & Beckmann,

2007; Vaughn, Bost, & van IJzendoorn, 2008). In a study of 119 mother-infant dyads with maternal report of infant temperament (Infant Temperament Questionnaire (ITQ-R); Carey & McDevitt, 1978) at 5 months and observational attachment data in the Strange Situation at 14 months, Vaughn, Lefever, Seifer, & Barglow (1989) found no significant relationships between ITQ-R variables and attachment classification. However, these analyses only involved A, B and C classifications as disorganisation was not included when coding attachment. A further study found associations between infant temperament and attachment varied as a function of the method used to measure attachment. No association was found between observational measures of infant temperament at multiple time points and attachment in the Strange Situation, whilst a significant relationship was found between infant temperament and attachment as measured by the Attachment Q-Sort (Seifer, Schiller, Sameroff, Resnick, & Riordan, 1996).

There is evidence to suggest that specific behavioural markers of difficult temperament such as irritability, negative emotionality and soothability may play a role in the development of an attachment relationship between the mother-child dyad (Egeland & Farber, 1984; Goldsmith & Alansky, 1987; Mills-Koonce, Propper, & Barnett, 2012; Niederhofer & Reiter, 2003). Meta-analytic results of 18 studies of temperament and attachment found that “distress proneness predicted resistant behaviour in the Strange Situation with low strength when the relation was uncorrected for attenuation” (Goldsmith & Alansky, 1987). Similarly, Mangelsdorf, Gunnar, Kestenbaum, & Lang (1990) found there to be an interaction between maternal personality and infant proneness-to-distress that predicted attachment security.

This idea that the infants' emotional state and ability to self-regulate has a direct impact on parental behaviour (and resultant dyadic behaviour) is in direct contrast to attachment theory which states that infant temperament has no effect on attachment as it can be counteracted by sensitive parenting. In support of this theory, Egeland & Farber (1984) found associations between neonatal nurse ratings and attachment security at 12 and 18 months with infants later rated as resistant and avoidant being rated as more difficult (on a scale of *ease of care for baby*) by nurses as newborns. These results are of particular importance as the predictor, being recorded during the first few days following birth, is pure and unlikely to have been affected by prior caregiver experience or anticipation.

There is also evidence to suggest that temperament does not predict attachment status but may predict emotionality within attachment categories as infants from the same global attachment classification group have been found to demonstrate different susceptibilities to distress (Belsky & Rovine, 1987). Other studies have found similar results with temperament predicting subcategory classification rather than distinct attachment category (Braungart-Rieker et al., 2001; Mangelsdorf, McHale, Diener, Goldstein, & Lehn, 2000; Marshall & Fox, 2005; Thompson, Connell, & Bridges, 1988; van Ijzendoorn, Vereijken, Carolus, BakermansKranenburg, & RiksenWalraven, 2004).

Whilst the bulk of research in this area involves the distinction between secure and insecure attachments and the relationship between difficult temperament and insecure resistant attachment in particular, there is also evidence to suggest



relations between infant temperament and disorganised attachment. The following section outlines the research in this area.

**1.5.2.3 Temperament and disorganised attachment.** A meta-analysis of nine studies including measures of infant temperament and disorganisation in the Strange Situation ( $N = 1790$ ) failed to find an association between the two constructs (van Ijzendoorn et al., 1999). Furthermore, a small and non-significant combined effect of  $r = .10$  was found across three of the studies when examining the relationship between disorganised attachment to mother and father. The authors argued that this lack of consistency of disorganisation with multiple caregivers is further evidence that infant temperament is not related to disorganisation in the Strange Situation. This conclusion was further supported in a more recent study (Wang, Cox, Mills-Koonce, & Snyder, 2015).

## **1.6 Attachment Organisation prior to age 12 months**

As the preceding literature review has shown, attachment status is generally assessed from age 12 months onwards, and studies of possible influences have assessed maternal behaviours and temperament during the preceding months. The question that has received little attention, and is the focus of this chapter, is whether infant attachment strategies are established before age 12 months. This is important if we are to understand the interplay between caregiver and infant behaviours over the first year. In this chapter, possible reasons as to why attachment status has not been assessed prior to 12 months are reviewed, together with consideration of why it is important to explore this further.

**1.6.1 Why is attachment not measured earlier than 12 months?** Babies need to regulate emotions in some way but the question is at what age do they develop distinctive ways or variations that might be more or less successful and measurable?

As long ago as 1969, it was suggested that before reaching the “clear cut attachment” phase between 8-12 months where attachment behaviours are organised and measurable, infants go through the “attachment in the making” phase (Bowlby, 1969). The attachment in the making phase begins at approximately 6 weeks and runs through to the clear cut attachment phase. During this time, infants learn to discriminate between strangers and familiar people, develop a sense of trust and learn that their actions can cause reactions in their environment and social world. So if this

idea has been around for so long, why hasn't more been done to understand the origins and developmental pathway of attachment from an infant perspective?

It would not be feasible to measure attachment behaviours in infants before the age of 3-4 months as before this time they are less able to focus and manage their arousal levels for any length of time. They are also more likely to become distressed or fall asleep for reasons that are developmental rather than relational. However, by approximately 5-10 months, infants are able to stay awake for longer and more predictable lengths of time and have developed more advanced emotion regulatory processes that enable them to better deal with episodes of stress.

Some relevant investigations of the very earliest processes have been conducted. In a longitudinal study of infants aged 1 to 7 months, Lamb & Malkin (1986) found evidence of established cognitive expectations of maternal behaviour in the attachment domain, as shown by an association between distress, pick-up and subsequent distress relief, in infants as young as 4-5 months of age. Infants of this age showed anticipatory calming (quietening or reduced distress) in the presence of the mother, implying an expectation that their needs are about to be met. Researchers also found evidence of infant emotion regulation at this age by introducing a maternal delay to infant pick-up when distressed, which was met by increased infant protest. The authors interpreted this protest as a cue or initiation of a behavioural sequence intended to regulate maternal behaviour to soothe distress. Other researchers have argued that infants as young as 5 months show communicative behaviours that suggest they have an expectation that their cries will elicit a response, and that they are able to use different cries to convey different messages

such as pain, hunger and tiredness (Kopp, 1989). This evidence of infant anticipatory and emotion regulatory behaviours in infants of 4-5 months supports the argument for the observation and measurement of attachment-like behaviours in infants before 12 months, as it suggests that they may have already developed emotion regulatory behaviours and IWMs that involve the use of the mother to achieve an optimal state when distressed.

It has also been argued that there is a 'bio-behavioural shift' that occurs at approximately 7 months of age where infants make advances in terms of locomotor ability, intentionality and object permanence. These developments seem to go hand-in-hand with the formation of an attachment to a primary care giver and other behaviours relating to attachment, such as fear of strangers and separation anxiety (Zeanah, Anders, Seifer, & Stern, 1989).

In terms of physical development and the measurement of attachment, the Strange Situation assumes some motor competence such as sitting, crawling, or some degree of ability to move towards or away from the mother. Infants younger than 12 months may be crawling but would not typically be able to walk or demonstrate the kinds of coordinated movements necessary for the observation and rating of certain attachment behaviours (e.g. aborted approach, freezing for 20 seconds).

Furthermore, the Strange Situation is designed specifically to be stressful to the majority of 12 – 18 month olds as they are left alone with a stranger in an unfamiliar room. Infants younger than 12 months may not experience this as stressful if they have not yet developed a fear of strangers. However, from around 8 months of age, infants tend to no longer be indiscriminately friendly and begin to show wariness of

unfamiliar people (Schaeffer & Emerson, 1964). In a longitudinal study where infants were seen at four weekly intervals from 6-14 weeks of age, it was found that all infants displayed a fear of strangers by 12 months and the mean onset of fear of strangers was 36 weeks (around 8 months) (Schaffer, 1966).

Given the evidence for associations between both parental and infant contributions and attachment, it may be that during the first year of life, attachment behaviours are being developed in an interactive model in which the mother and infant both contribute and there is an interplay between the two. Each party brings their own social skills, temperament and expectations to the interactions and responds accordingly. Each experience will then contribute to the next. So, if there is an attachment-like organisation over the first year of life, then the task of the caregiver is to find a way of responding to that organisation. Importantly, if this were the case, we need to study the origins of attachment even earlier, and we need to look at the contribution of early infant attachment status to parenting quality i.e. a more interactional perspective than currently.

**1.6.2 Why might it be important to study attachment in infants younger than 12 months?** If precursors to attachment behaviours do exist, and are measurable at a younger age than the standard 12 months, it may be possible to introduce early intervention programmes to deal with signs of disorganised or insecure organised attachment patterns in order to improve relationship functioning and later outcomes for the child. Parenting groups run by health visitors or child and adolescent mental health teams could include information about attachment and about how subtle behaviours can impact on the growing attachment relationship

between mothers and young infants. Information such as this could be given in antenatal groups or in general health visiting appointments, without the need for referral through services, in order to access a wider parental audience.

**1.6.3 Summary of attachment organisation prior to age 12 months.** In summary, the fact that attachment is not studied in infants younger than 11 months of age, even though they already possess at least some of the necessary cognitive, emotional and social faculties needed to form attachments, suggests that there remains much to learn. Unanswered questions include: do infants younger than 12 months show threat-related patterns of behaviour with mothers that resemble those seen in the Strange Situation? Is there stability of pattern from earlier in infancy to the Strange Situation? Do earlier infant patterns of behaviour and maternal sensitivity both predict later attachment security?

## **1.7 Rationale for this Study**

As discussed in Section 1.6, infant attachment is currently not measured before the age of one year and has been found to be moderately stable from this age to 18-20 months (Pinquart et al, 2013). Infants with insecure or disorganised attachment have been found to have more adverse outcomes than their secure counterparts in areas such as behaviour problems, peer relations, school performance and psychopathology (Fearon et al, 2010; Groh et al, 2014; Madigan et al, 2013; West et al, 2013). Since there is evidence of moderate attachment stability from 11 to 18 months, there is an argument for stability of attachment, or of patterns of attachment, from an earlier age to 12-18 months.

The Still-Face paradigm mirrors the pattern of interactions in the Strange Situation in that it introduces a disruption to the mother-infant communication in the still-face episode (in effect, a separation) and then an opportunity to repair in the reengagement/reunion episode. Infants have spent 6 months experiencing and anticipating maternal responses to distress and non-distress and will have developed some form of IWM or idea of how available their mother might be when faced with threat. Infants of this age may also have an anticipation of how successful the mother is in supporting distress reduction and these expectations may be precursors to attachment

The Still-Face paradigm has been used in previous studies to explore mother, infant and interactional behaviour patterns in relation to their later attachment status in the Strange Situation. These studies are summarised in Table 1.7.1. However,

there is a relative dearth of research into how attachment security might be categorised before 12 months. There have been a number of studies that have been able to differentiate between secure and insecure or disorganised attachment groups using microanalysis of infant behaviour (Beebe et al., 2012) or by exploring maternal sensitivity and intrusiveness (Tomlinson, Cooper, & Murray, 2005). Only two studies have been identified that assigned infants to attachment categories from the Still-Face, both unpublished PhD theses, the findings of which are reviewed in Section 1.7.2. However, the prediction to the four distinct attachment categories from the Still-Face has not yet been achieved.

The next section will outline the current research into the relationship between infant behaviour in the Still-Face and later attachment outcomes in the Strange Situation, with a focus on what has already been done and where further research is needed. Following this, the rationale for the current study will be introduced along with the study aims and hypotheses.

**1.7.1 Previous studies exploring associations between the Still-Face and Strange Situation.** A meta-analysis in 2009 reported 8 studies predicting attachment security from infant behaviours in the Still-Face (Mesman et al., 2009). Results revealed that overall, compared to future insecure infants, future secure infants showed more positive affect and less negative affect in the Still-Face. Since 2009, a further four known studies have been published that have predicted attachment at 12 months in the Strange Situation from earlier infant behaviours in the Still-Face. Table 1.7.1 provides a summary of all of these studies.



Table 1.7.1

*Studies predicting attachment at 12 months from earlier infant behaviours in the Still-Face*

<b>Study</b>	<b>Infant SFP age (months)</b>	<b>N</b>	<b>Sample</b>	<b>SSP attachment groups</b>	<b>SFP episode</b>	<b>Summary</b>
<b>Tronick, Ricks, &amp; Cohn, (1982)</b>	3	12	Not reported	B and C	Still-Face	Adaptation (positive, negative or absence of elicits) in the SFP predicting secure or anxious attachment months in the SSP
	6	17				
	9	19				
<b>Kiser, Bates, Maslin, &amp; Bayles, (1986)</b>	6	132	Middle class	A, B, C	Engagement, still-face & reunion (infant removed from seat between episodes)	Associations between security and maternal positive involvement, grimacing, fussing & interactional variables.
<b>Cohn, Campbell, &amp; Ross, (1991)</b>	2, 4, 6	66	Depressed and non-depressed mothers	B Vs A (low numbers of C)	Still-Face (no reunion episode administered)	Positive elicits in the SF at 6 months (only) predicted secure attachment, failure to elicit positively predicted avoidant attachment.

<b>Study</b>	<b>Infant SFP age (months)</b>	<b>N</b>	<b>Sample</b>	<b>SSP attachment groups</b>	<b>SFP episode</b>	<b>Summary</b>
<b>Kogan &amp; Carter, (1996)</b>	4	22	Diverse in parity, age, ethnicity, work & marital status.	SSP scale scores	Reunion	Continuity between SFP reunion behaviours and contact maintaining behaviours in the SSP. Toys used in the SFP.
<b>Braungart-Rieker et al., (2001)</b>	4	94	Middle class	A, B, C	Still-face (no reunion episode administered)	Infant affective and self-regulatory responses at 4 months predict attachment using linear discriminant functioning.
<b>Bingen, (2001)</b> Unpublished.	3-9 ( <i>M</i> =5.49)	50	Community sample	A, B, C (analysis only secure versus insecure).	Still-face and reunion episodes	Patterns of infant Still-Face behaviours used to derive attachment classifications. No significant agreement between SFP and SSP classifications.

<b>Study</b>	<b>Infant SFP age (months)</b>	<b>N</b>	<b>Sample</b>	<b>SSP attachment groups</b>	<b>SFP episode</b>	<b>Summary</b>
<b>Jamieson, (2004)</b> no touch Unpublished.	4	78	Middle class	A, B, C	Engagement, still-face & reunion episodes	Infant looking, grimacing and negative vocs in the SFP predicting attachment
<b>Jamieson, (2004)</b> with touch	6	81	Middle class	Secure Vs Insecure	Engagement, still-face & reunion	As above but SFP at 6 months
<b>Fuertes, Santos, Beeghly, &amp; Tronick, (2006)</b>	3	48	Prematurely born infants	A, B, C	Still-face and across all episodes.	Attachment influenced by infant temperament, coping behaviour and maternal sensitivity
<b>Mcquaid (2011)</b>	4-5 ( <i>M</i> =4.80)	72	Low-risk community sample	Secure Vs Insecure	Engagement, still-face & reunion	Neither maternal contingent responsiveness nor infant social bids in SFP correlated with SSP attachment.

<b>Study</b>	<b>Infant SFP age (months)</b>	<b>N</b>	<b>Sample</b>	<b>SSP attachment groups</b>	<b>SFP episode</b>	<b>Summary</b>
<b>Braungart-Rieker et al., (2014)</b>	3, 5, 7	117	Middle class	A, B, C, D	Still-face & reunion episodes	SFP response trajectories (affect, visual orientation and self-comforting) related to infant attachment.
<b>Holochwost, Gariépy, Propper, Mills-Koonce, &amp; Moore, (2014)</b>	6	95	European & African American (high & low income groups)	Secure versus insecure (with D score)	Engagement & reunion episodes.	Disorganisation associated with interaction of negative-intrusiveness & high RSA in the SFP.

*Note.* A = Avoidant, B = Secure, C = Resistant, D = Disorganised

*1.7.1.1 Differences in procedures and outcome measures across studies.* As shown in Table 1.7.1, there is heterogeneity between the studies, their predictions and their administration and use of the Still-Face. The Still-Face was administered to infants ranging from 2-9 months, using touch and no-touch paradigms, with episode lengths of between 90 seconds and 5 minutes, some with the use of toys (Braungart-Rieker et al., 2001) and some with warm up periods. This means that infants were sat in position for up to 10 minutes prior to the commencement of the engagement episode. The studies vary in terms of attachment outcomes with some predicting secure versus insecure (Tronick et al., 1982), some predicting secure versus secure in addition to continuous disorganised scale scores (Holochwost et al., 2014), others a three-way classification (Bingen, 2001; Braungart-Rieker et al., 2001; Cohn et al., 1991; Fuertes et al., 2006; Jamieson, 2004; Kiser et al., 1986) and only one using a four-way classification (Braungart-Rieker et al., 2014). Only two studies included disorganised attachment in their measurement and analyses (Braungart-Rieker et al., 2014 and Holochwost et al., 2014).

Studies also varied as to which episode, or episodes, of the Still-Face they used in their attachment predictions. This is interesting given one of the arguments for the use of the Still-Face in the prediction of attachment is that it mirrors the Strange Situation paradigm in its use of a social stressor involving the mother, and subsequent reunion and opportunity to repair. Certainly, the reunion episodes of the Strange Situation are vital to the rating of an attachment classification so it is counterintuitive to exclude the reunion episode of the Still-Face from the examination of precursors of attachment (Braungart-Rieker et al., 2001; Cohn et al., 1991; Tronick et al., 1982). Other studies were unable to examine the specificity of

the reunion episode as mean scores across all three episodes were used (Fuertes et al., 2006; Fuertes et al., 2009). There were two studies in which the reunion episode was completely omitted from the procedures (Braungart-Rieker et al., 2001; Cohn et al., 1991). No reason for this omission was given in either paper. Each of these papers still reported a three episode Still-Face, one with play with toys, play without toys and then the still-face (Braungart-Rieker et al., 2001) and the other with engagement, face turned to the side for 15 seconds then the still-face (Cohn et al., 1991). The sample sizes used in these studies are small with only two having more than 100 participants (range  $N = 12-132$ ).

***1.7.1.2 Summary of previous attachment prediction findings where no attachment classification was made in the Still-Face.*** All but two of the studies summarised in Table 1.7.1 found associations between infant behaviour in the Still-Face and future attachment classification (Bingen, 2001 and Mcquaid, 2011). The Bingen (2001) study made attempts to classify attachment security in the Still-Face whereas the Mcquaid (2011) study did not. Both of these studies were unpublished doctoral theses, and it is possible that there may be a further file drawer effect of other unpublished studies with negative findings.

Whilst the majority of the studies in the table above made hypotheses about the associations between infant behaviour in the Still-Face and later attachment security, not all categorised attachment in the Still-Face in order to explore continuities of attachment behaviours in the same way as the current study. That does not mean, however, that these studies cannot inform the development of a method for classifying attachment in the Still-Face. This section examines how relevant findings

from these studies might be extrapolated for use in the development of the method in the current study. The two studies which did categorise attachment in the Still-Face are discussed subsequent to this in Section 1.7.2 and the prediction of the disorganised attachment later in Section 1.7.2.3.

Across the studies reporting positive findings, infants who displayed more positive elicits towards their mothers at 6 months (for example smiling, positively vocalising, initiating a game) were more likely to be securely attached one year than infants who did not elicit these behaviours towards their mothers (Tronick et al., 1982). Similarly, future secure infants were found to elicit more positive communicative bids towards their mothers in the Still-Face episode at 6 months compared to those who were later categorised as avoidant (Cohn et al., 1991). Future secure infants were also found to show less negative affect during the still-face episode and more during the reunion compared to later resistant infants (Kiser et al., 1986). The future secure group were also found to show significantly more positive affect towards their mothers throughout the entire paradigm as compared to infants later classified as avoidant or resistant. Resistant infants showed significantly more negative behavioural expressions than avoidant infants. Future resistant infants as young as four months were found to use significantly reduced levels of emotion regulatory behaviours (self and mother-directed) during the Still-Face than both future secure and avoidant infants of the same age (Fuertes et al., 2006).

As discussed above, few studies have provided the opportunity to study the patterns of infant behaviour across episodes of the Still-Face. In one study that did, differences in behaviours across the engagement and reunion episodes were found to

distinguish between future attachment classifications (Kiser et al., 1986). This was particularly useful in the recognition of future avoidant infants who were less playful in the engagement phase and more positive in the reunion episode than their future secure or resistant peers. Thus, the examination of more than one episode of the Still-Face and the pattern of behaviour across these episodes can inform the classification of attachment-like behaviours.

Interestingly, Kogan and Carter (1996) conducted some preliminary analyses into the continuity of Strange Situation scale scores measured in the Still-Face reunion at 4 months and then later in the SSP and found evidence of continuities. These longitudinal exploratory analyses were, however, only conducted on a sample of 22 infants and so whilst they are interesting and promising, more work with larger samples is needed.

Braungart-Reiker et al., (2001) suggested that infant emotion regulatory processes might be measurable before the development of attachment security and explored the association between these processes in the Still-Face and later attachment security in the Strange Situation. Associations were found between infant affect regulation at 4 months and attachment classifications and sub-classifications at 12 months with later A or B1-B2 infants demonstrating high levels of affect regulation than later C or B3-B4 infants. Furthermore, infant affect regulation was found to partially mediate the relationship between maternal sensitivity at 4 months and attachment security at 12 months thus demonstrating the importance of investigating early infant contributions to the development of attachment security.



Thus, these studies provide important information as to the way in which one might expect infants with different 12 month attachment classifications to behave earlier in the Still-Face. The very fact that these associations have been identified provides support for the idea that early discrete markers of emotional and behavioural regulation may be measurable at 7 months in the Still-Face and that these may provide indications as to the way attachment strategies are evolving. Other examples of such markers of the emerging attachment system include the findings that scale scores similar to those in the Strange Situation can be applied to the Still-Face (Kogan & Carter, 1996), the pattern of infant behaviour across Still-Face episodes is informative (Kiser et al., 1986), the profile of future secure infants is likely to involve more positive behaviours and less negative behaviours directed towards the mother (Cohn et al., 1991; Tronick et al., 1982) and future resistant infants may be more likely to display fewer emotion regulatory behaviours than future secure or avoidant infants (Fuertes et al., 2006).

**1.7.2 Studies classifying attachment in the Still-Face.** Only two studies from those identified in Table 1.7.1 made explicit predictions about future attachment group status and assigned infants with attachment-like classifications in the Still-Face (Bingen, 2001 & Jamieson, 2004). These two studies remain unpublished and are discussed below.

**1.7.2.1 Negative findings in the prediction of attachment.** Whilst the Bingen (2001) study failed to find significant agreement between attachment classifications in the Still-Face and Strange Situation, the method by which attachment-like classifications were made is worth consideration. A three-way classification system

of attachment-like behaviour was generated on the basis of the qualitative observation of infant behaviour in the still-face and reunion episodes in much the same way as the Strange Situation is rated. Templates for how secure, avoidant and resistant infants would be expected to behave in each of these episodes, in terms of affect, engagement, greeting, recovery and self-soothing, were drawn up and tapes were viewed a minimum of two times before classification was made. These behavioural templates were reduced to salient markers of infant elicit and interactional behaviours to aid classification. Future secure infants were those who exhibited more positive elicits in the still-face and more positive interactions in the reunion. Future avoidant infants were predicted to show fewer elicits or distress in the still-face and few interactions in the reunion. Future resistant infants were predicted to show more negative elicits in the still-face and negative interactions in the reunion. Results revealed poor agreement between both attachment classifications in the Still-Face and Strange Situation and between the specific infant Still-Face behaviours in isolation and attachment at 12 months. Problems with this study include a wide age range of infants in the Still-Face (3-9 months, mean 5.49) and a small sample size ( $N = 50$ ). The developmental differences between infants of 3-9 months are immense and it could be argued that what is a developmentally appropriate measure for infants at one extreme would not be appropriate for those at the other.

**1.7.2.2 Positive findings in the prediction of attachment.** In the second study predicting attachment-like behaviours in the Still-Face, Jamieson (2004) conducted three studies to explore the relationship between infant behaviour in the Still-Face at 4 and 6 months and later attachment classification in the Strange Situation. Studies

one and two were exploratory studies in which hypotheses were made to compare patterns of infant behaviour in the Still-Face to attachment groups at 12 months. Study three was a predictive study in which the author generated a coding scheme that could be used to derive three-way attachment classifications at 6 months in the Still-Face. These attachment-like classifications were significantly associated with attachment classification in the Strange Situation at 12 months.

Analysis of the data from the 78 participant dyads in study 1 showed that patterns of behaviour in the no-touch condition of the Still-Face at 4 months, particularly visual attention and negative affect, varied by attachment security at 12 months. Specifically, infants classified as avoidant and resistant in the Strange Situation were quicker to avert gaze from the mother in the still-face and reunion episodes than their future secure peers, but the opposite was true for the engagement episode. Other interesting findings from this study include future secure infants showing less difficulty re-engaging with the mother on reunion. This was demonstrated by consistency in their latency to avert gaze times across episodes compared with the sharp decrease seen by avoidant and resistant infants from engagement onwards. Future insecure infants showed more distress during the still-face episode and more grimacing across all three episodes of the Still-Face, with those who were future resistant showing the most grimacing during the still-face episode. Surprisingly, future avoidant infants were found to be more distressed in the still-face than both future secure and future resistant infants. Emotion regulatory processes and Strange Situation coding would suggest that a typical avoidant pattern of responding would involve little distress. This anomalous finding could be a result of this study not discriminating between organised and disorganised forms of

insecure attachment and infants who would be otherwise classified as disorganised being instead placed in the avoidant group. The relatively small sample size of this study may have made it difficult to create a four-way attachment classification that provided sufficient numbers in each group for analyses. Indeed, the author commented that the sample was highly skewed towards security and there were small numbers in the insecure cells ( $n = 43$  future secure,  $n = 35$  future insecure).

Study 2 employed a Still-Face with 6 month olds that, instead, allowed the mothers to touch the infants in the engagement and reunion phases. Results of this study almost perfectly replicated those of study 1 in terms of durations of looking to mother and smiling during the still-face episode. Infants in this second study were found to grimace for significantly longer across all episodes and were more distressed by the still-face episode than infants in study 1. Patterns of exploration were noted, with infants looking away from the mothers and exploring more during the still-face episode and less in the reunion. Resistant children explored less and looked to mother less in the reunion compared to the engagement episode and showed difficulties regulating and reengaging with mother. Lastly, contrary to assumptions about avoidant attachment, avoidant infants were found to look and smile more in the reunion.

Study 3 is perhaps the most directly relevant to the current study. Having become a reliable rater of the Strange Situation, Jamieson viewed 30 Still-Face interaction tapes from study 1 (11 rated resistant, 8 avoidant and 10 secure in the Strange Situation at 12 months), identified patterns or similarities between the groups, and produced a template to aid classification at 6 months based on how each

group would be expected to behave during the Still-Face. These templates were informed by infant affect, reaction to the still-face and reunion, referencing to mother and interaction with the unfamiliar female researcher, where possible. Answers from a questionnaire completed by the mother at the time of the Still-Face were also used to aid classification. The following section briefly describes the templates used for attachment-like classification.

*Secure* infants displayed a balance of curiosity in the environment and engagement with mother in the engagement and reunion phases and made bids for the mother's attention if they became distressed during the still-face episode (noticing her absence and 'checking-in' if no distress). Initial looking times to mother were consistent across episodes, infants showed an ability to repair and return to exploration in the reunion and showed a range of affect.

*Resistant* infants were recognisable by their preoccupation with the mother in the engagement and reunion episodes and a lower latency to avert gaze time in the still-face and reunion episodes. Evidence of resistance or avoidance of contact with the mother in the reunion and higher levels of grimacing were also used as possible indicators of a resistant classification.

*Avoidant* indicators in the Still-Face included increased looking to mother in the engagement episode followed by apparent indifference in the remaining episodes, disparity between exploration and referencing to mother, lower latency to look away times in the still-face episode, avoidance in the reunion and a positive interest in the female researcher.

This classification system centred on a qualitative method of rating in which the rater watched each video multiple times (a minimum of three). The author stated that not all infants displayed patterns of behaviours that perfectly matched the attachment templates and when this was the case, “clinical judgement based upon a foundation of knowledge of attachment theory and infants’ responses in the Still-Face” was used to inform classification.

Using the templates for classification described above, agreement of attachment classification from Still-Face to Strange Situation was achieved 73% of the time when attachment was dichotomised into an insecure/secure variable. When the three-way attachment variable was used in analyses, there was 67% agreement (52 of 78) between attachment measured in the Still-Face and Strange Situation. Avoidant attachment was the least accurately identified with 48% agreement compared to 73% for resistant and 75% for secure.

***1.7.2.3 Predicting disorganisation from the Still-Face.*** Only two known studies have investigated the relationship between infant behaviours in the Still-Face and future disorganised attachment (Braungart-Rieker et al., 2014 and Holochwost et al., 2014). One of these studies found significant associations between disorganised attachment in the Strange Situation and an interaction between maternal behaviour (negative-intrusiveness) in free-play at 6 months and high infant respiratory sinus arrhythmia (RSA) in the engagement and reunion episodes of the Still-Face (Holochwost et al., 2014). As this association is in interaction with biological measures, it is not strictly relevant to the current study. The second study does not

predict from Still-Face to attachment classification but examines the associations between Still-Face response trajectories (measured at 3, 5 and 7 months) and four-way infant classification in the Strange Situation (Braungart-Rieker et al., 2014). No significant associations between maternal sensitivity and future disorganised attachment were reported but future disorganised infants displayed reduced parent orientation in the engagement episode compared to future secure infants. No associations were found between disorganisation in the Strange Situation and parental sensitivity trajectories.

In summary, very little research has been carried out in the prediction of disorganised attachment in the Strange Situation from infant Still-Face behaviours. Where there is research and significant associations have been found, this has focussed on interactions with biological measures. Other studies have failed to find significant associations between disorganised attachment with mother and Still-Face behaviours. As disorganised attachment in infancy has been found to have long term developmental outcomes, it is important to further develop this area of research.

**1.7.3 Conclusions and gaps in the literature.** To conclude, there are few studies into the early attachment-like patterns of infant behaviours prior to one year. This is despite evidence to support the idea that infants as young as 3 months might be in an “attachment in the making” phase (Bowlby, 1969) and that the Still-Face provides a valuable opportunity for examining this. Only two studies to date have attempted to classify infant attachment in the Still-Face; only one of these found positive findings but neither has been published. Furthermore, the disorganised attachment classification has received still less attention, with only one study

examining its associations with future attachment and no studies attempting to make a D classification in the Still-Face.

Surprisingly little attention has been paid to the reunion episode of the Still-Face. This is despite it providing an opportunity to observe interactional repair after an attachment threat in a much similar way as is executed and rated in the Strange Situation. As there is evidence of maternal sensitivity to distress being especially predictive of infant attachment, there is reason to believe that the reunion episode (following a stressor) may be a better opportunity to observe maternal behaviour and the interactional attachment relationship as a whole. Similarly, patterns of infant behaviours across episodes of the Still-Face have generally only been considered with regards to showing a Still-Face effect and not an effect of distress and consequent repair.

Of the two studies that did attempt to classify attachment-like behaviours in the Still-Face, both used a qualitative method of watching the tapes several times with templates of behaviour patterns for each category. Whilst this mirrors the Strange Situation coding procedure, it is time consuming and it means that only researchers with direct access to the data could make the step from Still-Face behaviours to attachment-like classifications. In addition, this method of classification involves having to make an informed but subjective judgement about classification where infant behaviour patterns do not fit the template.



## 1.8 The Current Study

The case has been made that there is no evidence to suggest that attachment-like behaviours are not already in place before 12 months nor that these behaviours are not measurable. The current study seeks to advance existing work on the links between infant behaviour in the Still-Face and Strange Situation paradigms by generating a classification system of attachment-like behaviours observable in the Still-Face paradigm. Classification will mirror, where possible, techniques used in the Strange Situation at 12-18 months in order to support exploration of continuities of attachment patterns. This will be done by employing quantitative measures of infant behaviour from an established scale and an algorithm of combinations of scores that does not require micro-analytic analysis of infant behaviour, subjective judgements or repeated viewing of interaction tapes. Unlike existing studies, the algorithm will aim to derive a four-way classification of infant attachment with the use of the Global Rating Scales of Mother-Infant Interaction (GRS; Murray, Fiori-Cowley, Hooper, & Cooper, 1996). Attachment-like classifications at 7 months will be made and examined with respect to attachment security in the Strange Situation at 14 months and measures of validity including maternal sensitivity, intimate partner violence and infant temperament.

An algorithmically derived attachment classification system was chosen with the view to this method being applicable to old or international data sets where access to the tapes is not possible. Also, to ensure that attachment-like classifications can be made on existing data sets with very little extra work.

The overall approach will be guided by the infant emotion regulatory processes that contribute to the pattern of attachment behaviours seen in the Strange Situation using information from within and across episodes of the Still-Face with a much larger sample containing higher numbers of future insecure infants. The rationale for the scales used and the generation of an algorithm for the purpose of classifying attachment-like behaviours in the Still-Face can be found in the following chapter on generating the scale.

### **1.8.1 Aims and objectives**

The current study aims to find out whether infant behaviours, in response to threat at 7 months, can be classified in the same way as from 12 months onwards.

To find out whether the properties of this classification are what would be expected if attachment strategies seen later have already developed by 7 months.

#### **Objectives**

- Create the algorithm
- Apply the algorithm
- Examine distribution generated by the algorithm
- Examine validity in relation to sensitivity and partner violence
- Examine continuity

### 1.8.2 Hypotheses

- The distribution of attachment classifications in the Still-Face will resemble that seen later in the Strange Situation.
- Lower maternal sensitivity at 7 months will be associated with insecure attachment-like status.
- Exposure to partner violence over the first 7 months will be associated with disorganised attachment-like status.
- Insecure organised attachment-like status in the Still-Face will predict insecure organised classification in the Strange Situation.
- Insecure disorganised attachment-like status in the Still-Face will predict insecure disorganised classification in the Strange Situation.

## **Chapter 2 Developing a Coding Scheme for the Still-Face that Generates an Attachment-like Classification**

The purpose of this chapter is to provide a justification for using ratings of infant behaviours in the Still-Face as a basis for an attachment-like classification at 7 months. This is done by outlining the main features of the validated procedure for rating attachment status over the period 12 -18 months, the Strange Situation Paradigm (Ainsworth, Blehar & Waters, 1978). The method of assessing the infant's emotional and behavioural regulatory strategy is explained, as a basis for formulating how equivalent strategies might be assessed in the Still-Face. The coding method for the Strange Situation is then described, as a basis for describing how Still-Face codes were used to generate attachment-like categories in a similar manner. Following this, parallels are drawn between scale scores in the Strange Situation and infant scores from the Global Rating Scales of Mother-Infant interaction (GRS) as used in the Still-Face, and the argument that these scales have sufficient parallels to support measurement of the same construct across different paradigms is proposed. Next, infant emotion and behavioural processes are discussed with regards to how they might be represented by behaviours in the reunion episode of the Still-Face, followed by how these patterns of behaviour might be represented by GRS code algorithms. Finally, the process of generating and applying the algorithm for classification of attachment-like patterns in the Still-Face is described in detail.

**2.1 The Strange Situation.** The Strange Situation was conducted according to the published procedures. For a further description of how it was introduced in this study see Section 3.3.2.1. The mother and infant are taken to an assessment room

with a one-way mirror and given a brief introduction by a researcher. Upon leaving the dyad alone in the assessment room, the three minutes of episode 2 commences. During this phase, the mother is asked to settle her infant to explore the toys and return to her chair, where she is to read a magazine until the stranger initiates a conversation with her in episode three. The mother is told to engage with the child only if necessary, or if the child initiates an interaction. The stranger enters the room after three minutes and sits quietly in the second chair, as though they are in a waiting room. After one minute the stranger begins to talk to the mother, during minute two the stranger approaches and interacts with the infant, and at the end of the third minute the mother is cued to leave the room for the first separation (episode 4). This separation lasts for three minutes unless the child becomes too distressed and the stranger is unable to support the child to soothe. The stranger leaves unobtrusively once the mother returns for episode 5, greeting the child and settling them to play once more. The mother and child are left alone together in the room for a further three minutes before the mother is again cued to leave for the second and final separation. This time (episode 6), the infant is left alone in the assessment room for up to three minutes, depending on their state of arousal and the mothers consent. After these three minutes, the stranger reenters the room and attempts to calm and settle the infant back to exploring the toys. If the stranger is unable to settle the infant, the episode is cut short and episode 8 is brought forward. Finally, the mother reenters and greets the child, picking him/her up whilst doing so. The stranger leaves unobtrusively and the mother and child are left in the assessment room for the final three minutes until the end of the paradigm. Table 2.1 briefly outlines each of the episodes in the Strange Situation paradigm.

Each time the mother is in the assessment room with the child she is given instructions to settle the child to play/explore the toys and then to return to her chair to read the magazine. The stranger is expressly told never to sit in the mother's chair and to do only as much as the child needs in terms of engagement and interaction. Figure 1 shows a still image of a stranger engaging with an infant in the Strange Situation in the WCHADS.

Table 2.1

*Summary of the episodes of the Strange Situation*

Episode	Persons Present	Duration	Brief Description of Action
1	Mother, Infant & Researcher	30 secs	Researcher introduces mother and infant to the experimental room, then leaves.
2	Mother & Infant	3 mins	Mother is non-participant while her child explores.
3	Stranger, Mother & Infant	3 mins	Stranger enters. 1 <sup>st</sup> minute: Stranger silent 2 <sup>nd</sup> minute: Stranger talks to mother 3 <sup>rd</sup> minute: Stranger approaches baby After the 3 <sup>rd</sup> minute, the mother leaves
4	Stranger & Infant	3 mins or less <sup>a</sup>	<u>First separation episode.</u> Stranger's behaviour is geared towards that of the infant
5	Mother & Infant	3 mins or more <sup>b</sup>	<u>First reunion episode.</u> Mother greets and/or comforts her child, then tries to settle the infant again in play. Stranger leaves unobtrusively. Mother then leaves, saying "bye-bye"
6	Infant alone	3 mins or less <sup>a</sup>	<u>Second separation episode.</u>
7	Stranger & Infant	3 mins or less <sup>a</sup>	<u>...continuation of second separation.</u> Stranger enters and gears her behaviour to that of the infant.
8	Mother & Infant	3 mins	<u>Second reunion episode.</u> Mother enters, greets and picks up infant. Stranger leaves unobtrusively.

<sup>a</sup> Episode is curtailed if the infant is unduly distressed

<sup>b</sup> Episode is prolonged if more time is required for the infant to become re-involved in play.

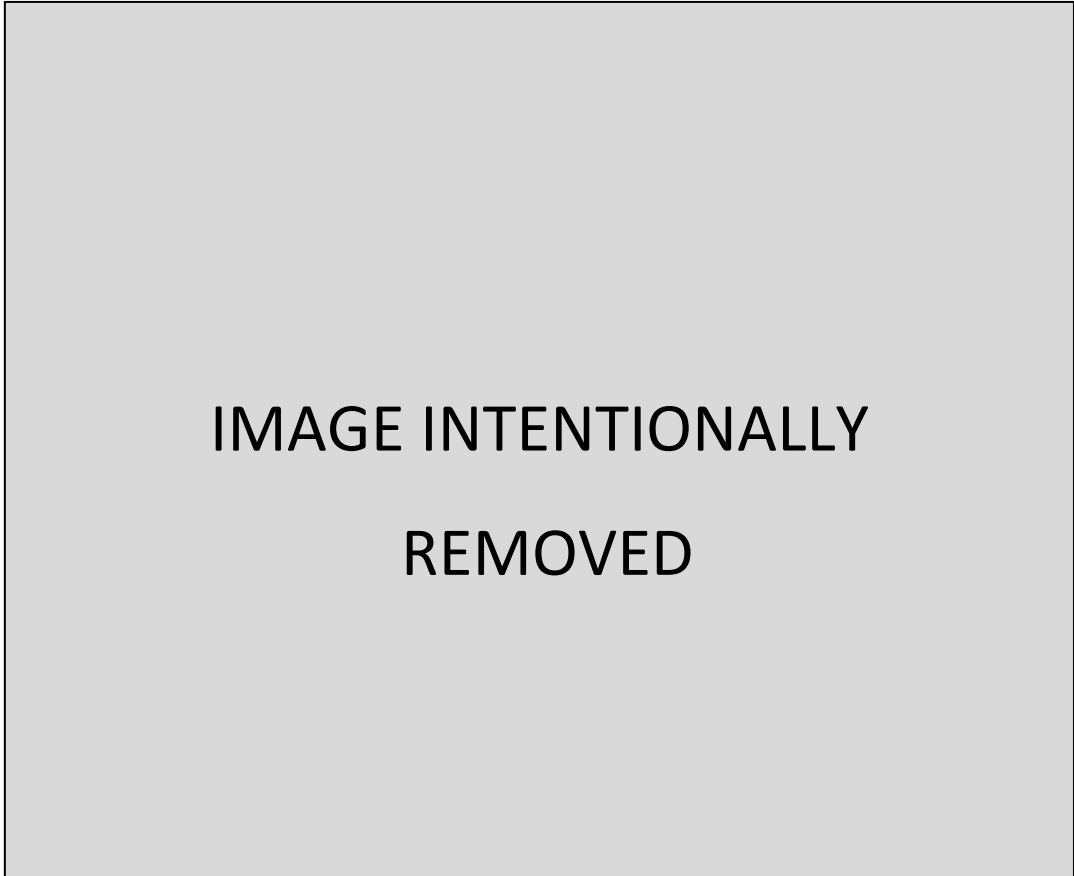


IMAGE INTENTIONALLY  
REMOVED

*Figure 1.* An infant interacting with the stranger during episode 7 of the Strange Situation

**2.1.1 What does the Strange Situation (SSP) assess?** Attachment status in the SSP is assessed mainly from the way the child behaves in reunions following separations. Where the child has been distressed, the attachment rating reflects how he/she has made use of the mother to lessen that distress and to move on to exploration. Where the child has not been distressed, attachment status depends on child behaviours that seem to acknowledge the mother's importance in relation to the separation. In this section, the emotional and behavioural regulatory strategies underlying each of the SSP attachment categories are described as a basis for considering how these might be recognised in the Still-Face Paradigm.



#### ***2.1.1.1 Emotion and behaviour regulatory process of secure attachment.***

Secure attachment, in the child who cries on separation, is evidenced on reunion first through clear signals to the mother for comfort, through eye contact and holding arms up to the mother. The emotion regulatory process therefore includes eliciting help from the mother, usually in the form of physical comfort. Then, provided the comfort has been given, the child holds on to the mother in a full embrace. The process therefore also includes maintaining the comfort. This embrace is continued until the distress lessens. The process therefore involves matching the duration of the comfort to the intensity of the distress. Once the distress has lessened, the child reduces the contact and starts to explore. So, in summary, the emotion regulatory process involves a direct relationship between amount of distress and comfort seeking, with a smooth interplay between the two. Where the child is not distressed by the separation, behaviours reflecting the regulatory process cannot be observed directly. However, a preparedness to make use of the mother in relation to threat is inferred from the way in which the child greets the mother on reunion.

#### ***2.1.1.2 Emotion and behaviour regulatory process of avoidant attachment.***

The child who is assigned an avoidant classification typically has not shown distress on separation and ignores the mother on reunion. He/she therefore appears to down regulate emotions under threat when a potential source of relief is available.

***2.1.1.3 Emotion and behaviour regulatory process of ambivalent/resistant attachment.*** Ambivalent/resistant attachment is typically rated where the child becomes distressed on separation and seeks out the mother on reunion but does not soothe or regulate quickly, if at all. In contrast to secure attachment, resistant

attachment is evidenced on reunion first through unclear or intermittent signals to the mother for comfort, for example holding up arms but also pushing her away. The emotion regulatory process therefore includes eliciting help from the mother, but also creating difficulties for her. Then, provided the comfort has been given, the child's embrace of the parent is partial or mixed with struggling or kicking. The emotion regulatory process is difficult to discern because it contains elements that might reduce distress and others that appear to be an expression of negative or angry feelings. This embrace is often terminated or reduced before the distress has lessened substantially, and distress often increases after the child has moved away from the mother. This means that the process of distress and comfort giving may go through several cycles and, unlike secure attachment, duration of the comfort is not titrated accurately against the intensity of the distress. So, in summary, the emotion regulatory process involves a complicated relationship between amount of distress and comfort seeking, with an erratic interplay between the two.

#### ***2.1.1.4 Emotion and behaviour regulatory process of disorganised***

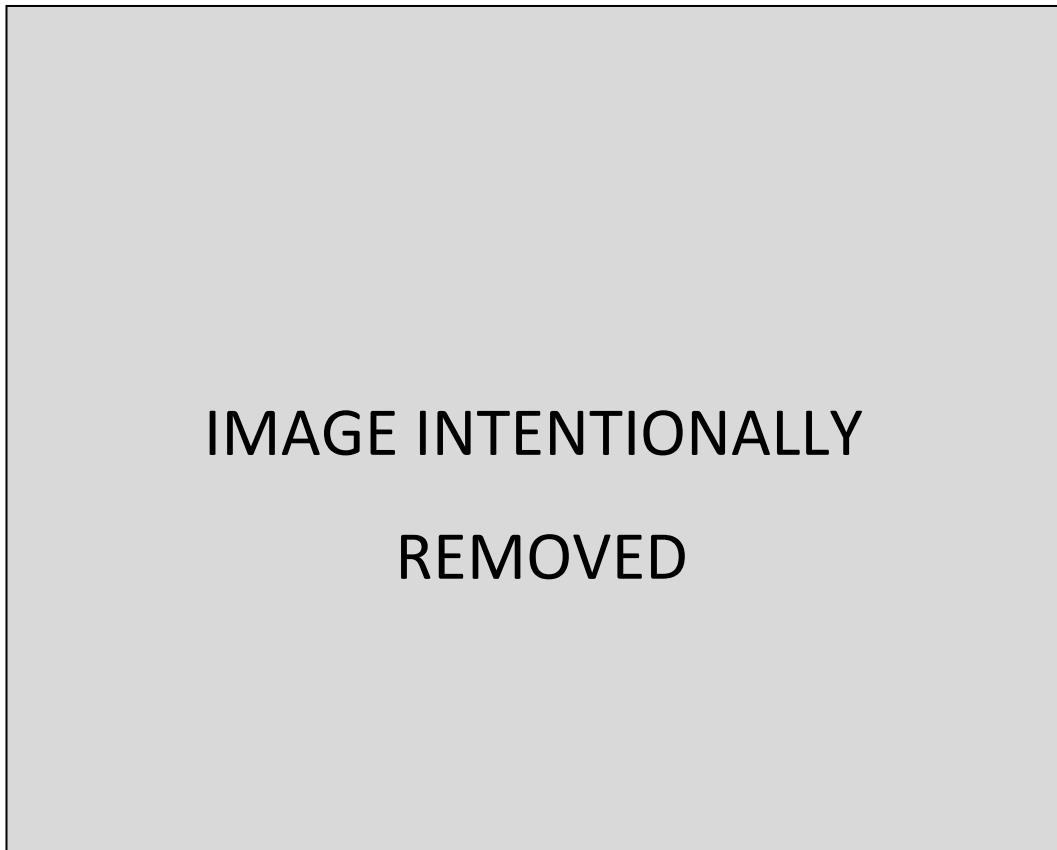
***attachment.*** Disorganised attachment is coded from a range of behaviours, and so may not represent one single regulatory process. However, it has been proposed that several of the behaviours reflect contradictory processes, on the one hand seeking comfort from the mother, and on the other hand seeking safety from her. This may be evidenced in sequential displays of contradictory behaviours such as the child seeking comfort immediately followed by freezing or avoidance of the mother, or in simultaneous displays of contradictory behaviours such as clinging to the parent bodily whilst averting his/her head or gaze. It is hypothesised that these contradictory processes may reflect an attempt to deal with the problem of a mother who is a

perceived source both of threat and comfort. Disorganised attachment is also coded on the basis of other isolated behavioural markers such as stereotypies, asymmetrical movements, mistimed movements and anomalous postures from which it is difficult to infer the strategy or strategies.

## **2.2 The use of the Still-Face to ascertain whether Attachment-like Emotion and Behavioural Regulatory Processes are seen at 7 months**

As outlined earlier, the method used in this thesis is to seek to identify emotional and behavioural regulatory processes in 7 month old infants that are similar to those seen at 14 months, and hence derive an attachment-like classification. This was done using the Still-Face Paradigm, and in this and following sections the case is made that this procedure is appropriate for this task. First, the Still-Face is described, followed by a description of its potential to assess the strategies assessed in the Strange Situation. The emphasis is initially on the parallels between the procedures, and then the differences are reviewed.

**2.2.1 The Still-Face Paradigm.** The infant is seated in a high chair (or similar) facing mother, with no toys or other colourful objects in their line of sight. Mothers are asked to engage with their infant for two minutes in the way that they would normally and then, when given the cue, stop engaging and assume a blank face for the following two minutes. When signaled again, the mothers are required to resume their interaction with their infant in the way that seems most natural and without the use of toys. Episodes are curtailed if the infant becomes too distressed. The Still-Face paradigm is videotaped using a mirror placed behind the infant or using two or more cameras focused on each participant. Figure 2 shows a still image of a mother and infant in the still-face episode of the Still-Face.



*Figure 2.* An image of a mother and infant from the WCHADS in the Still-Face (still-face episode).

### **2.2.2 The appropriateness of the Still-Face to assess emotion and behavioural regulatory processes as assessed in the Strange Situation.**

Regulatory processes with mothers are assessed in the Strange Situation by separations from, and reunions with, the mother. It is assumed that the separation is either overtly distressing or at least threatening to the child. It is designed to represent everyday separations experienced by most young children. In the Still-Face, there is a disruption to the flow of maternal responsiveness which has been shown to be distressing to the majority of infants (Tronick et al., 1978; Toda & Fogel, 1993). This emotional unavailability has been found to be more distressing to infants than a physical separation of the same period, causing increased disruption to

infant motor activity, crying and gaze aversion (Field, 1994). For the infant, this experience is perhaps similar to everyday occurrences of when the mothers' attention is occupied with other tasks such as attending to other children or answering the phone. In the Strange Situation, the separation is usually sustained for 3 minutes which is designed to be long enough to be stressful to the majority of infants. In the Still-Face, the unresponsiveness is sustained for 2 minutes, which is probably comparably long enough to be stressful to younger infants. In the Strange Situation, the regulatory process is assessed on the mother's return to the room, and over a 3 minute period. In the Still-Face, the mother has not left the room, and the 'reunion' is the resumption of the mother's responsiveness.

An adequate consideration of the appropriateness of the Still-Face to assess attachment-like processes must take account of the considerable differences, both in the procedures and the developmental differences between infants of 7 months and children of 14 months, and these are reviewed in detail later in Section 2.3.2. The differences are summarised here as a basis for considering emotional and behavioural regulatory processes in the Still-Face.

**2.2.3 Emotion regulatory processes and attachment classification in the Still-Face.** Emotion regulatory processes involved in the reunion behaviours of secure, insecure and disorganised infants in the Strange Situation were examined in Section 2.1.1. The following section outlines how these infant emotion regulatory processes might manifest in behaviour in the Still-Face, in terms of attachment-like classifications. This is done with a view to forming a clear picture of how attachment-like behaviours might present themselves in 7 month olds in the Still-

Face and of what processes are underpinning them. Combinations of Global Rating Scales scores are described after the description of the coding scheme for the Strange Situation.

**2.2.3.1 Secure emotion regulatory process in the Still-Face.** The prediction is that a secure classification in the Still-Face will be based on displays of behaviours that suggest his/her needs will be met both promptly and appropriately. He/she will seek out interaction with the mother and make bids for her attention for communication of both pleasure and distress. The infant will appear attentive and actively communicative with the mother during all three episodes but more so in the engagement and reunion phases. During the still-face episode, the infant may make attempts to reengage the mother and may become distressed. On reunion, the secure infant will be actively communicative to the mother as they reengage and return to a comfortable and reciprocal interaction. The smooth regulation of distress seen in the secure reunion of the Strange Situation will be seen in the Still-Face, with the distressed infant making eye contact and reaching for the mother, and maintaining this contact until the distress has reduced.

**2.2.3.2 Avoidant emotion regulatory process in the Still-Face.** An avoidant infant may present behaviours that suggest an expectation that their needs will not be met by the mother, so she would not be included in communication and exploration or sought out when faced with threat. This would mean the infant might not experience the disengagement of the Still-Face episode as stressful. One would then expect that such an infant would exhibit avoidance of eye contact during all three episodes of the Still-Face and would not become too distressed, if at all, during the

still-face episode. There would be little or no distress as the infant looks around without making communicative bids to the mother or reciprocating any that are directed towards them. Avoidant infants may appear neutral in affect with some happiness but would not appear as happy or glowing as their secure counterparts. It may be the case that very intrusive mothers will push the avoidant child to being fretful if they are forced to engage, but otherwise the paradigm would run without protest.

**2.2.3.3 Resistant emotion regulatory process in the Still-Face.** As explained earlier, a resistant emotion regulatory process is thought to reflect a history of inconsistent sensitivity in parenting, resulting in an exaggeration of attachment behaviours with simultaneous or alternating evidence of angry resistance. Resistant infants in the Still-Face would display attentiveness towards the mother whilst at the same time displaying some avoidant and fretful behaviours. They may become very distressed during the still-face episode, as they experience further rejection from their mother, and this distress may continue throughout the reunion. Whilst distressed, the infant will seek out the mother by being attentive and employing some amount of active communication but, for the most part, communicative bids towards the mother will be negative and fretful in nature.

**2.2.3.4 Disorganised emotion regulatory process in the Still-Face.** Disorganisation in the Still-Face will be evidenced either by contradictory behaviours, or behaviours that suggest that the mother is a source of threat (someone to be feared). Examples of contradictory behaviours will include crying whilst looking away from the caregiver. Behaviours reflecting the mother as a source of



threat will include increased distress in the transition from the still-face to the reunion, or increased distress during the reunion period.

## **2.3 Similarities and Differences between the Still-Face and the Strange Situation Paradigms**

This section outlines the procedural and environmental similarities and differences between the Still-Face and Strange Situation. These comparisons are made and discussed with a view to supporting the argument that the Still-Face provides a developmentally appropriate alternative measure of similar constructs to those measured in the Strange Situation. It is also suggested that the validity of the measurement of these similar constructs is increased due to these procedural and environmental differences.

**2.3.1 Similarities between the paradigms and the demands they place on the infant.** The loss of an available caregiver is a predominant feature of each paradigm. The Still-Face is standardised in the same way as the Strange Situation in that there are a set number of episodes that require the mother to engage with her child, and then to disengage and provide no support for a short period of time. Both paradigms feature a baseline episode for engagement with mother and one or more reunion episodes in which it is possible to examine and rate the behaviours of both mother and infant following their separation and subsequent reunion.

Children experience imposed self-regulation of emotions in each paradigm as they are left to regulate their emotions without support from the mother (whether they are physically present or absent). This allows examination of the emotion regulatory processes in each paradigm and as to whether the infant up regulates (likely resistant classification), down regulates (likely avoidant classification) or fails

to show evidence of a regulatory process (likely disorganised classification) upon reunion.

Each paradigm is a reflection of naturalistic experience that may have occurred in the past and will certainly be something that the infants will need to manage in the future. Mothers may nip out of the room for a couple of minutes to answer the door or bring the washing in and infants may be exposed to strangers in a doctor's waiting room or whilst queuing in a shop. The reunion episode of the Still-Face is analogous to that of the Strange Situation in that it marks an end to the separation and an opportunity for the dyad to repair and return to their pre-separation levels of interaction where possible.

**2.3.2 Differences between the paradigms and the demands they place on the infant.** Separation versus disengagement is perhaps one of the most obvious differences between the two paradigms. The separation in the Still-Face involves the mother becoming unresponsive to the child for two minutes, whilst remaining in close physical proximity and within view. The infant has someone present to try to elicit attention from so there may be differences in the number of bids for attention made and in the manner that attention is sought. Separation in the Strange Situation involves the mother leaving the room and remaining out of sight and contact for the entire episode. If a child is otherwise engaged with toys or the stranger they may not immediately notice the separation but, once discovered, there remains no ambiguity as to what has happened. As the mother leaves for the second separation, she is instructed to say "bye" to the child to ensure that the child is instantaneously aware

of her absence. The separation in the Still-Face may seem more deliberate as the mother is in view yet unresponsive.

Still-Face is playful and face to face and mothers are told that they can sing, play, clap or behave however they normally would during the engagement and reunion episodes. Mothers in the Strange Situation are, instead, instructed to settle the child into the room, encourage them to engage with the toys and then to sit back and read the magazine, allowing the child to explore independently. Mothers are told that they can respond to any needs or requests from the child but that they must wait for the child to initiate an interaction with them after the initial settling in period. The idea is that the situation simulates a waiting room of sorts, into which a friendly stranger may reasonably enter.

Differences in mother behaviour stem from the physical set-up of the Still-Face as they are sat almost knee-to-knee and to ignore the child would require a full body movement (e.g. turning to the side) or a purposeful disengagement as seen in the two minutes of still-face episode. Mothers are essentially forced to engage with their infants whether they would normally do so or not. This enforced engagement means that the initial engagement phase of the Still-Face is often more intense than that of the Strange Situation and, depending on how the mother behaves in this phase, and how receptive the infant is to this behaviour, this may manifest as more intense shared pleasure or more intense distress.

Mothers are given implicit instructions as to what is required of them during the Still-Face, namely: engage, ignore, engage. These instructions do not require

interpretation and it is only the manner in which they are executed that varies. In the Strange Situation, however, the mother can be as responsive as she chooses to be as the instruction “settle the child to playing with the toys” can be interpreted differently. As a result, some mothers are still fully engaged with the child when the stranger enters the room, whilst other mothers fail to respond to their child’s communicative bids for fear of engaging too much and not following the “rules”.

Differences in infant behaviour and experience may also arise as a result of the differences in design of the paradigms. In the Still-Face, the mother and infant are forced together. For some infants, the mother may be a stressor in herself. Verbally or physically intrusive behaviours can be particularly aversive to infants and, if a mother behaves in this way, it may be stressful to interact with her in the engagement and reunion episodes of the Still-Face. As Strange Situation instructions simply ask the mother to settle the child and then move to the chair to read the magazine, there is less of an opportunity for the mother to behave intrusively.

The presence of the stranger in the Strange Situation introduces a second stressor. However, the use of a stranger at 7 months might not be appropriate as infants of this age, whilst showing a preference for familiar people, do not always show the characteristic fear of strangers that they might at 12 months. It is argued that infants start to become wary of strangers at around 7 or 8 months of age (see Section 1.6.1 for a review), so not all of the sample would potentially experience a stranger as a source of threat at the time of administration rendering the use of a stranger invalid.

**2.3.2.1 Differences across episodes.** Perceiving the mother as a source of stress could lead to infants experiencing the still-face episode as a much needed break, or chance to regulate emotions and relax after the stressful experience of dealing with their mother. A child with similar perceptions in the Strange Situation may be less likely to relax during the separations as they have the additional stressor of being left alone with a stranger in an unfamiliar room. However, the Strange Situation episodes that precede the separation allow for independent exploration of the environment and play with novel toys in the presence of a mother who can be used as a source of support or avoided as the infant sees fit. This could mean that, for some infants, the separation in the Strange Situation is more clearly the stressor than the period of disengagement in the Still-Face as the infant does not have an opportunity to maintain a level of control over exposure to the mother.

Differences in arousal and engagement in the initial episode are arguably appropriately matched to the intensity of the separation that follows. That is, a child who is enjoying a playful, engaging sing-song in the Still-Face will be presented with a starkly contrasting environment, absent of stimuli, when the mother ceases to engage in the still-face episode. In the Strange Situation, the child has been disengaged from the mother for up to six minutes before the separation, so the shift may not be so dramatic. However, in this case the child is left in a strange room with a stranger.

**2.3.2.2 Environmental differences.** Environmental and equipment differences allow for different levels of restraint and locomotor activity in the paradigms. Depending on their gross motor abilities, children in the Strange Situation

are able to move freely or sit however and wherever they choose to. In the Still-Face however, the child must sit in a highchair for the duration of the paradigm.

Use of toys in the Strange Situation may provide a distraction or comfort to some children when faced with the separation or other form of stressor. Infants in the Still-Face have no toys and are situated in a sparsely decorated, familiar room that offers little stimulation so potentially have little to distract them from the demands made upon them.

**2.3.2.3 Developmental issues.** Differences in gross motor skills are relevant both between the 7 and 14 month old infants and between the infants in each age group. It is possible for infants of 7 months to be crawling and rolling to move away from the mother as a tool to avoid further distress or regulate emotion. The highchair involved in the Still-Face makes this impossible so, as a result, there are certain codes that do not apply to the Still-Face. Proximity seeking and contact maintaining are discussed in Section 2.5.2 and infant behavioural codes that are indicative of a disorganised pattern of attachment, that may also prove difficult to rate given the differences in protocol, are outlined in Section 2.7.4.6.

Postural control differences between the 7 month old infants meant that some had not yet sat in a highchair. Whilst this could have contributed to some distress throughout the paradigm, it is not clear to what extent this is true or to which dyads it applies. At such a young age there are always vast differences in physical development between infants.

### **2.3.3 Differences in the coding of infant behaviour in the Strange**

**Situation and Still-Face.** Whilst the coding schemes used for the Strange Situation and the Still-Face (in this study) are reviewed in detail in Sections 2.4 and 2.5.1 respectively, a very brief description of the structure of each scheme is given here in order to fully review the differences between the two paradigms in this section. Different scales are used to code each paradigm and, whilst there are some similarities between a number of the items on each, there are also differences due again to the nature and setup of the paradigms. The Strange Situation is always coded in the same way, with the exception of some studies using a three-way classification and others including disorganisation and using a four-way classification as a result. See Section 2.4 for an account of how the coding of the Strange Situation proceeds.

The Still-Face can be coded with different rating scales in accordance with the particular dimensions that the investigator wishes to explore. As detailed above, the Global Rating Scales (GRS) are used and considered in this case. Section 2.5.1 describes the differences between the GRS and other scales used in the Still-Face and gives a rationale for the use of the GRS in the current study. The essential difference between the Strange Situation coding scheme and the GRS is that the GRS use scale scores and the main outcome of the Strange Situation is a rating of attachment in a categorical format. These categories are, however, largely informed by scale scores of infant attachment behaviours exhibited (primarily) in the reunion episodes. By employing the infant scales of proximity seeking, contact maintaining, avoidance of proximity and contact, resistance to contact and comforting and amount of crying, the rater is able to derive an organised attachment category classification with the



help of the attachment matrix. Disorganisation is a little different as this classification can be made on the basis of isolated behavioural markers.

**2.3.4 Different procedures – same construct?** The above section has described the many ways in which the Still-Face and the Strange Situation differ. However, it is because of these differences that the procedures are able to measure such similar constructs. The paradigms are measuring constructs that are valid only for the age group for which they were designed. In order for the same construct to be measured at a later age, modifications to the paradigm are needed to ensure the measurement is valid. This is what is represented by the differences between the Still-Face and the Strange Situation. Infant response to the resumption of engagement with the mother after a period of separation is measured by each paradigm and the differences to the environment, instructions and set-up of each allow the validity of the measure to remain stable.

**2.3.5 Summary of Strange Situation and Still-Face comparisons.** In this section we have reviewed both the Strange Situation and Still-Face procedures and considered how the Still-Face may be used to assess emotional and behavioural regulatory strategies with mothers that resemble those assessed as categories of attachment in the Strange Situation. The case has been made that the similarities are strong enough to merit proceeding with the development of a coding system for attachment-like categories for use with the Still-Face. The next section describes the way attachment status is assigned in the Strange Situation and then outlines how existing rating scales for the Still-Face were used to generate attachment-like categories.

## 2.4 Coding the Strange Situation

Attachment classification ratings are based predominantly on the behaviours of the infant during their reunions with mother (episodes 5 and 8), with each reunion episode being weighted equally. The child's proximity seeking, contact maintaining, avoidance of proximity and contact and resistance to contact and comforting are scored on 7-point scales and these scores (and an overall impression of the interaction) contribute to the assignation of an attachment classification. The length of time the child spends crying in each episode is also noted and considered with the interactional behaviour scores in the final rating process (Ainsworth et al., 1978). The following section describes each of the scale scores that contribute to the attachment classification in the Strange Situation.

**2.4.1 Proximity and contact seeking behaviour.** When rating this scale, the infant's efforts to gain or regain contact with the mother are considered. Intensity, persistence and contingency of the behaviours are examined, and if several proximity and contact seeking behaviours are noted within an episode, the highest rating behaviour is used as the final score. To score highly, the child must initiate the contact seeking behaviours themselves (adult cooperation is not required) and do so within the initial 30 seconds of the reunion episode. These efforts must persist for a minimum of 15 seconds before the child moves on to another activity.

**2.4.2 Contact maintaining behaviour.** Scores in this domain derive from the degree to which the child seeks to maintain contact with the mother once it is gained. A child scoring highly on this scale shows at least two instances of active resistance

to being put down or separated. The child may cling to, climb on, sink into or turn towards the mother in his/her attempts to remain in close contact.

**2.4.3 Resistant behaviour.** Resistant behaviour scores are based on the child's protestations towards contact or proximity with the mother. These protestations are evidenced by displays of angry pouting, temper tantrums, petulance or fretfulness. Specific resistant behaviours include jerking or pushing away, kicking, hitting, resistance to being held or picked up, throwing themselves on the floor, squirming or screaming angrily. It is possible for the child to alternate between these behaviours and contact seeking and maintaining behaviours (detailed above) making their intentions appear contradictory or ambiguous.

**2.4.4 Avoidant behaviour.** This scale focusses on the child's avoidance of contact or proximity with the mother. The difference between this scale and the resistance scale is that avoidant behaviours do not have the same angry quality as those that contribute towards a score of resistance. Avoidant behaviours can be viewed across a greater distance than resistant behaviours, which usually involve close contact of at least within arm's reach. Recognisable avoidant behaviours include averting the head or body, increasing the distance between self and other, averting gaze, ignoring or hiding the face. It is also important to make a distinction between a child who is happily exploring his/her surroundings and one who is actively avoiding contact with the mother. To overcome this confounder, it is necessary to note the intensity, persistence and duration of avoidant behaviours and to examine these in the context of contact seeking behaviours initiated by either party. Avoidant behaviours are especially noticeable during the immediate return of

the mother, with children who show a brief or lack of greeting in these instances scoring more highly on this scale regardless of maternal behaviour. High scores could also be given to an infant who directs little or no attention to the mother for an extended period and remains neutral but unresponsive to her communicative bids or proximity seeking efforts.

In contrast to the other scales mentioned, raters must distinguish between avoidant behaviours directed to the mother and stranger. For the purposes of the current study, only the scoring of mother-directed avoidant behaviours are discussed here.

**2.4.5 Crying.** Crying in each episode is timed and considered when assigning scores for the primary scales. The descriptions of the points on each scale include information about the amount and intensity of crying that would be appropriate for that rating to be made and so raters use this information to support their final classification.

**2.4.6 Assigning an attachment classification.** Rating proceeds initially by watching the video of the Strange Situation to build an impression of the direction in which the classification will take, and of the classification or classifications that will be considered. This will be the first of many times the video is viewed in order to note any fine grained behaviours that are relevant to an attachment categorisation. Scores for each of the four scales are given for the reunion episodes (5 and 8) and raters must then critically examine episodes for further confirmatory or contradictory evidence (see Appendix 1 for an example of a coding sheet).

Once the scores have been derived, they are considered in relation to the preliminary attachment classification. Behaviours observed in episodes other than the reunions are also taken into consideration; when accounting for levels of emotional arousal prior to the commencement of a reunion for example, or when scoring atypical or unexplainable behaviours that may contribute to a disorganised classification.

Common combinations and likelihoods of scores are associated with each classification so, for example, an avoidant infant would score at least 4 or 5 for avoidance, rarely above 4 or 5 for proximity seeking and in the low (below 3 or 4) range for contact maintaining and resistance. These common combinations enable the rater to match their four scores to the descriptors of the attachment classifications before they proceed to giving a subgroup classification (these subgroups are not considered in the current study). The classification matrix aids a final decision (see Appendix 2). It is possible to make a decision of “can’t classify” (U or unclassifiable) if rating proves particularly troublesome or if there were errors in the administrative procedure that make rating difficult. This option serves to prevent raters from forcing a decision on classification that could potentially dilute the sample, by over or under inflating one attachment group, and reduce the power.

Attachment classifications are divided into Secure (group B) and Insecure groups. The Insecure group is further divided into Insecure Avoidant (group A), Insecure Resistant/Ambivalent (group C) and Disorganised (group D), so each child receives one of five primary classifications (A, B, C, D or U). If a child is classified as disorganised, a secondary (best fit) A, B or C rating is also given.

The disorganised group was a later addition to the attachment classification literature and was not included in Mary Ainsworth's original work. This group was added to account for children whose behaviour did not fit in the other three attachment groups, or for those whose behaviour showed discernible idiosyncrasies or atypies that set them aside from children in the organised groups. Disorganised attachment is typified by anomalous behaviours such as contradictory behaviours, incomplete or interrupted movements, freezing, overt displays of fear or stereotypes. These behaviours are reflective of either a lack of emotion regulatory process or of a contradictory one and so are not effective in supporting the infant to manage the threat and resultant arousal. Behaviours such as these, that are sufficient to require a disorganised classification, are often momentary so a secondary classification of one of the other three forms is also made. Isolated markers of disorganisation may be observed at any point within the Strange Situation paradigm.

#### **2.4.7 Summary of attachment classification using the Strange Situation.**

To summarise, the assignment of an organised attachment classification involves the rating of the four main scales and the generation of an overall judgement of where the classification will sit. Thresholds for the scales, with regards to how they relate to the categories, are not given, therefore a judgement is required for unusual combinations of scores or an unclassifiable rating can be made. A classification and sub-classification is made, or the two or three best fitting subgroup classifications are given, if an infant is unclassifiable. Disorganisation, by contrast, is coded from specific behaviours, with no guidance from the scales. If strong (italicised in the manual) and inexplicable markers of disorganisation are observed, a disorganised classification is given automatically. Where other disorganised markers or

behavioural sequences are noted, a judgement is made as to whether these justify a disorganised classification and in all instances the degree of disorganisation is scored on a 9-point scale.

## **2.5 Rationale for the use of Existing Scales of Infant Behaviours in the Still-Face as a basis for an Attachment-like Classification**

The following section starts with a description of the scales that are typically used to code mother and infant behaviours in the Still-Face. This is followed by a description of the GRS scales that were used in this study and comparisons between these and scales that are used to code the Still-Face in other studies. This is done with the intention of outlining the rationale for choosing the GRS for use in the current study as a method of deriving attachment classifications.

**2.5.1 Measures most often used to code the Still-Face.** The Still-Face is most often coded using the Monadic Phase Scoring System (Tronick, Als, & Brazelton, 1980) or with modified versions of this such as the Infant Regulatory Scoring System (IRSS; Tronick & Weinberg, 1990), the Maternal Regulatory Scoring System (MRSS; Tronick & Weinberg, 1990) or the Infant and Caregiver Engagement Phases system (ICEP; Weinberg & Tronick, 1999). These coding systems explore non-verbal behaviours in face-to-face interactions between infants and caregivers such as direction of gaze, gestures, vocalisations, self-comfort and proximity.

**2.5.2 Procedures to which the GRS has been applied.** The Global Rating Scales of mother-infant interaction (GRS; Murray et al, 1996) were developed specifically for short periods of face-to-face interaction, without the use of toys, between the mother and her infant of two to six months. Lynne Murray and colleagues developed these scales to examine the sensitivity of mothers who had



experienced postnatal depression relative to a control group who had not, finding that postnatally depressed mothers tended to exhibit lower levels of sensitivity towards their infants (Murray et al., 1996). They have proved to have predictive validity to future infant cognitive performance (Murray et al., 1996) and good discriminant validity in measuring mother-infant interactions in a number of different clinical groups including fathers (Ramchandani et al., 2013), mothers with schizophrenia (Healy, Lewin, Butler, Vaillancourt, & Seth-Smith, 2015; Wan et al., 2007), mothers with borderline personality disorder (Crandell, Patrick, & Hobson, 2003) and with infants at risk of autism (Wan et al., 2012). The Global Rating Scales have also proved to be valid cross-culturally (Cooper, 1999; Gunning et al., 2004).

**2.5.3 Comparison between the scales used in the IRSS and the GRS.** The IRSS has scales for social engagement, object engagement, scans, vocalisations, gestures, self-comforting, distancing/escape/get away, autonomic stress indicators and inhibition/freezing. The social engagement scale is a measure of how much the infant looks at the mother's face so is akin to the attentive end of the Attentive-Avoidant scale and the gestures scale has similarities to the active communication scale of the GRS as it measures organised gestures directed at mother, such as reaching. The vocalisation scale, whilst taking into account positive and negative vocalisations, is not limited to those that are directed towards the mother so information from this could be dispositional in addition (or isolation) to relational. The GRS provides similar infant and maternal information as the aforementioned IRSS, MRSS and ICEP in terms of gaze direction, initiation of interaction, reciprocation and vocalisations. The inhibition/freezing scale of the IRSS might be useful in the classification of disorganised attachment in the Still-Face as it records

information about the infant's attempts to reduce engagement with mother through inhibition or perceptual, motor or attentional means (e.g. becoming glassy-eyed). However, the IRSS and similar modified versions involve a micro-analytical, second-by-second approach to coding that is both time consuming and labour intensive in terms of achieving reliability and rating of the sample. In addition, this micro-analytical approach may cause problems for replication studies where old or poor quality recordings make it difficult to use a method such as this.

The GRS produces rich outcome measures that provide information about both mother and infant affective responses and a global measure of maternal sensitivity that has been found to be associated with infant attachment (Tomlinson et al., 2005). Indeed, maternal sensitivity scores from the GRS were used in analyses in this study as a second measure of maternal sensitivity in a different context. The IRSS has a scale that measures positive, neutral and negative vocalisations on a second by second basis but does not measure any other aspect of infant affect. For this reason, the IRSS is often paired with the Affective Expressions Scoring System (AFFEX; Izard, Dougherty, & Hembree, 1983) and therefore requires the training and reliability on two scales. The IRSS does not measure aspects of maternal behaviour so would need to be used in conjunction with the MRSS (Tronick & Weinberg, 1990) in order to procure measures of maternal behaviour in the Still-Face.

**2.5.4 Rationale for using the GRS over other measures.** The GRS were chosen for use in this study for their similarities to the Strange Situation scales, as this meant that the generation of an algorithm was intuitively obvious (see Section

2.5.2 for a description of the similarities and differences between the scales). Scales within the GRS are relatively simple and have natural cut-off points, so that a 1 and a 2 are clearly ‘mainly’ one aspect (e.g. distressed) and a 4 and a 5 are mainly the other (e.g. happy). Thus, they provide an overall characterisation of behaviours over a time period, whereas an instrument that uses counts may not. Training for the GRS coding scheme was accessible to the research team over a three-day period and completion of a reliability set separate to the WCHADS data was used to achieve reliability.

Instructions for the mother for this procedure were analogous to those given for the engagement and reunion phases of the Still-Face paradigm, namely to play with their infants as they would normally but without the use of toys. The position of the cameras in the assessment room providing facial and bodily images also supported the rating of the Still-Face in this way, as the GRS would normally require the interaction to be filmed with the use of a mirror in order to capture these images. Furthermore, the use of this measure supports the running of possible replication studies as others will be able to attempt replication with relatively little extra work. In cases where the GRS had already been used in the rating of the Still-Face, only re-coding of the mid-points would be necessary for a replication study.

Previous studies have used the GRS to explore mother and infant behaviour in the Still-Face (Conradt & Ablow, 2010; Crandell et al., 2003; Grant et al., 2009; Grant, McMahon, Reilly, & Austin, 2010; Gunning et al., 2013; Wan et al., 2012). These scales have primarily been used to rate behaviour in the engagement and reunion phases of the Still-Face but it is possible to use them across all three episodes on the condition that only the infant scales are used during the still-face episode

when the mother is non-responsive (Crandell et al., 2003). This is how the GRS were used in the current study, following Crandell et al., 2003.

**2.5.5 Global Rating Scales scores relevant to this thesis.** For the purposes of this thesis, and for generating an attachment-like classification from Still-Face behaviours, only the infant scales likely to be measuring similar constructs as those measured by the scale scores in the Strange Situation (as detailed in Section 2.4) are considered here. These scales are Attentive-Avoidant, Active communication-No active communication, Happy-Distressed and Non-fretful-Fretful, and are summarised below.

**2.5.5.1 Attentive-Avoidant.** This scale measures the amount of time the infant spends initiating and maintaining visual contact with the mother during the interaction. A high score on this scale would be given to a child who almost exclusively looks to their mother, only averting their gaze momentarily to regulate peaks in arousal. Conversely, a child given a low score would be seen to make little or no visual contact with their mother.

**2.5.5.2 Active communication-No active communication.** Any communicative behaviours directed at the mother in order to make a bid for her attention are considered here including movement of limbs such as pointing or reaching to mother, vocalisations, open mouthings, tongue movements, big facial expressions or gestures directed at the mother. Only positive forms of communication are taken into account here, with any gestures used to convey distress or displeasure contributing to other scales scores. A child scoring highly on this scale

would display many and continuous communicative behaviours towards mother. He or she may smile, vocalise and wave their limbs at their mother, either separately or simultaneously. A low score on this scale would be given to a child who made no communicative bids or expressions to the mother.

**2.5.5.3 Happy-Distressed.** The child's level of distress is measured on this Happy-Distressed scale. This scale ranges from very happy at one end and very distressed at the other so is, in effect, a measure of two emotions on one continuum. A child with a high score on this scale would appear actively and frequently happy throughout the interaction with many indices of happiness and no distress. Conversely, a child given the lowest score would appear distressed for almost all of the interaction to the point where the interaction had to be curtailed.

**2.5.5.4 Non-fretful-Fretful.** This scale differs from the Happy-Distressed scale in that it only deals with the one type of behaviour throughout. Behaviours that have an angrier quality than those considered in the distress scale are included here such as angry protesting, fussing, or frustrated shouting. Counts of fretful behaviour contribute to the mid-range scores, the highest score would be assigned to a child who is never fretful and the lowest to a child who is fretful almost all of the time.

**2.5.6 Comparisons between the scale scores in the Strange Situation and Still-Face.** This section will discuss each relevant Strange Situation scale score and how it relates to a score derived from the Global Rating Scales in the Still-Face. The developmental considerations for differences between each will be considered along with how differences in the protocols influence these disparities. It will also be

argued that the Still-Face codes provide close enough parallels to the Strange Situation codes for them to be used in a similar fashion to derive attachment-like categories.

**2.5.6.1 Strange Situation scales with direct parallels in the Still-Face – Avoidance.** Avoidance of proximity and contact, as measured in the Strange Situation, is directly comparable to the Attentive-Avoidant code from the Global Rating Scales used in the Still-Face. The Attentive-Avoidant scale measures the same aspects of avoidance (although this is specifically avoidance of eye contact for the environmental and developmental reasons discussed in Section 2.3) as the avoidance of proximity and contact scale does in the Strange Situation.

**2.5.6.2 Strange Situation scales with direct parallels in the Still-Face – Crying.** Amount of crying is captured in the Still-Face using the Happy-Distressed scale that details the amount of time spent in a distressed state during each episode. This code uses proportions of time spent in a distressed state rather than timing the actual amount of distress. This is a dual ended scale and also examines markers of happiness or positive affect. Issues relating to the Happy-Distressed scale measuring two different emotions will be discussed further in Section 2.6.2.1.

**2.5.6.3 Strange Situation scale with direct parallels in the Still-Face – Resistance to contact and comforting.** Resistant behaviours in the Strange Situation are those that involve protestations against contact or proximity with the mother, such as temper tantrums, angry pouting or fretfulness. Whilst infants of 7 months are not sufficiently developmentally advanced to display angry pouting and temper

tantrums, the fretfulness code of the Global Rating Scales captures the corresponding behaviours of angry vocalising, jerking away, angry squirming or screaming that younger infants display when resisting or protesting.

**2.5.6.4 Strange Situation Scales that do not have direct parallels in the Still-face – Proximity seeking.** Proximity seeking cannot be measured in the Still-Face in the same way that it is in the Strange Situation as the infants are strapped in a highchair and unable to move towards (or away from) the mother. Furthermore, infants of 7 months have often yet to develop the motor capacity needed to move independently (see Section 2.3.2.3). Despite the enforced proximity of the Still-Face, it would still be possible for either party to reduce their proximity by averting gaze and instead attending to the external environment. It is also possible for the infant to seek proximity and engagement with the mother in ways that do not involve more gross physical efforts than of which they are capable. The active communication and attentiveness codes can be employed to quantify ways in which the infant purposefully aims to achieve physical proximity and engagement with their mother. Active communication (as described fully in Section 2.5.1.2) measures the amount of positive communicative bids for maternal attention, whilst attentiveness is a measure of the amount of time the infant spends initiating and responding to visual contact with the mother. When unable to move, coordinate bodily gestures, or use complex verbal cues to invite or elicit proximity, directing attention and making developmentally appropriate communicative bids (such as cooing and vocalising) are the infant's only means of promoting contact, engagement and closeness. By employing these strategies, the infant is doing all that their communicative repertoire enables them to in order to encourage interest, engagement and reciprocation. As a

result, it was concluded that the combination of these would be the best parallel to the proximity seeking code in the Strange Situation.

***2.5.6.5 Strange Situation Scales that do not have direct parallels in the Still-face - Contact maintaining.*** Similarly, the Still-Face employs the active communication and attentiveness scores to provide an equivalent to the contact maintaining scale from the Strange Situation. By using behaviours that are relevant to these scales (as detailed above), along with mirroring, turn-taking and positive affect, the infant is responsive to communication from the mother and is doing all they can to ensure that the mother reciprocates and engagement or contact is maintained. The dyad may be positioned in a face-to-face arrangement that supports engagement, but this alone is not enough to ensure a positive interaction in which both parties are motivated to continue to participate. The infant is able to support, and essentially employ, contact maintaining behaviours akin to those used by older infants in the Strange Situation, by being attentive and actively communicative towards their mother.

Table 2.5.6.5 presents a summary of the parallels between the relevant scales used in each paradigm (the four main scales and crying in the case of the Strange Situation and a subgroup of the infant scales from the GRS in the case of the Still-Face).



Table 2.5.6.5

*Parallels between the scale scores from the Strange Situation and the relevant infant scores from the Global Rating Scales used in the Still-Face*

<b>Strange Situation</b>	<b>Still-Face</b>	<b>Scale similarities</b>
Proximity seeking	Active communication & Attentiveness	Infants can promote proximity by being attentive and communicative to mother even though they are stationary in the Still-Face. Infant can avoid proximity by averting gaze and avoidant behaviours.
Contact maintaining	Active communication & Attentiveness	Infants in the Still-Face can maintain contact by continuing to engage and make bids to facilitate engagement. Dyad has enforced proximity but either can avert gaze and disengage this way.
Avoidance of proximity and contact	Avoidance	Infant is constrained in the highchair in the Still-Face but can avoid mother by averting gaze – captured in avoidance scale.
Resistance to contact and comforting	Fretfulness	Infant can protest at close contact or comforting with mother in the Still-Face using angry fretful behaviours although cannot get away.
Amount of crying	Distress	Captured in the distress scale as a proportion of the period spent distressed during each Still-Face episode.

## **2.6 Developing a Process for using the Established Global Rating Scales to Generate Attachment-like Categories from the Still-Face**

As outlined in Section 2.4, coding of the Strange Situation requires an initial assignment to a category, followed by a process of critical scrutiny and consideration of plausible alternatives. The scales provide a guide to that scrutiny. The coding does not, however, proceed in an orderly fashion from scale scores to categories as considerations must be made about markers of disorganisation and other similar categories or subcategories.

The decision had to be made whether or not to follow the same method in rating the Still-Face. A key consideration was the scale of the task and its feasibility within the timescale. If the Strange Situation method were to be used, a new coding system would have had to be devised to take account of developmental differences between infants in the Still-Face and the Strange Situation and the differences in the procedures. In order to ensure comparability, the coding system would have required review by experienced attachment researchers, and possibly further revisions. A study of inter-rater reliability would then have had to be conducted, which, if it were to include 3 or 4 categories, would have required losing substantial numbers of the sample to reliability analyses. The outcome of that reliability study could not be guaranteed. By contrast, a method making use of existing scales would be much more straightforward. The Global Rating Scales have known reliability and validity, they were designed specifically for face to face engagement, and had easily accessible and adequate training courses and reliability sets. The following section

describes issues with the use of the Global Rating Scales in the Still-Face paradigm and how these were resolved in the current study.

Four further key issues were identified as in need of further consideration. Firstly, is it desirable to retain the method of the Strange Situation, whereby the attachment categories, whilst strongly influenced by scales scores, are not determined algorithmically by them? Secondly, should the rating of attachment-like categories from the Still-Face rely only on the reunion episode, thus closely paralleling the almost exclusive use of reunion behaviours in the Strange Situation? Thirdly, how should thresholds be drawn for Still-Face scales given that each has five points, and that in some cases mid ratings have considerable heterogeneity? Fourthly, given that the disorganised (D) category is not derived from scale scores in the Strange Situation, how might the D category be derived from the Still-Face? The following section addresses each of these issues in turn.

**2.6.1 Should rating proceed in the same way as the Strange Situation with scale scores influencing attachment categorisation but not determined algorithmically by them?** It was decided that the attachment-like classification of infant behaviours in the Still-Face would proceed through use of the infant scales from the GRS only for the organised attachment categories A, B and C, using these scores in an analogous fashion to the scale scores in the Strange Situation. It would be incredibly labour intensive to review the original interaction tapes repeatedly in order to generate an impression about an attachment classification and to examine other infant behaviours in further detail. As the infant scale scores of the GRS used in the Still-Face have close enough parallels to the scale scores used in the Strange

Situation (see Section 2.5.2) it was thought that they did enough work in generating the attachment categories.

The classification of disorganised attachment is done differently in the Strange Situation and this approach, to a certain extent, was followed in the Still-Face. Whilst isolated markers of disorganisation contribute to a disorganised classification in the Strange Situation, to do this in the Still-Face would again require having to review all the interactions so was not considered. These markers, and how they might appear in the Still-Face however, are reviewed in Section 2.7.4.4. Instead, the patterns of behaviour thought to reflect a disorganised emotion regulatory process were identified and the corresponding infant scale scores were used in the same way as for patterns of organised attachment. As one of the two major considerations for a disorganised classification, according to the Strange Situation coding scheme, are determining whether or not the observed behaviour is inexplicable or only explicable if the child is presumed to be frightened of the mother (the second is timing of disorganised markers), and as disorganised infants have been found to have mothers with significantly higher frightening behaviour scores than their non-disorganised peers (Schuengel et al., 1999), the current author had hoped to use the presence of facial expressions of fear as a route to a disorganised attachment classification. However, a reliability set was generated and two raters failed to achieve reliability so this was not taken any further (see Section 2.7.4.5 for a discussion).

**2.6.2 How should thresholds be drawn for the Still-Face given that each has 5 points?** As rating the Strange Situation relies both on an impression as to how the interaction is proceeding and on the four scale scores, it is not necessary to have

cut-offs for ratings that give direct translation from scale scores to attachment categories. There are patterns of scores that one would expect to see reflected in the categorisation, but this might take more the form of 'mid-range' etc. In order to make a straightforward translation from scale scores to categories, without having to review the interactions, it is important to have cut-offs and to ensure that each point on the scale reliably represents behaviours that contribute to a classification. The Global Rating Scales, having 5-point scales, creates a problem for this as it is difficult to decide where to put the mid-point. It was felt that the mid-point of the infant scales from the GRS included too many different types of behaviours to be of real use in terms of informing the generation of patterns of attachment-like behaviours. This is due to the fact that a score of three could be attributed to a variety of behavioural patterns, each of which could have different implications for attachment classification.

A child with a score of 3 on the Happy-Distressed scale, for example, could be distressed for half the time, largely neutral throughout or distressed for one half of the episode and happy for the other. Encompassing so many varying behaviours in one scale point is not helpful in terms of noting behaviours immediately following separation and reunion and amount of distress exhibited in each episode. To remedy this, the mid-points of each of the relevant scales were broken down to allow them to give further information about what type of behaviour the score represents. The following section describes this process, and the development of a more informative mid-point score is outlined for each scale where appropriate.

**2.6.2.1 Happy-Distressed scale: argument for recoding the mid-point.** When assigning an attachment classification, it is important to note when the distress occurred, if at all. Being distressed at the start of the reunion and then soothing has very different implications for attachment classification than being happy at the start of the reunion and becoming distressed once the mother makes bids for proximity and contact. However, as the Happy-Distressed scales stands, each of these behaviours would result in a mid-point score of 3. More detailed information as to the degree, intensity or timing of infant distress is vital to the rating of an attachment-like classification. It is therefore imperative to note the point at which the distress begins and ends within the reunion episode when using the Global Rating Scales in this way.

The Happy-Distressed scale comprises of two different dimensions rather than a continuum of happiness and a separate continuum for distress. A rating of 1 on this scale is most distressed (“distressed nearly all, or all, of the interaction”) and a 5 is “actively happy.” The mid-point of the scale poses a problem as it contains three different scenarios within it. The Happy-Distressed rating of 3 states:

“the infant appears neutral in affect with muted smiles, and no or little distress. OR, the infant is happy for half the session and a little distressed during the other half, OR, he is generally happy but there are 2 or 3 intervals of distress.”

As a result of this, an infant with a rating of three could be neutral, distressed for up to half of the session or distressed sporadically throughout. A child who is neutral or happy in the still-face then neutral at the beginning of the reunion but

becomes increasingly upset as they engage with their mother (distress half the time), should be considered for a disorganised attachment classification as distress has increased on reunion. This may not be clear from the ratings as they are, as they could score a 3, 3, 3 pattern and appear to exhibit no changes in emotional arousal. To overcome this, the mid-point of the Happy-Distressed scale was further broken down into four component scores. 3 neutral (3N or 0) is given to those children that are mostly neutral throughout the episode and accounts for those infants that were previously assigned a 3 with the proviso “the infant appears neutral with muted smiles, and no or little distress.”

Infants who would normally be assigned a 3 on the basis that “the infant is happy for half the session and a little distressed during the other half” were split into the remaining three groups according to the timing of their distress within the episode. 3 (1) is given to those infants who show signs of distress for around half of the session and whose distress is mainly in the first half. 3 (2) for infants whose distress is seen mainly in the second half and 3 (3) for those infants who are distressed for about half of the episode but whose distress is equally distributed throughout the two minutes (predominant in neither half).

**2.6.2.2 Attentive–Avoidant: argument for recoding the mid-point.** The timing of attentiveness in the mid-point of this scale was also thought to have important implications for attachment classification. A secure infant might look to the mother at the beginning of the reunion to use her as a tool in their emotion regulatory process to deal with distress caused by the Still-Face but then could reasonably move to exploration once they have regulated. This pattern would present

as only looking to mother for the first half of the reunion but this timing would not be captured by the mid-point score without modification. Accordingly, the timing and duration of attentiveness within the episodes, and particularly within the reunion, could be of great importance for attachment purposes.

This scale is a single continuum of attentiveness with a 5 being most attentive (“the infant spends all, or very nearly all, of the interaction in visual contact with his mother) and a 1 being most avoidant (“the infant makes no visual contact at all with his mother, or only for a very brief period”). As the scale stands, a rating of 3 is given to an infant who “spends about half the interaction looking at his mother” so, for further clarification, it was broken down into three subcategories to distinguish between those whose attentiveness occurred mainly in the first half (3 (1)), mainly in the second half (3 (2)) and those whose attentiveness was evenly distributed throughout but occurred for approximately half the time overall (3 (3)). The final algorithm did not include timing of attentiveness. Reasons for this are given in Section 2.8.

**2.6.2.3 Recoding the mid-point in other infant codes.** Recoding the mid-points of the remaining infant codes of fretfulness, active communication and positive vocalisations in this way was considered but it was decided that this would not provide any additional information in terms of emotion regulatory processes. It was felt that clarification of when the infant engaged in these types of behaviours during the episodes would not support attachment classification or add to any information garnered from knowing that these occurred approximately half the time.



**2.6.3 Should the rating of attachment-like categories rely only on the reunion phase in the Still-Face?** Organised attachment classification in the Strange Situation relies almost entirely on infant behaviours observed in the reunion episodes 5 and 8. To categorise organised attachment in the Still-Face through use of the reunion scores only can be justified on this basis. This is useful as no further work or reviewing of interactions is required once the scores are derived. A disorganised attachment classification however, can be made on the basis of markers of disorganisation in other episodes with those italicised in the manual leading to an automatic disorganised classification. This next section describes how disorganisation can be classified in the Still-Face by using patterns of behaviours across episodes. For a review of other ways of classifying disorganised attachment in terms of discrete behavioural markers and combinations of GRS scores within the reunion episode, see Section 2.7.4.

**2.6.3.1 *Disorganised patterns of infant behaviours across episodes.*** The pattern of distress across the three Still-Face episodes should add to the understanding of the emotion regulatory process of the infant. If a secure infant becomes distressed during the Still-Face, they may need time to regulate their emotions, with the support of the mother, resulting in residual distress during the first half of the reunion. This is in stark contrast to a child who is neutral during the Still-Face and then shows signs of distress as the reunion episode begins. This increase in distress may be a result of the infant experiencing the mother as frightening, intrusive or noxious in some way, and experiencing her return to active engagement as aversive. As a result of this, it was decided that a child who shows an increase in distress from still-face to reunion should be considered for a disorganised

classification. An increase can be as little as one point but it must include some amount of distress in the reunion episode. That is, a decrease in the Happy-Distressed score of 5-4 from still-face to reunion would not include any distress in either episode so would not lead to a disorganised classification. The reunion score must be a 3(3), 3(1), 2 or 1 on the Happy-Distressed scale and this score must be lower than that observed in the still-face episode. See Section 2.7.4.3 for a discussion about the implications of scoring a 3(2) on the Happy-Distressed scale.

## **2.7 How Emotion Regulatory Processes in the Still-Face are represented by combinations of Global Rating Scale Scores – the Final Algorithm for Attachment-like Classification**

It has been argued that attachment-like patterns of behaviour can be observed and rated in the Still-Face using the GRS infant codes of Attentive-Avoidant, Active communication-No active communication, Happy-Distressed and Non-fretful-Fretful. This next section describes how this was done with reference to the underlying emotion regulatory processes of each attachment classification described in Section 2.1.1. Finally, a description of how each attachment classification may be represented by combinations of GRS infant scores is described and the final algorithm for this each is presented.

**2.7.1 How a secure emotion regulatory process is represented by GRS scores in the Still-Face.** A secure classification in the Still-Face is represented by mid-high attentive, high active communication, mid-high happy and low fretful scores. Mid-high attentive scores were used, as opposed to simply high scores, as the secure infant should be able to return to using the mother as a secure base from which to explore once soothed in the reunion episode. There is evidence to show that future secure infants balance their time exploring the environment and looking to mother in the Still-Face engagement and reunion episodes (Jamieson, 2004). This exploration might be independent or joint as infants of this age are able to engage with the mother in common third focus exchanges where both are jointly engaged in exploring an object but may not require eye contact (resulting in lower attentiveness scores). The object of this third focus may be mothers hand, if she were singing

‘three little dickie birds’ for example, or an item in the room such as the door or ceiling. The GRS does indeed have a scale named “much engagement in common 3rd focus/no engagement in common 3rd focus” and these behaviours were seen regularly in the WCHADS sample at this age. So long as there is attentiveness for approximately half the time, this joint or independent exploration would not affect the secure classification.

Mid-high happy scores were used in the algorithm, as opposed to simply high scores, as there may be some residual distress from the still-face episode seen in the reunion, although this should be alleviated relatively promptly on reunion with mother in secure infants.

**2.7.2 How an avoidant emotion regulatory process is represented by GRS scores in the Still-Face.** Avoidant infants would not be expected to attend to the mothers’ reengagement and would not actively seek out contact or proximity with her. Nor would they be likely to show any distress during the separation. This is represented by reunion behaviours of high avoidance, low active positive communication, mid-high happy (they may be neutral throughout as represented by a score a 3(0)) and low fretfulness.

**2.7.3 How a resistant emotion regulatory process is represented by GRS scores in the Still-Face.** The expected predominant reunion behaviour of resistant infants is alternating proximity seeking and angry protesting towards the mother. This is represented by mid-high attentiveness, mid-low active communication, mid-high distress and high fretfulness.

**2.7.4 How a disorganised emotion regulatory process is represented by GRS scores in the Still-Face.** Unlike the organised attachment classifications, there is more than one route to a disorganised classification using the GRS scores. The next section describes each of the three routes to disorganisation used in the current study. Following this, isolated behavioural markers of disorganisation that contribute to a disorganised classification in the Strange Situation are discussed along with how they might be recognisable in the Still-Face and how the GRS infant scores can or cannot support the recognition of these.

***2.7.4.1 Combinations of GRS scores - route one to disorganisation.***

Disorganised attachment, as represented by combinations of GRS scores, looks like low attentiveness, low active positive communication, high distress and/or high fretfulness. The use of high distress and/or high fretfulness ensures that all instances of infants showing high negative affect accompanied by low attentiveness (a pattern of behaviour that suggests they have no effective emotion regulatory strategy with the mother) leads to a disorganised classification.

***2.7.4.2 Increase in distress from still-face to reunion – route two to disorganisation.*** The rationale for the use of increasing distress from the still-face to reunion episode to contribute to a disorganised classification is reviewed in Section 2.6.3.1. The following section is repetition for ease of reference. An increase in distress from still-face to reunion episode contributes to a disorganised classification as it may imply that the infant finds interaction with the mother stressful and the still-face is a welcome relief. This increase in distress need only be by a single point but

the reunion score must provide evidence of at least some distress (e.g. a score higher 3(1), 3(3) or lower).

**2.7.4.3 Increase in distress within the reunion episode – route three to disorganisation.** Any increase in distress within the reunion episode also leads to a disorganised classification. This increase appears as happy or neutral in the first half of the reunion, possibly a continuation of still-face episode behaviour, followed by distress in the second half. This pattern is represented by the Happy-Distressed reunion score of 3(2).

**2.7.4.4 How might isolated behavioural markers of disorganisation appear in the Still-Face?** As outlined in Section 2.4, a disorganised classification can be made based on the evidence of one strong behavioural marker in the Strange Situation. The following section examines these isolated markers of disorganisation as observed in the Strange Situation and outlines how they may or may not be measurable in the Still-Face using the GRS. Reasons for these differences are generally due to physical development differences between 7 and 14 month olds or because of procedural and coding scheme differences between the Strange Situation and Still-Face.

**2.7.4.5 Isolated behavioural markers of disorganisation that could be measured by GRS infant codes in the Still-Face.** Crying whilst moving away from the parent could be demonstrated by crying and trying to turn away from the mother or directing cries away from her (high distress, low attentiveness) despite children in the Still-Face being unable to move completely away from their mother due to the

highchair. This marker is captured by the combination of infant GRS scores route to disorganisation.

*Seemingly undirected movements and expressions* could be shown by initiation of extensive crying in the presence of the mother without any move or look towards her. This, again, is captured by the combination of GRS scores route to disorganisation.

*Presumed fear of the mother* might be demonstrated through indices of apprehension regarding the mother such as flinging hands about or in front of the face or mouth with fearful expression upon her return. This could be measured by the observation of fear in the face of the infant. However, an unsuccessful attempt at recognising fear in 7 month old infants using the AFFEX scale (Izard et al., 1983) meant that this means of classification was not pursued further in the current study.

***2.7.4.6 Isolated behavioural markers of disorganisation that could not be measured by GRS infant codes in the Still-Face.*** The following indicators of disorganisation were considered in the context of being recognisable in the Still-Face at 7 months. However, it was decided that these behaviours would not be identifiable using combinations of GRS scores and so were not used in the classification of disorganisation in the current study.

*Simultaneous display of opposing behavioural propensities* could be evidenced by striking, pushing or pulling against the mother's face or eyes whilst in apparent good mood.

*Stereotypies* such as extended rocking, ear-pulling, hair twisting, and any other rhythmical, repeated movements without visible function would be observable so long as they do not occur in context such as rubbing eyes when tired.

*Direct indices of disorientation* include behaviours such as raising hand or hands to mouth directly upon return of the mother with a clearly confused or wary expression.

*Freezing, stilling and slowed movements and expressions* require a great amount of conscious effort and resistance, of which most 7 month olds would be physically incapable of. Furthermore, infants as young as 7 months can present as “pudding like” (as described in the GRS lively-inert scale) and this could easily be confused with stilling.

*Sequential display of contradictory behaviours* would have to be marked and of stark contrast, not just indicative of an infant greeting the mother and then gradually feeling able to disengage and further explore their environment in the reunion.

*Simultaneous display of contradictory behaviours* such as aggressive behaviours, which follow apparent positive mood, may not always be distinguishable from non-intentional hitting or uncoordinated movements in younger infants.



**2.7.4.7 Summary of routes to disorganisation included in the algorithm for the current study.** In order to provide a classification system that could be easily replicated using only the Global Rating Scales and without having to re-watch the original interaction tapes (if for example, the study was historical or international and no videos were readily available), only data that could be derived from the GRS scales were included.

These include combinations of infant scores that reflect a lack of an emotion regulatory process, namely low attentiveness, low active communication, high distress and high fretfulness. Increases in distress from still-face to reunion episode and increasing distress within the reunion episode also contributed to disorganisation. Isolated behavioural markers of disorganisation were not considered where they were not easily represented by combinations of GRS scores as indicated above (Section 2.7.4.6).

## **2.8 Applying the Algorithm to Generate Attachment-like Classifications in the Still-Face.**

The following section describes the way in which the final algorithm of scores used to generate each of the attachment-like classifications at 7 months in the Still-Face paradigm was applied to the data set. Information about how to proceed hierarchically with this classification process is described, followed by information about inspection of the data once the algorithm was applied. Adjustments made to the algorithm on inspection of the data are outlined and the justifications for these adjustments are described. It is important to note that the initial algorithm was applied to the sample used in the current study (N = 224, see Section 3.2.1 for a full description of the sample), modified following inspection of the GRS interaction of the scales and then reapplied to the data set for final analyses.

The algorithm for generating attachment-like classifications from patterns of GRS scores begins with the disorganised category, as route to membership of this group differs from that of the organised attachment classification groups. Following this, the categorisation of dyads to the three remaining attachment groups is discussed in hierarchical order and the process of dealing with difficulties with assignment to groups or anomalous patterns of scores is described.

**2.8.1 Hierarchical rules for classifying attachment in the Still-Face - Prioritising disorganised attachment.** To prevent classifying disorganised dyads twice, i.e. assigning an organised classification based on patterns of GRS reunion scores and later reassigning a disorganised classification due to increases in distress

from still-face to reunion, the patterns for a disorganised-like attachment were considered first.

During the classification process, inspection of the data revealed that active communication did not add to the infant information needed for the disorganised algorithm. A Pearson product-moment correlation was run to determine the relationship between infant's Attentive-Avoidant and Active communication-No active communication scores in the reunion episode. There was a positive correlation between the two scales, which was statistically significant ( $r = .60$ ,  $N = 224$ ,  $p < .001$ ). An effect size of this magnitude has been described as strong (Rosenthal, Rosnow, & Rubin, 2000), so Active-Communication was removed from the algorithm and the disorganised classification was made on the basis of the Attentive-Avoidant, Happy-Distressed and Non-fretful-Fretful codes only.

Classification proceeds through inspection of the still-face and reunion Happy-Distressed scores, with any infants showing at least a one-point increase in distress across these episodes being automatically given a disorganised classification. This is followed by the classification of all infants with a Happy-Distressed score of 3(2) in the reunion being rated as disorganised. Finally, the data is inspected for the combination of scores route to disorganisation, namely low attentiveness (1 or 2), mid to low happy (3(3)-1) AND/OR low non-fretful (1 or 2).

**2.8.2 Hierarchical rules for classifying attachment in the Still-Face - Resistant/Ambivalent attachment-like algorithm.** The most pertinent scale here is fretfulness as this represents the angry behaviours that are typical of a resistant child

in the reunion episode. Active communication measures positive forms of communication. Inspection of the data found that a high active communication score (4-5) was accompanied by a low fretfulness score (1-2) in only one instance. The reverse relationship between these two scales (low active communication and high fretful) was much more commonplace and seen in 35 infants. Furthermore, as was outlined in Section 2.8.1, Active Communication-No active communication was found to be significantly, positively correlated with Attentive-Avoidant. As a result of the above points, active communication was also removed from this algorithm.

Further inspection of the data showed that the Happy-Distressed and Non-fretful-Fretful scales followed a similar direction and co-occurrence with high fretful (1-2) was seen with high happy (4-5) in only one case. A Pearson product-moment correlation was run to determine the relationship between infant's Happy-Distressed and Non-fretful-Fretful scores in the reunion episode. There was a positive correlation between the two scales, which was statistically significant ( $r = .74$ ,  $N = 224$ ,  $p < .001$ ). An effect size of this magnitude has been described as strong (Rosenthal et al., 2000). Consequently, as angry behaviours are the most recognisable quality of resistant attachment, Happy-Distressed was not including in this algorithm. Instead, a combination of high fretfulness (1-2) and mid-high attentiveness (3-5) were used to classify resistant infants.

The timing of attentiveness in the reunion was not considered here due to the contradictory messages delivered by resistant infants who are thought to alternate between attentiveness and angry rejecting behaviours. This cycle could repeat many

times so the timing of attentiveness is not as important as the proportion of time spent being attentive to mother.

**2.8.3 Hierarchical rules for classifying attachment in the Still-Face – Avoidant attachment-like algorithm.** Attentive-Avoidant is the most important score for this classification. Inspection of the data revealed that only five infants showed a score combination of high attentive (4-5) and low active communication (1-2) and the reverse relationship was found only once. It is important to note that none of these five cases were given an avoidant classification as they did not fit the algorithm. They were, instead, three disorganised (increase in distress from still-face to reunion), one secure and one resistant as informed by algorithms involving other scales. As a result of this and the fact that Attentive-Avoidant and Active communication-No active communication scales were found to correlate strongly and significantly (see Section 2.8.1), active communication was removed from the algorithm for avoidant attachment.

Non-fretful-Fretful was not considered as a contributor towards the algorithm for avoidant attachment as it was significantly positively correlated with the Happy-Distressed scale (see above Section 2.8.2 for further details). Timing of attentiveness was not considered for this classification as mid-point scores did not contribute to the algorithm. The final algorithm for avoidant attachment was represented by scores that were low attentiveness and mid-high happy (not 3(2)).

**2.8.4 Hierarchical rules for classifying attachment in the Still-Face – Secure attachment-like algorithm.** Once the hierarchical process of classification

detailed above has been followed, the remaining unclassified infants in the data set are all classified secure. These infants are those who score mid-high on Attentive-Avoidant and mid-high (3(1), 4 or 5) on Happy-Distressed. Some residual distress may be left over from the still-face episode, as evidenced by a score of 3(1) on Happy-Distressed, but no other form of distress score should be found here.

This hierarchical classification process, in which the secure infants are classified last and by nature of them not fitting into other algorithms, means that timing of attentiveness was not used in the classification of secure attachment (or any of the other attachment algorithms). In terms of timing of attentiveness, one thing that hadn't been considered was that secure infants might be distressed with eyes closed at the start of the reunion and soothe later 3(2) in addition to the anticipated pattern of looking to mother then returning to exploration once soothed 3(1). All references to the timing of attentiveness were removed from the algorithm, which can be found in Table 2.8.4.

Once the mid-points of the scales had been recoded, 116 possible combinations of infant GRS scores were derived from the sample in the Still-Face reunion ( $N = 224$ ). There are a number of combinations that are exactly the same across all points but contribute to different classifications once alternative methods of classifying disorganisation were taken into account, e.g. if one infant showed an increase in distress from still-face to reunion and another did not.

Table 2.8.4

*Patterns or combinations of infant behaviour scores from the GRS that contribute to each attachment-like classification algorithm in the Still-Face.*

<b>Reunion Behaviours</b>				
	<b>Attentive-Avoidant</b>	<b>Active Positive Communication- No Active Positive Communication</b>	<b>Happy-Distressed</b>	<b>Non-Fretful-Fretful</b>
<b>Disorganised</b>			3(2)	
			Increased distress from Still-Face to Reunion	
	Low 1-2	Not in algorithm	Low 1-2, 3(3)	<b>OR</b> Low 1-2
<b>Resistant</b>	Med-High 3-5	Not in algorithm	Not in algorithm	Low 1-2
<b>Avoidant</b>	Low 1-2	Not in algorithm	Med-High 3(0)-4 NOT 3(2)	Not in algorithm
<b>Secure</b>	Mid-High 3-5	Not in algorithm	High 3(0), 3(1)-5 NOT 3(2)	Not in algorithm

\*the reunion score for Happy-Distressed must be lower than that observed in the still-face and must include some distress as evidenced by a score of 3(2), 3(3), 2 or 1.

**2.8.5 Summary: Developing a coding scheme for the Still-Face that generates an attachment-like classification.** This chapter has described the procedures and coding systems for the Strange Situation and Still-Face paradigms. Parallels between the two were drawn in terms of coding and procedures, and differences described in terms of how they are necessary to support the measurement of the same attachment construct in different paradigms with younger infants. The rationale for, and process of generating, an algorithm for the classification of attachment in the Still-Face was described in detail as were further adjustments to these algorithms that were made on inspection of the data set. The next chapter describes the specific methods used in the WCHADS sample to generate the infant and maternal data set for this study at 7 and 14 months.



## **Chapter 3 Method**

This chapter begins with a summary of the study design and sampling strategy of the wider study from which the sample for this thesis was drawn. Details about ethical approval, recruitment and retention and specific protocol arrangements are given, and demographics of the sample used for this thesis are described. Relevant infant and interactional measures are summarised again for ease of reference and the approach to data analysis is discussed.

### **3.1 The WCHADS design overview**

The current study reports data derived from a longitudinal study investigating prenatal and early infancy origins of conduct problems in children, the ‘Wirral Child Health and Development Study’ (WCHADS).

The WCHADS used a two-stage epidemiological strategy resulting in an extensive and intensive sample, both followed longitudinally and concurrently up to one year postpartum. The aim of the extensive sample was to establish a consecutive general population sample for epidemiological study. A smaller intensive sample, over-representative of risk, was identified for more frequent and in-depth measurement that could be weighted back to the extensive sample to derive population estimates in the WCHADS. Weighting requires analyses to be conducted in Stata which was beyond the scope of this PhD. Therefore, all analyses refer to the unweighted data from the intensive sample.

Figure 3 shows the timing of assessments for both the intensive and extensive samples in the WCHADS from pregnancy to one year postpartum. The relevant phases used in the current study (Phase 6 at 7 months and Phase 8 at 14 months) are shaded in blue.

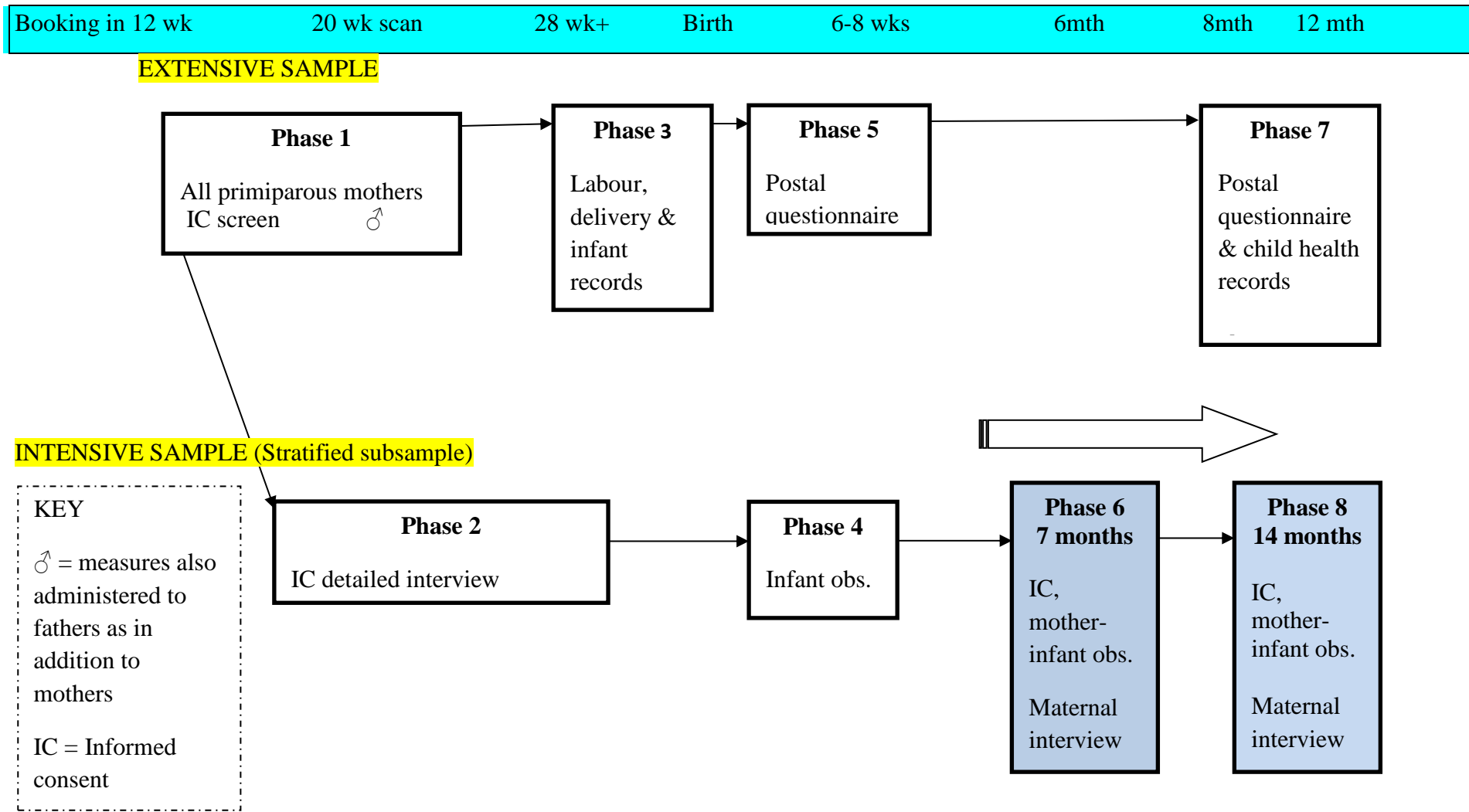


Figure 3: Flow chart of phases of the study from antenatal recruitment to 14 months (Phase 8)

**3.1.1 Ethical Approval.** WCHADS is funded by the Medical Research Council and run in partnership with NHS Wirral, NHS Western Cheshire and Wirral University Teaching Hospital NHS Foundation Trust. It has received full ethical approval from Cheshire Local and North West 5 Research Ethics Committees (ref: 05/Q1506/107). For a copy of the ethical approval letter, see Appendix 3.

**3.1.2 WCHADS recruitment to the extensive sample.** Recruitment to the study took place over a period of 19 months, between 12 February 2007 and 26 September 2008. Expectant mothers were eligible for inclusion into the study if they were primiparous and over the age of 18 at the time of booking in for their 12-week scan at the antenatal clinic of Arrowe Park Hospital. This NHS hospital serves a large, well-defined geographical area in the Wirral. No exclusions were made on the basis of premature birth or low birth weight (<2500g), or late registration for antenatal care, as these events have been associated with prenatal stress in previous research. Mothers were withdrawn from the study if their baby was later found to have a gross congenital abnormality or did not survive.

Clinic midwives made efforts to approach every eligible expectant mother at the time of their 12-week scan to ask if they would be happy to hear more about the study from one of a team of three research midwives at their 20-week appointment. Mothers who expressed an interest in participation were given a study information sheet to take away with them. When attending for their 20-week scan, the mothers were asked to spend approximately 30 minutes with a research midwife, providing informed consent to participate in the WCHADS and completing a short interview and questionnaire battery (Phase 1).

The 1286 mothers who completed Phase 1 became the extensive sample.

Expectant mothers who declined the invitation to participate at this phase were asked for their age and post code for demographic comparison purposes. See Figure 4 for an illustration of the recruitment process into the extensive sample.

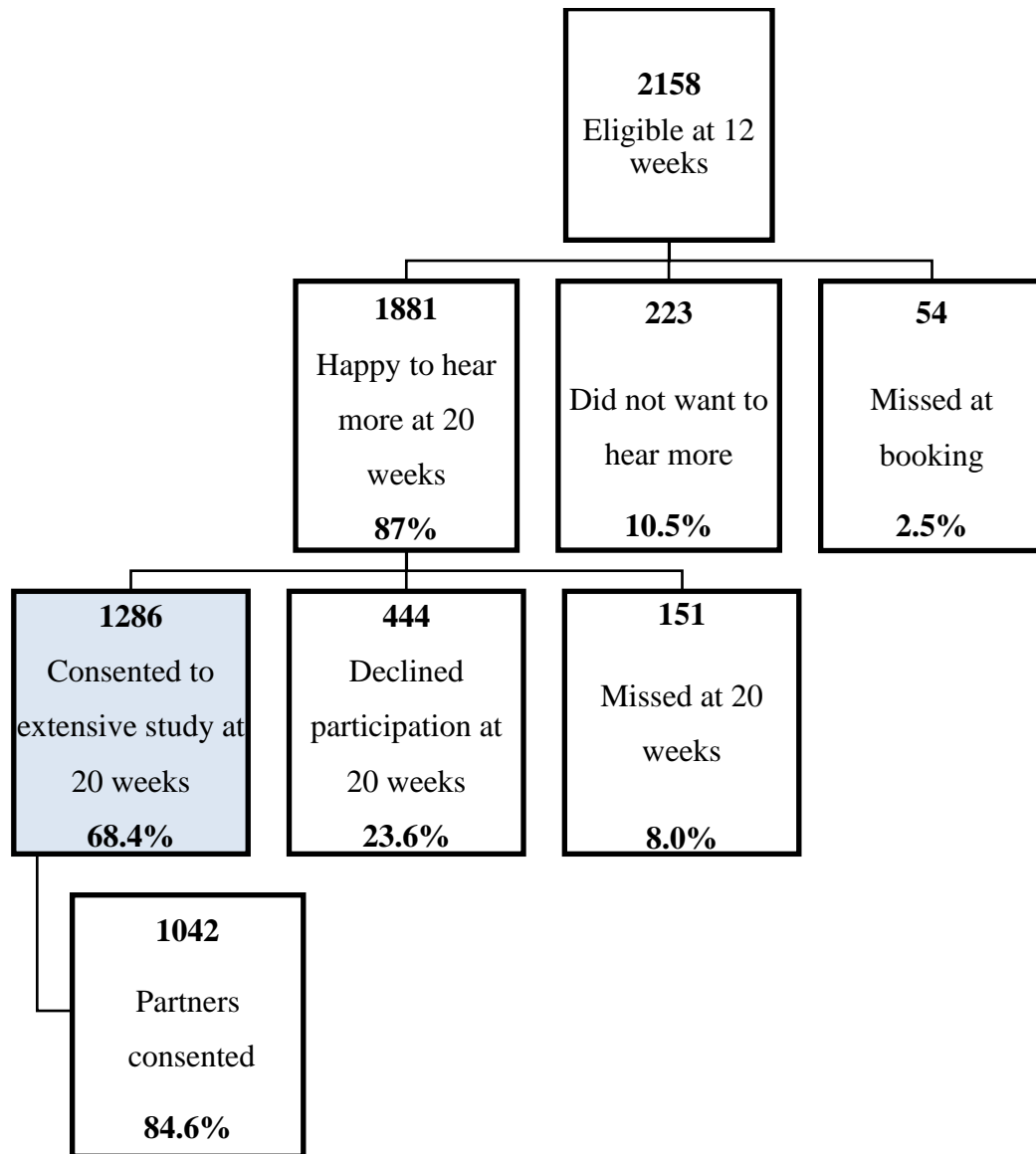


Figure 4. Extensive sample antenatal recruitment process

Expectant mothers in the extensive sample then gave demographic and medical birth data (Phase 3) and completed a battery of questionnaires when their babies were 8 weeks (Phase 5) and 12 months (Phase 7).

### ***3.1.2.1 Comparison of consenters and non-consenters to extensive sample.***

Basic demographic data was taken from the 444 participants who said they were happy to hear more about the study but later declined to consent to further follow-up. The English Index of Multiple Deprivation (IMD; Noble et al., 2007) was used to measure deprivation in the study. This measure is derived from UK Census data from 2001 and involves the ranking of postal code areas in England in terms of seven domains of deprivation; income, employment, health and disability, education, skills and training, barriers to housing and services, living environment and crime. Research midwives asked all those approached for their postcode at Phase 1 and a ranked deprivation score was derived from this according to which of the 32,844 lower super output areas (LSOA) they lived in. These scores are also split into quintiles and each mother was assigned a score on a scale of 1-5 where 1 is the 20% most deprived. A binary deprivation variable of most deprived quintile versus all other quintiles was created and used in analyses.

A comparison between those women who consented and became part of the extensive sample and those who declined, revealed that non-participants were significantly younger ( $t(1927) = -5.3, p < .001$ ) and more deprived ( $\chi^2(1) = 6.6, p < .01$ ) than those who consented.

**3.1.3 Intensive sample selection.** During Phase 1, all expectant mothers were informed that women reporting elevated levels of stress during pregnancy, and a subsample of those reporting lower levels of stress, would be contacted by researchers from the WCHADS team to be invited to take part in a more detailed part

of the study. All researchers working for the WCHADS were, and remained, blind to the risk status of the participants in the sample.

The intensive sample was derived from the extensive sample, with the intention of selecting those mothers who were high risk in terms of elevated levels of relationship difficulties, which have previously been shown to be associated with personality dysfunction (Hill, Fudge, Harrington, Pickles, & Rutter, 2000) and increased genetic and environmental risks for the development of behavioural problems in their children. A random sample of low risk mothers were also included in the intensive sample to provide variations across the full range of psychosocial risks.

The stratifier for the intensive sample was the Dunedin Relationship Scale (Moffitt et al., 1997) for interpartner psychological abuse and was completed by all extensive mothers as part of the questionnaire battery at Phase 1 (20 weeks). This scale comprises 18 items to measure psychological abuse committed in relationships in the past 12 months with questions relating to both the mother and partner as perpetrator of the abuse. An additional 2 items from the Conflict Tactics Scale (CTS; Straus, 1979) were included in the screening measure (see Section 3.4.3.1 for a description of the CTS).

A threshold for selection of the high risk stratum was used based on data provided by Moffitt on associations with partner violence (Moffitt et al., 1997). Mothers whose scores met this threshold (and those randomly selected) were then invited to take part in the intensive study by one of the study researchers and were

asked to visit the study base to complete a further consent form and a series of antenatal measures and interviews at around 32 weeks gestation. After birth, intensive sample mothers were asked to complete observational measures at the study base (in addition to the extensive sample questionnaire measures) at five weeks postpartum (Phase 4), seven months postpartum (Phase 6) and 14 months postpartum (Phase 8).

The initial threshold did not generate sufficient high risk mothers, and so it was lowered after 11 months of recruitment. Towards the end of the study, consecutive participants in the extensive sample were invited into the intensive sample. All analyses with weighted data take account of the changing threshold. Figure 5 illustrates how the intensive sample was derived from the wider extensive sample.



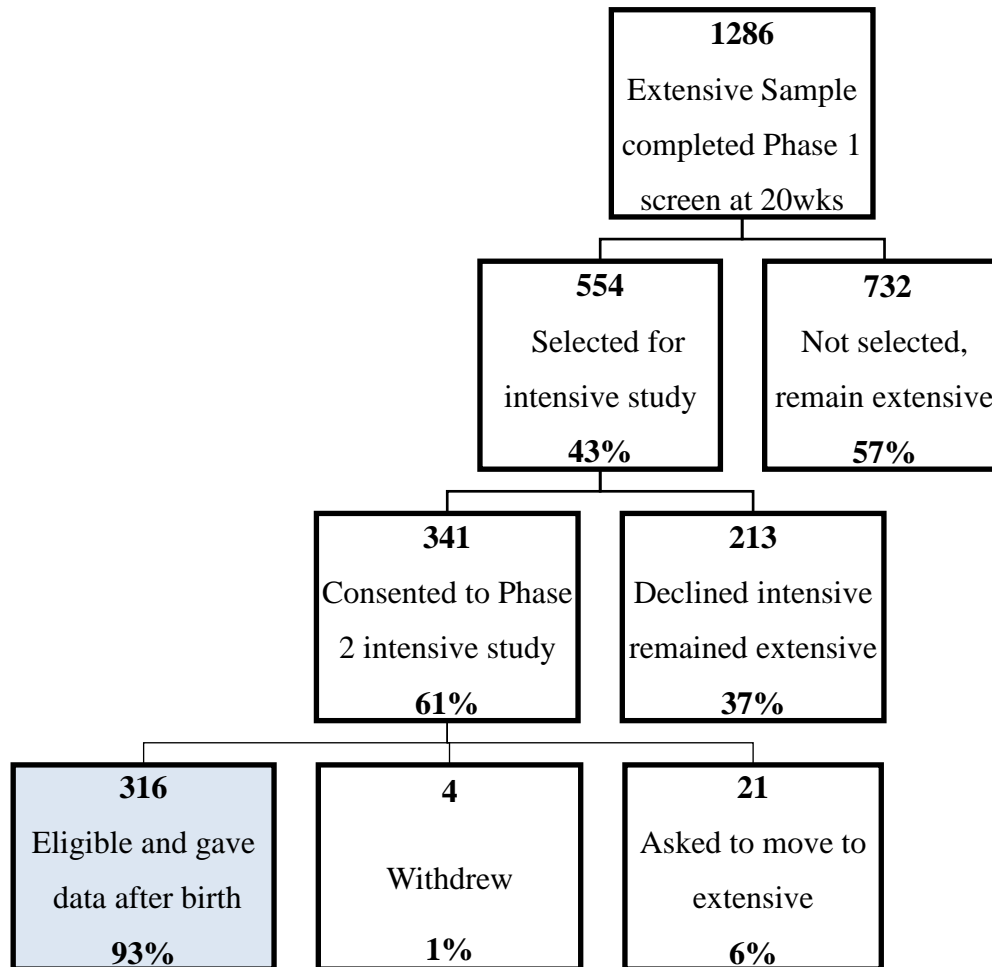


Figure 5. Intensive sample selection.

### 3.1.3.1 Comparison of consenters and non-consenters to intensive sample.

Of the 554 participants selected to be invited into the intensive sample, 316 consented and gave some data after birth. One participant withdrew after giving data at Phase 8 and requested that her data be removed from the sample and so all analyses use  $N = 315$  for the full intensive sample. Comparisons of those who agreed to take part in the intensive arm of the study and those who declined were made with respect to demographic variables including maternal age, deprivation and number of years spent in full time education.

Non-consenters were found to be significantly younger than consenters, ( $t(551) = -4.582, p < .001$ ). Those who did not consent to be in the intensive sample were significantly more likely to belong to the most deprived quintile of the IMD than those who consented. Of those who declined, 50.4% were in the most deprived group compared to 39.71% who consented ( $\chi^2(1) = 6.12, p = .013$ ). There was also a significant difference found between consenters and non-consenters with respect to maternal age on leaving full-time education. Of those who declined, 53.2% had left education before the age of 18 whereas the proportion of consenters who left full-time education before the age of 18 was 36.9% ( $\chi^2(1) = 13.71, p < .001$ ). See Table 3.1.3.1 for means and standard deviations of these variables.

Table 3.1.3.1

*Mean, standard deviation and significance values of maternal demographic measures for intensive consenters and non-consenters*

	Consenters to		Non-consenters	
	intensive		to intensive	
	Mean	SD	Mean	SD
Maternal age	28.17	6.14	25.80	5.25
Age completed education	18.90	3.00	18.03	2.67

**3.1.4 WCHADS study space.** The laboratory space in the study base had been divided into several rooms to enable separate assessments of different phases to run in parallel. Up to four assessment rooms were in use at any one time and one of these was divided into a further three assessment rooms and a waiting area where

infants could be fed, changed or take a nap. Participants were asked not to bring their partners when they attended for interview due to the sensitive nature of the data collected, but in the event of this happening, partners were asked to wait in a separate room where there was no risk of the interview being overheard. Partners were asked to watch infant assessments from an observation room, either through a one-way mirror or on a computer screen, if they attended for this. Mothers were given questionnaire packs to complete at home but any data about partner violence or risk was completed in the study base so as to maintain confidentiality from the partner and reduce any possible risk where physical or psychological abuse was endorsed.

### **3.2 Current Study Design.**

The study for this thesis makes use of assessments at 7 and 14 months from the Intensive Sample. The focus at 7 months is on the assessment of the infant's response to a standard stressor, the 'Still-Face', and the assessment of maternal sensitivity in the Still-Face and in a separate play procedure from the NICHD Study of Early Child Care. Predictions were examined from 7 months assessments to the Strange Situation assessment of attachment at 14 months.

**3.2.1 Overview of the sample for the current study.** 308 participants remained in the intensive sample when the infants were 7 months old as 8 had withdrawn at Phase 4 when the infants were 5 weeks old. Attempts were made to contact each of these mothers for participation at this assessment phase. Figure 6 shows the number of participants who were contacted and who gave data at this phase.

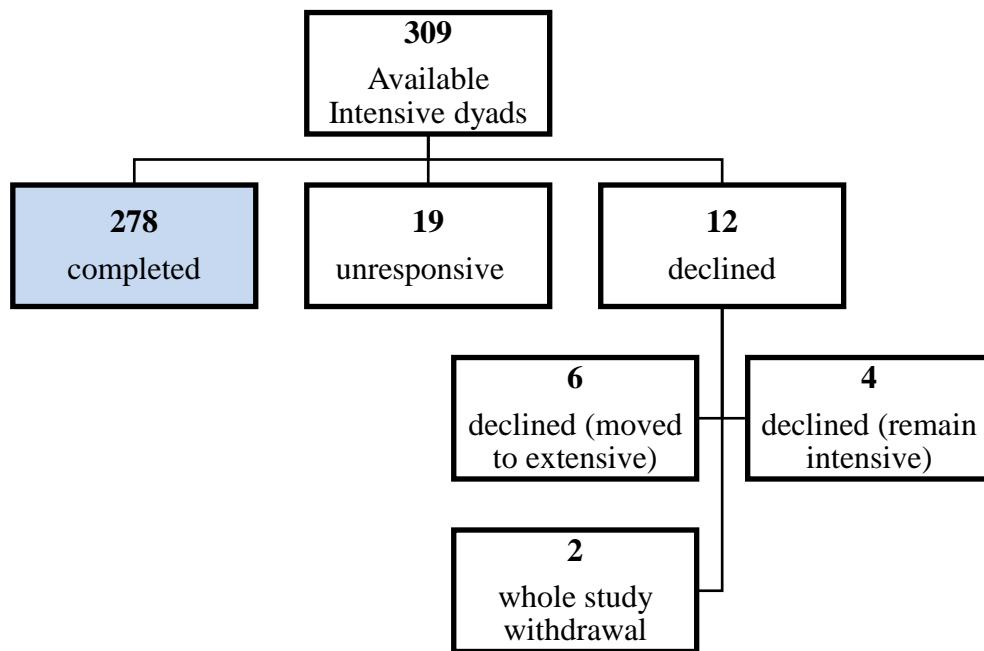


Figure 6. The flow of participants available for the 7 months assessment (Phase 6) and the number of those who gave data.

**3.2.1.1 Retention of the intensive sample for the current study.** 278 mother-infant dyads consented and completed at least part of the infant assessment at 7 months. 9 dyads did not complete the Still-Face during the assessment due to excessive infant distress during part of the paradigm. A further 23 dyads were excluded despite completing the Still-Face; 14 because of a technical reasons, 4 because the mother spoke in a second language for part of the paradigm, 4 because the reunion episode was cut short to less than half the expected length and 1 because the mother used a dummy in the reunion episode.

Of the 246 mother-infant dyads that had complete Still-Face data at Phase 6, 227 provided consent and complete data at Phase 8 (14 months). 19 of the 246 were excluded because they did not complete Phase 8 due to being unresponsive to contact or declining to take part. Of the 227 dyads that had full data at each phase, a further 3

were excluded as their Strange Situation was rated as unclassifiable (U) and so prediction of attachment could not be made.

**3.2.1.2 Missing data.** Missing data arose in 18 cases for the IBQ-R when mothers took questionnaire packs home to complete and failed to return them, 4 cases for the EPDS at Phase 6 and 13 at Phase 8 and in 2 cases for the NICHD free-play (NICHD ECCRN, 2001) when mothers spoke in a language other than English. Where this did occur, the analyses were conducted only with those who had full data and this is reflected in the sample numbers in the descriptive statistics at each point.

Figure 7 illustrates the flow of the sample used for this thesis.

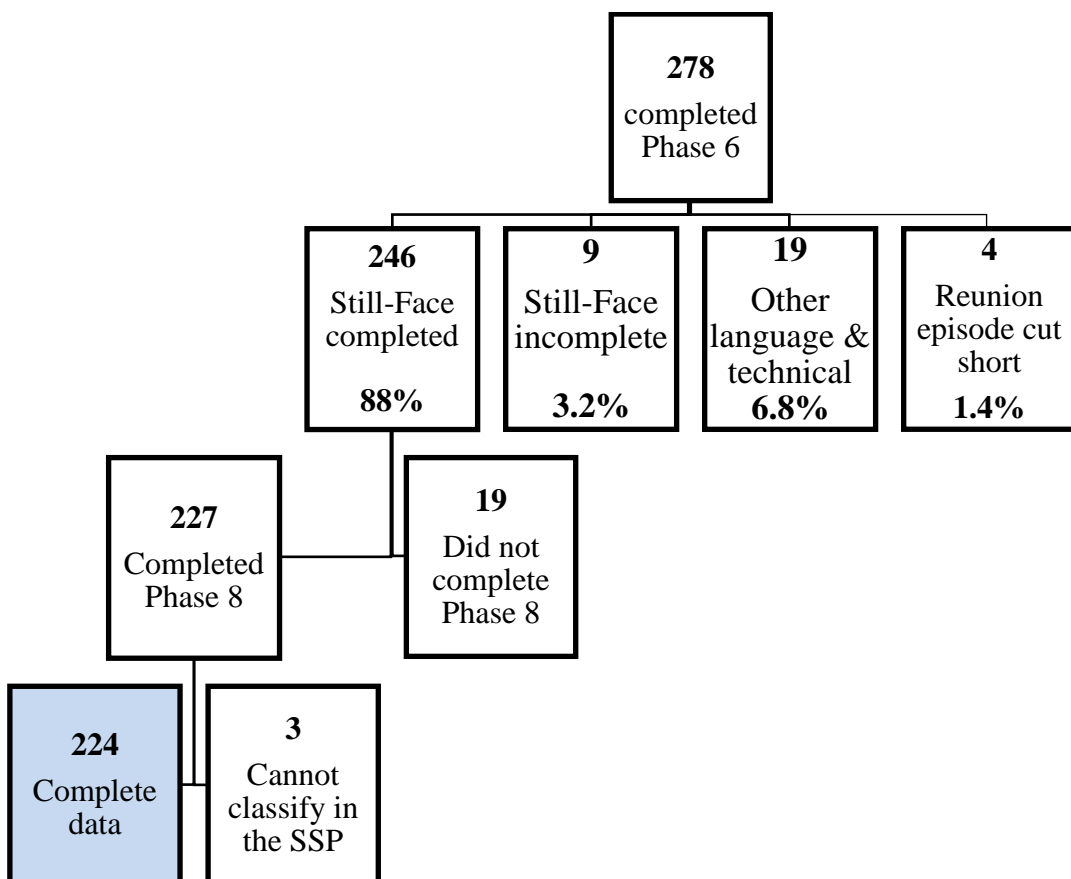


Figure 7. Flow chart of mother-infant participation in the Still-Face and Strange Situation.

**3.2.1.3 Characteristics of the sample used for the current study.** The sample was made up of 108 male (48.2%) and 116 female (51.8%) infants. Demographic characteristics of this sample are presented in Table 3.2.1.2.

Socioeconomic circumstances on the Wirral range between inner city deprivation and affluent suburbia and there are very low levels of ethnic minorities (Sharp et al., 2012). Ethnicity is not included in the table as the sample was overwhelmingly white British. The distributions were, 97.32% white ( $n = 218$ ), 0.89% Other Black ( $n = 2$ ), 0.45% Chinese ( $n = 1$ ) and 1.34% Other ( $n = 3$ ). This is consistent with published data on ethnic representation on the Wirral. 34.4% of the sample was in the most deprived quintile of the IMD.

Table 3.2.1.3

*Means, standard deviations and range for maternal and infant characteristics at Phase 6 of thesis sample*

	Mean	SD	Range
Maternal age (years)	29.51	6.23	18.91-51.83
Infant age (weeks)	28.57	3.01	23-41
Age completed education	19.26	3.12	14-37

**3.2.1.4 Comparisons between mothers who had complete data and those who were not retained.** Overall, of the 316 singleton births who were allocated and consented to the intensive sample, 224 (70.9%) provided complete data for this study. Those included are compared with those who did not have complete data in Table 3.2.1.4.

Compared to the current study sample, those excluded were significantly younger ( $t(313) = 2.98, p = .003$ ) than participants who were included. Those who did not provide complete data for the purposes of the current study, were significantly more likely to belong to the most deprived quintile of the IMD than those who consented. Of those who were excluded, 50.5% were in the most deprived group compared to 34.4% who consented ( $\chi^2(1) = 7.11, p = .008$ ). There were no differences between those who did and did not provide complete data for the current study in terms of number of years spent in education, with 42.2% of those who were excluded and 31.8% of those who were included leaving full-time education before the age of 18 ( $\chi^2(1) = 3.045, p = .081$ ).

Table 3.2.1.4

*Mean and standard deviation of maternal demographic measures for those in the current sample and intensive but not included in the thesis sample*

	Sample providing data at 7 and 14 months ( $N = 224$ )		Sample identified in pregnancy but did not provide complete data ( $N = 91$ )	
	Mean	SD	Mean	SD
Maternal age at birth (years)	28.95	6.23	26.73	5.65
Age completed education (years)	19.26	3.12	18.43	2.57



**3.2.3 Power analysis.** The sample size for the WCHADS study had been determined during pregnancy for predictions of infancy outcomes from prenatal risks, and not specifically for analyses to be conducted in this study. This, in turn, determined the sample size available for assessments at ages 7 and 14 months. The power of the available sample size to detect differences in mean maternal sensitivity scores, which were a key test of validation, was estimated. In an anticipated two group comparison, either of secure versus insecure or organised versus disorganised dichotomous attachment-like variables in the Still-Face, the sample had 0.85 power to detect an effect size (difference in means divided by common standard deviation) of 0.4 and .62 power for an effect size of 0.30. Thus small effects would not be detected, however power to detect effects between 0.3 and 0.4 were considered adequate given that quite substantial associations between attachment-like classification in the Still-Face and maternal sensitivity might be expected if the classification is valid. For this power analysis, the assumption of a sample of 50% secure and 50% insecure attachment classifications was made based on the elevated risk status of the current sample and the evidence in the literature that suggests that the incidence of disorganised attachment increases with risk, see Section 1.2.4.1.

For comparisons of the binary partner violence outcome, for which the overall rate was expected to be around 10%, in relation to a disorganised attachment-like classification, the sample had 0.80 power to detect an odds ratio of 3.4. For the prediction of secure attachment in the Strange Situation from Still-Face attachment-like classifications, and based on expected overall rates of secure attachment of around 50%, there was 0.80 power to detect an odds ratio of 2.7. Thus the sample

size was not adequate to detect modest associations between attachment status at the two time points.

### **3.3 Procedures**

#### **3.3.1 Procedure for Phase 6 (7 months).**

**3.3.1.1 Still-Face Paradigm.** The Still-Face paradigm was administered as described in Section 2.2.1. In this section, the specific arrangements for the WCHADS are described along with some repetition of the administration procedure and standardised protocol for ease of reference.

On arrival at the study base, the mother and infant were greeted by a researcher and taken to the assessment room seating area. The pair were made comfortable and the assessment session was explained to the mother, allowing for questions and emphasising that breaks could be taken whenever required for naps, changing, feeding or other care-taking needs. The information sheet was given to the mother for her to read, any further questions were answered before written consent was taken using the study phase consent form (see Appendix 4 for the Phase 6 information sheet and consent form).

The Still-Face paradigm followed two other components of the assessment during which the infant sat on their mother's knee watching a form of puppet show, the Helper-Hinderer (Hamlin, Wynn, & Bloom, 2007) and then explored a novel toy for two minutes. The Helper-Hinderer involves a series of trials in which coloured shapes with googly eyes help each other up, or prevent each other from climbing, to the top of a hill. Infants of 6 months have been found to show a prosocial preference,

as evidenced by their reaching towards and touching the helper and avoiding the hinderer when presented with both shapes at the end of this procedure.

During the Still-Face paradigm, the infant was seated in a high chair facing mother with no toys or other colourful objects in their line of sight. The mother was reminded of the procedure and told that this part of the assessment would take 6 minutes in total – 2 minutes of talking to the child (engagement), 2 minutes without talking during which time they were required to look over the infant's head with a neutral expression (still-face), and the last 2 minutes of talking (reunion).

Researchers explained to each mother that they understood that this can seem difficult but that it was really important that she try her best to keep her face still for the whole two minutes, if possible. Mothers were asked to interact with their infants in whichever way they would normally do at home during the engagement and reunion episodes, e.g. singing, touching, pulling faces. For this study, mothers were permitted to touch their infants during the engagement and reunion but not in the still-face episode.

The mothers were told that the first two minutes of engagement would commence once the researcher had left the assessment room and that they would be given a signal of a knock on the door for each change of episode. If the researchers felt that the child was becoming too distressed, or if the mother displayed signs of distress during the still-face, the episode would be curtailed by an earlier knock on the door. Likewise, the mothers were told that if they felt that their infant was too upset during the still-face, and that they were unable to wait for the signal, then they

should begin interacting with them again (thus bringing the reunion episode forward).

The Still-Face paradigm was captured by three cameras positioned in the assessment room and controlled in the observation room by the researchers (see Figure 2). A video recording of the ECG trace of the infant's heart rate was also captured, although this was not used in the current study, and these four views made up the quad view recording that was used for coding. Cameras were zoomed in to the faces of the mother and infant in order to facilitate coding of facial expressions and eye gaze. On completion of the three episodes of the Still-Face, the researcher returned to the assessment room to signal the end of the paradigm, answer any questions and ensure that both parties were settled and reassured. The infants were removed from the high chair and given to the mother whilst the next part of the assessment was explained and set up. See Appendix 5 for an excerpt from the WCHADS procedures manual regarding the Still-Face.

**3.3.1.2 NICHD semi-structured free-play.** As part of the Phase 6 infant assessment battery at 7 months, mothers were also asked to play alone with their infants for a total of 15 minutes. Mothers were asked to bring a favourite toy, belonging to the child, to the assessment when booking in. The mother was asked to play with the infant with this favourite toy as they would at home for the first seven minutes and then, when they heard a knock on the door, they were instructed to put the toy away and use one or more toys from a selection provided by the researchers for the remaining eight minutes. At the end of the fifteen minutes the researchers re-entered the room and answered any questions the mother may have had. See

Appendix 6 for an excerpt from the WCHADS procedures manual detailing how this was task was administered.

### **3.3.2 Procedures for Phase 8 (14 months).**

**3.3.2.1 *The Strange Situation.*** The Strange Situation was administered as described in Section 2.1. In the following section, the specific arrangements for administration of this paradigm in the WCHADS are described with some repetition of procedures and protocol for ease of reference.

The mother and infant dyad were greeted by the researchers on arrival at the study base and taken to a holding room for consent in order to keep the Strange Situation room and surroundings as unfamiliar as possible. The researchers explained the format of the assessment and what procedures would be involved. The mothers were given an opportunity to ask questions and to read the participant information sheet for Phase 8 before being asked to complete the participant consent form (see Appendix 7 for copies of the Phase 8 information sheet and consent form). Once consent had been gained, the Strange Situation episodes were further explained and it was reiterated that there would be two 3 minute separations but that the mother would be able to watch their infant at all times through the one-way mirror in the observation room. It was explained to the mother that a “stranger” would be entering the room and making bids for contact with the child whilst they were there. The mother was told that this stranger was another researcher who they may or may not have had contact with at previous phases. Previous contact with mother and infant

was acceptable so long as the child had not been in contact with the stranger for a period of six months or longer.

The mother and infant were then taken to the assessment room and given a brief introduction to the room by the researcher. Upon leaving the dyad alone in the assessment room, the three minutes of episode 2 commenced. During this phase the mother is asked to settle her infant to explore the toys and return to her chair where she is to read a magazine until the stranger initiates a conversation with her in episode three. The mother is told to engage with the child only if necessary or if the child initiates an interaction. The stranger enters the room after three minutes and sits quietly in the second chair, as though they were in a waiting room. After one minute the stranger begins to talk to the mother, during minute two the stranger approaches and interacts with the infant and at the end of the third minute the mother is cued to leave the room for the first separation (episode 4). This separation lasts for three minutes unless the child becomes too distressed and the stranger is unable to support the child to soothe, in which case the mother returns sooner. The stranger leaves unobtrusively once the mother has returned in episode 5 and has greeted the child and settled them to play once more. The mother and child are left alone together in the room for a further three minutes before the mother is cued to leave the room for the second and final separation. This time (episode 6), the infant is left alone in the assessment room for up to three minutes depending on their state of arousal and the mothers consent. After these three minutes, the stranger reenters the room and aims to calm and settle the infant back to exploring the toys. If the stranger is unable to settle the infant, the episode is cut short and episode 8 is brought forward. Finally, the mother reenters the room and greets the child, picking him/her up whilst doing

so. The stranger leaves unobtrusively and the mother and child are left alone in the assessment room for a further three minutes until the end of the paradigm.

Each time the mother is in the assessment room with the child, she is given the instructions to settle the child to play/explore the toys and then to return to her chair to read the magazine. The stranger is expressly told never to sit in the mother's chair and to do only as much as the child needs in terms of engagement and interaction. See Appendix 8 for an excerpt from the WCHADS procedures manual regarding the Strange Situation Paradigm



### **3.4 Measures**

#### **3.4.1 Measures at Phase 1 (20 weeks).**

*3.4.1.1 Socio-Demographics.* All women who were approached by the research midwives were asked to provide socio-demographic data to allow for the analysis of differences between consenters and non-consenters. This information included maternal age, years in education, marital status, ethnicity and postcode. See Appendix 9 for a copy of the demographic questionnaire.

#### **3.4.2 Measures at Phase 6 (7 months).**

*3.4.2.1 The Global Rating Scales of Mother-Infant Interaction (GRS).* All three episodes of the Still-Face paradigm were rated with the GRS (Murray et al, 1996), with only the infant scales being used in the still-face episode. Rating of the GRS produces 28 scores in total, 13 for the mother (including 3 maternal scales that are for use only with infants who are 4 months of age or older), 10 for the infant (including 2 that are sensitively adjusted for use with infants from 2 and 4 months and older) and 5 for the interaction between the two; all of which are on a five-point scale, where five is the most positive and one the most negative. Ratings can be clustered to produce three maternal dimensions of sensitivity and responsiveness, affective behaviours and intrusiveness; two infant dimensions of interactive behaviours and inertness or fretfulness and one dyadic interaction dimension to describe how smooth and synchronous the episode appeared to be. See Appendix 10 for a copy of the GRS coding sheet.

The only maternal scale used from the GRS was the Sensitive–Insensitive scale when exploring the relationship between attachment and measures of maternal sensitivity in the engagement and reunion episodes (see Section 4.5.1). This scale represents the maternal sensitivity and responsiveness dimension. Only the infant scales likely to be measuring similar constructs as those measured by the scale scores in the Strange Situation (as detailed in Section 2.4) were used in the generation of the attachment-like classification at 7 months. These included Attentive-Avoidant, Happy-Distressed and Non-fretful-Fretful. Active communication-No active communication was considered for use in the generation of the classification algorithms but inspection of the data revealed that, when used with the other scales, this did not sufficiently add to the recognition of emotion regulatory processes as it correlated significantly with the Attentive-Avoidant scale and so it was removed (see Section 2.8 for full details).

For reasons discussed in Section 2.6.2, the mid-points of the Attentive-Avoidant and Happy-Distressed scales were subdivided to provide more detailed information about the behaviours contributing to a mid-point score of 3. However, the mid-point scores of the Attentive-Avoidant scale were not used in the final algorithm of attachment-like classification so are not described here. The mid-point of the Happy-Distressed scale was broken down according to when the distress occurred in the episode, with the addition of a fourth subdivision to accommodate for the option of no distress. The subdivisions were as follows; 3(1) when distress occurred mainly in the first half, 3(2) when distress occurred mainly in the second half, 3(3) when distress was evenly distributed and 3(0) when the infant was largely neutral with no distress.

**3.4.2.2 Reliability in recoding the mid-points.** A subsample of 30 infants who were assigned a score of 3 on the Happy-Distressed scale in the reunion and a separate sample of 30 who were assigned a score of 3 on the Attentive-Avoidant scale were used as a reliability sample and re-rated by two independent raters. For the Happy-Distressed scale, this re-rating involved making a decision as to whether distress was present or absent, then (if present) where the distress occurred during the episode (3(1) if in the first half, (3(2)) in the second or (3(3)) if evenly distributed). Both raters were blind to the attachment status of the infant at 14 months in the Strange Situation.

*Presence or absence of distress in reunion when rated 3.* Cohen's Kappa was used to determine if there was agreement between the two raters as to whether distress was present or if the infant was neutral in the reunion episode. There was almost perfect agreement between the two raters,  $k = .74$  (95% CI, .531 to .951),  $p < .01$ .

*Timing of distress in reunion episode – reliability.* Cohen's Kappa was then used to determine if there was agreement between the two raters as to where the distress occurred in the reunion episode. There was substantial agreement between the two raters,  $k = .62$  (95% CI, -1.412 to 2.386),  $p < .01$ .

**3.4.2.3 Maternal sensitivity in the Still-Face.** Maternal sensitivity in the Still-Face was measured using the maternal dimension of sensitivity and responsiveness, the Sensitive-Insensitive GRS scale. This is a summary of the scales Warm/Positive-Cold/Hostile, Accepting-Rejecting, Responsive-Unresponsive and Non-demanding-

Demanding. These summary scales were not used in isolation in the current study. The Still-Face videos were rated by three researchers, with one researcher rating the majority (rater KA = 187, rater KS = 25 and rater LW= 21). Inter-rater reliability was evaluated between the trainer and the researchers, and the required reliability was achieved. This criterion (set by the author of the GRS) required at least 90% of the scores to be within one point of the original score and at least 50% to be exactly the same.

**3.4.2.4 Maternal sensitivity in the semi-structured free-play.** Maternal sensitivity in the semi-structured NICHD free-play was rated using the “Qualitative Ratings for Parent-Child Interaction at 3-15 months of age” manual which was adapted from the NICHD Study of Early Child Care Mother-Infant Interaction Scales (Owen, 1992). These rating scales have seven items measuring maternal behaviours, four items measuring infant behaviours and one dyadic item. All items are rated on a 5-point scale where 1 is no evidence of the behaviour and 5 indicates that the behaviour was highly characteristic of the interaction.

Maternal sensitivity was rated separately in the 7 and 8 minute episodes and discrete scores were given for sensitivity to distress (where appropriate), sensitivity to non-distress and global sensitivity. Mean maternal sensitivity scores across episodes were used in analyses in the current study. Where analyses involve maternal sensitivity to distress, only those infants who showed distress in the free-play were included; infants who showed distress in one half but not the other were included and the maternal sensitivity score for that one half was used in place of an overall mean score.

Three researchers rated the free-play interactions, with one researcher rating the majority. Training for reliability was administered by Dr. Margaret Tresch Owen, who worked on the NICHD study for 20 years. Reliability was achieved through coding of 20 mother-infant NICHD interaction training videos and agreement across the three raters using intraclass correlations was  $r = .83$  for sensitivity to distress and  $r = .91$  for mean sensitivity scores.

**3.4.2.5 Strengths and weaknesses of maternal sensitivity measures.** Two measures of maternal sensitivity were used in the current study; maternal sensitivity in the Still-Face engagement and reunion episodes and in the semi-structured NICHD free-play. Both tasks were completed during the same assessment visit with the mother and infant at 7 months, although 2 dyads completed the tasks on different days due to distress and time constraints imposed by the mother. The free-play immediately followed the Still-Face paradigm in the assessment order but breaks were often taken to ensure the infant had had an opportunity to regulate his/her emotion and return to an optimal state. Intervals between the end of the reunion episode and the start of the free-play ranged from 1 to 68 minutes with the mean interval being 5.72 minutes.

Efforts were made to train independent raters to code each task but this proved difficult in terms of time needed to commit to becoming reliable in the first instance and then, where reliability was achieved, in terms of time available for coding the interactions of the infants and mothers in the study sample. Available raters were three students who were working on the WCHADS study for a limited amount of time, one researcher from a different study with a limited amount of time

to give to the WCHADS and two further researchers who were trained to rate the GRS but who, ultimately, did not have time to complete the reliability set. When these efforts did not prove successful, it was decided that it would be necessary to give priority to independence of the ratings over time and the primary rater coded the remaining interactions. This meant that, for the NICHD free-play, 38 videos were rated by JK, 23 by AH and 161 by KA (2 interactions were not included as the mother spoke in a language other than English for a substantial amount of the time) and for the Still-Face, 17 videos were rated by LW, 24 by KS and the remaining 183 were rated by KA. Raters other than KA were tasked with rating the interactions where KA had rated the corresponding task for that dyad to increase the incidences of independent rating. However, as the numbers show, this was only possible for a small number, see Table 3.4.2.5. Instead, where ratings were not independent, they were separated by periods of up to three and a half years. Coding of the free-play took place first during the 6 months from November 2010, followed by the coding of those Still-Face interactions for dyads of which free-play had not already been coded by KA in the 12 months from August 2011. The remaining Still-Face interactions were coded three-and-a-half years later in the 6 months from August 2014.

Rating of the NICHD free-play videos was undertaken in the first instance, followed by the rating of the Still-Face interactions of those dyads whose NICHD free-play had been coded by the student raters. Once it became clear that independent rating would not be possible, the coding of the remaining Still-Face paradigms was completed approximately 3-3.5 years after the rating of the NICHD free-play.

Maternal sensitivity in the Still-Face was rated at the same time as the infant scales and by the same raters. As a result, there may be interactional effects between this measure of maternal sensitivity and infant attachment in the Still-Face as the two are perhaps likely to be influenced by one another. Consequently, a stronger test of the validity of the 7 months attachment classification is the link to maternal sensitivity in the NICHD free-play. This is described in Section 4.5.1.3.

Table 3.4.2.5

*Number of maternal sensitivity measures in NICHD free-play and Still-Face that were rated by the same coder.*

Rater	NICHD free-play	Number rated by same coder in Still-Face (%)
JK	38	0 (0%)
AH	23	0 (0%)
KA	161	120 (75%)
Not rated/other language	2	N/A
Total	224	120 (54%)

**3.4.2.6 Infant Behaviour Questionnaire Revised (IBQ-R).** The IBQ-R (Gartstein & Rothbart, 2003) is a widely used 91 item maternal report questionnaire measure of infant temperament for use with infants between the ages of 3 and 12 months that has been found to show good levels of reliability, validity and internal consistency (Gartstein & Rothbart, 2003; Parade & Leerkes, 2008). Item responses are made on a 7-point Likert scale where 1 is never and 7 is always. By asking about

specific infant behaviours across a number of events over the preceding two weeks, the IBQ-R is able to measure specific aspects of temperament on 14 subscales. These subscales load onto three dimensions of infant behaviour; Positive Affectivity (PAS; including smiling and laughter, high intensity pleasure, activity level, approach, perceptual sensitivity and vocal reactivity), Orienting/Regulatory Capacity (ORC; including duration of orienting, soothability, cuddliness and low intensity pleasure) and, relevant to the current study, Negative Affectivity (NEG). Negative affectivity includes the subscales of sadness, fear, distress to limitations and falling reactivity, a pattern of subscale loadings that has been found to be consistent with neuroticism in older children and adults (Rothbart, Ahadi, & Evans, 2000). See Appendix 11 for a copy of the IBQ-R.

**3.4.2.7 The Edinburgh Postnatal Depression Scale (EPDS).** The EPDS (Cox, Holden & Sagovsky, 1987) is a well-validated 10-item self-report scale designed as a screening measure for postpartum depression but also validated for use with mothers of children up to 3 year 9 months (Cox, Chapman, Murray & Jones, 1996). This scale asks mothers to indicate how they have felt in the past week in relation to common symptoms of depression. Each item is rated on a 4-point scale, 7 of which are reverse scored, and a total score is derived whereby higher scores are indicative of increased incidence and severity of depressive symptoms. The EPDS was administered at Phase 6 (7 months) and Phase 8 (14 months) in the current study.



### **3.4.3 Measures at 14 months (Phase 8).**

**3.4.3.1 *The Conflict Tactics Scale (CTS)*.** The Conflict Tactics Scale (CTS; Straus, 1979) is a well-established measure of relationship violence. Whilst it also includes measures of psychological aggression/abuse, only the physical assault items are used in the current study as a measure of intimate partner violence. The physical aggression section of the CTS is a 13 item measure that records incidences of violence from mother to partner and then from partner to mother. The CTS was administered retrospectively when the infant was 14 months old with rating periods including birth to 7 months (data included in this study) and 7 months to now. It is used in the present study as a validation variable (in combination with the PCC, see Section 3.4.3.2) for the 7 months attachment classification scheme, as research has shown an association between partner violence and disorganised infant attachment (Zeanah et al., 1999) as described in Section 1.2.4.3. See Appendix 12 for a copy of the CTS.

**3.4.3.2 *The Partner Conflict Calendar (PCC)*.** The PCC (Ehrensaft, Moffitt, & Caspi, 2004) is a structured interview used to record violent events in a relationship. The interviewer presents the participant with a prompt card listing a catalogue of violent behaviours and asks them to report whether any of these have occurred, and if so, when. The interview also gathers information about injuries that may have been sustained by either party, details about treatment and intoxication where relevant, and the involvement of external agencies. This measure was not administered at 7 months (Phase 6) but was administered at 14 months (Phase 8) covering a rating period of up to 18 months (Phase 2 in the third trimester to Phase

8). These responses were amalgamated with maternal CTS responses at 7 months and any reporting of partner violence (regardless of the perpetrator) from birth to 7 months led to the rating of presence of partner violence for that dyad. See Appendix 13 for a copy of the PCC interview schedule.

**3.4.3.3 *Infant attachment in the Strange Situation.*** The Strange Situation videos were rated by two researchers who were reliable using this coding scheme at the Center for Attachment Research (CAR), trained and supervised by Professor Howard Steele in New York. Both researchers were blind to all other forms of data from this sample and had not had any direct contact with any of the study participants.

### **3.5 Procedure for the Classification of Attachment-like Behaviours at 7 months**

This next section briefly describes the way in which the infant scales from the Global Rating Scales of Mother Infant Interaction (GRS) from the Still-Face were used to describe emotion regulatory processes and subsequent attachment-like classifications at 7 months of age. For a more complete description of the approach to deriving attachment categories see chapter 2. The information contained in this section is a summary of this for ease of reference.

**3.5.1 Assigning an attachment-like classification.** Once all the Still-Face videos had been rated for the 224 infants in the sample, the infant scores for the still-face and reunion episodes were examined. This section briefly outlines the hierarchical process of generating a classification from patterns of GRS scores. Examination of the data revealed 116 possible combinations of infant GRS scores in the Still-Face reunion ( $N = 224$ ).

**3.5.1.1 Classifying disorganised attachment in the Still-Face.** As there are three routes to disorganisation, to prevent classifying disorganised dyads twice, the patterns for a disorganised-like attachment are considered first in the classification hierarchy. Disorganised attachment is represented by GRS scores that suggest the infant is distressed yet not using the mother as a source of support. This is represented by low attentiveness, high distress and/or high fretfulness. Disorganisation is also classified through the route of increasing distress either from still-face to reunion or within the reunion episode itself (represented by a score of 3(2) for Happy-Distressed).

In order to mirror the coding in the Strange Situation, infant scores from the reunion were the only means of classifying organised attachment. Infant scores from the still-face episode were however, also considered for a disorganised classification, in order to pick up on the characteristic increases in distress on reunion with mother. See Section 2.7.4.6 for a review as to why it was not possible to include all the isolated markers of disorganisation in this classification system.

**3.5.1.2 *Classifying resistant attachment in the Still-Face.*** The classification of resistant-like attachment follows disorganisation in the hierarchical process. The emotion regulatory process of a resistant infant is demonstrated by alternating proximity seeking and angry protesting towards the mother and this is represented by mid-high attentiveness and high fretfulness.

**3.5.1.3 *Classifying avoidant attachment in the Still-Face.*** Avoidant infants down-regulate emotions by not actively seeking out contact or proximity with the mother. Avoidant attachment is third in the hierarchical classification system and is represented by reunion behaviours of high avoidance, and mid-high happy (avoidant infants may be neutral throughout so score a 3(0)).

**3.5.1.4 *Classifying secure attachment in the Still-Face.*** Once the three insecure attachment patterns of behaviours have been classified through the hierarchical algorithmic process, all infants who remain unclassified are secure. A secure pattern of behaviour on reunion is presented as seeking the mother out for greeting and repair of distress (where necessary), a positive exchange to re-establish baseline levels of arousal and then return to exploration or play. This is represented

by the algorithm of mid-high attentiveness and mid-high happiness.

### 3.6 Approaches to Validity

As outlined in Section 2.8, the attachment-like classification system was derived from algorithms of scale scores from the Global Rating Scales of Mother-Infant interaction. The algorithm provides a concrete, quantitative way of generating attachment classifications and so, when used correctly, there should be perfect agreement between raters applying this. Given that the measure of attachment-like classification reported in this study has not been used before, the next section reviews the data surrounding its validity and how these analyses were conducted.

**3.6.1 Validity.** Construct validity has been named as the best approach to validating a test (Cronbach & Meehl, 1955). It allows for the evaluation of a test used to measure a specific construct by employing other measures of validity such as convergent and divergent validity (Messick, 1980). The following section describes factors to consider when examining construct validity, such as whether the attachment-like classification system measures only attachment and not additional constructs, whether it has concurrent validity with other well-established measures and whether the attachment-like scores have consistent relationships with other attachment related constructs.

**3.6.1.1 *If this measure of attachment-like classification in the Still-Face were a valid measure, what association would be expected?*** The use of descriptions of emotion regulatory processes that underlie attachment behaviour patterns at each age supports the idea that the attachment-like algorithm is relevant and representative of the attachment construct that it aims to measure. The GRS scales are similar to the

scale scores used in the Strange Situation so could be described as relevant and appropriate.

*Concurrent validity* would require the attachment-like classifications made in the Still-Face to correlate positively and substantially ( $>.4$ ) with other tests of infant attachment. Since there are currently no other validated tests of infant attachment at this age, the next most appropriate measure of attachment would be that made in the Strange Situation from 12 months. However, prediction to the 14 months attachment classification is one of the main outcomes of the current study (see Section 4.5 for these analyses) and so this comparison was not used in analyses of validity.

*Convergent validity* involves demonstrating that measures of constructs that should be related to each other are significantly associated. Measures that should be related to infant attachment include maternal sensitivity, maternal sensitivity to distress and partner violence. These associations are described in Sections 1.5.1.1 and 1.2.4.3. Therefore, if this measure of attachment-like classification were to show convergent validity, one would expect that infants classified as securely attached in the Still-Face would have mothers who are significantly more sensitive in terms of overall sensitivity and sensitivity to distress. One would also expect to find an association between disorganised attachment in the Still-Face and exposure to partner violence, as disorganised attachment in infancy has been found to be associated with concurrent maternal reporting of partner violence (Zeanah et al., 1999).

*Discriminant validity* requires the demonstration that measures of constructs that theoretically should not be related do not have statistically significant associations, such as infant temperament.



### **3.7 Approaches to Analysis.**

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 22.0 for Windows.

Initial analyses involved the use of descriptive statistics to report the distribution of infant behaviour scores across the Still-Face episodes and the ‘Still-Face effect’ was examined using repeated measures analyses of variance (ANOVA). Distributions of attachment-like classifications, derived using the algorithm described earlier, in the Still-Face at 7 months were then examined, together with the attachment distributions from the Strange Situation at 14 months. In order to assess the validity of the Still-Face attachment-like categories in relation to maternal sensitivity and temperament, mean scores across the 4 categories were compared using ANOVA. Proportions of each of the 4 categories with histories of exposure to partner violence were assessed using binary logistic regression.

The overall association between attachment at the two time points was examined using a chi square analysis and the main analyses regarding the specificity of the associations between attachment in the Still-Face and Strange Situation were examined using a series of multinomial logistic regression analyses. This method was used because the dependent variable (attachment in the Strange Situation) could not be assumed to be ordered and had more than two categories.

**3.7.1 Approach to skewed data.** Skewness was identified using the criterion of whether or not the skewness statistic was greater than twice that of its standard error. Skewed variables were transformed with commonly used transformations (details of these for each variable can be found in Appendix 14). Raw data is presented in tables in the form of means and standard deviations and the test statistics and values of  $p$ , where appropriate, are derived from analyses using transformed data variables. See Appendix 14 for histograms for untransformed and transformed data and skewness statistics.

## Chapter 4 Results

### 4.1 Overview of Results

In the first section of this chapter, 4.2, the scores for the Still-Face infant behaviour codes, that were used to generate the attachment categories, are examined across the three Still-Face episodes. The attachment-like categories generated by applying the algorithm described in Section 2.7 are then shown in Section 4.3. The distributions of the attachment-like categories derived from the Still-Face at 7 months are compared with the distribution of the Strange Situation attachment categories rated at age 14 months. Associations between the Still-Face attachment classification and maternal sensitivity, infant exposure to partner violence and infant temperament are presented in Section 4.4 as tests of convergent and discriminant validity of the 7 months classification scheme. Lastly, continuities between the 7 and 14 months classifications are examined, together with tests of whether they are explained by continuities from 7 months maternal sensitivity to 14 months attachment status.

**4.1.1 Approach to analyses.** Unlike many studies of infant attachment, the current study has a large enough sample size, with sufficient numbers in each attachment classification group, to allow for the use of all four classifications in analyses. In analyses where numbers in categories are low, power will be reduced and so the categories will be collapsed into three (secure, insecure organised and disorganised). Categories are also collapsed and dichotomised in some analyses to be comparable to previous research, as much of the literature uses insecure/secure and

disorganised/organised comparisons. The number and nature of the attachment classifications used for analyses are described in each section.

Throughout the presentation of the results, the 7 months attachment-like classification will be referred to as attachment without the assumption being made that this is attachment. All analyses presented in this section were conducted on the sample of 224 infants and their mothers as described in Section 2.3.1.2.

## 4.2 Examining the Still-Face Effect

The patterns of infant behaviours across the three Still-Face episodes were examined in order to see if the Still-Face in the current study showed the characteristic Still-Face effect that has been found in previous studies. This effect is typified by a decrease in looking and positive affect from engagement to still-face and an increase in these behaviours from still-face to reunion.

The distributions, means and standard deviations (in bold) of attentiveness, active communication, happiness and fretfulness are shown in Table 4.2. Differences in means across the three episodes were first examined using repeated measures ANOVAs, followed by Bonferroni post hoc pairwise comparisons. In this section, for the purposes of clarity, the scale names were adjusted to reflect the direction of the scores in each scale (for example, the scale attentive-avoidant was renamed as avoidant-attentive as low scores are indicative of avoidance and high scores of attentiveness).

*Avoidant-Attentive* scores differed significantly between episodes of the Still-Face ( $F(2, 446) = 34.77, p < .001$ ). Post hoc tests revealed a statistically significant reduction in attentiveness from engagement to still-face ( $p < .001$ ), and increase from still-face to reunion ( $p < .001$ ). Mean Avoidant-Attentive scores did not differ significantly between engagement and reunion.

*No active communication scores-Active communication* differed significantly between episodes of the Still-Face ( $F(2, 446) = 57.08, p < .001$ ). In pairwise

comparisons, similar to Avoidant-Attentive scores, there was a significant decrease from engagement to still-face ( $p < .001$ ) and significant increase from still-face to reunion ( $p < .001$ ). However, in contrast to Avoidant-Attentive, No active communication-Active communication levels remained significantly lower during the reunion than they had been during engagement ( $p < .001$ ).

*Distressed-Happy scores* differed statistically significantly between episodes of the Still-Face ( $F(1.90, 423.45) = 91.39, p < .001$ ). In pairwise comparisons, there was again a decrease in happiness from engagement to still-face ( $p < .001$ ) but also a decrease in happiness from engagement to reunion ( $p < .001$ ). However, whilst there was an increase in happiness from still-face to reunion, this difference was not statistically significant.

*Fretful-Non-fretful scores* differed significantly between episodes of the Still-Face ( $F(1.90, 423.90) = 104.66, p < .001$ ). Post hoc tests revealed a significant reduction in Fretful-Non-fretful scores (increasing fretfulness) from engagement to both still-face ( $p < .001$ ) and reunion ( $p < .001$ ) episodes. A statistically significant decrease was also found between the still-face and reunion Fretful-Non-fretful scores ( $p = .002$ ), meaning that infant fretfulness increased throughout the paradigm and did not recover.

Table 4.2

*Distribution of infant GRS scores across each episode of the Still-Face and their means and standard deviations.*

Score	Avoid-	Avoid-	Avoid-	Active	Active	Active	Dist-	Dist-	Dist-	Fretful	Fretful	Fretful
	Atten	Atten	Atten	Comm	Comm	Comm	Happy	Happy	Happy	- Non-	- Non-	- Non-
	Eng	SF	Reun	Eng	SF	Reun	Eng	SF	Reun	Eng	SF	Reun
<b>1</b>	19	38	23	16	66	55	1	8	25	7	20	39
<b>2</b>	58	91	69	76	89	70	8	48	33	4	38	34
<b>3</b>	64	64	64	66	56	58	77	56	84	19	128	42
<b>4</b>	56	27	48	45	12	27	105	37	70	56	55	54
<b>5</b>	27	4	20	21	1	14	33	3	12	138	67	55
<b>Mean</b>	<b>3.06</b>	<b>2.41</b>	<b>2.88</b>	<b>2.91</b>	<b>2.08</b>	<b>2.44</b>	<b>3.72</b>	<b>2.91</b>	<b>3.05</b>	<b>4.40</b>	<b>3.50</b>	<b>3.23</b>
<b>SD</b>	<b>1.15</b>	<b>0.97</b>	<b>1.13</b>	<b>1.09</b>	<b>0.89</b>	<b>1.17</b>	<b>0.77</b>	<b>0.76</b>	<b>1.06</b>	<b>0.95</b>	<b>1.32</b>	<b>1.42</b>

### 4.3 Distribution of Attachment Classification

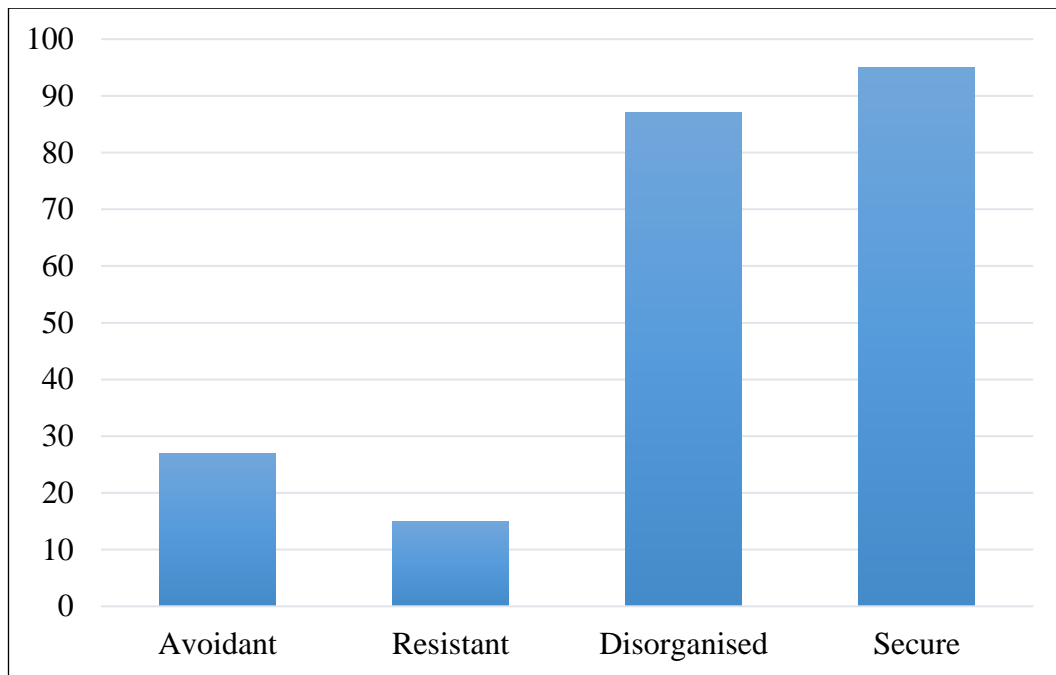
**4.3.1 Attachment in the Still-Face at 7 months.** Using the algorithm described in Section 2.7, an attachment classification was derived for each infant in the Still-Face using their infant GRS scores. Table 4.3.1 shows the distribution of the sample across attachment categories and the percentage assigned to each, this is also depicted graphically in Figure 8.

Table 4.3.1

*Distribution of attachment classifications at 7 months in the Still-Face*

<b>Attachment</b>	<b>N</b>	<b>Percent</b>
<b>Prediction</b>	<b>Still-Face</b>	
<b>Avoidant</b>	27	12.1
<b>Resistant</b>	15	6.7
<b>Disorganised</b>	87	38.8
<b>Secure</b>	95	42.4





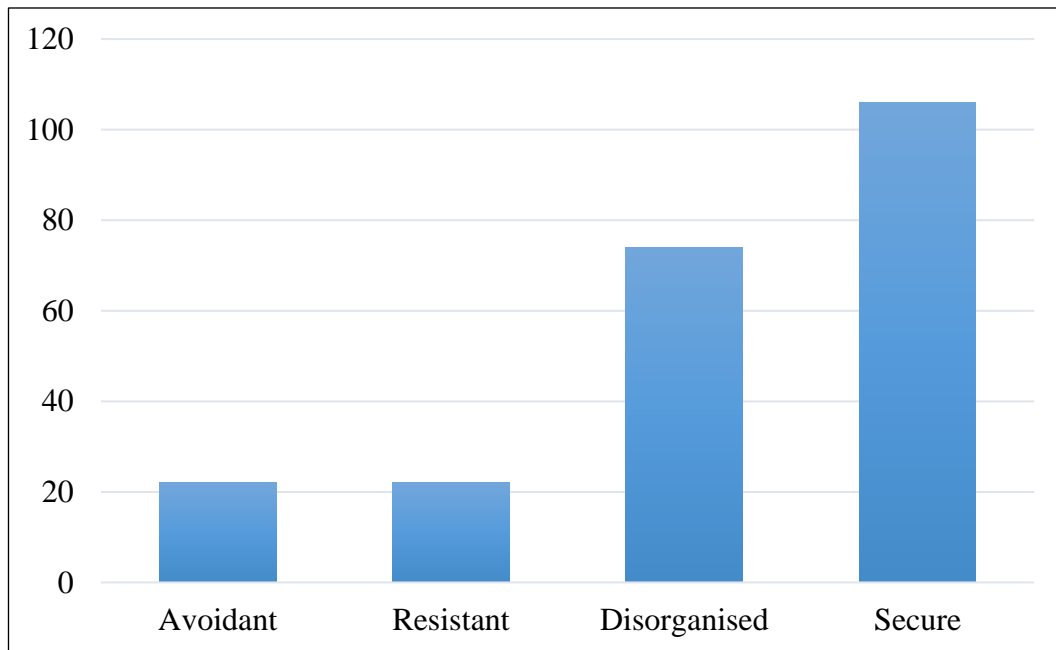
*Figure 8.* Distribution of attachment classifications in the Still-Face

**4.3.2 Attachment in the Strange Situation at 14 months.** The distribution of infant attachment classifications based on the Strange Situation at 14 months, and assessed independently in the Steele lab in New York as described in Section 3.4.3.3, is shown in Table 4.3.2 and Figure 9. As can be seen, percentages of infants in each attachment category were very similar to that of the Still-Face at 7 months.

Table 4.3.2

*Distribution of Attachment classifications at 14 months in the Strange Situation*

<b>Attachment Classification</b>	<b>N</b>	<b>Percent</b>
<b>Avoidant</b>	22	9.8
<b>Resistant</b>	22	9.8
<b>Disorganised</b>	74	33.0
<b>Secure</b>	106	47.3



*Figure 9.* Distribution of attachment classifications in the Strange Situation at 14 months

### **4.3.3 Distributions of attachment classifications at 7 months and 14**

**months.** It can be seen that an attachment classification generated at 7 months from the Still-Face yielded a remarkably similar distribution to that from the Strange Situation at 14 months. Percentages of avoidant and resistant attachment at both 7 and 14 months were similar to those reported across general population studies as described in Section 1.2.4. The rates of disorganised attachment assessed at 14 months in the Strange Situation were typical of high-risk samples as reviewed in Section 1.2.4.1 and this was very closely replicated in the Still-Face classification derived at 7 months.

#### **4.4 Associations between Attachment Status and Demographics.**

One-way ANOVAs revealed non-significant relationships between attachment classification in the Still-Face at 7 months and maternal age at assessment ( $p = .72$ ), infant age at assessment ( $p = .28$ ) and maternal concurrent depression score on the EPDS ( $p = .97$ ). Chi-square tests revealed no association between infant attachment in the Still-Face and gender ( $\chi^2 = (3, N = 224) = 2.07, p = .56$ ) or deprivation ( $\chi^2 = (3, N = 224) = 2.56, p = .46$ ).

Non-significant relationships were again found between maternal age at assessment ( $p = .75$ ), infant age at assessment ( $p = .089$ ), maternal concurrent depression score on the EPDS ( $p = .25$ ) and attachment classification in the Strange Situation at 14 months. A chi-square test revealed no association between infant attachment in the Strange Situation and gender ( $\chi^2 = (3, N = 224) = 0.10, p = .99$ ) or deprivation ( $\chi^2 = (3, N = 224) = 1.66, p = .65$ ). Table 4.4 shows the means and standard deviations of these maternal and infant variables for each of the four attachment classifications in the Still-Face and the Strange Situation.

Table 4.4

*Means and standard deviations of maternal and infant variables according to Still-Face attachment classification*

	Still-Face attachment				Strange Situation attachment			
	Avoidant	Resistant	Disorganised	Secure	Avoidant	Resistant	Disorganised	Secure
Maternal age (years)	29.58	28.68	29.12	29.98	30.32	31.20	29.69	30.25
Infant age (weeks)	28.48	27.87	28.29	28.97	64.41	62.86	63.96	61.42
% Male infants	44.44	40.00	54.02	45.26	50.00	45.45	48.65	48.11
% Highest deprivation quintile	40.74	46.67	34.63	29.47	36.36	36.36	39.19	30.19
Maternal concurrent depression (EPDS)	5.89	5.93	5.54	5.50	5.65	3.85	6.07	5.16

#### **4.5 Tests of Validity of the Still-Face Attachment Classification at 7 months**

As outlined in Sections 1.5.1.1 and 3.6.1.1, prospective associations have been demonstrated between maternal sensitivity around 6 months and attachment status at 12 – 18 months, and so it is to be expected that a valid measure of attachment at 7 months should show associations in cross-section with maternal sensitivity. Measures of maternal sensitivity were coded in the engagement and reunion episodes of the Still-Face and in the NICHD free-play. A detailed account of the nature and independence of these ratings is described in Section 3.4.2.2 but to summarise, maternal sensitivity in the free-play is a stronger test of validity as it was not measured or coded at the same time as attachment. Findings surrounding the association between maternal sensitivity in the Still-Face and free-play as measures of convergent validity are shown in Section 4.5.1.

One of the ways that disorganised attachment is thought to arise is through attempts to deal with fear of a parent (Section 1.2.4.3) and so a valid measure of disorganisation at age 7 months should show an association with potentially frightening experiences. Associations with exposure to partner violence as a measure of convergent validity are shown in Section 4.5.2.

**4.5.1 Maternal sensitivity and attachment classification at 7 months.** The results for the associations between maternal sensitivity and attachment classification in the Still-Face are presented separately according to the measure of maternal sensitivity. For a description of the methods of collection and coding of these measures, see Section 3.4.2.2.

#### ***4.5.1.1 Maternal sensitivity in the Still-Face by four-category attachment***

*variable.* The means and standard deviations of maternal sensitivity in the Still-Face engagement and reunion episodes for each Still-Face attachment classification are shown in Table 4.5.1.1.

Table 4.5.1.1

*Mean and standard deviations of maternal sensitivity scores in the engagement and reunion episodes of the Still-Face by attachment classification*

	<b>Maternal sensitivity</b>			
	<b>Engagement</b>		<b>Reunion</b>	
	Mean	SD	Mean	SD
Avoidant	3.56	0.85	3.44	0.80
Resistant	3.73	0.59	3.80	0.56
Disorganised	3.60	0.89	3.44	0.91
Secure	4.16	0.61	4.34	0.66

An initial MANOVA examined maternal sensitivity in the engagement and reunion episodes as dependent variables and the attachment classification in the Still-Face as the independent variable. There was a statistically significant difference in levels of maternal sensitivity based on attachment classification in the Still-Face ( $F(6, 438) = 11.20, p < .001$ ). Attachment classification had a statistically significant effect on measures of maternal sensitivity in both episodes (engagement ( $F(3, 220) = 8.92, p < .001$ ; partial  $\eta^2 = .11$ ); reunion ( $F(3, 220) = 24.12, p < .001$ ; partial  $\eta^2 = .25$ ).

Mean maternal sensitivity scores in the engagement episode were statistically different between the secure and avoidant groups ( $p = .006$ ) and the secure and disorganised groups ( $p < .001$ ). These same differences were also found in mean maternal sensitivity scores in the reunion episode (both with  $p < .001$ ).

**4.5.1.2 Maternal sensitivity in the Still-Face by three-category attachment**

**variable.** The associations with maternal sensitivity in the Still-Face were then examined using a three-category attachment variable. Means and standard deviations of maternal sensitivity in the engagement and reunion episodes for each of these three attachment groups can be seen in Table 4.5.1.2.

Table 4.5.1.2

*Mean and standard deviations of maternal sensitivity scores in the engagement and reunion episodes of the Still-Face by attachment classification*

		<b>Maternal Sensitivity</b>			
		Engagement		Reunion	
		Mean	SD	Mean	SD
<b>Still-Face</b>	Secure	4.17	0.61	4.34	0.66
<b>Attachment</b>	Insecure organised	3.62	0.76	3.57	0.74
<b>classification</b>	Disorganised	3.61	0.89	3.46	0.91

A MANOVA found a statistically significant difference in maternal sensitivity scores based on an infant's attachment classification ( $F(4, 440) = 16.50$ ,  $p < .001$ ). Attachment classification had a statistically significant effect on measures



of maternal sensitivity in both episodes (engagement ( $F(2, 221) = 13.28, p < .001$ ; partial  $\eta^2 = .11$ ); reunion ( $F(2, 221) = 35.51, p < .001$ ; partial  $\eta^2 = .24$ ).

Mean maternal sensitivity scores in the engagement episode were statistically different between the secure and both insecure organised ( $p < .001$ ) and disorganised groups ( $p < .001$ ). No statistically significant difference was found between the disorganised and insecure organised groups. This pattern was the same for the reunion episode with significant differences between the secure and both insecure organised and disorganised groups (both at  $p < .001$ ) but not the insecure organised and disorganised.

**4.5.1.3 Maternal sensitivity in the semi-structured free-play.** The means and standard deviations of maternal sensitivity in the semi-structured free-play for each Still-Face attachment classification are shown in Table 4.5.1.3.

Table 4.5.1.3

*Mean and standard deviations of maternal sensitivity scores in the free-play by attachment classification*

	<b>Maternal sensitivity</b>	
	<b>in free-play</b>	
	Mean	SD
Avoidant	3.70	1.03
Resistant	3.43	1.05
Disorganised	3.52	1.02
Secure	3.91	.93

An initial ANOVA was carried out to examine the associations between maternal sensitivity in the free-play and attachment classification in the Still-Face. There was a statistically significant difference between groups ( $F(3,216) = 2.75$ ,  $p = .044$ ). A Bonferroni post-hoc test revealed that there were no statistically significant differences in maternal sensitivity scores between the attachment groups, although the difference between the secure and disorganised groups approached significance ( $p = .054$ ).

**4.5.1.4 Sensitivity to distress in the free-play and infant attachment.** 171 of the 224 infants showed some distress in the free-play interaction, allowing an opportunity for the observation of maternal sensitivity to distress in this task. The means and standard deviations of maternal sensitivity to distress in the semi-structured free-play for each Still-Face attachment classification are shown in Table 4.5.1.4.

Table 4.5.1.4

*Mean and standard deviations of maternal sensitivity to distress scores in the free-play by attachment classification in the Still-Face*

	N	Maternal sensitivity in free-play	
		Mean	SD
Avoidant	19	3.42	1.07
Resistant	13	3.27	0.86
Disorganised	76	3.26	1.12
Secure	63	3.90	1.12

An ANOVA was carried out to examine the associations between maternal sensitivity to distress in the free-play and attachment classification in the Still-Face. There was a statistically significant difference between groups ( $F(3,167) = 4.14$ ,  $p = .007$ ). Again, a Bonferroni post-hoc test revealed statistically significant differences in maternal sensitivity scores between the secure and disorganised groups only ( $p = .005$ ).

**4.5.1.5 Secure versus insecure attachment and maternal sensitivity.** In order to make links with the literature, much of which reports associations between attachment and maternal sensitivity using a secure/insecure binary variable of attachment (see Section 1.5.1.1), a binary variable was created and the following analyses carried out.

Means and standard deviations of the maternal sensitivity variables for each binary attachment category can be seen in Table 4.5.1.5. The associations between the two variables were examined using t-tests and the results of these for each interactional episode are presented next.

Table 4.5.1.5

*Maternal sensitivity and infant secure versus insecure attachment in the Still-Face*

<b>Maternal sensitivity</b>	<b>Infant Attachment</b>	<b>Mean</b>	<b>SD</b>
Engagement	Secure	4.17	0.61
	Insecure	3.61	0.85
Reunion	Secure	4.34	0.66
	Insecure	3.50	0.86
Free-play	Secure	3.92	0.93
	Insecure	3.55	1.03

As predicted, infants who were securely attached in the Still-Face were found to have mothers with significantly higher levels of maternal sensitivity than infants who were insecurely attached and this effect held for each of the three interactional episodes; maternal sensitivity in the engagement episode of the Still-Face ( $t(222) = -4.83, p < .001$ ), maternal sensitivity in the reunion episode of the Still-Face ( $t(222) = -8.44, p < .001$ ) and mean maternal sensitivity scores in the NICHD free-play ( $t(218) = -2.68, p = .008$ ).

**4.5.2 Disorganisation and partner violence.** As disorganised attachment has been linked with partner violence in the parental relationship (Zeanah et al., 1999), partner violence was used as a means of validating the 7 months disorganised attachment measure derived in this study. Exposure to partner violence was assessed using the CTS and PCC measures. Any mother reporting incidences of partner violence on either of these measures from birth to 7 months was assigned a yes on the partner violence variable, as outlined in Section 3.4.3.2.

The relationship between the Still-Face attachment classification and exposure to partner violence over the period from birth to the 7 months assessment is shown in Table 4.5.2.

Table 4.5.2

*Disorganised attachment at 7 months and Partner Violence*

		<b>Partner violence</b>		
		No	Yes	Total
<b>Attachment</b>	Avoidant	26	1	27
<b>classification in the</b>	Resistant	15	0	15
<b>Still-Face</b>	Disorganised	70	17	87
	Secure	90	5	95
	Total	201	23	224

Of the 23 infants exposed to partner violence, 17 were assigned to the disorganised category, and the overall association was strong,  $\chi^2(3) = 13.68$ ,  $p = .003$ . As none of the resistant infants and only one of the avoidant infants had been exposed to partner violence, an organised versus disorganised variable of infant attachment was derived and was entered into a binary logistic regression as the dependent variable along with partner violence as the independent variable. Children exposed to partner violence were 5.31 times more likely to be categorised as disorganised than organised in the Still-Face (95% CI 2.00 – 14.06,  $p = .001$ ).

**4.5.3 Infant temperament.** Infant temperament was examined as a measure of the discriminant validity of the attachment classification at 7 months to test the prediction that attachment would not be associated with negative affectivity from the IBQ-R. Previous findings have shown that attachment classification is not associated with negative temperament, indicating that attachment categories are not simply a measure of infant temperament, see Section 1.5.2.2 for a review.

The means and standard deviations of IBQ-R negative affectivity scores according to attachment classification can be seen in Table 4.5.3a.

Table 4.5.3a

*Mean, Standard Deviation and Range of IBQ-R Negative Affectivity Scores*

	Mean	SD	Range
Avoidant ( $n = 26$ )	2.89	0.94	1.77 - 5.90
Resistant ( $n = 15$ )	3.01	0.61	1.97 - 4.31
Disorganised ( $n = 82$ )	2.92	0.69	1.50 – 4.48
Secure ( $n = 83$ )	2.75	0.70	1.36 – 4.64

A one-way ANOVA was used to examine the differences in mean negative affectivity scores across the Still-Face attachment groups (IBQ-R; Gartstein, 2003). No statistically significant differences in negative affectivity scores between the attachment groups using a four-category attachment variable ( $F_{(3, 202)} = 1.01, p = .39$ )

Due to the small numbers in the avoidant and resistant attachment groups, these were collapsed into an insecure organised variable for further analyses. The

means and standard deviations of the negative affectivity variable for the three attachment groups can be seen in Table 4.5.3b.

Table 4.5.3b

*Means and standard deviations of negative affectivity scores of secure, insecure organised and disorganised attachment groups*

		Negative Affectivity score	
		Mean	SD
Secure	(n = 83)	2.75	0.94
Insecure organised	(n = 41)	2.93	0.61
Disorganised	(n = 82)	2.92	0.69

A one-way ANOVA revealed there were no statistically significant differences in negative affectivity scores between the attachment groups ( $F_{(2, 203)} = 1.18, p = .31$ )

**4.5.4 Summary of validation findings.** Overall, validation of the 7 months attachment classification scheme was supported. In terms of convergent validity, the attachment measure was found to have the predicted statistically significant associations with maternal sensitivity across all three interactional episodes. The established finding that secure infants have mothers with higher levels of maternal sensitivity than insecure infants was replicated. Furthermore, the anticipated specificity of the association between disorganised attachment and intimate partner violence was supported with the odds of being in the disorganised category



(compared to secure) being 4.37 times higher if there is partner violence than if there is no partner violence. A measure of discriminant validity was also supported with the finding that infant temperament (negative affectivity from the IBQ-R) was not significantly associated with the attachment measure.

## **4.6 Attachment Classification at 7 months in the Still-Face and Attachment in the Strange Situation at 14 months**

This section examines the prediction of attachment in the Strange Situation at 14 months from attachment in the Still-Face at 7 months. First, descriptive statistics are presented along with an overall model for the prediction from 7 to 14 months. This is followed by an examination of the specificity of the prediction of attachment from 7 to 14 months and analyses based on binary attachment variables in order to make links with previous research. Finally, a multinomial regression analysis is reported in order to explore whether the continuities in attachment prediction can be explained by continuities between maternal sensitivity at 7 months and later attachment classification.

### **4.6.1 Associations between attachment classification at 7 and 14 months.**

The cross-tabulation between the Still-Face attachment classifications at 7 months and the Strange Situation classifications at 14 months are shown in Table 4.6.1.

Table 4.6.1

*Four-way classification of Attachment in the Still-Face and Strange Situation*

		<b>Strange Situation classification</b>				
		A	C	D	B	Total
<b>Still-Face</b>	A - Avoidant	<b>5</b> <b>(19%)</b>	2	7	13	27
<b>Classification</b>	C - Resistant	4	<b>6</b> <b>(40%)</b>	3	2	15
	D - Disorganised	7	10	<b>37</b> <b>(43%)</b>	33	87
	B - Secure	6	4	27	<b>58</b> <b>(61%)</b>	95
	Total	22	22	74	106	224

*Note.* Percentage of those assigned to each category in the Still-Face that were assigned to the same category in the Strange Situation are shown in parentheses under the number of those concordant.

A chi square was used to examine the overall association and it was highly significant ( $\chi^2(9) = 38.49, p < .001$ ) although inspection of the table suggested that the degree of association varied across the Still-Face attachment categories. The secure to secure association appeared to be the strongest with 61% of infants rated secure at 7 months assigned to the secure classification at 14 months, whereas only 22% of the avoidant infants remained avoidant at 14 months.

#### 4.6.2 Specificity of attachment predictions from Still-Face to Strange

**Situation.** The specificity of the associations was examined in a multinomial logistic regression. Secure attachment was used as the reference category, the independent variable, or predictor, was Still-Face attachment and the dependent variable was attachment in the Strange Situation. The results of this regression are shown in Table 4.6.2.

Table 4.6.2

*The association between the Still-Face attachment classification at 7 months and the Strange Situation classifications at 14 months*

<b>SSP classification predicted – compared to secure</b>	<b>SFP category predictor – compared to secure</b>	<b>Odds Ratio (95% CI)</b>	<b>Value of P</b>
Avoidant	Avoidant	3.72 (0.98 – 14.07)	.053
	Resistant	19.33 (2.91 – 128.50)	.002
	Disorganised	2.05 (0.64 – 6.62)	.23
Resistant	Avoidant	2.23 (0.37 – 13.51)	.38
	Resistant	43.50 (6.54 – 289.12)	<.001
	Disorganised	4.39 (1.28 – 15.12)	.019
Disorganised	Avoidant	1.16 (0.42 – 3.23)	.78
	Resistant	3.21 (0.51 – 20.42)	.21
	Disorganised	2.41 (1.25 – 4.64)	.009

The associations need to be interpreted in relation to the numbers in the attachment categories. For example, the relatively small number of infants rated resistant in the Still-Face explains why the quite large odds ratio of 3.21 in the prediction of Strange Situation disorganised is non-significant, while the smaller odds ratio for the prediction from disorganised in the Still-Face (where the numbers were larger) to disorganised in the Strange Situation was significant.

Nevertheless, there were some specificities. Only Still-Face disorganised attachment predicted Strange Situation disorganisation, and Still-Face disorganised did not predict Strange Situation avoidant. The Still-Face resistant classification strongly predicted Strange Situation resistance, but this was also predicted by Still-Face disorganisation. Avoidant Still-Face attachment did not significantly predict Strange Situation attachment although this approached significance.

### 4.6.3 Specificity of attachment predictions from Still-Face to Strange

**Situation with avoidant and resistant combined to form an ‘insecure organised’ group.** As outlined in the previous section, interpretation of the specificity of associations was limited by the relatively small numbers in the avoidant and resistant groups. The analyses were therefore repeated comparing secure, insecure-organised, and disorganised groups, and the results of the multinomial logistic regression are shown in Table 4.6.3.

Table 4.6.3

*The association between the Still-Face attachment classification at 7 months and the Strange Situation classifications at 14 months*

<b>SSP classification predicted – compared to secure</b>	<b>SFP category predictor – compared to secure</b>	<b>Odds Ratio (95% CI)</b>	<b>Value of P</b>
Insecure Organised	Insecure organised	6.57 (2.50 – 17.26)	< .001
	Disorganised	2.99 (1.23 – 7.28)	.016
Disorganised	Insecure organised	1.43 (0.57 – 3.60)	.45
	Disorganised	2.41 (1.25 – 4.64)	.009

Again, using the three category attachment variable, only Still-Face disorganised attachment predicted Strange Situation disorganisation. The Still-Face insecure organised classification strongly predicted Strange Situation insecure organised attachment, but this was also predicted by Still-Face disorganisation.

#### 4.6.4 Specificity of attachment predictions from Still-Face to Strange

**Situation comparing insecure-organised and disorganised groups.** The analyses presented in the previous two sections use secure attachment as the reference category, which does not permit examination of prediction within insecure attachment of organised contrasted with disorganised patterns. The three category analyses were therefore repeated taking disorganisation as the reference category, the results of these analyses are shown in Table 4.6.4.

Table 4.6.4

*The association between the three category Still-Face (SFP) attachment classification at 7 months and the three category Strange Situation (SSP) classifications at 14 months, showing the contrast between insecure organised and disorganised groups*

<b>SSP classification predicted – compared to disorganised</b>	<b>SFP category predictor – compared to disorganised</b>	<b>Odds Ratio (95% CI)</b>	<b>Value of P</b>
<b>Secure</b>	Secure	2.41 (1.25 – 4.64)	.009
	Insecure organised	1.87 (0.72 – 4.83)	.20
<b>Insecure organised</b>	Secure	0.81 (0.32 – 2.03)	.65
	Insecure organised	4.35 (1.63 – 11.66)	.003

The findings suggest substantial specificity in the prediction of insecure organised contrasted with disorganised attachment at 14 months. This specificity was found from insecure organised contrasted with disorganised at 7 months, but not by secure contrasted with disorganised, to insecure organised attachment at 14 months compared to disorganised. The specificity of prediction of secure contrasted with disorganised attachment at 14 months was not so striking with similar odds ratios for secure and insecure organised contrasted with disorganised in the Still-Face, although only the secure contrasted with disorganised Still-Face predictor was significant in its prediction to Secure contrasted with disorganised at 14 months.

#### **4.6.5 Analyses of the prediction of attachment from 7 to 14 months using binary variables.**

*4.6.5.1 Attachment stability using the secure/insecure variable.* As reviewed in Section 1.4.1.1, as a result of limited numbers, studies commonly examine continuity in terms of the secure-insecure and organised-disorganised contrasts. Table 4.6.5.1 shows the cross-tabulation between Still-Face and Strange Situation using the secure-insecure binary variable.



Table 4.6.5.1

*Secure/Insecure in the Still-Face and Secure/Insecure in the Strange Situation*

		Strange Situation		
		Insecure	Secure	Total
Still-Face	Insecure	<b>81 (63%)</b>	48	129
	Secure	37	<b>58 (61%)</b>	95
	Total	118	106	224

*Note.* Percentage of those assigned to each category in the Still-Face that were assigned to the same category in the Strange Situation are shown in parentheses next to the number of those concordant.

The overall model for the association was highly significant ( $\chi^2(1) = 12.48$ ,  $p < .001$ ). The odds of being in the Strange Situation secure group were increased 2.65 times by membership of the Still-Face secure group (95% CI 1.53 – 4.56).

Table 4.5.6.3 shows the cross-tabulation between organised-disorganised attachment from 7 to 14 months.

#### ***4.6.5.2 Secure/insecure attachment stability compared to previous studies.***

In order to compare stability of attachment in this study with previous studies that examined stability over a similar interval, see Section 1.4.1.1, a Phi and Cramer's V test of association was carried out. This revealed a small to moderate positive association between attachment at 7 and 14 months, which was statistically significant ( $r = .24$ ,  $N = 224$ ,  $p < .001$ ). The mean weighted correlation coefficient for previous studies of attachment stability over a 6 month period, with infants at time 1 being approximately 12 months old, was  $r = .27$ , see Section 1.4.1.1. A Fisher

r-to-z transformation showed that the difference between these two correlations was not statistically significant ( $Z = .42, p = .34$ ).

**4.6.5.3 Attachment stability using the organised/disorganised variable.** In the following section, attachment stability from 7 to 14 months is examined using the organised versus disorganised attachment variables from each age. Table 4.6.5.3 shows the cross-tabulation of the attachment variables.

Table 4.6.5.3

*Organised/Disorganised in the Still-Face and Organised/Disorganised in the Strange Situation*

		Strange Situation		
		Organised	Disorganised	Total
Still-Face	Organised	<b>100 (73%)</b>	37	137
	Disorganised	50	<b>37 (43%)</b>	87
	Total	150	74	224

*Note.* Percentage of those assigned to each category in the Still-Face that were assigned to the same category in the Strange Situation are shown in parentheses next to the number of those concordant.

The overall model for the association was significant ( $\chi^2(1) = 5.80, p = .016$ ). The odds of being in the Strange Situation disorganised group were increased 2.00 times by membership of the Still-Face disorganised group (95% CI 1.13 – 3.53).

#### **4.7 Attachment Status and Maternal Sensitivity at 7 months in relation to Attachment Status at 14 months**

As outlined in Chapter 1, a major aim of this study is to establish whether there are already, at 7 months, infant attachment strategies that may contribute to early developmental processes in the origins of attachment from one year onwards. The previous sections have presented evidence supporting this claim, implying that prediction of later attachment may need to take account both of early attachment patterns and caregiving quality. A comprehensive approach to this question, considering both additive and interactive models, is beyond the scope of this thesis, however this section addresses the questions of whether maternal sensitivity assessed at 7 months predicted attachment status at 14 months, and whether attachment status at 7 months predicts attachment status over and above the contribution of maternal sensitivity.

Although the majority of the existing literature examines maternal sensitivity in relation to the secure-insecure and organised-disorganised binary contrasts, the three-group attachment categories were retained for these analyses. This was because there was evidence for specificity across the three categories, and numbers in each of the three categories were comparable to those of many previous studies that had used binary variables.

Sensitivity on reunion in the Still-Face and overall sensitivity, sensitivity to non-distress and to distress in the NICHD free-play procedure were examined. Means across the three attachment groups at age 14 months are shown in Table 4.7.

Table 4.7

*Mean maternal sensitivity scores from the Still-Face and NICHD free-play procedures at 7 months for the secure, insecure organised, and disorganised groups in the Strange Situation at 14 months*

		<b>Attachment at 14 months</b>	<b>Secure Mean (SD)</b>	<b>Insecure organised Mean (SD)</b>	<b>Disorganised Mean (SD)</b>
SFP sensitivity	Reunion		4.02 (0.79)	3.80 (0.70)	3.65 (1.05)
NICHD free-play sensitivity	Overall		3.88 (0.89)	3.53 (1.09)	3.54 (1.06)
	Non-distress		3.92 (0.86)	3.59 (1.06)	3.60 (1.10)
	Distress (N = 171)		3.68 (1.08)	3.38 (1.24)	3.36 (1.10)

As can be seen from Table 4.7, mean sensitivity scores were highest for the secure groups across each of the four measures of maternal sensitivity. Differences in mean sensitivity scores across the three attachment groups were first examined in repeated measures ANOVAs, followed by Bonferroni post hoc pairwise comparisons.

*Maternal sensitivity scores in the Still-Face reunion at 7 months* differed statistically significantly between infant attachment groups at 14 months using the three category variable ( $F(2, 221) = 4.05, p = .019$ ). Post hoc tests revealed a statistically significant difference between the secure and disorganised groups ( $p = .017$ ). No differences were found between the insecure organised group and either the secure or the disorganised groups.

*Overall maternal sensitivity scores in the NICHD free-play at 7 months* also differed statistically significantly between infant attachment groups at 14 months using a three category variable ( $F(2, 217) = 3.23, p = .041$ ). In pairwise comparisons, there were no statistically significant associations.

No statistically significant differences were found between the mean maternal sensitivity to distress or non-distress in the NICHD free-play scores and attachment group at 14 months.

**4.7.1 Examining the specificity of predication from maternal sensitivity**

**at 7 months to attachment at 14 months.** The specificity of prediction from maternal sensitivity at 7 months to attachment status at 14 months was examined for sensitivity in the Still-Face reunion and overall sensitivity in the NICHD free-play, using multinomial logistic regression.

Table 4.7.1a

*Prediction from maternal sensitivity in the reunion episode of the Still-Face at 7 months to attachment status in the Strange Situation at 14 months*

<b>SSP classification</b>	<b>Predictor at 7 months</b>	<b>Odds Ratio (95% CI)</b>	<b>Value of p</b>
<b>Insecure organised</b>	SFP reunion maternal sensitivity	0.73 (0.49 – 1.11)	.14
<b>Disorganised</b>	SFP reunion maternal sensitivity	0.61 (0.43 – 0.87)	.006

Table 4.7.1b

*Prediction from maternal sensitivity in the reunion episode and attachment in the Still-Face at 7 months to attachment in the Strange Situation at 14 months*

<b>SSP classification</b>	<b>Predictor at 7 months</b>	<b>Odds Ratio (95% CI)</b>	<b>Value of p</b>
<b>Insecure organised</b>	SFP reunion	1.05 (0.64 – 1.70)	.86
	maternal sensitivity		
	Insecure organised	6.80 (2.41 – 19.18)	<.001
	Disorganised	3.10 (1.17 – 8.18)	.023
<b>Disorganised</b>	SFP reunion	0.71 (0.48 – 1.04)	.081
	maternal sensitivity		
	Insecure organised	1.09 (0.41 – 2.89)	.86
	Disorganised	1.78 (0.85 – 3.72)	.12

It is evident from Tables 4.7.1a and 4.7.1b that sensitivity on reunion in the Still-Face did not predict the insecure organised group in the Strange Situation, and when examined jointly with Still-Face attachment at 7 months, insecure organised attachment remained the strongest predictor. The findings for the prediction of disorganisation in the Strange Situation were not so clear cut. Compared to the contribution of Still-Face disorganisation when examined alone (shown in Table 4.5.3) where there was an odds ratio of 2.41 (1.25 – 4.64,  $p = .009$ ), the contribution was reduced to 1.78 (0.85 – 3.72) and no longer statistically significant. Also, the contribution of maternal sensitivity was somewhat reduced and having been

significant ( $p = .006$ ) was no longer significant ( $p = .081$ ). In neither case was the reduction in contribution marked, but equally when examined jointly neither made a significant contribution.

The multinomial regression analyses were repeated to examine the specificity of prediction from maternal sensitivity in the NICHD free-play at 7 months to attachment status at 14 months. Table 4.7.1c shows the results of the regression model for the contribution of maternal sensitivity in the NICHD free-play to attachment and Table 4.7.1d shows the model when both NICHD free-play and attachment at 7 months predict attachment at 14 months.

Table 4.7.1c

*Prediction from overall maternal sensitivity in the NICHD free-play at 7 months to attachment status in the Strange Situation at 14 months*

<b>SSP classification</b>	<b>Predictor at 7 months</b>	<b>Odds Ratio (95% CI)</b>	<b>Value of p</b>
<b>predicted – compared to secure</b>			
<b>Insecure organised</b>	NICHD free-play maternal sensitivity	0.70 (0.49 – 1.00)	.05
<b>Disorganised</b>	NICHD free-play maternal sensitivity	0.71 (0.52 – 0.96)	.028



Table 4.7.1d

*Prediction from overall maternal sensitivity in the NICHD free-play and attachment in the Still-Face at 7 months to attachment in the Strange Situation at 14 months*

<b>SSP classification</b>	<b>Predictor at 7 months</b>	<b>Odds Ratio (95% CI)</b>	<b>Value of p</b>
<b>Insecure organised</b>	NICHD free-play maternal sensitivity	0.76 (0.52 – 1.10)	.15
	Insecure organised	5.93 (2.24 – 15.71)	< .001
	Disorganised	2.71 (1.10 – 6.70)	.031
<b>Disorganised</b>	NICHD free-play maternal sensitivity	0.75 (0.55 – 1.03)	.075
	Insecure organised	1.34 (0.53 – 3.41)	.54
	Disorganised	2.26 (1.15 – 4.44)	.018

As can be seen from Tables 4.7.1c and 4.7.1d, maternal sensitivity in the NICHD free-play predicted both the insecure organised and the disorganised groups compared to secure in the Strange Situation. When examined jointly with Still-Face attachment at 7 months, insecure organised attachment in the Still-Face remained the strongest predictor of insecure organised attachment in the Strange Situation and maternal sensitivity in the NICHD free-play was no longer significant. A similar pattern was seen in the prediction of disorganisation in the Strange Situation. When examined jointly, disorganised attachment at 7 months was the strongest predictor of

disorganisation in the Strange Situation and maternal sensitivity in the NICHD free-play was no longer significant.

## **Chapter 5 Discussion**

This discussion begins with an overview of the study aims and design. This is followed by a review of the results and interpretation of the same. The strengths and limitations of the study are then discussed. Finally, implications of the results are considered, with suggestions for future work.

### **5.1 Overview of the Study Aims, Methodology and Results**

The central question of the study was ‘Do infants show evidence of differentiated attachment strategies before the age of 12 months?’ This was prompted partly by the fact that, although many ways of measuring attachment from infancy onwards have been developed, there are none that aim to assess attachment security before the age of 12 months. Was this determined simply by the dominant position of the Strange Situation Paradigm, which is appropriate only from 12 months, or by a theoretical formulation, or by the evidence? As reviewed in Chapter 1, theoretical considerations tended to indicate that younger infants might not yet be capable of generating differentiated attachment strategies, and the evidence did not point strongly in either direction. However, there were indications that a plausible case for earlier elaboration of attachment strategies could be made, from evidence to suggest that infants as young as 3 months might be in an “attachment in the making” phase, and are already beginning to develop some of the necessary cognitive and emotion regulatory skills. Furthermore, establishing whether or not infant attachment security is established before 12 months is potentially important both to

our understanding of early developmental processes and to refining approaches to early intervention.

With these considerations in mind, the main aim of this study was to explore attachment-like behaviours in infants of 7 months. This was done in a procedure that introduces a perturbation to the mother-infant interaction and subsequent opportunity to repair, with the view to identifying patterns of behaviours that may reflect similar emotion regulatory processes to those employed by older infants in the Strange Situation. It was hypothesised that infants of 7 months would already be beginning to show attachment-like behaviour patterns, when faced with a threat, which would be directly comparable to those shown by infants at 14 months in the established method of the Strange Situation.

The current study was designed against the background of previous studies showing associations between infant behaviour in the Still-Face and later attachment in the Strange Situation, as reviewed in Section 1.7.1. No published studies have examined whether a valid attachment classification can be generated by the Still-Face. There have, however, been two unpublished studies (reviewed in Section 1.7.2). One of these studies failed to find significant associations between attachment in the Still-Face and later in the Strange Situation in a group of 50 mother-infant dyads (Bingen, 2001). The second study showed a significant association between 3-way attachment group status (secure, avoidant and resistant) generated from the Still-Face at 6 months and the 3-way attachment group status in the Strange Situation in 78 infants ( $\chi^2(4) = 35.69, p < .001$ , Jamieson, 2004). The

attachment classification coding scheme for the Still-Face in this study was based on attachment theory and earlier microanalytical studies of Still-Face behaviours.

The current study is the first to examine a 4-way classification based on the Still-Face, and using a substantially larger sample. It is also well suited to replication by other groups because the attachment assignments are derived using a set of rules for combining established scales with known inter-rater reliability (GRS; Murray, et al., 1996). Thus, unlike the method described in Jamieson (2004), this coding scheme could be readily applied to existing data.

**5.1.1 Methodology of the study compared to previous work.** Whilst two previous studies have explored the Still-Face behaviours of infants who were later found to be disorganised in the Strange Situation, no known studies have tried to classify disorganised attachment in young infants or make predictions and links to future disorganisation.

Secondly, this study used a much bigger sample size than previous studies examining early attachment behaviours in the Still-Face. This, and the fact that the sample also had higher numbers of insecure attachment (specifically disorganisation) than might be seen in a normal population sample, allowed the analysis of 3 and 4-way category attachment predictions in addition to the secure/insecure and organised/disorganised analyses that most studies employ.

Thirdly, unlike the two previous studies classifying attachment in the Still-Face, both of which classified attachment in a much similar way to the Strange

Situation, this study used an algorithm of established infant behaviour scale scores, informed by emotion regulatory processes that are seen in the Strange Situation. This means that, once the GRS scale scores are derived and mid-points recoded, the process of generating an attachment classification is algorithmic and does not require any judgement to be made, nor does it require the rater to view the interaction tapes. As a result, so long as the Still-Face has been coded using the GRS, the only extra work needed for attachment classification is the recoding of the mid-points of the Happy-Distressed scale. Since this recoding simply involves making decisions as to the presence or absence of distress, and as to the timing of the distress where it is present, it does not require the person doing the recoding to be reliable in the use of the GRS. In summary, this means that this attachment classification system is well suited to replication by other groups because the attachment assignments are derived using a set of rules for combining established scales with known inter-rater reliability (GRS; Murray, et al., 1996). Thus, unlike the method described in Jamieson (2004), this coding scheme could be readily applied to existing data.

**5.1.2 Summary of main findings.** There were several main findings in the current study. Firstly, it was found to be possible, using the concept of an attachment based path to emotion regulation between infants and mothers, to generate attachment categories based on a procedure at 7 months that includes a challenge and a reunion. Using an established scale for infant behaviour in the Still-Face, four-way attachment classification at 7 months was found to yield a distribution that is very similar to the distribution of attachment derived independently from the Strange Situation in the same sample.

Secondly, the validity of the attachment classification scheme at 7 months was supported in three ways based on the prediction that infant attachment would be significantly associated with maternal sensitivity and intimate partner violence and not associated with infant temperament.

Thirdly, stability of the attachment classification from 7 to 14 months was similar to that of published findings for stability over the second year of life. Stability was supported by a highly significant association from Still-Face to Strange Situation, although the degree of this association varied across the attachment categories. Infants who were secure in the Still-Face were also secure in the Strange Situation 61% of the time. Still-Face disorganised attachment predicted Strange Situation disorganisation and Still-Face resistant attachment strongly predicted Strange Situation resistance. However, Strange Situation resistant attachment was also predicted by Still-Face disorganisation. Avoidant Still-Face attachment did not significantly predict Strange Situation avoidance, although this association approached significance.

Lastly, Prediction from attachment in the Still-Face to attachment in the Strange Situation was not accounted for by maternal sensitivity at 7 months. Whilst maternal sensitivity at 7 months did distinguish between attachment group status at 14 months, this effect was no longer significant when examined jointly with attachment at 7 months. Thus showing that the attachment classification at 7 months is not simply a reflection of maternal sensitivity because it shows continuity after accounting for sensitivity.

## **5.2 Interpretation of Results**

### **5.2.1 Evidence to suggest that attachment can be measured at 7 months.**

Overall, the findings supported the hypothesis that differentiated attachment strategies are already present in interactions of infants aged 7 months with their mothers. However, there were important variations that are considered in the following sections.

**5.2.1.1 *Similar attachment distributions at each age.*** The distributions of attachment across the four attachment categories at 7 and 14 months were remarkably similar. This supports the idea that the method of attachment classification at 7 months is generating valid attachment (or attachment-like) classifications.

**5.2.1.2 *Associations between attachment security and partner violence.*** In line with previous research, classification of disorganised attachment at 7 months was found to be significantly associated with exposure to intimate partner from birth to 7 months. The specificity of partner violence to disorganised attachment was strong, with 17 of the 24 infants exposed to partner violence being classified as disorganise in the Still-Face at 7 months.

**5.2.1.3 *Evidence for the stability of attachment classification.*** Stability of attachment status from 7 to 14 months was shown by significant association between the attachment categories as measured at each age. This was the case using four-category, three-category and two-category variables.



**5.2.1.4 Stability across all four of the attachment categories.** Use of the four-category attachment variable in analyses of stability was limited by relatively small numbers in the avoidant and resistant groups. Within the constraints of these small numbers, the evidence based on continuity was stronger for secure and disorganised and not so clear cut for resistant and avoidant. However, in terms of establishing whether attachment can be assessed at 7 months, requiring it to be supported across all 4 categories is quite demanding and rarely achieved in studies of attachment stability (see Sections 1.4.1.1 and 1.4.1.2).

**5.2.1.5 Stability using the three categories of secure, insecure organised and disorganised.** This was examined by collapsing the avoidant and resistant groups to form an insecure organised group. Compared to Still-Face secure attachment, Still-Face disorganised attachment predicted Strange Situation disorganisation and Still-Face insecure organised attachment strongly predicted Strange Situation insecure organised attachment. When compared with disorganised attachment, substantial specificity in the prediction of insecure organised attachment in the Strange Situation was found. Infants who were organised insecure in the Still-Face were 4.35 times more likely to be in the organised insecure group in the Strange Situation, compared to those who were disorganised. However, the specificity of prediction of secure contrasted with disorganised attachment at 14 months was not so striking and had similar odds ratios for secure and insecure organised contrasted with disorganised in the Still-Face. Still, only the secure contrasted with disorganised Still-Face predictor was significant in its prediction to secure contrasted with disorganised at 14 months.

**5.2.1.6 Stability of attachment using dichotomous insecure/organised and secure/disorganised variables.** Stability of attachment from 7 to 14 months using a secure/insecure attachment variable was statistically significant with a correlation coefficient ( $\phi$ ) of  $r = .24$ . If the 7 months attachment measure is assessing attachment, it should be supported by similar levels of stability as those in the second year of life, over similar intervals, using established measures. As described in Section 1.4.1.1, the mean weighted effect size across 5 studies measuring stability in secure/insecure attachment from approximately 12 to 18 months ( $N = 826$ ) was  $r = .27$ . This effect size was derived using only those studies measuring attachment stability up to age two with sample sizes of over 100 from a review by Pinquart, (2013). Thus stability of attachment security assessed during the first year of life was very similar to that reported during the second year of life.

Stability of organised versus disorganised attachment from 7 to 14 months was somewhat lower but also statistically significant. Recent meta-analyses of stability of disorganised attachment over the second year of life are not available, so comparisons could not be made.

To summarise, this method of attachment classification at 7 months has shown evidence of its ability to assess attachment at this age but that this is not equally true across all attachment categories. Evidence of stability using the two category attachment variables of secure/insecure and organised/disorganised was strong and showed similar levels as published studies of stability in the second year of life over similar time intervals. Evidence of stability for secure and disorganised attachment using the four category variable was also strong. However, stability of

attachment status for the avoidant and resistant groups was less so and this could be a result of the smaller numbers in these groups in this sample, so more research into this area is needed.

### **5.3 Sample**

The current study presents data from a wider study, the WCHADS, that used a community based sample, stratified by psychosocial risk, in order to generate an ‘intensive’ sample with elevated levels of risk. Participants from this intensive sample were used in the current study (see Section 3.1.3 for full details of the methods of inclusion to the intensive sample and Section 3.2.1.1 for details of how the participants in the current study related to this intensive sample). The following section outlines the strengths and weaknesses of this sample.

**5.3.1 Sample size.** The sample in the current study consisted of 224 mother and infants with complete data in the Still-Face and Strange Situation paradigms. This sample was substantially larger than has been reported from previous studies of associations between infant behaviours in the Still-Face and the Strange Situation (previous study sample sizes ranged from  $N = 12-132$ ).

**5.3.2 Sample characteristics.** The study sample was generated from an approach to consecutive referrals of first time mothers to an ante-natal department of a universal health provision serving a defined geographical area. Very few expectant mothers are likely to have been seen in other provisions, and so the sample can be considered to be drawn from the general population. As all those approached to take part in the study were asked to complete a basic demographic questionnaire, whether they consented into the study or not, comparison of consenters and non-consenters was made possible. This is a strength of the current study as this information is often not available. Analyses revealed that expectant mothers who did not consent to be

part of the WCHADS sample were significantly younger and more deprived than those who did. Similarly, those intensive participants who were not included in the current study sample (due to missing data or speaking another language during the assessment) were significantly younger and more likely to be in the most deprived quintile. No differences were found with regards to number of years spent in full-time education. As a result of this, the current study sample may not be as representative in terms of elevated risk as the intensive sample as a whole. Nonetheless, the distribution of attachment classification at each time point suggests that the sample is more high risk than a normal population sample as there is increased incidence of insecure attachment, especially disorganisation.

## **5.4 Methodological innovations, strengths and weaknesses**

A substantial amount of the innovation of this study relates to the methodology used for the process of generating an attachment classification scheme for use at 7 months. In order to highlight this innovation, the following section gives an overview of the novel aspects of this study in comparison to the existing work in the area of measuring attachment in infants younger than 12 months.

**5.4.1 Methodological innovations.** The generation of attachment categories from the Still-Face was not completely innovative as this has been achieved in two previous unpublished studies. However, this has not previously been accomplished using a combination of infant behaviour scales, and as described in Section 2.7 is different from the method for attachment coding in the Strange Situation.

Furthermore, no previous studies have attempted to define disorganised attachment from the Still-Face. This required a consideration of the various ways in which disorganisation may be manifested in the Still-Face and how this might be identified from the infant scales. The algorithm sought to identify two major dynamics of disorganised attachment, contradictory strategies, and behaviours indicative of fear of the caregiver. Evidence of contradictory attachment strategies was reflected in combinations of scores on the infant scales indicating distress on reunion, accompanied by lack of attention to the mother. Evidence of fear of the mother was reflected in ratings indicating that distress intensified on reunion, either by increase of distress from the still-face to the reunion phase or increase of distress during the reunion. The latter was achieved by differentiating within mid-point

ratings of infant distress, those where there was an increase of distress during reunion, from those where initial distress declined during reunion, or low level distress persisted throughout. Additional inter-rater reliability for these subdivisions was demonstrated. In addition, as reviewed later, attempts were made to code infant fear on reunion, but reliability on these was not achieved, and so this additional index of infant fear was not included.

## **5.4.2 Methodological strengths**

### ***5.4.2.1 The use of an attachment based path to emotion regulation.***

Developmentally appropriate behaviours, and patterns of behaviours, were identified in each paradigm that were reflective of infant attachment behaviours and emotion regulatory processes. This made the translation of attachment behaviours from Strange Situation to Still-Face a relatively simple process given that the scales of the GRS were similar, whilst taking account of important developmental and procedural differences, to those used in the Strange Situation.

***5.4.2.2 The utilisation of procedures and measures that have enough similarities but also important differences.*** The similarities and differences between the two paradigms meant that each task was a developmentally appropriate way of measuring infant emotion regulation with the mother, following a stressor. Classification of attachment at 7 months was based on infant behaviours in an assessment that has important similarities to the Strange Situation, which are outlined in Section 2.3.1, and also important differences, outlined in Section 2.3.2. The success of doing this depended on there being enough equivalence across the

two measures as well as the attachment-like behaviours already being established at 7 months. It is argued that the differences between the two procedures are important to ensure that they are measuring the same construct and so, in fact, add to the similarities between the measurement of attachment in each.

**5.4.2.3 Sampling.** In line with previous studies (see Section 1.2.4.1), the elevated risk in the current sample led to increased incidence of insecure attachment and particularly high levels of disorganisation. This supported the use of analyses which predict 3 and 4-way attachment classification group status across the two time points as there were sufficient numbers in each group to allow for this.

**5.4.2.4 The use of observational measures.** Observational measures of attachment at each age and measures of maternal sensitivity in the Still-Face and NICHD free-play at 7 months were used in this study. The only maternal report measure included in the main analyses was that of infant temperament, as derived from the IBQ-R negative affectivity score. These observational measures were coded from videos of the interactions and the tasks took place with only the mother and infant in the room (with the exception of the stranger in the Strange Situation) to ensure that the dyad felt able to act as naturally as possible within the confines of an assessment in an infant laboratory. As each of these tasks involved standardised procedures and established rating scales, everything that was possible was done to achieve objective measures of infant and mother behaviour, sensitivity and infant attachment.



#### ***5.4.2.5 Independence of rating of attachment classification in the Strange***

***Situation.*** This independence of rating was achieved as a result of having the interactions rated by the research team, trained and supervised by Professor Howard Steele, at the Center for Attachment Research (CAR) in New York. The videos of the Strange Situation paradigms for each infant in the sample were digitised, encrypted and uploaded onto a secure server which was accessed by the team in New York. This meant that the coding of attachment in the Strange Situation was completely independent of any other ratings of mother or infant behaviour, as this was done in isolation and because the raters had no contact with any of the participants in the study sample.

#### ***5.4.2.6 Low levels of missing data.***

Whilst technical issues and infant distress meant that the sample size of the study was reduced, the size of the sample remained large in comparison to existing studies and levels of missing data were very low. Missingness was found in the IBQ-R data at 7 months and the EPDS data at 7 and 14 months where mothers took the questionnaires home and failed to return them. Missingness was found in the maternal sensitivity in the NICHD play task where two of the mothers spoke in a language other than English for a substantial portion of the task. These two dyads were retained in the sample because only English was spoken in the Still-Face and Strange Situation paradigms.

#### ***5.4.2.7 The generation of data in attachment categories rather than***

***dimensions.*** Generation of the algorithm was based on the processes involved in emotion regulation as described above in Section 5.4.2.1. The question of whether attachment status should be quantified dimensionally or categorically has been the

focus of considerable debate. In introducing attachment theory, Bowlby did not specify whether measurement would be categorical or dimensional and it was not until Ainsworth introduced the Strange Situation that infant attachment behaviours were argued to fit into three primary categories. Ainsworth and colleagues reasoned that categories best preserved infant behavioural patterns that would be otherwise lost with a dimensional approach and would also help maintain an emphasis on the roots of the theory that underpins the understanding of attachment behaviours (Ainsworth, 1978). However, a general problem with categories like these, where there are no natural cut-offs, is that the lines may be drawn in the wrong places.

More recently, a strong empirical case has been made for a dimensional approach, arguing that there is little evidence in support of a categorical model of attachment organisation (Fraley & Spieker, 2003). Continuous attachment security scores have been generated from Strange Situation scale scores and crying using multiple discriminant function analysis (Richters, Waters and Vaughn, 1988; Qu, Leerkes & King, 2016), and taxometric techniques (Meehl, 1973; Fraley & Spieker, 2003). Fraley and Spieker (2003) examined Strange Situation data from 1139 dyads in order to determine whether there was evidence of 'taxons' or natural categories as opposed to predetermined attachment categories. They concluded that the variation in patterns of attachment was better explained in a continuous rather than categorical manner as the Strange Situation coding suggests.

It may be that some aspects of attachment are more accurately defined by categories and others by dimensions. Indeed, the Strange Situation employs both approaches in the case of disorganisation where infants are classified as belonging to

the D category and then given a dimensional score from 1-9 to denote the level of observed disorganised behaviours. A combination of category and dimensional scores in other classifications could potentially provide key information about severity or degree of 'belonging' to that category.

However, given that the majority of longitudinal studies have used attachment categories, specifically those derived from the Strange Situation, this seemed to be the most appropriate starting point. Furthermore, given that a major aim of the current study was to find out whether infant behaviours at 7 months can be classified in the same manner as they currently are from 12 months onwards, it was imperative to employ an established measure of attachment for the purposes of comparison and continuity. At 12 months, this is the Strange Situation which employs a categorical model of attachment and so it was considered important to follow this method of measurement. Whilst scale scores were derived in the current study, using only dimensional methods could have caused important factors to become lost. If, for example, each infant was given a dimensional score across Still-Face episodes for each of the four scales, the pattern of behaviours across episodes would be lost and this could cause an infant who would be classified as disorganised according to the algorithm (distressed, happy/neutral, distressed) to instead be interpreted as neutral throughout. Future analyses should consider a dimensional approach to attachment-like processes in the Still-Face perhaps starting with generating the categories and then examining them for natural taxons.

### **5.4.3 Methodological weaknesses.**

**5.4.3.1 Lack of independence in the rating of maternal sensitivity and infant behaviours in the Still-Face.** Whilst it was hoped that the rating of the Still-Face and NICHD free-play would be done independently, this did not prove entirely feasible. In the majority of cases, infant behaviours in the Still Face and maternal behaviours in NICHD were coded by the same rater so associations may have arisen from lack of blindness. Separate analyses for blind ratings were not done because of the small number for which these were available. Priority was given to blindness over time and the rating of the two different measures of maternal sensitivity took place separately over a period of more than three-and-a-half-years. See section 3.4.2.5 for a detailed review.

**5.4.3.2 The use of the global rating scales (GRS) in the Still-Face is not commonly reported.** Whilst the GRS is a well-established scale for use in mother-infant face-to-face interactions with infants of 2-6 months, it has not been used extensively in the Still-Face paradigm. There are a number of studies that have used these scales in the Still-Face and across all three episodes of the Still-Face (with only the infant scales being used in the still-face episode, as was the case in this study), but the GRS are not the primary scales used to measure infant behaviour in the Still-Face. For a review of the measures that are normally used, and comparisons between these and the GRS, see Section 2.5.1. Section 2.5.1.1 describes the rationale behind choosing the GRS to rate the Still-Face paradigm in this study.

To summarise, the GRS were chosen because they provide information about maternal as well as infant behaviours and affect, including a measure of maternal

sensitivity that was used in the analysis of validity of the classification coding scheme. In addition, the GRS provide clear cut-off points within their scales, where one side of each scale is mostly one behaviour (e.g. distressed) and the opposite side is mostly another (e.g. happy). Once the mid-points were recoded, this meant that there were no difficult judgements to be made as to where each infant might fit on the scales. It also meant that the coding of the Still-Face did not involve microanalytical methods, within which it is easy to miss very subtle or momentary behaviours. Training to reliability was also readily available to the research team for the GRS scores and this was achieved in a timely fashion wherever the commitment could be made. Finally, and perhaps most importantly, the scales of the GRS bear some striking resemblances to the scale scores of the Strange Situation as detailed in Section 2.5.3. This made the generation of an attachment algorithm using these scales much easier as. Once the emotion regulatory behaviours expected in the Still-Face were outlined, direct comparison of the GRS scales and the Strange Situation scale scores that contribute towards each classification could be made in terms of the patterns of scores one would expect to see in each.

#### ***5.4.3.3 Lack of independence in administration and coding of the tasks.***

For the most part, the Still-Face and Strange Situation paradigms were administered, at least in part, by the current author (90 and 92% respectively), who also coded the majority of the infant behaviours and maternal sensitivity in the Still-Face and the maternal sensitivity in the NICHD free-play. However, these paradigms are standardised and, at the time of administration and by virtue of the two paradigms being administered in the same visit, no coding for that dyad had been done when the assessment was carried out. Nonetheless, the same cannot be said for the Strange

Situation. That is, a number of the Still-Face paradigms were coded after the Strange Situation for those dyads had been administered and observed. Again, due to constraints in staffing at the WCHADS, priority was given to blindness over time and the coding of these final Still-Face paradigms was completed 3.5-4 years after the last assessment at 14 months was completed.

**5.4.3.4 Infant fear of mother not included as a behavioural marker of disorganisation.** This was not possible as reliability of rating facial expressions of fear in the 7 month old infants, in the Still-Face reunion episodes, was not achieved within the time constraints of the study. Infant fear of mother has important links with disorganised attachment that have been supported by empirical work. Whilst one possible method of measuring fear of mother was used in this study (evidence that the infant experiences the mother as aversive as indicated by increases in distress at the start of and during the reunion), facial expressions of fear were not included in analyses. However, the absence of facial recognition of fear meant that the attachment classification at 7 months could run on a purely algorithmic basis, without the need for microanalytic scrutiny of the interaction videos in order to recognise infant fear.

**5.4.3.5 Same sample used for the development and application of the coding of the algorithm.** Although the algorithm was generated independently of this sample, based on consideration of the emotion regulatory strategies in each attachment group and on the use of scales in the Strange Situation, both the classification generation and the longitudinal predictions were conducted on the

same sample. The generalisability of this algorithm and its ability to generate a predictive classification needs to be tested with further samples.

## **5.5 Implications of the Findings for the Study of the Origins of Attachment**

### **Status**

Findings such as those presented here need replication. However, if they prove to be robust, they have the potential to be important to our understanding of the evolution of early attachment processes in two main ways.

Firstly, they indicate that infants differ systematically in the ways they make use of their mothers to solve distress from earlier than previously thought. It is likely therefore that these systematic differences affect how mothers perceive their infants, how they feel about themselves as a mother, and how they behave towards their infants. Thus, there are bidirectional influences from at least 7 months, which are likely to be influenced by the attachment status of both infants and mothers. Furthermore, the subsequent development of the parent-infant relationship up to 12 months is likely to be shaped by combinations of infant attachment and maternal behaviours, so that the influence of maternal sensitivity at 7 months on later attachment status varies by the attachment status at 7 months. It could, for example, be that high maternal sensitivity makes a difference to later outcomes only for infants who are insecure or disorganised at 7 months. If that is the case, then there are implications for our understanding of the role of maternal sensitivity, or other potential influences such as maternal mind-mindedness, over the first year of life.

Secondly, they suggest that mother influences on attachment status start very early, well before 7 months, and perhaps in the first weeks of life. As outlined below in relation to future work, the Still-Face procedure is well suited to establishing a



time-line for the development of attachment strategies as it is appropriate from the age of around 2 months when face-to-face interactions become established (Trevarthen & Aitken, 2001). Establishing this will provide pointers to key periods for attachment development. It may be that the main influences arise once social interactions have become established, and that later during the first year, caregiver responsiveness to infant signals are key. On the other hand, maternal responsiveness, particularly to infant distress, over the first weeks, and prior to social smiling and communication may be influential. This period has rarely been studied in relation to the origins of attachment status.

**5.5.1 Early attachment processes or developmental antecedents of attachment?** As there has been relatively little research into the origins of attachment processes prior to 12 months of age, it would be important for future work to consider whether the associations observed in the current study are reflective of early attachment processes or of antecedents of attachment processes. Meta-analytic research has shown maternal sensitivity to be an important antecedent of attachment security in addition to other maternal behaviours such as mutuality and synchrony, emotional support and stimulation (De Wolff & Van IJzendoorn, 1977). However, there is more work needed in the examination of infant antecedents to attachment security and how the infant actively contributes to the development attachment relationship. If the infant behaviours observed in the current study were antecedents rather than attachment behaviours, it may be the case that those infants classified as disorganised in the Still-Face were in fact displaying behaviours indicative of an unsophisticated or developing attachment behavioural repertoire that is not yet organised and so appears disorganised as a result.

**5.5.2 Clinical and practical implications.** As this study has shown evidence that it is possible to measure attachment in the Still-Face Paradigm at 7 months, it might be possible to use this paradigm as a very quick method of identifying and evaluating problematic mother-infant relationships. This could be done with the view to intervening and improving infant outcomes later in life with respect to psychopathology and future relationship functioning. The Still-Face requires very little equipment or personnel and its effects, in terms of infant behaviour following a threat, are extremely robust and uniform across studies, despite huge procedural differences as described in Section 1.7.1.2. It is portable and can be administered in any setting where there is not a great deal for the infant to be distracted by (e.g. not in a brightly coloured children's play area or somewhere with lots of external noise). So long as there is a mirror, camera (or permanent camera set up, as in the current study), chair for the mother and highchair or infant seat for the child, the Still-Face can be administered.

In addition to this, the Still-Face is a very brief tool, lasting for just 6 minutes or less depending on the length of the episodes used, that could prove to be an extremely cost effective measure of early mother-infant attachment relationship difficulties, both in terms of time taken to administer and equipment needed. As the GRS can also be used to measure maternal behaviours in the Still-Face, maternal sensitivity scores, and those that contribute to this, derived from the engagement and reunion episodes could be used in intervention video feedback sessions with the mother, without the need for a further measures of maternal sensitivity.

The Still-Face can be used with infants as young as 2 months of age and has successfully been used as a repeated measure to explore behavioural trajectories (Braungart-Rieker et al, 2014), so effects of intervention could be monitored at predetermined intervals to explore its temporal effects. There has been meta-analytic evidence to show that the association between attachment and maternal sensitivity is stronger when using concurrent measures of maternal sensitivity as compared to earlier measures (Atkinson, 2000). A substantial decrease in effect size was found when the interval between the two measures changed from concurrent measurement to a separation of 2.5 months, supporting the idea that intervention studies could use relatively small time intervals in observations to measure change in both maternal sensitivity and attachment.

## 5.6 Future Directions for Research

As outlined earlier in Section 5.5, if the findings reported here are replicated, they imply that studies are needed to examine the timeline for the establishment of attachment strategies over the first year of life. Furthermore, for the reasons given in the previous section, the Still-Face is well suited to this task from the age of 2 months. The Global Rating Scales are also reliable and valid from 2 months. Repeated Still-Face assessments, for example every 6 weeks from the age of 2 months, could be used to examine when categories of attachment, meeting the validity and continuity tests described in this thesis, become established. This would need to be done bearing in mind that the behavioural markers for attachment status may change over this period of time. Once the timeline has been identified, studies should examine processes prior to the establishment of attachment categories, and the interplay between attachment status and caregiving quality.

Future studies might look to include infant facial expression of fear as a behavioural marker of disorganisation in the Still-Face, to mirror the method used in the Strange Situation. It would be interesting to note if incidence of infant fear in the Still-Face was associated with the increases in distress that are used to identify disorganised infants in the current study, or if fear recognition would significantly add to the prediction of attachment from 7 to 14 months. This would, however, detract from the ease with which attachment can be categorised in the Still-Face using the appropriate algorithms in this study.

As there has been much variation in the way the Still-Face has been administered in terms of length and number of episodes, use of toys and touching and inclusion of reunion episodes, it might be important for future studies to focus on the standardisation of the administration procedure, particularly in relation to the measurement of attachment. The use of an initial engagement phase, followed by a perturbation to the mother-infant interaction, of which most infants are likely to find distressing, then subsequent opportunity to repair with the use of the mother is essential if one is to draw on comparisons to attachment as measured in the Strange Situation.

The sample used in this study was from the intensive sample of the WCHADS, a sample that was drawn from the wider 'extensive' community population sample but stratified by psychosocial risk. This study design was employed by the WCHADS in order to be able to make generalisations from the more in depth study of the intensive sample, to the larger extensive sample. This process was not followed in this study and further research is needed in order to make the results included here more generalisable to the population as a whole. On the other hand, although the WCHADS sample was enriched for psychosocial risk, it was not representative of higher risk samples, for example of infants with parents with serious mental illness, or infants at risk for maltreatment.

More work is needed to examine whether the behaviours observed in the current study are in fact attachment behaviours or are simply antecedents of these behaviours. This may involve repeated administrations of the Still-Face to track the course of behaviours that may appear to be organised in an attachment manner but

could also be developing over time into a more concrete pattern of attachment behaviours.

Future research is needed to examine the stability of infant attachment from 7 months over longer time intervals in order to test how stable these early attachment measures are over time.

## **5.7 Conclusion**

This study showed evidence that infants as young as 7 months already show patterns of organised (and disorganised) behaviours in interaction with their mothers that, informed by our understanding of the underlying emotion regulatory processes, can be classified in terms of attachment using all four categories. The distribution of these classifications is strikingly similar to those seen in the Strange Situation using an established method of attachment classification. Associations with maternal sensitivity and exposure to partner violence also support the validity of the classification. What's more, there was continuity between attachment group status from 7 to 14 months, at similar levels as has been found in previous studies measuring stability of attachment in the second year or life across similar intervals. The continuities of attachment classification, whilst significant overall, do differ in strength across categories and this may be a result of smaller numbers in the avoidant and resistant groups in this sample.

## References

- Ahnert, L., Piquart, M., & Lamb, M. E. (2006). Security of children's relationships with nonparental care providers: A meta-analysis. *Child Development, 77*(3), 664-679.
- Ainsworth, M. D. S. (1969). Object relations, dependency, and attachment: A theoretical review of the infant-mother relationship. *Child Development, 40*, 969-1025.
- Ainsworth, M., Blehar, M., & Waters, E. (1978). *Patterns of Attachment: A Psychological Study of the Strange Situation*.
- Ainsworth, M. D., & Bell, S. M. (1970). Attachment, exploration, and separation: Illustrated by the behavior of one-year-olds in a strange situation. *Child Development, 41*(1), 49-67.
- Ainsworth, M. D. S., Bell, S. M., & Stayton, D. F. (1974). Infant-mother attachment and social development: Socialization as a product of reciprocal responsiveness to signals., 99-135.
- Atkinson, L., Niccols, A., Paglia, A., Coolbear, J., Parker, K. C. H., Poulton, L., Sitarenios, G. (2000). A meta-analysis of time between maternal sensitivity and attachment assessments: Implications for internal working models in infancy/toddlerhood. *Journal of Social and Personal Relationships, 17*(6), 791-810.
- Atkinson, L., Paglia, A., Coolbear, J., Niccols, A., Parker, K. C. H., & Guger, S. (2000). Attachment security: A meta-analysis of maternal mental health correlates. *Clinical Psychology Review, 20*(8), 1019-1040.
- Bar-Haim, Y., Sutton, D. B., Fox, N. A., & Marvin, R. S. (2000). Stability and change of attachment at 14, 24, and 58 months of age: Behavior, representation, and life events. *Journal of Child Psychology and Psychiatry, 41*(3), 381-388.

- Bates, J. E., Olson, S. L., Pettit, G. S., & Bayles, K. (1982). Dimensions of individuality in the mother-infant relationship at six months of age. *Child Development, 44*, 446-461.
- Beebe, B., Lachmann, F. M., Markese, S., Buck, K. A., Bahrick, L. E., Chen, H., . . . Jaffe, J. (2012). On the origins of disorganized attachment and internal working models: Paper II. an empirical microanalysis of 4-month Mother–Infant interaction. *Psychoanalytic Dialogues, 22*(3), 352-374.
- Behrens, K. Y., Hart, S. L., & Parker, A. C. (2012). Maternal sensitivity: Evidence of stability across time, contexts, and measurement instruments. *Infant and Child Development, 21*(4), 348-355.
- Beijersbergen, M. D., Juffer, F., Bakermans-Kranenburg, M., & van IJzendoorn, M. H. (2012). Remaining or becoming secure: Parental sensitive support predicts attachment continuity from infancy to adolescence in a longitudinal adoption study. *Developmental Psychology, 48*(5), 1277-1282.
- Belsky, J., Campbell, S. B., Cohn, J. F., & Moore, G. (1996). Instability of infant–parent attachment security. *Developmental Psychology, 32*(5), 921-924.
- Belsky, J., & Fearon, R. M. P. (2002). Early attachment security, subsequent maternal sensitivity, and later child development: Does continuity in development depend upon continuity of caregiving? *Attachment & Human Development, 4*(3), 361-387.
- Belsky, J., & Rovine, M. (1987). Temperament and attachment security in the strange situation: An empirical rapprochement. *Child Development, 58*(3), 787-795.
- Bingen, K. (2001). *Individual differences in infant response to the still -face paradigm and prediction of later attachment (order no. 3035452). available from ProQuest dissertations & theses global. (304698432).* (Unpublished Doctor of Philosophy in Psychology). Illinois Institute of Technology, Chicago, Illinois.



- Booth, C. L., Rubin, K. H., & Rose-Krasnor, L. (1998). Perceptions of emotional support from mother and friend in middle childhood: Links with social-emotional adaptation and preschool attachment security. *Child Development, 427-442.*
- Bowlby, J. (1982). Attachment and loss: Retrospect and prospect. *American Journal of Orthopsychiatry, 52(4), 664.*
- Bowlby, J., Ainsworth, M., Boston, M., & Rosenbluth, D. (1956). The effects of mother-child separation: A follow-up study. *British Journal of Medical Psychology, 29(3-4), 211-247.*
- Bowlby, J. (1969). Disruption of affectional bonds and its effects on behavior. *Canada's Mental Health Supplement, 59, 12.*
- Bowlby, J. (1977). The making and breaking of affectional bonds: II. some principles of psychotherapy. *British Journal of Psychiatry, 130 May, 421-431.*
- Braungart-Rieker, J. M., Garwood, M. M., Powers, B. P., & Wang, X. (2001). Parental sensitivity, infant affect, and affect regulation: Predictors of later attachment. *Child Development, 72(1), 252-270.*
- Braungart-Rieker, J. M., Zentall, S., Lickenbrock, D. M., Ekas, N. V., Oshio, T., & Planalp, E. (2014). Attachment in the making: Mother and father sensitivity and infants' responses during the still-face paradigm. *Journal of Experimental Child Psychology, 125(0), 63-84.*
- Bureau, J., & Moss, E. (2010). Behavioural precursors of attachment representations in middle childhood and links with child social adaptation. *British Journal of Developmental Psychology, 28(3), 657-677.*
- Buss, A., & Plomin, R. (1984). Theory and measurement of EAS. *Temperament: Early Developing Personality Traits, 98-130.*
- Buss, A. H., & Plomin, R. (1986). The EAS approach to temperament. *The Study of Temperament: Changes, Continuities and Challenges, 67-79.*

- Campbell, S. B. G. (1979). Mother-infant interaction as a function of maternal ratings of temperament. *Child Psychiatry and Human Development, 10*(2), 67-76.
- Carey, W. B., & McDevitt, S. C. (1978). Revision of the infant temperament questionnaire. *Pediatrics, 61*(5), 735-739.
- Carlson, V., Cicchetti, D., Barnett, D., & Braunwald, K. (1989). Disorganized/disoriented attachment relationships in maltreated infants. *Developmental Psychology, 25*(4), 525.
- Cohn, D. A. (1990). Child-Mother attachment of Six-Year-Olds and social competence at school. *Child Development, 61*(1), 152-162.
- Cohn, J. F., Campbell, S. B., & Ross, S. (1991). Infant response in the still-face paradigm at 6 months predicts avoidant and secure attachment at 12 months. *Development and Psychopathology, 3*(04), 367-376.
- Conradt, E., & Ablow, J. (2010). Infant physiological response to the still-face paradigm: Contributions of maternal sensitivity and infants' early regulatory behavior. *Infant Behavior & Development, 33*(3), 251-265.
- Cooper, P. J. (1999). Post-partum depression and the mother infant relationship in a South African peri-urban settlement. *British Journal of Psychiatry, 175*, 554-558.
- Cox, J.L., Chapman, G., Murray, D., & Jones, P. (1996). Validation of the Edinburgh postnatal depression scale (EPDS) in non-postnatal women. *Journal of Affective Disorders, 39*, 185-189.
- Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry, 150*, 782-783.
- Crandell, L. E., Patrick, M. P. H., & Hobson, R. P. (2003). Still-face interactions between mothers with borderline personality disorder and their 2-month-old infants. *The British Journal of Psychiatry, 183*(3), 239-247.

- Crockenberg, S. B., & Smith, P. (1982). Antecedents of mother-infant interaction and infant irritability in the first three months of life. *Infant Behavior and Development*, 5(2-4), 105-119.
- Crockenberg, S., & Acredolo, C. (1983). Infant temperament ratings: A function of infants, of mothers, or both? *Infant Behavior and Development*, 6(1), 61-72.
- Crockenberg, S. B. (1981). Infant irritability, mother responsiveness, and social support influences on the security of infant-mother attachment. *Child Development*, 52(3), 857-865.
- Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin*, 52(4), 281.
- DeCoster, J., & A., Iselin. (2005). Microsoft Excel Spreadsheets, Averaging Correlation Coefficients. Retrieved May 28, 2016, from <http://www.stat-help.com/spreadsheets.html>
- De Wolff, M., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, 68(4), 571-591.
- Easterbrooks, M. A. (1989). Quality of attachment to mother and to father: Effects of perinatal risk status. *Child Development*, 60(4), 825-830.
- Egeland, B., & Farber, E. A. (1984). Infant-mother attachment: Factors related to its development and changes over time. *Child Development*, 55(3), 753-771.
- Ehrensaft, M. K., Moffitt, T. E., & Caspi, A. (2004). Clinically abusive relationships in an unselected birth cohort: Men's and women's participation and developmental antecedents. *Journal of Abnormal Psychology*, 113(2), 258.
- Eisenberg, N. (2000). Emotion, regulation, and moral development. *Annual review of psychology*, 51(1), 665-697.
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. (2009). Statistical power analyses using G\*power 3.1: Tests for correlation and regression analyses. *Behavior Research*

*Methods*, 41(4), 1149-1160.

Fearon, R. M. P., & Belsky, J. (2004). Attachment and attention: Protection in relation to gender and cumulative social-contextual adversity. *Child Development*, 75(6), 1677-1693.

Fearon, R. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Lapsley, A., & Roisman, G. I. (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior: A meta-analytic study. *Child Development*, 81(2), 435-456.

Field, T. (1994). The effects of mother's physical and emotional unavailability on emotion regulation. *Monographs of the Society for Research in Child Development*, 59(2), 208-227.

Fish, M., & Crockenberg, S. (1981). Correlates and antecedents of nine-month infant behavior and mother-infant interaction. *Infant Behavior and Development*, 4, 69-81.

Fraley, R. C. (2002). Attachment stability from infancy to adulthood: Meta-analysis and dynamic modeling of developmental mechanisms. *Personality and Social Psychology Review*, 6(2), 123-151.

Fraley, R. C., & Spieker, S. J. (2003). Are infant attachment patterns continuously or categorically distributed? A taxometric analysis of strange situation behavior. *Developmental psychology*, 39(3), 387.

Fuertes, M., Santos, P. L. d., Beeghly, M., & Tronick, E. (2006). More than maternal sensitivity shapes attachment. *Annals of the New York Academy of Sciences*, 1094(1), 292-296.

Fuertes, M., LopesdosSantos, P., Beeghly, M., & Tronick. (2009). Infant coping and maternal interactive behavior predict attachment in a Portuguese sample of healthy preterm infants. *European Psychologist*, 14(4), 320-331.

- Gartstein, M. A., & Iverson, S. (2014). Attachment security: The role of infant, maternal, and contextual factors. *International Journal of Psychology and Psychological Therapy, 14*(2), 261-276.
- Gartstein, M. A., & Rothbart, M. K. (2003). Studying infant temperament via the revised infant behavior questionnaire. *Infant Behavior and Development, 26*(1), 64-86.
- George, C., Kaplan, N., & Main, M. (1985). Adult attachment interview (AAI). *Unpublished Manuscript, University of California at Berkeley,*
- George, C., & Solomon, J. (1999). Attachment and caregiving: The caregiving behavioral system. *Handbook of Attachment: Theory, Research, and Clinical Applications, 649-670.*
- Goldberg, S., Benoit, D., Blokland, K., & Madigan, S. (2003). Atypical maternal behavior, maternal representations, and infant disorganized attachment. *Development and Psychopathology, 15*(02), 239-257.
- Goldsmith, H. H., & Alansky, J. A. (1987). Maternal and infant temperamental predictors of attachment: A meta-analytic review. *Journal of Consulting and Clinical Psychology, 55*(6), 805-816.
- Grant, K., McMahon, C., Austin, M., Reilly, N., Leader, L., & Ali, S. (2009). Maternal prenatal anxiety, postnatal caregiving and infants' cortisol responses to the still-face procedure. *Developmental Psychobiology, 51*(8), 625-637.
- Grant, K., McMahon, C., Reilly, N., & Austin, M. (2010). Maternal sensitivity moderates the impact of prenatal anxiety disorder on infant responses to the still-face procedure. *Infant Behavior and Development, 33*(4), 453-462.
- Green, J., Stanley, C., Smith, V., & Goldwyn, R. (2000). A new method of evaluating attachment representations in young school-age children: The Manchester child attachment story task. *Attachment & Human Development, 2*(1), 48-70.

- Groh, A. M., Fearon, R. P., Bakermans-Kranenburg, M., van IJzendoorn, M. H., Steele, R. D., & Roisman, G. I. (2014). The significance of attachment security for children's social competence with peers: A meta-analytic study. *Attachment & Human Development, 16*(2), 103-136.
- Groh, A. M., Roisman, G. I., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., & Fearon, R. P. (2012). The significance of insecure and disorganized attachment for children's internalizing symptoms: A meta-analytic study. *Child Development, 83*(2), 591-610.
- Grossmann, K. E., Grossmann, K., Huber, F., & Wartner, U. (1981). German children's behavior towards their mothers at 12 months and their fathers at 18 months in Ainsworth's strange situation. *International Journal of Behavioral Development, 4*(2), 157-181.
- Gunning, M., Conroy, S., Valoriani, V., Figueiredo, B., Kammerer, M. H., Muzik, M., Murray, L. (2004). Measurement of mother-infant interactions and the home environment in a European setting: Preliminary results from a cross-cultural study. *British Journal of Psychiatry, 184*(Suppl46), s38-s44.
- Gunning, M., Halligan, S. L., & Murray, L. (2013). Contributions of maternal and infant factors to infant responding to the still face paradigm: A longitudinal study. *Infant Behavior and Development, 36*(3), 319-328.
- Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature, 450*, 557-559.
- Harlow, H. F., & Zimmermann, R. R. (1958). The development of affectional responses in infant monkeys. *Proceedings of the American Philosophical Society, 102*, 501-509.
- Healy, S. J., Lewin, J., Butler, S., Vaillancourt, K., & Seth-Smith, F. (2015). Affect recognition and the quality of mother-infant interaction: Understanding parenting difficulties in mothers with schizophrenia. *Archives of Women's Mental Health, 1*-12.

- Hill, J., Fudge, H., Harrington, R., Pickles, A., & Rutter, M. (2000). Complementary approaches to the assessment of personality disorder. the personality assessment schedule and adult personality functioning assessment compared. *The British Journal of Psychiatry: The Journal of Mental Science*, 176, 434-439.
- Holochwost, S. J., Gariépy, J., Propper, C. B., Mills-Koonce, W. R., & Moore, G. A. (2014). Parenting behaviors and vagal tone at six months predict attachment disorganization at twelve months. *Developmental Psychobiology*, 56(6), 1423-1430.
- IJzendoorn, M. H. v., & Kroonenberg, P. M. (1988). Cross-cultural patterns of attachment: A meta-analysis of the strange situation. *Child Development*, 59(1), 147-156.
- Izard, C. E., Dougherty, L. M., & Hembree, E. A. (1983). *A system for identifying affect expressions by holistic judgments (AFFEX)* Instructional Resources Center, University of Delaware.
- Jamieson, S. (2004). *Identifying precursors of attachment in the still -face paradigm* (Ph.D.). Available from ProQuest Dissertations & Theses Global. (305088763).
- Jin, M. K., Jacobvitz, D., Hazen, N., & Jung, S. H. (2012). Maternal sensitivity and infant attachment security in Korea: Cross-cultural validation of the strange situation. *Attachment & Human Development*, 14(1), 33-44.
- Joosen, K. J. (. 1. ), Mesman, J. (. 1. ), Bakermans-Kranenburg, M., & van IJzendoorn, M.H. ( 1,2 ). (2012). Maternal sensitivity to infants in various settings predicts harsh discipline in toddlerhood. *Attachment and Human Development*, 14(2), 101-117.
- Kagan, J. (1982). *Psychological research on the human infant: An evaluative summary* WT Grant Foundation.
- Kagan, J. (1996). Three pleasing ideas. *American Psychologist*, 51(9), 901-908.

- Kemppinen, K., Kumpulainen, K., RaitaHasu, J., Moilanen, I., & Ebeling, H. (2006). The continuity of maternal sensitivity from infancy to toddler age. *Journal of Reproductive and Infant Psychology, 24*(3), 199-212.
- Kerns, K. A., Tomich, P. L., Aspelmeier, J. E., & Contreras, J. M. (2000). Attachment-based assessments of parent-child relationships in middle childhood. *Developmental Psychology, 36*(5), 614-626.
- Kiser, L. J., Bates, J. E., Maslin, C. A., & Bayles, K. (1986). Mother-infant play at six months as a predictor of attachment security at thirteen months. *Journal of the American Academy of Child Psychiatry, 25*(1), 68-75.
- Klaus, M. H., & Kennell, J. H. (1976). Maternal-infant bonding: The impact of early separation or loss on family development.
- Kochanska, G., & Kim, S. (2013). Early attachment organization with both parents and future behavior problems: From infancy to middle childhood. *Child Development, 84*(1), 283-296.
- Kogan, N., & Carter, A. S. (1996). Mother-infant reengagement following the still-face: The role of maternal emotional availability and infant affect regulation. *Infant Behavior and Development, 19*(3), 359-370.
- Kopp, C. B. (1989). Regulation of distress and negative emotions: A developmental view. *Developmental Psychology, 25*(3), 343-354.
- Lamb, M. E., & Malkin, C. M. (1986). The development of social expectations in distress-relief sequences: A longitudinal study. *International Journal of Behavioral Development, 9*(2), 235-249.
- Lamb, M. E., Hwang, C., Frodi, A. M., & Frodi, M. (1982). Security of mother- and father-infant attachment and its relation to sociability with strangers in traditional and nontraditional Swedish families. *Infant Behavior & Development, 5*(4), 355-367.



- Leerkes, E. M. (2011). Maternal sensitivity during distressing tasks: A unique predictor of attachment security. *Infant Behavior & Development, 34*(3), 443-446.
- Linn, P. L., & Horowitz, F. D. (1983). The relationship between infant individual differences and mother-infant interaction during the neonatal period. *Infant Behavior and Development, 6*(4), 415-427.
- Lohaus, A., Keller, H., Ball, J., Voelker, S., & Elben, C. (2004). Maternal sensitivity in interactions with three- and 12-month-old infants: Stability, structural composition, and developmental consequences. *Infant and Child Development, 13*(3), 235-252.
- Lorenz, K. (1935). The companion in the bird's world. the fellow-member of the species as releasing factor of social behavior. *Journal Fur Ornithologie.Beiblatt.(Leipzig), 83*, 137-213.
- Lyons-Ruth, K., Alpern, L., & Repacholi, B. (1993). Disorganized infant attachment classification and maternal psychosocial problems as predictors of hostile-aggressive behavior in the preschool classroom. *Child Development, 64*(2), 572-585.
- Lyons-Ruth, K., Connell, D. B., Grunebaum, H. U., & Botein, S. (1990). Infants at social risk: Maternal depression and family support services as mediators of infant development and security of attachment. *Child Development, 61*(1), 85-98.
- Lyons-Ruth, K., Bronfman, E., & Parsons, E. (1999). Maternal frightened, frightening, or atypical behavior and disorganized infant attachment patterns. *Monographs of the Society for Research in Child Development, 64*(3, Atypical Attachment in Infancy and Early Childhood Among Children at Developmental Risk), 67-96.
- Lyons-Ruth, K., Repacholi, B., McLeod, S., & Silva, E. (1991). Disorganized attachment behavior in infancy: Short-term stability, maternal and infant

correlates, and risk-related subtypes. *Development and Psychopathology*, 3(04), 377-396.

Madigan, S., Atkinson, L., Laurin, K., & Benoit, D. (2013). Attachment and internalizing behavior in early childhood: A meta-analysis. *Developmental Psychology*, 49(4), 672-689.

Main, M., & Hesse, E. (1990). Parents' unresolved traumatic experiences are related to infant disorganized attachment status: Is frightened and/or frightening parental behavior the linking mechanism?

Main, M., & Weston, D. R. (1981). The quality of the toddler's relationship to mother and to father: Related to conflict behavior and the readiness to establish new relationships. *Child Development*, 52(3), 932-940.

Mangelsdorf, S. C., McHale, J. L., Diener, M., Goldstein, L. H., & Lehn, L. (2000). Infant attachment: Contributions of infant temperament and maternal characteristics. *Infant Behavior and Development*, 23(2), 175-196.

Mangelsdorf, S., Gunnar, M., Kestenbaum, R., & Lang, S. (1990). Infant proneness-to-distress temperament, maternal personality, and mother-infant attachment: Associations and goodness of fit. *Child Development*, 61(3), 820-831.

Marshall, P. J., & Fox, N. A. (2005). Relations between behavioral reactivity at 4 months and attachment classification at 14 months in a selected sample. *Infant Behavior & Development*, 28(4), 492-502.

McElwain, N. L., & BoothLaForce, C. (2006). Maternal sensitivity to infant distress and nondistress as predictors of infant-mother attachment security. *Journal of Family Psychology*, 20(2), 247-255.

Mcquaid, N. E. (2011). *Exploring the Foundations of Attachment: Relations between Mother-Infant Interaction at 4-5 Months and Attachment Security at 12 Months*,

Meehl, P. E. (1973). MAXCOV-HITMAX: A taxonomic search method for loose genetic syndromes. *Psychodiagnosis: selected papers*, 200-224.

- Meier, P., Wolke, D., Gutbrod, T., & Rust, L. (2003). The influence of infant irritability on maternal sensitivity in a sample of very premature infants. *Infant and Child Development, 12*(2), 159-166.
- Mesman, J., Linting, M., Joosen, K. J., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2013). Robust patterns and individual variations: Stability and predictors of infant behavior in the still-face paradigm. *Infant Behavior and Development, 36*(4), 587-598.
- Mesman, J., van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2009). The many faces of the still-face paradigm: A review and meta-analysis. *Developmental Review, 29*(2), 120-162.
- Messick, S. (1980). Test validity and the ethics of assessment. *American Psychologist, 35*(11), 1012.
- Mills-Koonce, W. R., Propper, C. B., & Barnett, M. (2012). Poor infant soothability and later insecure-ambivalent attachment: Developmental change in phenotypic markers of risk or two measures of the same construct? *Infant Behavior and Development, 35*(2), 215-225.
- Moffitt, T. E., Caspi, A., Krueger, R. F., Magdol, L., Margolin, G., Silva, P. A., & Sydney, R. (1997). Do partners agree about abuse in their relationship? A psychometric evaluation of interpartner agreement. *Psychological Assessment, 9*(1), 47.
- Moss, E., Cyr, C., Bureau, J., Tarabulsy, G. M., & Dubois-Comtois, K. (2005). Stability of attachment during the preschool period. *Developmental Psychology, 41*(5), 773.
- Murray, L., Fiori-Cowley, A., Hooper, R., & Cooper, P. (1996). The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcomes. *Child Development, 67*(5), 2512-2526.

- Neyer, F. J., Schäfer, M., & Asendorpf, J. B. (1998). Bindung, gehemmtheit, soziale netzwerke und die entwicklung sozialer beziehungen im kindergarten. *Zeitschrift Für Entwicklungspsychologie Und Pädagogische Psychologie*, *30*(2), 70-79.
- NICHD Early Child Care Research Network. (2001). Nonmaternal care and family factors in early development: An overview of the NICHD study of early child care. *Journal of Applied Developmental Psychology*, *22*(5), 457-492.
- Niederhofer, H., & Reiter, A. (2003). About the association between attachment and temperament at the age of 6 months. *Psychiatria Danubina*, *15*(1-2), 7-12.
- Noble, M., McLennan, D., Wilkinson, K., Whitworth, A., Exley, S., Barnes, H., McLennan, D. (2007). The English indices of deprivation 2007.
- Oppenheim, D. (1997). The attachment doll-play interview for preschoolers. *International Journal of Behavioral Development*, *20*(4), 681-697.
- Osofsky, J. D., & Danzger, B. (1974). Relationships between neonatal characteristics and mother-infant interaction. *Developmental Psychology*, *10*(1), 124.
- Owen, M. (1992). The NICHD study of early child care mother–infant interaction scales. *Unpublished Manuscript, Timberlawn Psychiatric Research Foundation, Dallas, TX*,
- Parade, S. H., & Leerkes, E. M. (2008). The reliability and validity of the infant behavior questionnaire-revised. *Infant Behavior & Development*, *31*(4), 637-646.
- Pasco Fearon, R., & Belsky, J. (2011). Infant–mother attachment and the growth of externalizing problems across the primary-school years. *Journal of Child Psychology and Psychiatry*, *52*(7), 782-791.
- Pauli-Pott, U., Haverkock, A., Pott, W., & Beckmann, D. (2007). Negative emotionality, attachment quality, and behavior problems in early childhood. *Infant Mental Health Journal*, *28*(1), 39-53.

- Pauli-Pott, U. (2008). Mothers with depressive symptoms: Cross-situational consistency and temporal stability of their parenting behavior. *Infant Behavior & Development, 31*(4), 679-687.
- Paulus, M., Becker, E., Scheub, A., & König, L. (2016). Preschool children's attachment security is associated with their sharing with others. *Attachment & Human Development, 18*(1), 1-15.
- Pederson, D. R., Gleason, K. E., Moran, G., & Bento, S. (1998). Maternal attachment representations, maternal sensitivity, and the infant–mother attachment relationship. *Developmental Psychology, 34*(5), 925.
- Pederson, D. R., Bailey, H. N., Tarabulsky, G. M., Bento, S., & Moran, G. (2014). Understanding sensitivity: Lessons learned from the legacy of Mary Ainsworth. *Attachment & Human Development, 16*(3), 261-270.
- Pederson, D. R., & Moran, G. (1996). Expressions of the attachment relationship outside of the strange situation. *Child Development, 67*(3), 915-927.
- Pederson, D. R., Moran, G., Sitko, C., & Campbell, K. (1990). Maternal sensitivity and the security of infant-mother attachment: A Q-sort study. *Child Development, 61*(6), 1974-1983.
- Pickles, A., Hill, J., Breen, G., Quinn, J., Abbott, K., Jones, H., & Sharp, H. (2013). Evidence for interplay between genes and parenting on infant temperament in the first year of life: Monoamine oxidase A polymorphism moderates effects of maternal sensitivity on infant anger proneness. *Journal of Child Psychology and Psychiatry, 54*(12), 1308-1317.
- Pinquart, M., Feussner, C., & Ahnert, L. (2013). Meta-analytic evidence for stability in attachments from infancy to early adulthood. *Attachment & Human Development, 15*(2), 189-218.
- Pleck, J., & Lamb, M. (1997). Paternal involvement. *The Role of the Father in Child Development, 66*-104.

- Qu, J., Leerkes, E. M., & King, E. K. (2016). Preschoolers' distress and regulatory behaviors vary as a function of infant–mother attachment security. *Infant Behavior and Development, 44*, 144-147.
- Ramchandani, P. G., Domoney, J., Sethna, V., Psychogiou, L., Vlachos, H., & Murray, L. (2013). Do early father-infant interactions predict the onset of externalising behaviours in young children? findings from a longitudinal cohort study. *Journal of Child Psychology and Psychiatry, 54*(1), 56-64.
- Richters, J. E., Waters, E., & Vaughn, B. E. (1988). Empirical classification of infant-mother relationships from interactive behavior and crying during reunion. *Child Development, 59*, 512-522.
- Rosenthal, R., Rosnow, R. L., & Rubin, D. B. (2000). *Contrasts and effect sizes in behavioral research: A correlational approach* Cambridge University Press.
- Rothbart, M. K., & Derryberry, D. (1981). Development of individual differences in temperament. *Advances in Developmental Psychology, 1*, 3-27.
- Rothbart, M. K., Ahadi, S. A., & Evans, D. E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology, 78*(1), 122-135.
- Schaeffer, H. R., & Emerson, P. E. (1964). The development of social attachments in infancy. *Monographs of the Society for Research in Child Development, 29*(3, Whole 94), 1-77.
- Schaffer, H. (1966). The onset of fear of strangers and the incongruity hypothesis. *Journal of Child Psychology and Psychiatry, 7*(2), 95-106.
- Schneider, B. H., Atkinson, L., & Tardif, C. (2001). Child–parent attachment and children's peer relations: A quantitative review. *Developmental Psychology, 37*(1), 86-100.
- Schuengel, C., Bakermans-Kranenburg, M., & van IJzendoorn, M. H. (1999). Frightening maternal behavior linking unresolved loss and disorganized infant attachment. *Journal of Consulting and Clinical Psychology, 67*(1), 54-63.

- Seifer, R., Schiller, M., Sameroff, A. J., Resnick, S., & Riordan, K. (1996). Attachment, maternal sensitivity, and infant temperament during the first year of life. *Developmental Psychology*, *32*(1), 12-25.
- Sharp, H., Pickles, A., Meaney, M., Marshall, K., Tibu, F., & Hill, J. (2012). Frequency of infant stroking reported by mothers moderates the effect of prenatal depression on infant behavioural and physiological outcomes. *PloS One*, *7*(10), e45446.
- Silva, P. A. (1990). The Dunedin multidisciplinary health and development study: A 15 year longitudinal study. *Paediatric and Perinatal Epidemiology*, *4*(1), 76-107.
- Spieker, S. J., & Booth, C. L. (1988). Maternal antecedents of attachment quality. *Clinical Implications of Attachment*, 95-135.
- Sroufe, L. A. (1985). Attachment classification from the perspective of infant-caregiver relationships and infant temperament. *Child Development*, *56*(1), 1-14.
- Straus, M. A. (1979). Measuring intrafamily conflict and violence: The conflict tactics (CT) scales. *Journal of Marriage and the Family*, 75-88.
- Suess, G. J., Grossmann, K. E., & Sroufe, L. A. (1992). Effects of infant attachment to mother and father on quality of adaptation in preschool: From dyadic to individual organisation of self. *International Journal of Behavioral Development*, *15*(1), 43-65.
- Suomi, S. J., & Harlow, H. F. (1972). Social rehabilitation of isolate-reared monkeys. *Developmental Psychology*, *6*(3), 487.
- Takahashi, K. (1986). Examining the strange-situation procedure with Japanese mothers and 12-month-old infants. *Developmental Psychology*, *22*(2), 265-270.
- Target, M., Fonagy, P., & Shmueli-Goetz, Y. (2003). Attachment representations in school-age children: The development of the child attachment interview (CAI). *Journal of Child Psychotherapy*, *29*(2), 171-186.

- Thompson, R. A., Connell, J. P., & Bridges, L. J. (1988). Temperament, emotion, and social interactive behavior in the strange situation: A component process analysis of attachment system functioning. *Child Development, 59*(4), 1102-1110.
- Toda, S., & Fogel, A. (1993). Infant response to the still-face situation at 3 and 6 months. *Developmental Psychology, 29*(3), 532.
- Tomlinson, M., Cooper, P., & Murray, L. (2005). The mother-infant relationship and infant attachment in a South African peri-urban settlement. *Child Development, 76*(5), 1044-1054.
- Torres, N., Maia, J., Veríssimo, M., Fernandes, M., & Silva, F. (2012). Attachment security representations in institutionalized children and children living with their families: Links to problem behaviour. *Clinical Psychology & Psychotherapy, 19*(1), 25-36.
- Trevarthen, C., & Aitken, K. J. (2001). "Infant intersubjectivity: Research, theory, and clinical applications." *Journal of child psychology and psychiatry 42*(1), 3-48.
- Tronick, E. Z., Ricks, M., & Cohn, J. F. (1982). Maternal and infant affective exchange: Patterns of adaptation. *Emotion and Early Interaction, 83-100*.
- Tronick, E. Z., & Weinberg, M. K. (1990). The infant regulatory scoring system (IRSS). *Unpublished Manuscript, Children's Hospital/Harvard Medical School, Boston,*
- Tronick, E., Als, H., & Brazelton, T. B. (1980). Monadic phases: A structural descriptive analysis of infant-mother face to face interaction. *Merrill-Palmer Quarterly of Behavior and Development, 26*(1), 3-24.
- Tronick, E., & Weinberg, M. (1990). The maternal regulatory scoring system (MRSS). *Unpublished Manuscript, Children's Hospital and Harvard Medical School, Boston, MA,*



- Tronick, E., Als, H., Adamson, L., Wise, S., & Brazelton, T. B. (1978). The infant's response to entrapment between contradictory messages in face-to-face interaction. *Journal of the American Academy of Child Psychiatry, 17*(1), 1-13.
- True, M. M., Pisani, L., & Oumar, F. (2001). Infant-mother attachment among the Dogon of Mali. *Child Development, 72*(5), 1451-1466.
- van den Boom, Dymphna C. (1989). Neonatal irritability and the development of attachment.
- van IJzendoorn, M. H., & Sagi-Schwartz, A. (2008). Cross-cultural patterns of attachment: Universal and contextual dimensions.
- van IJzendoorn, M. H., Vereijken, Carolus M. J. L, BakermansKranenburg, M. J., & RiksenWalraven, J. M. (2004). Assessing attachment security with the attachment Q sort: Meta-analytic evidence for the validity of the observer AQS. *Child Development, 75*(4), 1188-1213.
- van IJzendoorn, M. H., Schuengel, C., & Bakermans–Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology, 11*(02), 225-250.
- Vaughn, B. E., Bost, K. K., & van IJzendoorn, M. H. (2008). Attachment and temperament: Additive and interactive influences on behavior, affect, and cognition during infancy and childhood.
- Vaughn, B. E., Lefever, G. B., Seifer, R., & Barglow, P. (1989). Attachment behavior, attachment security, and temperament during infancy. *Child Development, 60*(3), 728-737.
- Verschueren, K., & Marcoen, A. (1999). Representation of self and socioemotional competence in kindergartners: Differential and combined effects of attachment to mother and to father. *Child Development, 70*(1), 183-201.

- Wan, M. W., Green, J., Elsabbagh, M., Johnson, M., Charman, T., & Plummer, F. (2012). Parent–infant interaction in infant siblings at risk of autism. *Research in Developmental Disabilities, 33*(3), 924-932.
- Wan, M. W., Salmon, M. P., Riordan, D. M., Appleby, L., Webb, R., & Abel, K. M. (2007). What predicts poor mother–infant interaction in schizophrenia? *Psychological Medicine, 37*(04), 537-546.
- Wang, F., Cox, M. J., Mills-Koonce, R., & Snyder, P. (2015). Parental behaviors and beliefs, child temperament, and attachment disorganization. *Family Relations, 64*(2), 191-204.
- Waters, E. (1978). The reliability and stability of individual differences in infant–mother attachment. *Child Development, 49*(2), 483-494.
- Waters, E., & Deane, K. E. (1985). Defining and assessing individual differences in attachment relationships: Q-methodology and the organization of behavior in infancy and early childhood. *Monographs of the Society for Research in Child Development, 50*(1/2, Growing Points of Attachment Theory and Research), 41-65.
- Weinberg, M., & Tronick, E. (1999). Infant and caregiver engagement phases (ICEP). *Harvard Medical School, Boston, MA*,
- West, K. K., Mathews, B. L., & Kerns, K. A. (2013). Mother–child attachment and cognitive performance in middle childhood: An examination of mediating mechanisms. *Early Childhood Research Quarterly, 28*(2), 259-270.
- Wolff, M. S., & Ijzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68*(4), 571-591.
- Zeanah, C. H., Anders, T. F., Seifer, R., & Stern, D. N. (1989). Implications of research on infant development for psychodynamic theory and practice. *Journal of the American Academy of Child & Adolescent Psychiatry, 28*(5), 657-668.

Zeanah, C. H., Danis, B., Hirshberg, L., Benoit, D., Miller, D., & Scott Heller, S. (1999). Disorganized attachment associated with partner violence: A research note. *Infant Mental Health Journal*, 20(1), 77-86.

Zevalkink, J., Riksen-Walraven, J. M., & Van Lieshout, C. F. (1999). Attachment in the Indonesian caregiving context. *Social Development*, 8(1), 21-40.

## Appendices

**Appendix 1 – Strange Situation Coding Sheet**

**Strange Situation Coding Sheet**

	<b>Episode 5</b>	<b>Episode 8</b>	<b>Child I.D.</b> _____
<b>P.S.</b>	_____	_____	<b>Coder</b> _____
<b>C.M.</b>	_____	_____	<b>Date</b> _____
<b>R.</b>	_____	_____	<b>Classification</b> _____
<b>A.</b>	_____	_____	<b>Rating</b> 1 3 5 7 9

**Episode 1-2 Play:**

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**Episode 3 M/S/C:**

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**Episode 4 S/C:**

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**Episode 5 M/C Reunion:**

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**Episode 6 C Alone:**

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**Episode 7 S/C:**

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**Episode 8 M/C Reunion:**

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## **Appendix 2 - Strange Situation Classification Matrix**

## **Strange Situation Classification matrix**

Researchers first learning the Strange Situation classification system are often struck with the impression of overwhelming complexity. In fact, you don't need to keep all the scoring criteria in mind all the time. Experienced coders quickly rule out classifications that are entirely implausible, develop some ideas for one or two most likely classifications, and then go about deciding among them. Even when a classification seems "easy", experienced scorers check the most likely alternative classifications before making a final decision.

In both instances, it is useful to know which classifications are most likely alternatives (or most easily confused with) which other classifications. The most likely alternative to a classification is not necessarily the adjacent categories. That is, the most likely alternative to C1 is not C2 but A2, etc. The Strange Situation Similarity Matrix summarizes the "proximity" among classifications.

To use the Matrix, simply locate the row corresponding to your preliminary classification decision. Read across the row to find the most likely alternative classification (dark blue) and the next most likely classifications. Focus on deciding among these alternatives. This should make the task much easier.

Here's the Matrix. Some commentary of decisions associated with each classification and its alternatives follow.



### Possible Alternative Classification

Preliminary Classification

	A1	A2	B1	B2	B3	B4	C1	C2
A1		Next Most Likely Alternative	Most Likely Alternative	Next Most Likely Alternative				
A2	Next Most Likely Alternative						Most Likely Alternative	
B1	Most Likely Alternative			Most Likely Alternative				
B2	Next Most Likely Alternative		Most Likely Alternative		Most Likely Alternative			
B3				Next Most Likely Alternative				
B4							Most Likely Alternative	Most Likely Alternative
C1		Most Likely Alternative						Most Likely Alternative
C2						Most Likely Alternative	Next Most Likely Alternative	

Most Likely Alternative ■    Next Most Likely Alternative ■    Not Likely

### **Appendix 3 – Ethical permission for the study**

## Cheshire North & West Research Ethics Committee

Cheshire West PCT  
1829 Building  
Countess of Chester Health Park  
Liverpool Road  
Chester  
CH2 1HJ

Telephone: 01244 650 334  
Facsimile: 01244 650 333

27 June 2006

Professor Jonathan Hill  
Professor of Child and Developmental Psychiatry  
University of Liverpool, Alder Hey Hospital  
Mulberry House, Alder Hey Hospital  
Eaton Road  
L12 2AP

Dear Professor Hill

**Full title of study:** The Wirral Child Health and Development Study  
**REC reference number:** 05/Q1506/107

Thank you for your letter of 19 May 2006, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Vice-Chairman.

### Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

### Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

### Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Application		09 January 2006
Investigator CV		
Protocol	1	09 January 2006
Covering Letter		09 January 2006
Summary/Synopsis	1	09 January 2006
Response to Request for Further Information		19 May 2006
Father Information Sheet, Study 1500 - Phases 1, 3, 5 & 7	2	01 May 2006
Study 300 Parent Information Sheet, one year - Phase 8	2	01 May 2006
Study 300 Parent Information Sheet, 6 months - Phase 6	2	01 May 2006

Study 300 Parent Information Sheet, Antenatal Phases 2 & 4	2	01 May 2006
Mother Information Sheet, Study 1500 - Phases 1, 3, 5, & 7	2	01 May 2006
Letter confirming funding - MRC		09 March 2005
Supporting letter from Mr Doyle, Wirral Hospitals NHS Trust		09 December 2005
Supporting letter from Ms Sheila Hillhouse, Birkenhead & Wallasey PCT		09 December 2005
Phase 8: Study 300 12 month mother and baby postnatal assessments	1	09 January 2006
GP Letter Study 1500	1	01 January 2006
GP Letter Study 300		01 January 2006
Parent Consent, Study 1500 - Phases 1, 3, 5 & 7	1	09 January 2006
Consent to contact a relative - Study 1500	1	09 January 2006
Parent Consent, Fathers, - Study 1500 - Phases 1, 3, 5 & 7	1	09 January 2006
Parent Consent - Study 300 Antenatal, perinatal - (Phases 2 & 4)	1	09 January 2006
Study 300 Parent Information Sheet 6 months (Phase 6)	1	09 January 2006
Parent Consent - Study 300, first birthday (Phase 8)	1	09 January 2006
Parent Consent - Study 300, DNA First Birthday (Phase 8)	1	09 January 2006
Phase 1: Study 1500 mother antenatal screen	1	09 January 2006
Phase 1: Study 1500 father antenatal screen	1	09 January 2006
Phase 2: Study 300 mother antenatal interview	1	09 January 2006
Phase 3: Study 1500 pregnancy/obstetric/birth outcomes	1	09 January 2006
Phase 4: Study 300 perinatal baby assessment	1	09 January 2006
Phase 5: Study 1500 6-8 week questionnaire mother	1	09 January 2006
Phase 6: Study 300 6 month postnatal assessments mother and baby	1	09 January 2006
Phase 7: Study 1500 8 month questionnaire and routine health visitor developmental check (mother)	1	09 January 2006
Phase 7: Study 1500 8 month questionnaire (father)	1	09 January 2006

#### Research governance approval

The study should not commence at any NHS site until the local Principal Investigator has obtained final research governance approval from the R&D Department for the relevant NHS care organisation.

#### Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

<b>05/Q1506/107</b> <b>Please quote this number on all correspondence</b>
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With the Committee's best wishes for the success of this project

Yours sincerely

**Mr Peter Ward**  
**Vice-Chairman**

Email: [julia.thomas@cwpcct.nhs.uk](mailto:julia.thomas@cwpcct.nhs.uk)

*Enclosures:*

*Standard approval conditions*



## National Research Ethics Service

### Cheshire Research Ethics Committee

Western Cheshire PCT  
1829 Building  
Countess of Chester Health Park  
Liverpool Road  
Chester  
CH2 1HJ

Tel: 01244 650334  
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20 July 2007

Professor Jonathan Hill  
Professor of Child and Developmental Psychiatry  
Mulberry House, Alder Hey Hospital  
Eaton Road  
LIVERPOOL  
L12 2AP

Dear Professor Hill

**Study title:** The Wirral Child Health and Development Study  
**REC reference:** 05/Q1506/107  
**Amendment number:** 1  
**Amendment date:** 31 May 07

The above amendment was reviewed at the meeting of the Sub-Committee of the REC held on 18 July 2007.

#### Ethical opinion

The members of the Committee present gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

#### Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Notice of Substantial Amendment (non-CTIMPs)	1	31 May 2007

#### Membership of the Committee

The members of the Committee who were present at the meeting are listed on the attached sheet.

This Research Ethics Committee is an advisory committee to North West Strategic Health Authority  
The National Research Ethics Service (NRES) represents the NRES Directorate within  
the National Patient Safety Agency and Research Ethics Committees in England

**R&D approval**

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

**Statement of compliance**

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

**05/Q1506/107: Please quote this number on all correspondence**

Yours sincerely



**Mr Robert Emmett  
Committee Co-ordinator**

E-mail: [rob.emmett@wcheshirepct.nhs.uk](mailto:rob.emmett@wcheshirepct.nhs.uk)

Enclosures List of names and professions of members who were present at the meeting and those who submitted written comments

**Appendix 4 – Phase 6 participant information sheet and consent form**





**Study Base:**

**The Lauries Centre, 142 Claughton Road, Birkenhead, Wirral, CH41 6EY**  
**Freephone: 0800 051 7597**  
**(from a mobile) 800 051 7597**



**Parent Information Sheet – Study 300**

**Title of study : The Wirral Child Health and Development Study**

**Investigators: Jonathan Hill, Helen Sharp, Andrew Pickles, Gill Lancaster**  
**Research Staff: Karen Lunt, Carol Bedwell, Belinda Thompson, Julie Carlisle, Kate Marks, Nichaela Broyden, Kate Marshall, Florin Tibu, Carol Sadler, Jeanette Appleton, Jo Roberts, Jenny Lee, Liz Green**

When you were pregnant, and again just after your baby was born you kindly helped us with a study that we are conducting designed to understand better how stress affects mothers to be, their partners and their babies, and how good experiences and support can make a difference. We are following 1500 women up to the first birthday of their babies mainly using questionnaires. In addition we are asking 300 to take part in interviews and to agree to us filming their babies during the first year of their life. You are one of the 300 that we would like to see again now that your baby is nearly 6 months old. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether you wish to take part. Thank you for reading this.

**What is the study about?**

The aim of the study is to find out about the effects of stress on parents and children during the antenatal period and in the first months after birth. We plan to measure each baby's development and how they interact with their mother in some detail. We believe that for some parents and children the effects are quite long lasting, and others find ways of coping. We want to understand these processes better so that services to support families experiencing stress can be improved. We are focussing on mothers for this detailed part of the study because most babies spend most time with their mother.

**Who is being invited to take part?**

The computer chooses the names of women who we approach based on the information they have given about how much stress they may be experiencing. Because we particularly want to understand about stress in pregnancy the computer is picking more women who are experiencing stress. Your name has been chosen either because you have indicated that you are dealing with quite a lot of stress or because you have said you are not facing a lot.

**Do I have to take part?**

It will be up to you to decide whether or not you would like to take part. If you agree, and change your mind later, you can withdraw from the study. This will not affect the care you receive.

**How often will I be contacted?**

Now that your baby is around 6 months old we would like you and your baby to come to our study centre for a full morning or afternoon. We will ask to see you again close to your baby's first birthday.

**What will we have to do?**

- We would like to see you and your baby at the Study Centre. You will be with your baby at all times.
- We will talk with you about your feelings and experiences since the last visit, and ask you about your baby's usual behaviour. We will audio tape part of this talk. We may ask to visit you at home to complete these assessments if it becomes easier to do so.
- We would like to make a short video (about 20 minutes) of your baby playing with you.
- We will also make a video of how your baby responds to everyday events such as watching new things, the researcher talking and playing with them, hearing a loud noise or not being allowed to play with a toy for a short time.
- We will put three patches on your baby's back or chest to record your baby's heart while we are watching your baby.
- We will gather two saliva samples from your baby by wiping a cotton swab in his/her mouth at the start of the visit to the Study Centre and once again at the end. This is completely safe and will be used to measure your baby's stress hormones.

**Will my expenses be paid?**

We will be pleased to organise transport to the interview, or to pay for your transport. We are able to pay up to £30 in vouchers to compensate you for time lost from home or work or any other expenses incurred from taking part in the study.

**How will this information be used?**

- We would like to make a video recording of your baby and you so that we go over what has happened in detail afterwards. The recording will be identified only by a number, so that information on it cannot be traced to you. The recording will be kept secure at the university base for up to ten years.
- All information that we receive from you will be treated as strictly confidential, under the guidelines of the Universities of Liverpool and Manchester, the UK Medical Research Council, and the Data Protection Act.
- Information on audio and video recordings, on paper records, and that we enter on to the computer will be identified only by a number. A list of names and addresses of participants and their case numbers will be kept separately and securely in the university base.
- We will report general findings about parents and children, and you or your child will never be identified. Reports will only be based on the ratings that we make from the interview and none of what you say will be reported.
- The only reason we might have to share information from the study with other people is if there are concerns about you or a child being at risk of serious harm. If that happens we will talk with you first to decide on the best way forward. Concerns like this would be addressed by seeking appropriate forms of help for you and following Trust Child Protection Guidelines.

**Who is organising and funding the research study?**

The study is being run by Professor Jonathan Hill of the University of Manchester and Dr Helen Sharp of the University of Liverpool. The research is funded by the Medical Research Council.

**Are there any benefits in taking part in this study?**

There are no benefits to your or your child's health in taking part in this study. However, we hope that you will feel you are contributing to medical research in a way that will help children and families in the future.

**What if something goes wrong?**

If you feel you or your child have been harmed by taking part in this research and that the researchers have been negligent or at fault, then you may be able to make a legal claim for compensation to their

employer. You might have to pay the legal costs of doing this. However, if you are harmed and the researchers are not at fault, there is no facility for you to make a claim. If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, normal University or National Health Service complaints procedures should be available to you.

**Are there any risks to myself or my child taking part in this study?**

No, there are no known or likely risks.

**Who has reviewed and approved the study?**

A team of international experts on child development has reviewed this study for the Medical Research Council. The study has been reviewed and approved by the Research & Development committees of Wirral University Teaching Hospital NHS Foundation Trust, Wirral Primary Care Trust and the Cheshire Local Research Ethics Committee.

**Can I ask further questions?**

When the researcher meets you they will be very happy to answer any questions you might have. In the meantime, if you would like any more information, please do not hesitate to contact Professor Jonathan Hill, Dr Helen Sharp, or Liz Green on the freephone number shown on the front page.



**Appendix 5 – Still-Face procedure from the WCHADS procedures manual**

### ***Still-Face procedure***

Ensure that baseline saliva sample has been taken before going into the Still-Face.

- Sit baby in high chair facing mum. Ensure there are no toys in baby's line of sight (e.g. that all toys in the box are covered up).
  - Switch quad view camera over to still-face view and zoom into baby's face (camera 5). Change camera in upper right quad over (using the black button on small box on top of dvd recorders) and change camera three to position 2 in order to capture mum's face.
- Explain to the mother that this part of the assessment will take 6 minutes in total – 2 minutes of engagement, 2 minutes still-face and the last 2 minutes re-engagement. You will have already told her at the start of phase 6 that there will be a period during which she will be required to hold her face still and not engage with her baby. Explain that you realise this can seem difficult but it is really important for us that she try her best to keep her face still for the whole two minutes if possible. During the engagement phases, mum's can interact with their babies in whichever way they would normally do at home, e.g. singing, touching, pulling faces.
- Mum then plays face-to-face with the baby for 2 minutes
- Experimenter knocks on the door to signal to the mum that she should begin the still-face.
- Mum holds her face still with a neutral facial expression for two minutes, remaining still and looking slightly above the infant's head to avoid eye contact.
- After two minutes experimenter knock on the door a second time and mum will return to normal interaction for another 2 minutes with her baby.

**Appendix 6 – The NICHD semi-structured free-play procedure,  
from the WCHADS procedures manual**

### ***Free play***

Use camcorder to record a 15 minute playful interaction between mother and infant seated in a reclining chair OR on the floor mat (if preferred by mother). The first 7 minutes will be with a toy of the mother's choice and the second 8 minutes will be a standardised set of toys provided by us. Make clear to the parent that you will need to leave the room so as not to distract the baby. Instruction would be something like 'Play as you might usually do with your baby.' Tell the mother where the camera is pointing so she doesn't move in front of it. Tell her you will knock on the door when the end of the first 7 minutes is up and she needs to change to playing with our toys in the white toy box.

Notes: The camera is placed so it gets a "near full-face view of the infant and the mother is captured in profile so that eye to eye contact can be coded.

**CHECK THE CAMERA IS ON RECORD.**

Also record this episode using the quad view cameras 2 and 6. These can be moved manually from the observation room and are useful for capturing crawling babies or if mum picks a distressed baby up and out of view of the camcorder. These can also be used to zoom in and out.



**Appendix 7 – Phase 8 participant information sheet and consent form**



**Study Base:**

The Lauries Centre, 142 Claughton  
Road, Birkenhead, Wirral, CH41 6EY

Freephone: 0800 051 7597

(from a mobile) 800 051 7597

Text: 07956 297412

**Parent Information Sheet – Study 300**

**Title of study : The Wirral Child Health and Development Study**

**Investigators: Jonathan Hill, Helen Sharp, Andrew Pickles, Gill Lancaster**

**Research Staff: Kate Marks, Florin Tibu, Kate Marshall, Melissa Bensinyor, Helen**

**Jones, Liz Green, Nicola Sandman, Alice Hulbert, Kirsty Entwistle, Gemma Culverwell, Louise Fisher, Stuart Kehl, Fay Huntley**

When you were pregnant, and again just after your baby was born you kindly helped us with a study that we are conducting designed to understand better how stress affects mothers to be, their partners and their babies, and how good experiences and support can make a difference. We are following 1500 women up to the first birthday of their babies mainly using questionnaires. In addition we are asking 300 to take part in interviews and to agree to us filming their babies during the first year of their life. You are one of the 300 that we would like to see again now that your baby is one year old.

Before you decide whether you want to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether you wish to take part. Thank you for reading this.

**What is the study about?**

The aim of the study is to find out about the effects of stress on parents and children during the antenatal period and in the first months after birth. We plan to measure each baby's development and how they interact with their mother in some detail. We believe that for some parents and children the effects are quite long lasting, and

others find ways of coping. We want to understand these processes better so that services to support families experiencing stress can be improved.

Our research team is very interested to know more about the genes that influence children's emotions and behaviours. Every child is a unique individual, and that is partly due to the genes that have been passed on from each parent. Genes are like maps inside our bodies that hold information. For example, it is well known that the colour of our eyes depends on our genes. More recently we have learnt much more about how health and behaviour are influenced by genes. This study provides an important opportunity to learn more about the ways in which genes affect the way infants behave and their ability to cope with new situations.

### **Who is being invited to take part?**

The computer chooses the names of women who we approach based on the information they have given about how much stress they may be facing. Because we particularly want to understand about stress in pregnancy the computer is picking more women who are experiencing stress. Your name has been chosen either because you have indicated that you may be dealing with quite a lot of stress or because you have said you are not facing a lot.

### **Do I have to take part?**

It will be up to you to decide whether or not you would like to take part. If you agree, and change your mind later, you can withdraw from the study. This will not affect the care you receive.

### **How often will I be contacted?**

Now that your baby is one year old we would like you and the baby to come to our study centre for about half a day. We are planning further contacts for the future and we hope we will be able to obtain funding to see you again when your baby is around two to two and a half years old.

### **What will we have to do?**

- We would like to see you and your child at the Lauries Centre for half a day.
- We will talk with you about your feelings and experiences since the last visit and audio record our conversation.
- We will ask you about your child's behaviours and emotions. For example we will ask what makes him/her anxious, or angry, or happy, and what he/she likes to do with you. We will audio record this conversation also.
- We would like to make a short video (about 15 minutes) of your baby playing with you with some toys.
- We would like to make a video of how your baby responds to everyday events such as playing with various toys, seeing an unusual character or not being allowed to play with a toy for a short time.
- We would also like to make a video of how your child responds to being separated from you. Some children find this quite hard and others are not worried by it. You will be able to see your child's response and if he or she is distressed by it you will be able to comfort him/her straight away. This experience is designed to mimic or copy natural times at home when you have to separate for a short time, for example while you go briefly into another room.

- We will put two patches on your baby's chest (just as we did when your baby was younger) to record your baby's heart during video recordings of your baby and of the separation and when he/she is with you again.
- We are also going to see whether some babies are more likely to produce the kinds of hormones that help them to deal with challenging situations. To do this, all we have to do is ask your baby to chew on a soft, cotton dental roll, which is completely safe, and will not produce any allergic reactions. This allows us to collect a sample of your baby's saliva, which can then be analysed to measure the hormones. We would like to do this four times, once before, and once after the separation from you, and once before and once after a toy play task
- We would also like to collect saliva from your baby for DNA analysis using a similar cotton swab.
- We would like to find out about your child's development by giving him/her some puzzles to solve.
- We will weigh your child and measure their height and head size.

### **Will my expenses be paid?**

We will be pleased to organise transport to the interview, or to pay for your transport. We are able to pay up to £30 to compensate you for time lost from home or work or any other expenses incurred from taking part in the study.

### **How will this information be used?**

- We would like to make a video recording of your baby and you so that we go over what has happened in detail afterwards. The recording will be identified only by a number, so that information on it cannot be traced to you. The recording will be kept secure at the university base for up to ten years.
- All information that we receive from you will be treated as strictly confidential, under the guidelines of the Universities of Liverpool and Manchester, the UK Medical Research Council, and the Data Protection Act.
- Information on audio and video recordings, and on paper records, and that we enter on to the computer will be identified only by a number. A list of names and addresses of participants and their case numbers will be kept separately and securely in the university base.
- The genetic samples will be analysed anonymously. No records will be generated that directly link your name, your partner's name, or your child's name to the genetic samples. They will only be analysed for the purpose of this study, and will never be analysed for any other purpose. We will analyse the samples for genes that affect infants' emotions and behaviour, and not for any other purpose. They will not be kept as part of your medical record. All samples will be destroyed after 20 years. The anonymous samples will be analysed by a laboratory technician who is not affiliated with the study, and will have no access to your name, your partner's name, or your child's name.
- We will report general findings about parents and children, and you or your child will never be identified. Reports will only be based on the ratings that we make from the interview and none of what you say will be reported.
- The only reason we might have to share information from the study with other people is if there are concerns about you or a child being at risk of serious harm. If that happens we will talk with you first to decide on the best

way forward. Concerns like this would be addressed by seeking appropriate forms of help for you and following Trust Child Protection Guidelines.

**Who is organising and funding the research study?**

The study is being run by Professor Jonathan Hill of the University of Manchester and Dr Helen Sharp of the University of Liverpool. The research is funded by the Medical Research Council.

**Are there any benefits in taking part in this study?**

There are no benefits to your or your child's health in taking part in this study. However, we hope that you will feel you are contributing to medical research in a way that will help children and families in the future.

**What if something goes wrong?**

If you feel you or your child have been harmed by taking part in this research and that the researchers have been negligent or at fault, then you may be able to make a legal claim for compensation to their employer. You might have to pay the legal costs of doing this. However, if you are harmed and the researchers are not at fault, there is no facility for you to make a claim. If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, normal University or National Health Service complaints procedures should be available to you.

**Are there any risks to myself or my child taking part in this study?**

No, there are no known or likely risks.

**Who has reviewed and approved the study?**

A team of international experts on child development has reviewed this study for the Medical Research Council. The study has been reviewed and approved by the Research & Development committees of Wirral University Teaching Hospital NHS Trust, Wirral Primary Care Trust, Western Cheshire PCT and the Cheshire Local Research Ethics Committee.

**Can I ask further questions?**

When the researcher meets you they will be very happy to answer any questions you might have. In the meantime, if you would like any more information, please do not hesitate to contact Professor Jonathan Hill, Dr Helen Sharp or Liz Green on the freephone number shown on the front page.



The University of Manchester



Study Base:

The Lauries Centre, 142 Claughton Road, Birkenhead, Wirral, CH41 6EY

Freephone: 0800 051 7597  
(from a mobile) 800 051 7597  
Text: 07956 297412

## RESEARCH CONSENT FORM

Title of study: Wirral Child Health and Development Study

Names of researchers: Jonathan Hill, Helen Sharp, Andrew Pickles, Gill Lancaster

1. I confirm that I have read and understand the information sheet dated ..... for the above study. I have had an opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my care or legal rights being affected.
3. I agree to my GP being notified that I am taking part in this study.
4. I agree to a video recording being made of my baby and me and an audio Recording of my interview
5. I understand that any concerns about a child being in potential danger, will be addressed in line with the Trust Child Protection Guidelines.
6. I agree to take part in the above study.
7. I give permission for WCHADS researchers to contact me directly in future to ask me to take part in further parts of the study as my child grows older.

\_\_\_\_\_  
Name of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name of person taking consent Date  
(if different from researcher)

\_\_\_\_\_  
Signature

---

Researcher	Date	Signature
1 for participant; 1 for researcher; 1 for NHS notes (if applicable)		

\*

**Appendix 8 – The Strange Situation Paradigm procedure,  
from the WCHADS procedures manual**



## Strange Situation

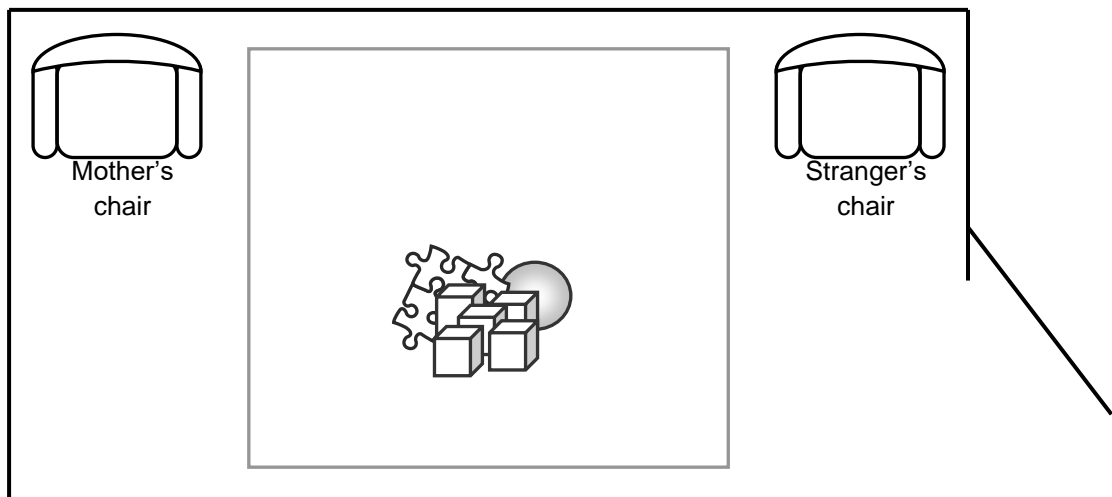
The Strange Situation consists of eight episodes presented in a standard order for all subjects, with those expected to be least stressful occurring first.

### THE PHYSICAL SITUATION

Two rooms are needed to conduct the Strange Situation: assessment room 2 and the observation room, where the mother will be able to observe her child during separations. Video recordings are made through the one-way observation window using the camcorder. Recordings are also captured from the wall-mounted cameras within the room.

The play room (assessment room 2) should be set out as pictured below.

Figure 1: Strange Situation Room Layout



There should be a chair for the stranger in one corner and a chair for the mother in the other corner. The stranger and mother should never sit in each other's chairs. In the child's area there should be

a variety of attractive toys. Think of the child's area as the apex of a triangle with the mother and the stranger located at the other two points.

## **TOYS**

Although it is likely that the toys may be duplicates of what the child has at home, it is assumed that the total array of toys will be novel enough to encourage exploration.

The toys used in the procedure are:

- Stacking rings
- Stacking cups
- Press and go giraffe
- Peg bench and hammer
- Pull toy zebra
- Chunky wooden puzzle
- Bus plus driver and passengers

## **PERSONNEL**

The Strange Situation requires the following personnel: researcher, stranger (must be a female who is unfamiliar to the child) and a camera operator. All personnel must be thoroughly familiar with the procedure.

### **a. Instructions to the Researcher**

The researcher has the responsibility of supervising the assessment. As such, they act as director for the camera operator, prompt for the stranger, and coach for the mother. The various tasks of the researcher are described below.

1. It is the researcher's responsibility that the 8 episodes are timed carefully. This should include allowing enough time to give the mother instructions between episodes.

2. It is the researcher's responsibility to provide signals (by knocking on the door or mirror) to cue both the mother and stranger.
3. It is the researcher's responsibility to coach the mother and provide reassurance throughout the episodes of the Strange Situation.
4. The researcher should decide if and when an episode is curtailed. The mother should be reminded that she can return to the room at any time if the child gets too distressed. Decisions about curtailing an episode should also reflect the mother's wishes.

#### **b. Instructions to the Stranger**

The role of the stranger is a difficult one. At times there should not be undue intervention in order to permit the infant to play, search for their mother, or display distress. At other times, as instructed in Episode 3, the stranger is instructed to approach the baby and to distract their attention away from the mother and to the toys. The stranger's behaviour is very much contingent on that of the infant's, particularly during separations.

1. The stranger's approach to the child should be gentle and non-intrusive. The stranger should avoid prolonged eye contact or face-to-face orientation, particularly if the infant is wary. Sitting side-by-side, focusing on the toys, is tolerated better by most children. When possible, the stranger should follow the child's lead in toy selection and play.
2. The stranger must be careful not to obstruct the camera's view of the child at any time and avoid being positioned between the mother and the child, particularly at the moments of reunion.

#### **c. Instructions to the Camera Operator**

The camera operator has a crucial role in the Strange Situation procedure. If the camera is not focused on the critical behaviours

as they happen, the assessment may not be codable. General guidelines for the camera operator are described below:

1. Ensure that recording is started before the mother and child enter the room
2. Be prepared for those times when children are likely to move fast, such as at the moment of reunion. It is very important to capture the moment of reunion so anticipate the need to move the camera up if the mother picks the child up. Avoid re-focusing the camera or making adjustments at the moment of reunion, in case this obscures the recording
3. Ensure that the line between the two mirrors is not in the centre of the recording or obstructing the view of the mother or child. At times this will mean moving the tripod. Ensure that the tripod is always to the right of the gap between the mirrors before the reunion. This ensures that the moment of the reunion is not obscured if the camera needs to pan to the right.
4. The wall-mounted camera over the door of the observation room 2 should always be directed towards the mother

**Appendix 9 – Phase 1 Demographic questionnaire pack**

# Wirral Child Health and Development Study



We are very grateful to you for helping us with our research. We hope to learn a great deal from your experiences and those of other women having their first baby. The questions we ask are not a test, so there are no right or wrong answers. We just want to learn as much as we can about how different experiences of pregnancy and life during pregnancy and early motherhood influence children's early development over time, starting now!

Date today? \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
(date / month / year )

Accompanied [  ]

## First, some background information about you....

- (1) How many weeks pregnant are you? \_\_\_\_\_ weeks
- (2) How old are you? \_\_\_\_\_ years
- (3) What is your date of birth? \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
(date / month / year )
- (4) How would you describe your own ETHNIC ORIGIN: (please tick the box)

Bangladeshi	<input type="checkbox"/>	Irish	<input type="checkbox"/>
Black African	<input type="checkbox"/>	Other Black	<input type="checkbox"/>
Black Caribbean	<input type="checkbox"/>	Pakistani	<input type="checkbox"/>
Chinese	<input type="checkbox"/>	Turkish/Turkish Cypriot	<input type="checkbox"/>
Greek/Greek Cypriot	<input type="checkbox"/>	White	<input type="checkbox"/>
Indian	<input type="checkbox"/>	Other	<input type="checkbox"/>

If you feel that the categories above do not accurately reflect your ethnic origin, please describe your ethnic origin below:

.....  
.....

- (5) Are you currently: (Please tick a box)
 

Married	<input type="checkbox"/>
Single	<input type="checkbox"/>
Widowed	<input type="checkbox"/>
Divorced	<input type="checkbox"/>
Separated	<input type="checkbox"/>
Cohabiting (Living with a partner)	<input type="checkbox"/>
Partner living elsewhere	<input type="checkbox"/>
Other (please describe below)	<input type="checkbox"/>

.....  
Ques Ref: [ ] [ ] [ ] [ ] [ ] [ ] [ 0 ] [ 0 ] [ 4 ]

(6) What is your postcode? [ ][ ][ ][ ][ ] [ ][ ][ ][ ]

(7) How many bedrooms do you have? [ ]

(8) What type of housing do you live in? *(Please circle one answer from the list below)*

House / Flat / Bedsit / Maisonette / Work-related accommodation /caravan / hostel /  
Student residence Or Other (please describe).....

(9) How old were you when you finished full-time education? \_\_\_\_\_ years

(10) What was your employment status when you became pregnant?

<input type="checkbox"/>	Full time paid employment	<input type="checkbox"/>	Full time education
<input type="checkbox"/>	Part time paid employment	<input type="checkbox"/>	Part time education
<input type="checkbox"/>	Self-employed	<input type="checkbox"/>	Voluntary
<input type="checkbox"/>	Unemployed	<input type="checkbox"/>	Full time education and part time work
<input type="checkbox"/>	On sick leave or disability	<input type="checkbox"/>	Other

**Appendix 10 – Global Rating Scales of Mother Infant Interaction Coding Sheet**



**GLOBAL RATINGS OF MOTHER-INFANT INTERACTION AT TWO AND FOUR MONTHS**

**MOTHER**

Warm/Positive .....	5	...	4	...	3	...	2	...	1	.....	Cold/Hostile
Accepting .....	5	...	4	...	3	...	2	...	1	.....	Rejecting
Responsive .....	5	...	4	...	3	...	2	...	1	.....	Unresponsive
Non-demanding .....	5	...	4	...	3	...	2	...	1	.....	Demanding
Sensitive .....	5	...	4	...	3	...	2	...	1	.....	Insensitive
Non-intrusive behaviour .....	5	...	4	...	3	...	2	...	1	.....	Intrusive behaviour
Non-intrusive speech .....	5	...	4	...	3	...	2	...	1	.....	Intrusive speech
Non-remote .....	5	...	4	...	3	...	2	...	1	.....	Remote
Non-silent .....	5	...	4	...	3	...	2	...	1	.....	Silent
Happy .....	5	...	4	...	3	...	2	...	1	.....	Sad
Much energy .....	5	...	4	...	3	...	2	...	1	.....	Low energy
Absorbed in infant .....	5	...	4	...	3	...	2	...	1	.....	Self-absorbed
Relaxed .....	5	...	4	...	3	...	2	...	1	.....	Tense

**ADDITIONAL RATINGS FOR 4 MONTH OLD INFANTS**

Much effort (to engage baby) ....	5	...	4	...	3	...	2	...	1	.....	No effort
Much engagement .....	5	...	4	...	3	...	2	...	1	.....	No engagement
No use of object .....	5	...	4	...	3	...	2	...	1	.....	Constant use of object

**INFANT**

Attentive to mother .....	5	...	4	...	3	...	2	...	1	.....	Avoidant
Active communication .....	5	...	4	...	3	...	2	...	1	.....	No active communication
Positive vocalisations .....	5	...	4	...	3	...	2	...	1	.....	No positive vocalisations
Engaged with environment .....	5	...	4	...	3	...	2	...	1	.....	Self absorbed
Lively .....	5	...	4	...	3	...	2	...	1	.....	Inert
Happy .....	5	...	4	...	3	...	2	...	1	.....	Distressed
Non-fretful .....	5	...	4	...	3	...	2	...	1	.....	Fretful

**INTERACTION**

Smooth/Easy .....	5	...	4	...	3	...	2	...	1	.....	Difficult
-------------------	---	-----	---	-----	---	-----	---	-----	---	-------	-----------

Fun .....	5 ...	4 ...	3 ...	2 ...	1 ...	..... Serious
Mutually satisfying .....	5 ...	4 ...	3 ...	2 ...	1 ...	..... Unsatisfying
Much engagement .....	5 ...	4 ...	3 ...	2 ...	1 ...	..... No engagement
Excited engagement .....	5 ...	4 ...	3 ...	2 ...	1 ...	..... Quiet engagement

---

**Appendix 11 – Infant Behaviour Questionnaire-Revised (IBQ-R)**

# Wirral Child Health and Development Study

MANCHESTER  
1824



UNIVERSITY OF  
**LIVERPOOL**

Date today?     /    /      
(date / month / year )

Now your baby has reached 6 months of age we would like to ask you about how you are feeling and what your baby is like in some detail. Each baby is very different so we want to learn from you about your baby’s development in these early months of his or her life. We are very grateful to you for helping us with our research. The questions we ask are not a test, so there are no right or wrong answers. We will start with questions about your baby and then return to how you have been feeling.

## Infant Behaviour Questionnaire

Today’s Date: [ ][ ]/[ ][ ]/[ ][ ]  
                  day / month / year

### INSTRUCTIONS:

Please read carefully before starting:

As you read each description of the baby’s behaviour over the page, please indicate how often YOUR 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 behaviour described during the last week.

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

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 behaviour 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 every item.

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

### Feeding

During feeding, how often did the baby:

- 1 2 3 4 5 6 7 X . . . (1) lie or sit quietly?  
1 2 3 4 5 6 7 X . . . (2) squirm or kick?  
1 2 3 4 5 6 7 X . . . (3) wave arms?  
1 2 3 4 5 6 7 X . . . (4) notice lumpy texture in food (e.g., oatmeal)?

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

- 1 2 3 4 5 6 7 X . . . (5) seem to enjoy the closeness?  
1 2 3 4 5 6 7 X . . . (6) snuggle even after she was done?  
1 2 3 4 5 6 7 X . . . (7) seem eager to get away as soon as the feeding was over?

How often did your baby make talking sounds:

- 1 2 3 4 5 6 7 X . . . (8) while waiting in a high chair for food?  
1 2 3 4 5 6 7 X . . . (9) when s/he was ready for more food?  
1 2 3 4 5 6 7 X . . . (10) when s/he has had enough to eat?

### Sleeping

Before falling asleep at night during the last week, how often did the baby:

- 1 2 3 4 5 6 7 X . . . (11) show no fussing or crying?

During sleep, how often did the baby:

- 1 2 3 4 5 6 7 X . . . (12) toss about in the cot?  
1 2 3 4 5 6 7 X . . . (13) move from the middle to the end of the cot?  
1 2 3 4 5 6 7 X . . . (14) sleep in one position only?

After sleeping, how often did the baby:

- 1 2 3 4 5 6 7 X . . . (15) fuss or cry immediately?  
1 2 3 4 5 6 7 X . . . (16) play quietly in the cot?  
1 2 3 4 5 6 7 X . . . (17) cry if someone doesn't come within a few minutes?

How often did the baby:

- 1 2 3 4 5 6 7 X . . . (18) seem angry (crying and fussing) when you left her/him in the cot?  
1 2 3 4 5 6 7 X . . . (19) seem contented when left in the cot?  
1 2 3 4 5 6 7 X . . . (20) cry or fuss before going to sleep for naps?

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

When going to sleep at night, how often did your baby:

1 2 3 4 5 6 7 X . . . . (21) fall asleep within 10 minutes?

1 2 3 4 5 6 7 X . . . . (22) have a hard time settling down to sleep?

1 2 3 4 5 6 7 X . . . . (23) settle down to sleep easily?

When your baby awoke at night, how often did s/he:

1 2 3 4 5 6 7 X . . . . (24) have a hard time going back to sleep?

1 2 3 4 5 6 7 X . . . . (25) go back to sleep immediately?

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

1 2 3 4 5 6 7 X . . . . (26) stay awake for a long time?

1 2 3 4 5 6 7 X . . . . (27) go to sleep immediately?

1 2 3 4 5 6 7 X . . . . (28) settle down quickly?

1 2 3 4 5 6 7 X . . . . (29) have a hard time settling down?

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

1 2 3 4 5 6 7 X . . . . (30) whimper or sob?

1 2 3 4 5 6 7 X . . . . (31) become tearful?

### **Bathing and Dressing**

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

1 2 3 4 5 6 7 X . . . . (32) wave her/his arms and kick?

1 2 3 4 5 6 7 X . . . . (33) squirm and/or try to roll away?

1 2 3 4 5 6 7 X . . . . (34) smile or laugh?

1 2 3 4 5 6 7 X . . . . (35) coo or vocalize (makes noises)?

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

1 2 3 4 5 6 7 X . . . . (36) smile?

1 2 3 4 5 6 7 X . . . . (37) laugh?

1 2 3 4 5 6 7 X . . . . (38) splash or kick?

1 2 3 4 5 6 7 X . . . . (39) turn body and/or squirm?

When face was washed, how often did the baby:

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

1 2 3 4 5 6 7 X . . . . (41) fuss or cry?

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

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

When hair was washed, how often did the baby:

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

1 2 3 4 5 6 7 X . . . . (44) fuss or cry?

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

### Play

How often during the last week did the baby:

1 2 3 4 5 6 7 X . . . . (46) look at pictures in books and/or magazines for 2-5 minutes at a time?

1 2 3 4 5 6 7 X . . . . (47) look at pictures in books and/or magazines for 5 minutes or longer at a time?

1 2 3 4 5 6 7 X . . . . (48) stare at a mobile, cot bumper or picture for 5 minutes or longer?

1 2 3 4 5 6 7 X . . . . (49) play with one toy or object for 5-10 minutes?

1 2 3 4 5 6 7 X . . . . (50) play with one toy or object for 10 minutes or longer?

1 2 3 4 5 6 7 X . . . . (51) spend time just looking at playthings?

1 2 3 4 5 6 7 X . . . . (52) repeat the same sounds over and over again?

1 2 3 4 5 6 7 X . . . . (53) laugh aloud in play?

1 2 3 4 5 6 7 X . . . . (54) 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 . . . . (55) pay attention to your reading during most of the story when looking at picture books?

1 2 3 4 5 6 7 X . . . . (56) smile or laugh after accomplishing something (e.g., grasping something etc.)?

1 2 3 4 5 6 7 X . . . . (57) smile or laugh when given a toy?

1 2 3 4 5 6 7 X . . . . (58) smile or laugh when tickled?

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

How often during the last week did the baby **enjoy**?

- 1 2 3 4 5 6 7 X . . . (59) being sung to?  
1 2 3 4 5 6 7 X . . . (60) being read to?  
1 2 3 4 5 6 7 X . . . (61) hearing the sound of words, as in nursery rhymes?  
1 2 3 4 5 6 7 X . . . (62) looking at picture books?  
1 2 3 4 5 6 7 X . . . (63) gentle rhythmic activities, such as rocking or swaying?  
1 2 3 4 5 6 7 X . . . (64) lying quietly and examining his/her fingers or toes?  
1 2 3 4 5 6 7 X . . . (65) being tickled by you or someone else in your family?  
1 2 3 4 5 6 7 X . . . (66) being involved in very lively play?  
1 2 3 4 5 6 7 X . . . (67) watching while you, or another adult, playfully made faces?  
1 2 3 4 5 6 7 X . . . (68) touching or lying next to stuffed animals?  
1 2 3 4 5 6 7 X . . . (69) the feel of soft blankets ?  
1 2 3 4 5 6 7 X . . . (70) being rolled up in a warm blanket?  
1 2 3 4 5 6 7 X . . . (71) listening to a musical toy in a cot?

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

- 1 2 3 4 5 6 7 X . . . (72) show pleasure?  
1 2 3 4 5 6 7 X . . . (73) enjoy lying in the cot for more than 5 minutes?  
1 2 3 4 5 6 7 X . . . (74) enjoy lying in the cot for more than 10 minutes?

When something the baby was playing with had to be removed, how often did s/he:

- 1 2 3 4 5 6 7 X . . . (75) cry or show distress for a time?  
1 2 3 4 5 6 7 X . . . (76) seem not bothered?

When tossed around playfully how often did the baby:

- 1 2 3 4 5 6 7 X . . . (77) smile?  
1 2 3 4 5 6 7 X . . . (78) laugh?

During a peekaboo game, how often did the baby:

- 1 2 3 4 5 6 7 X . . . (79) smile?  
1 2 3 4 5 6 7 X . . . (80) laugh?

How often did your baby enjoy bouncing up and down:

- 1 2 3 4 5 6 7 X . . . (81) while on your lap?  
1 2 3 4 5 6 7 X . . . (82) on an object, such as a bed, bouncer chair, or toy?

How often did the infant look up from playing:

- 1 2 3 4 5 6 7 X . . . (83) when the telephone rang?  
1 2 3 4 5 6 7 X . . . (84) when s/he heard voices in the next room?

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

- 1 2 3 4 5 6 7 X . . . (85) get very excited about getting it?  
1 2 3 4 5 6 7 X . . . (86) immediately go after it?



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

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

- 1 2 3 4 5 6 7 X . . . . (87) get very excited about getting it?  
 1 2 3 4 5 6 7 X . . . . (88) immediately go after it?  
 1 2 3 4 5 6 7 X . . . . (89) seem not to get very excited about it?

**Daily Activities**

How often during the last week did the baby:

- 1 2 3 4 5 6 7 X . . . . (90) cry or show distress at a change in parents' appearance, (glasses off, with hat on, etc.)?  
 1 2 3 4 5 6 7 X . . . . (91) when in a position to see the television set, look at it for 2 to 5 minutes at a time?

How often during the last week did the baby:

- 1 2 3 4 5 6 7 X . . . . (92) when in a position to see the television set, look at it for 5 minutes or longer?  
 1 2 3 4 5 6 7 X . . . . (93) protest being placed in a confining place (infant seat, play pen, car seat, etc.)?  
 1 2 3 4 5 6 7 X . . . . (94) startle at a sudden change in body position (for example, when moved suddenly)?  
 1 2 3 4 5 6 7 X . . . . (95) appear to listen to even very quiet sounds?  
 1 2 3 4 5 6 7 X . . . . (96) attend to sights or sounds when outdoors (for example, wind chimes or traffic noise)?  
 1 2 3 4 5 6 7 X . . . . (97) move quickly toward new objects?  
 1 2 3 4 5 6 7 X . . . . (98) show a strong desire for something s/he wanted?  
 1 2 3 4 5 6 7 X . . . . (99) startle to a loud or sudden noise?  
 1 2 3 4 5 6 7 X . . . . (100) look at children playing in the park or on the playground for 5 minutes or longer?  
 1 2 3 4 5 6 7 X . . . . (101) watch adults performing household activities (e.g., cooking, etc.) for more than 5 minutes?  
 1 2 3 4 5 6 7 X . . . . (102) squeal or shout when excited?  
 1 2 3 4 5 6 7 X . . . . (103) imitate the sounds you made?  
 1 2 3 4 5 6 7 X . . . . (104) seem excited when you or other adults acted in an excited manner around him/her?

When being held, how often did the baby:

- 1 2 3 4 5 6 7 X . . . . (105) pull away or kick?  
 1 2 3 4 5 6 7 X . . . . (106) seem to enjoy him/herself?  
 1 2 3 4 5 6 7 X . . . . (107) mold to your body?  
 1 2 3 4 5 6 7 X . . . . (108) squirm?

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

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

- 1 2 3 4 5 6 7 X . . . . (109) fuss or protest?  
 1 2 3 4 5 6 7 X . . . . (110) smile or laugh?  
 1 2 3 4 5 6 7 X . . . . (111) wave arms and kick?  
 1 2 3 4 5 6 7 X . . . . (112) squirm and/or turn his/her body?

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

- 1 2 3 4 5 6 7 X . . . . (113) become upset when s/he could not get what s/he wanted?  
 1 2 3 4 5 6 7 X . . . . (114) 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 . . . . (115) wave arms and kick?  
 1 2 3 4 5 6 7 X . . . . (116) squirm and turn body?  
 1 2 3 4 5 6 7 X . . . . (117) lie or sit quietly?  
 1 2 3 4 5 6 7 X . . . . (118) show distress at first; then quiet down?

When frustrated with something, how often did your baby:

- 1 2 3 4 5 6 7 X . . . . (119) calm down within 5 minutes?

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

- 1 2 3 4 5 6 7 X . . . . (120) stay upset for up to 10 minutes or longer?  
 1 2 3 4 5 6 7 X . . . . (121) stay upset for up to 20 minutes or longer?  
 1 2 3 4 5 6 7 X . . . . (122) soothe her/himself with other things (such as a stuffed  
 animal, or blanket)?

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

- 1 2 3 4 5 6 7 X . . . . (123) seem to enjoy her/himself?  
 1 2 3 4 5 6 7 X . . . . (124) seemed eager to get away?  
 1 2 3 4 5 6 7 X . . . . (125) make protesting noises?

When reuniting after having been away during the last week how often did the baby:

- 1 2 3 4 5 6 7 X . . . . (126) seem to enjoy being held?  
 1 2 3 4 5 6 7 X . . . . (127) show interest in being close, but resisted being held?  
 1 2 3 4 5 6 7 X . . . . (128) show distress at being held?

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

- 1 2 3 4 5 6 7 X . . . . (129) seem to enjoy him/herself?  
 1 2 3 4 5 6 7 X . . . . (130) push against you until put down?

While sitting in your lap:

- 1 2 3 4 5 6 7 X . . . . (131) how often did your baby seem to enjoy her/himself?  
 1 2 3 4 5 6 7 X . . . . (132) how often would the baby not be content without moving  
 around?

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

How often did your baby notice:

- 1 2 3 4 5 6 7 X . . . . (133) low-pitched noises, washing machine, heating system, or refrigerator running or starting up?  
 1 2 3 4 5 6 7 X . . . . (134) sirens from fire trucks or ambulances at a distance?  
 1 2 3 4 5 6 7 X . . . . (135) a change in room temperature?  
 1 2 3 4 5 6 7 X . . . . (136) a change in light when a cloud passed over the sun?  
 1 2 3 4 5 6 7 X . . . . (137) sound of an airplane passing overhead?  
 1 2 3 4 5 6 7 X . . . . (138) a bird or a squirrel up in a tree?  
 1 2 3 4 5 6 7 X . . . . (139) fabrics with scratchy texture (e.g., wool)?

When tired, how often was your baby:

- 1 2 3 4 5 6 7 X . . . . (140) likely to cry?  
 1 2 3 4 5 6 7 X . . . . (141) show distress?

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

- 1 2 3 4 5 6 7 X . . . . (142) become tearful?  
 1 2 3 4 5 6 7 X . . . . (143) show distress?

For no apparent reason, how often did your baby:

- 1 2 3 4 5 6 7 X . . . . (144) appear sad?  
 1 2 3 4 5 6 7 X . . . . (145) seem unresponsive?

How often did your baby make talking sounds when:

- 1 2 3 4 5 6 7 X . . . . (146) riding in a car?  
 1 2 3 4 5 6 7 X . . . . (147) riding in a shopping cart?  
 1 2 3 4 5 6 7 X . . . . (148) you talked to her/him?

**OVER THE PAST TWO WEEKS**

When you returned from having been away and the baby was awake, how often did s/he:

- 1 2 3 4 5 6 7 X . . . . (149) smile or laugh?

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

- 1 2 3 4 5 6 7 X . . . . (150) cling to a parent?  
 1 2 3 4 5 6 7 X . . . . (151) refuse to go to the unfamiliar person?  
 1 2 3 4 5 6 7 X . . . . (152) hang back from the adult?  
 1 2 3 4 5 6 7 X . . . . (153) never “warm up” to the unfamiliar adult?

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

- 1 2 3 4 5 6 7 X . . . . (154) cling to a parent?  
 1 2 3 4 5 6 7 X . . . . (155) cry?  
 1 2 3 4 5 6 7 X . . . . (156) continue to be upset for 10 minutes or longer?

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

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

- 1 2 3 4 5 6 7 X . . . . (157) show distress for the first few minutes?  
 1 2 3 4 5 6 7 X . . . . (158) continue to be upset for 10 minutes or more?  
 1 2 3 4 5 6 7 X . . . . (159) get excited about exploring new surroundings?  
 1 2 3 4 5 6 7 X . . . . (160) move about actively when s/he is exploring new surroundings?

When introduced to a dog or cat, how often did the baby:

- 1 2 3 4 5 6 7 X . . . . . (160A) cry or show distress?

When your baby was approached by an unfamiliar person when you and s/he were out (for example, shopping), how often did the baby:

- 1 2 3 4 5 6 7 X . . . . (161) show distress?  
 1 2 3 4 5 6 7 X . . . . (162) cry?

When an unfamiliar adult came to your home or flat, how often did your baby:

- 1 2 3 4 5 6 7 X . . . . (163) allow her/himself to be picked up without protest?  
 1 2 3 4 5 6 7 X . . . . (164) cry when the visitor attempted to pick her/him up?

When in a crowd of people, how often did the baby:

- 1 2 3 4 5 6 7 X . . . . (165) seem to enjoy him/herself?

Did the baby seem sad when:

- 1 2 3 4 5 6 7 X . . . . (166) caregiver is gone for an unusually long period of time?  
 1 2 3 4 5 6 7 X . . . . (167) left alone/unattended in a cot or a playpen for an extended period of time?

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 . . . . (168) become sad?  
 1 2 3 4 5 6 7 X . . . . (169) cry?

When your baby saw another baby crying, how often did s/he:

- 1 2 3 4 5 6 7 X . . . . (170) become tearful?  
 1 2 3 4 5 6 7 X . . . . (171) show distress?

When familiar relatives/friends came to visit, how often did your baby:

- 1 2 3 4 5 6 7 X . . . . (172) get excited?  
 1 2 3 4 5 6 7 X . . . . (173) seem indifferent?

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

### Soothing Techniques

Have you tried any of the following soothing techniques in the last two weeks? If so, how quickly did your baby soothe using each of these techniques? Circle (X) if you did not try the technique during the LAST TWO WEEKS.

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

1 2 3 4 5 6 7 X . . . . (174) soothe immediately?

1 2 3 4 5 6 7 X . . . . (175) not soothe immediately, but in the first two minutes?

1 2 3 4 5 6 7 X . . . . (176) take more than 10 minutes to soothe?

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

1 2 3 4 5 6 7 X . . . . (177) soothe immediately?

1 2 3 4 5 6 7 X . . . . (178) not soothe immediately, but in the first two minutes?

1 2 3 4 5 6 7 X . . . . (179) take more than 10 minutes to soothe?

When walking with the baby, how often did s/he:

1 2 3 4 5 6 7 X . . . . (180) soothe immediately?

1 2 3 4 5 6 7 X . . . . (181) not soothe immediately, but in the first two minutes?

1 2 3 4 5 6 7 X . . . . (182) take more than 10 minutes to soothe?

When giving him/her a toy, how often did the baby:

1 2 3 4 5 6 7 X . . . . (183) soothe immediately?

1 2 3 4 5 6 7 X . . . . (184) not soothe immediately, but in the first two minutes?

1 2 3 4 5 6 7 X . . . . (185) 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 . . . . (186) soothe immediately?

1 2 3 4 5 6 7 X . . . . (187) not soothe immediately, but in the first two minutes?

1 2 3 4 5 6 7 X . . . . (188) 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 . . . . (189) soothe immediately?

1 2 3 4 5 6 7 X . . . . (190) not soothe immediately, but in the first two minutes?

1 2 3 4 5 6 7 X . . . . (191) take more than 10 minutes to soothe?

When giving the baby a dummy, how often did s/he:

1 2 3 4 5 6 7 X . . . . (192) soothe immediately?

1 2 3 4 5 6 7 X . . . . (193) not soothe immediately, but in the first two minutes?

1 2 3 4 5 6 7 X . . . . (194) take more than 10 minutes to soothe?

**We would very much like to thank you for your time and help.**



## **Appendix 12 – Conflict Tactics Scales (CTS)**

**At one or more of the time periods while you were pregnant did you:**

**Please tick if applicable (✓)**

		NO	Yes during pregnancy		
		Not during pregnancy	1 – 12 weeks	13 – 24 weeks	25 – 40 weeks
1	Physically twisted your partner's arm				
2	Pushed, grabbed or shoved your partner				
3	Slapped your partner				
4	Physically forced sex on your partner				
5	Shaken your partner				
6	Thrown or tried to throw your partner bodily				
7	Thrown an object at your partner				
8	Choked or strangled your partner				
9	Kicked, bitten, or hit your partner with a fist				
10	Hit or tried to hit your partner with something				
11	Beaten your partner up				
12	Threatened your partner with a knife or gun				
13	Used a knife or gun on your partner				

**At one or more of the time periods while you were pregnant did your partner:**

**Please tick if applicable (✓)**

		NO	Yes during pregnancy		
		Not during pregnancy	1 – 12 weeks	13 – 24 weeks	25 – 40 weeks
1	Physically twisted your arm				
2	Pushed, grabbed or shoved you				
3	Slapped you				
4	Physically forced sex on you				
5	Shaken you				
6	Thrown or tried to throw you bodily				
7	Thrown an object at you				
8	Choked or strangled you				
9	Kicked, bitten, or hit you with a fist				
10	Hit or tried to hit you with something				
11	Beaten you up				
12	Threatened you with a knife or gun				
13	Used a knife or gun on you				

**At one or more of the time periods below since your baby was born did you:**

**Please tick if applicable (✓)**

		NO	YES since my baby was born	
		Not since my baby was born	Birth – 6 months	6 months – now
1	Physically twisted your partner's arm			
2	Pushed, grabbed or shoved your partner			
3	Slapped your partner			
4	Physically forced sex on your partner			
5	Shaken your partner			
6	Thrown or tried to throw your partner bodily			
7	Thrown an object at your partner			
8	Choked or strangled your partner			
9	Kicked, bitten, or hit your partner with a fist			
10	Hit or tried to hit your partner with something			
11	Beaten your partner up			
12	Threatened your partner with a knife or gun			
13	Used a knife or gun on your partner			

**At one or more of the time periods below, since your baby was born has your partner:**

**Please tick if applicable (✓)**

		NO	YES since my baby was born	
		Not since my baby was born	Birth – 6 months	6 months – now
1	Physically twisted your arm			
2	Pushed, grabbed or shoved you			
3	Slapped you			
4	Physically forced sex on you			
5	Shaken you			
6	Thrown or tried to throw you bodily			
7	Thrown an object at you			
8	Choked or strangled you			
9	Kicked, bitten, or hit you with a fist			
10	Hit or tried to hit you with something			
11	Beaten you up			
12	Threatened you with a knife or gun			
13	Used a knife or gun on you			



**Appendix 13 – Partner Conflict Calendar (PCC)**

PCC

**I am now going to ask you a little about some more specific life events that can occur within relationships. We all know relationships can be stressful at times, and these are the sorts of incidents I am referring to.**

**As with the life events I have just asked you about, for now all we are doing is timing on the LHC when and if these events have happened, they may be discussed in more detail later in the interview**

**I am now going to ask you about possible periods when you or your partner, or ex partners, may have reacted physically to one another during the last 5 years and your pregnancy.**

**In the past 5 years and during your pregnancy have any of the following incidents occurred between you and your partner?**

Show violence flash card.

If yes,

**Could you tell me any months in which any of these incidents occurred?**

Prompt using events recorded on life history calendar (LHC).

Once all months are recorded, the following questions are asked for each month:

**How many times did the incidents on this card occur during each of the months we have just highlighted on the calendar?**

Record on LHC

**Did you, your partner or your ex-partner receive any of the following injuries during any of months we have highlighted on the calendar?**

If yes:

**Can you tell me which months?**

Show injury flashcard and record on LHC

**Did you, your partner or your ex-partner receive any of the following treatment during any of the months we have highlighted?**

If yes:

**Can you tell me which months?**

Show treatment flashcard and record on LHC

**Were you, your partner or your ex-partner under the influence of alcohol or drugs during these incident(s)?**

Record on LHC for each month

**Were any of the following agencies involved during these incident(s)?**

Show help-seeking flashcard and record on LHC.

**Repeat questions for all months where violence occurred.**

**People often assume these sorts of things only happen to women, and forget this can also happen to the man in a relationship. During the incidents we have just spoken about, were there any times when it was your partner or ex-partner who was injured, received treatment or got help from an agency?**

**ONLY MOVE ONTO FOLLOWING QUESTIONS IF ANSWERS 'YES'**

**So, during any of the months we have discussed, did your partner or ex-partner receive any of these injuries (show flashcard)**

If yes – **Which months?**

Record 'P' on LHC for months referring to

**During any of the months we have discussed did your partner or ex-partner receive any of these treatments (show flashcard)**

If yes – **Which months?**

Record 'P' on LHC for months referring to

**During any of the months we have discussed was your partner or ex-partner under the influence of alcohol or drugs when the incident occurred?**

If yes – **Which months?**

Record on LHC

**During any of the months we have discussed did your partner or ex-partner involve any of these agencies? (show flashcard)**

**If yes – Which ones?**

Record 'P' on LHC for months referring to

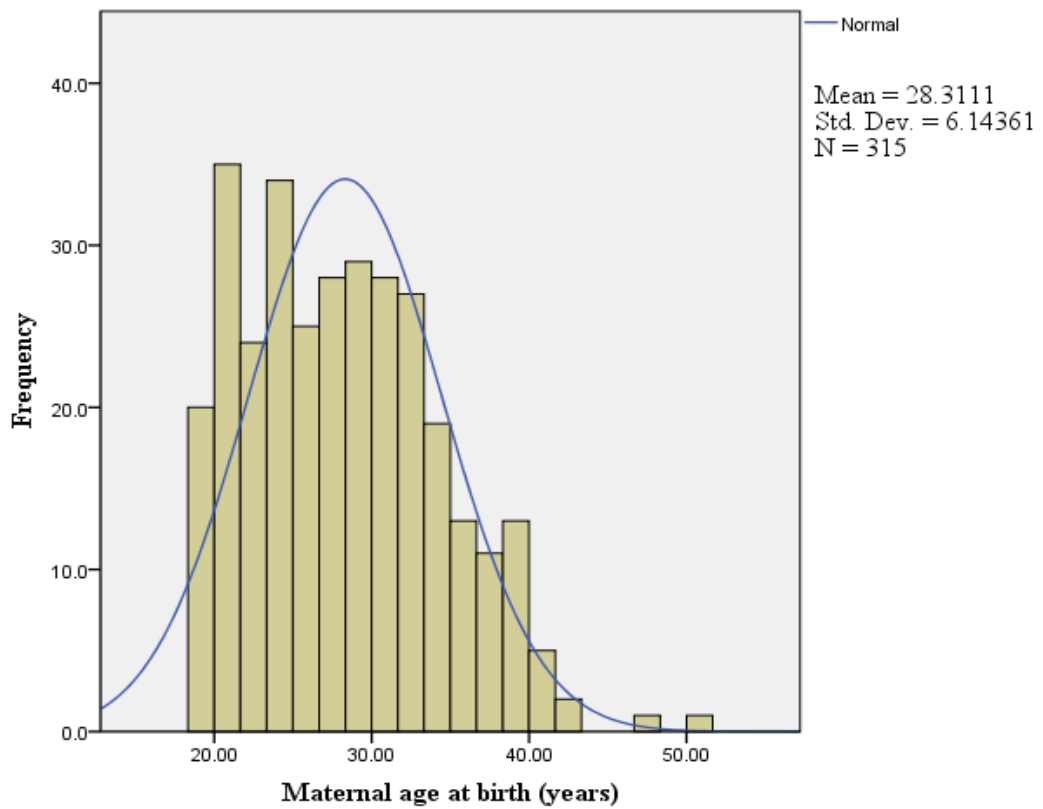
**Appendix 14 – Skewness and kurtosis data and histograms showing distributions of raw and transformed variables for those that were not normally distributed**

### Variable distribution properties pre and post transformations

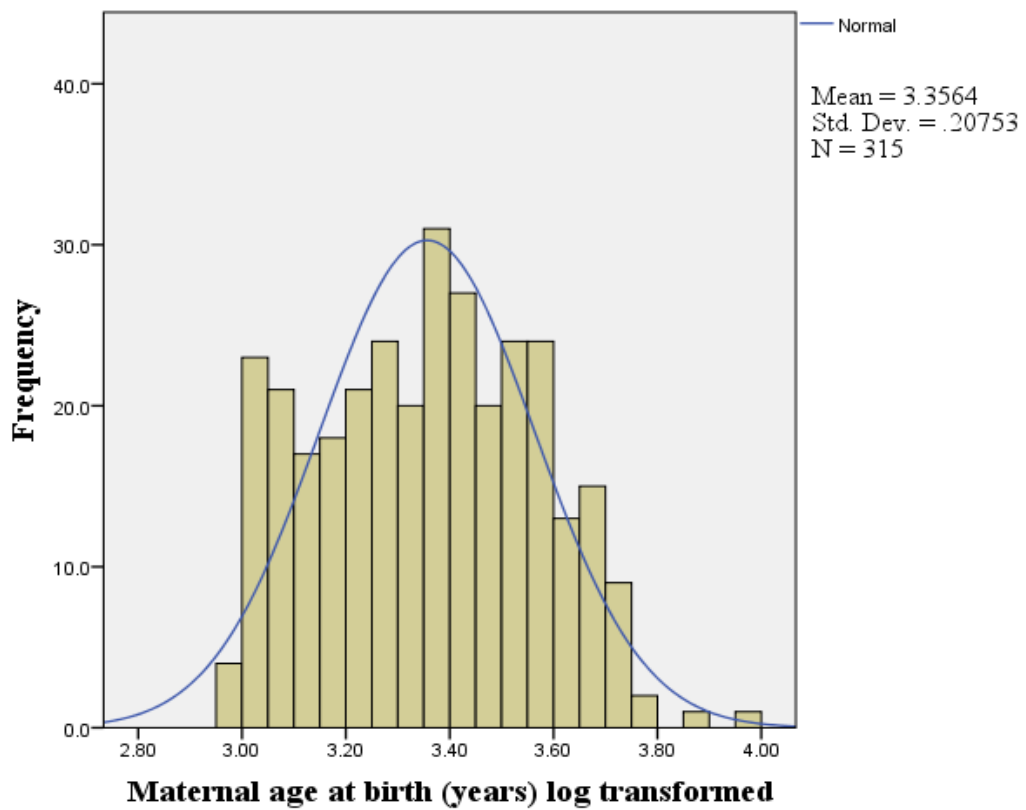
Variable	Raw scores		Transformed scores	
	Skewness	Kurtosis	Skewness	Kurtosis
	(SE)	(SE)	(SE)	(SE)
Maternal age at birth (N = 315)	0.493	-0.185	0.085	-0.800
LN(variable +1)	(.137)	(.274)	(.137)	(.274)
Maternal age at antenatal booking	0.563	-0.223	0.179	-.881
LN(variable)	(.104)	(.207)	(.104)	(.207)
Attentive-Avoidant scores in the still-face episode	0.391	0.163	-0.213	-0.606
LN(variable)	(.163)	(.324)	(.163)	(.324)
Happy-Distressed scores in the Still-Face reunion	-0.442	-0.310	-0.044	-0.319
SQRT(5+1-variable)	(.176)	(.350)	(.163)	(.324)
Maternal sensitivity in the Still- Face engagement	-0.339	-0.311	-0.086	-0.569
SQRT(5+1-variable)	(.163)	(.077)	(.163)	(.324)
Maternal sensitivity in the Still- Face reunion episode	-0.651	0.54	-0.261	-0.643
LN(5+1-variable)	(.163)	(.324)	(.163)	(.324)

Variable	Raw scores		Transformed scores	
	Skewness	Kurtosis	Skewness	Kurtosis
	(SE)	(SE)	(SE)	(SE)
Maternal sensitivity in the NICHD LN(5+1-variable)	-0.400 (.164)	-0.740 (.327)	-0.243 (.164)	-1.089 (.327)
Phase 6 EPDS scores LN(variable + 2)	1.313 (.176)	2.326 (.350)	-0.172 (.164)	-0.665 (.327)
Negative Affectivity scores from the IBQ-R LN(variable)	0.544 (.176)	0.871 (.350)	-0.283 (.199)	0.123 (.396)
Phase 8 EPDS scores LN(variable + 1.5)	1.116 (.176)	1.259 (.350)	-0.285 (.167)	-.876 (.333)
Phase 6 infant age LG10(variable - 4.5)	1.273 (.176)	3.409 (.350)	0.141 (.163)	0.602 (.324)
Phase 6 mother age LN(variable)	0.490 (.176)	-0.046 (.350)	0.036 (.163)	-0.713 (.324)
Ph8 mother age LN(variable)	0.481 (.176)	-0.080 (.350)	0.043 (.199)	-0.813 (.396)
Ph8 infant age LG10(variable - 10)	1.069 (.176)	0.765 (.350)	0.278 (.163)	0.072 (.324)

**1a. Maternal age at birth in years for the intensive sample**

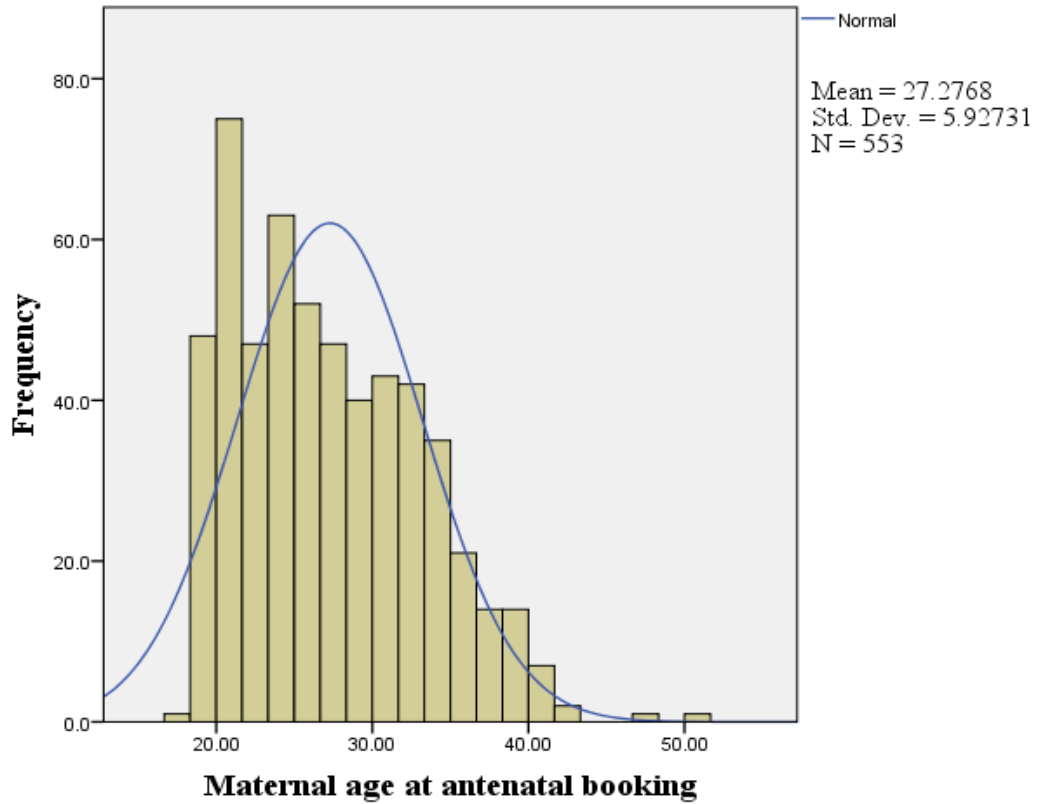


**1b. Maternal age at birth in years for the intensive sample log transformed**

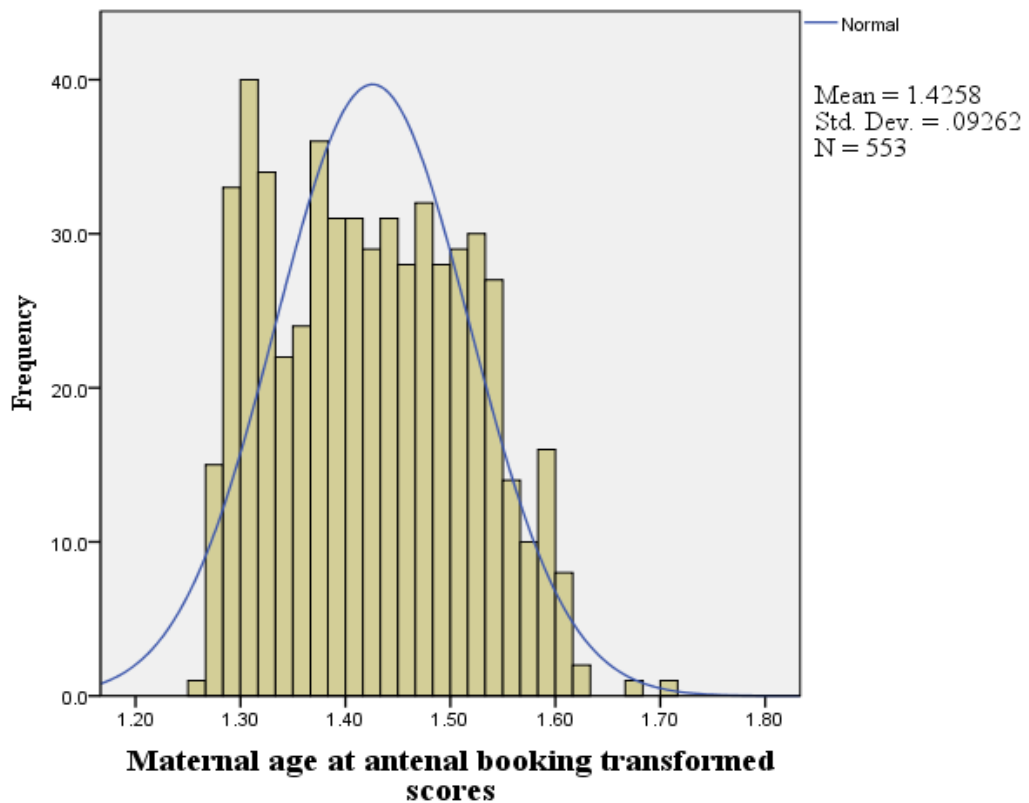




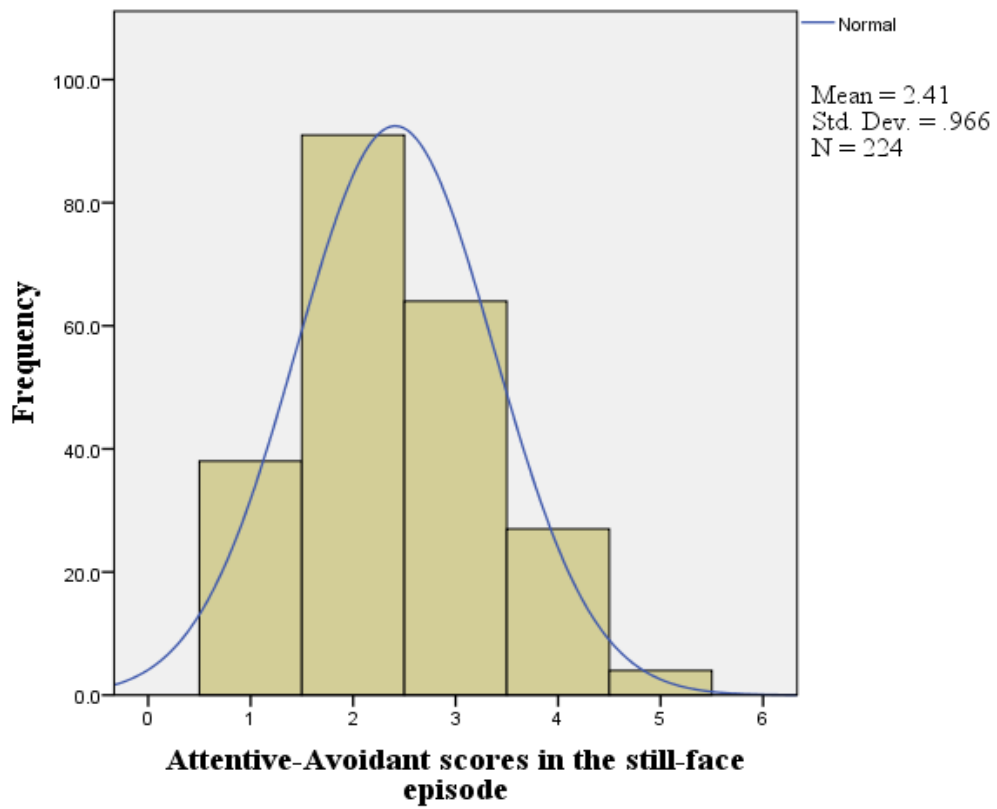
## 2a. Maternal age at antenatal booking appointment



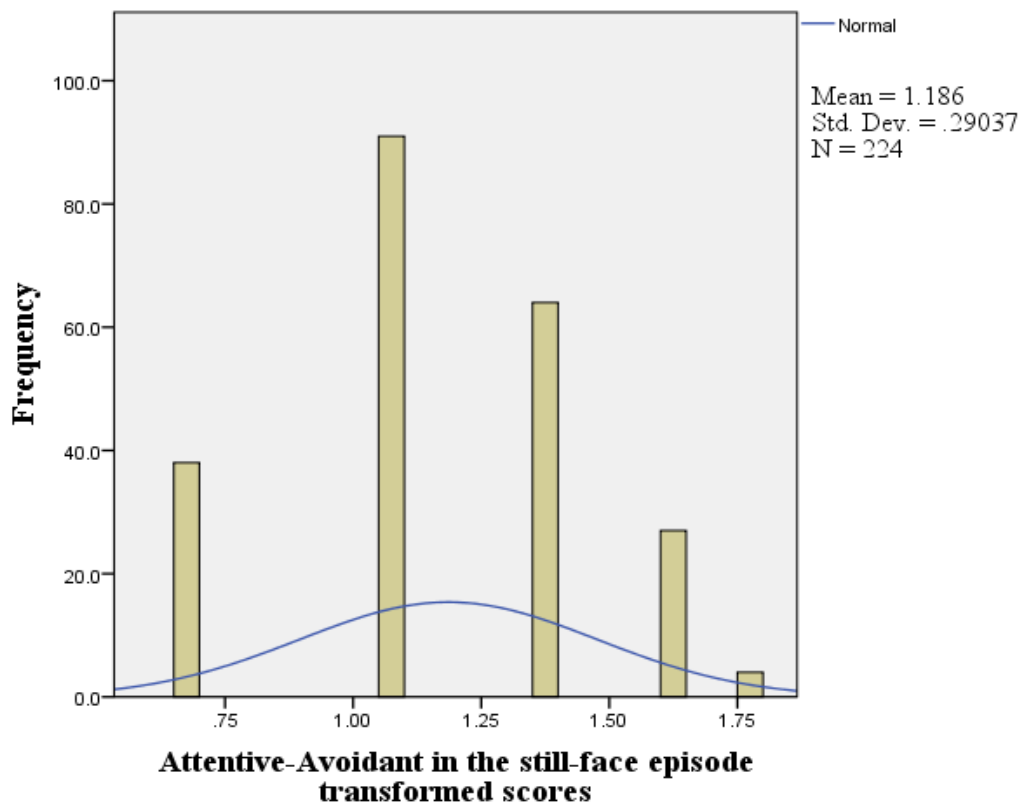
## 2b. Maternal age at antenatal booking appointment transformed



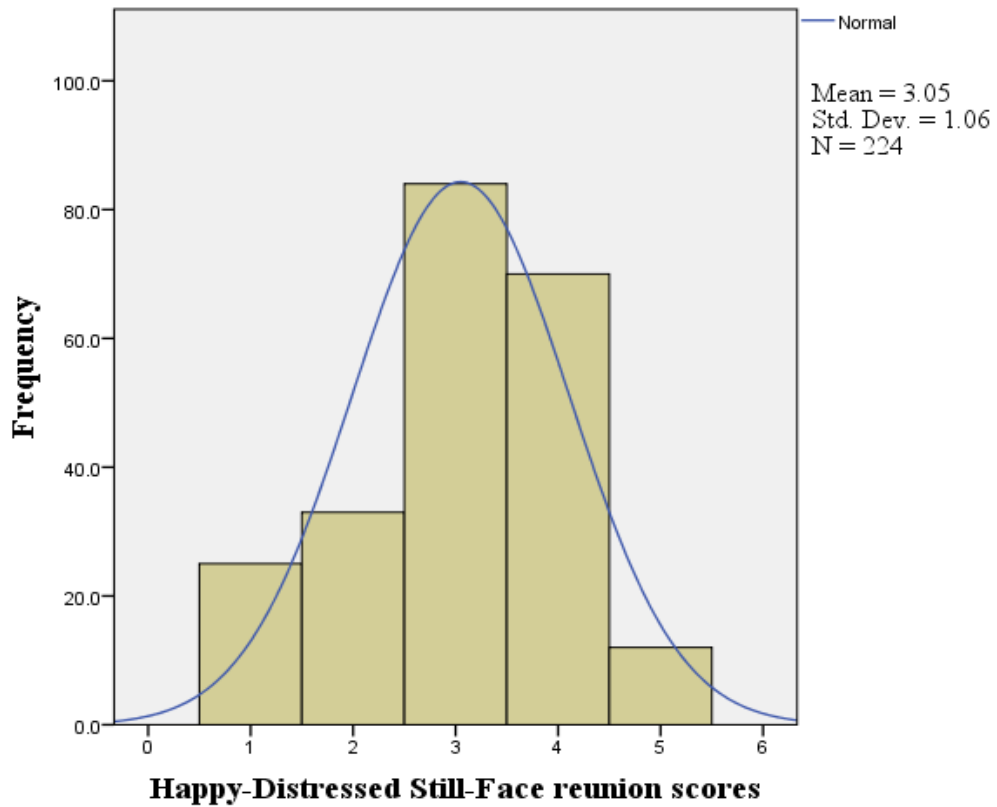
### 3a. Attentive-Avoidant scores in the still-face episode



### 3b. Attentive-Avoidant in the Still-Face scores transformed



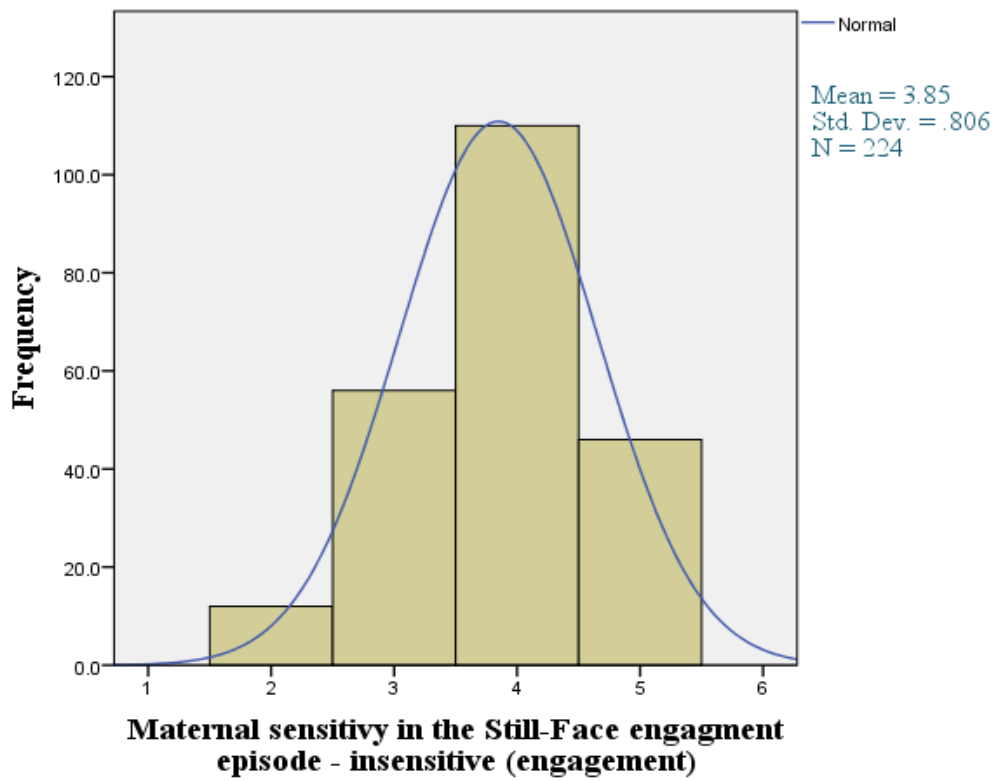
#### 4a. Happy-Distressed Still-Face reunion scores



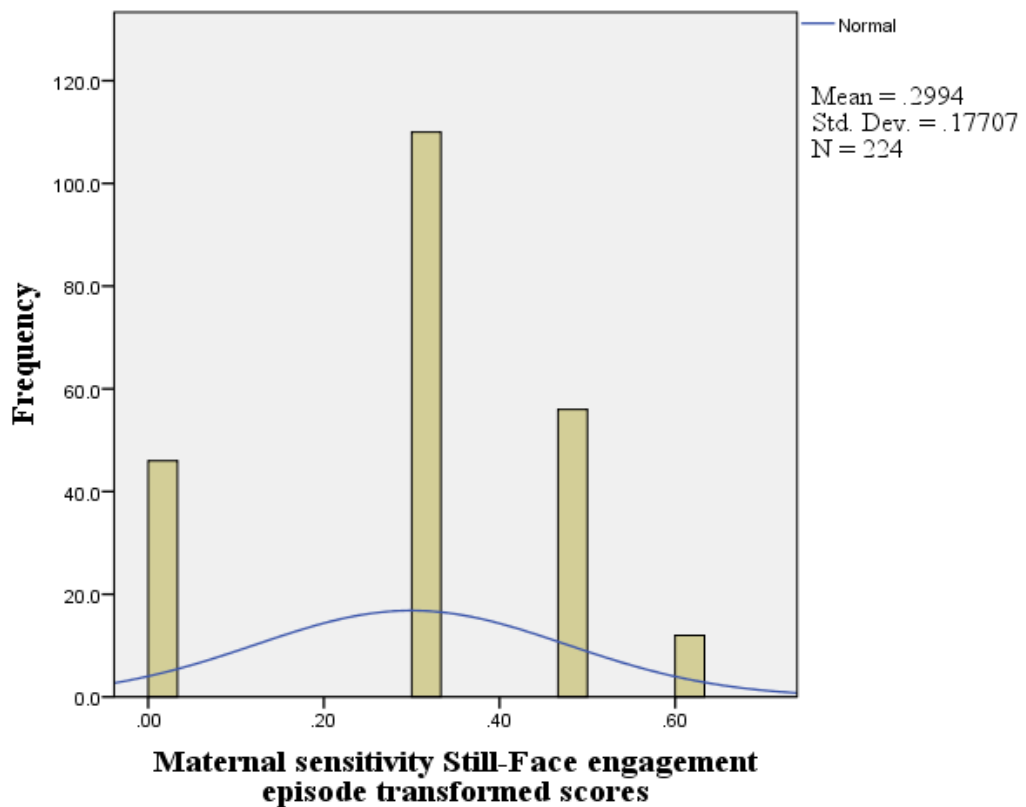
#### 4b. Happy-Distressed transformed scores in the reunion episode of the Still-Face



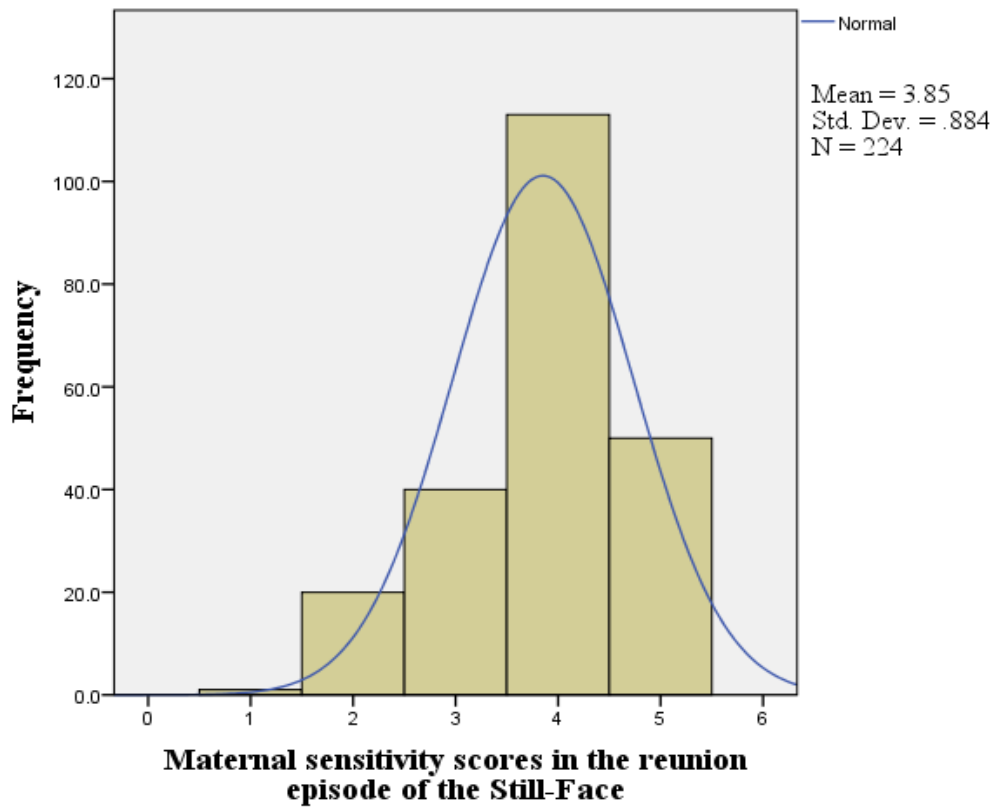
**5a. Maternal sensitivity in the Still-Face engagement episode of the Still-Face**



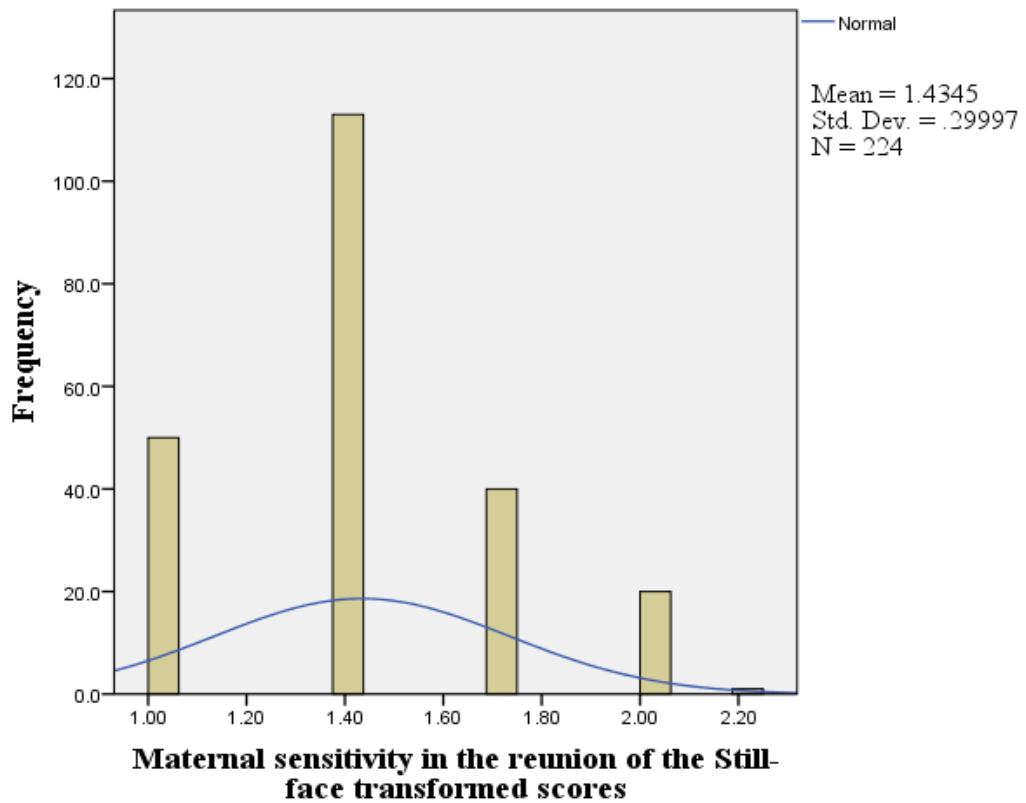
**5b. Maternal sensitivity in the Still-Face engagement episode transformed scores**



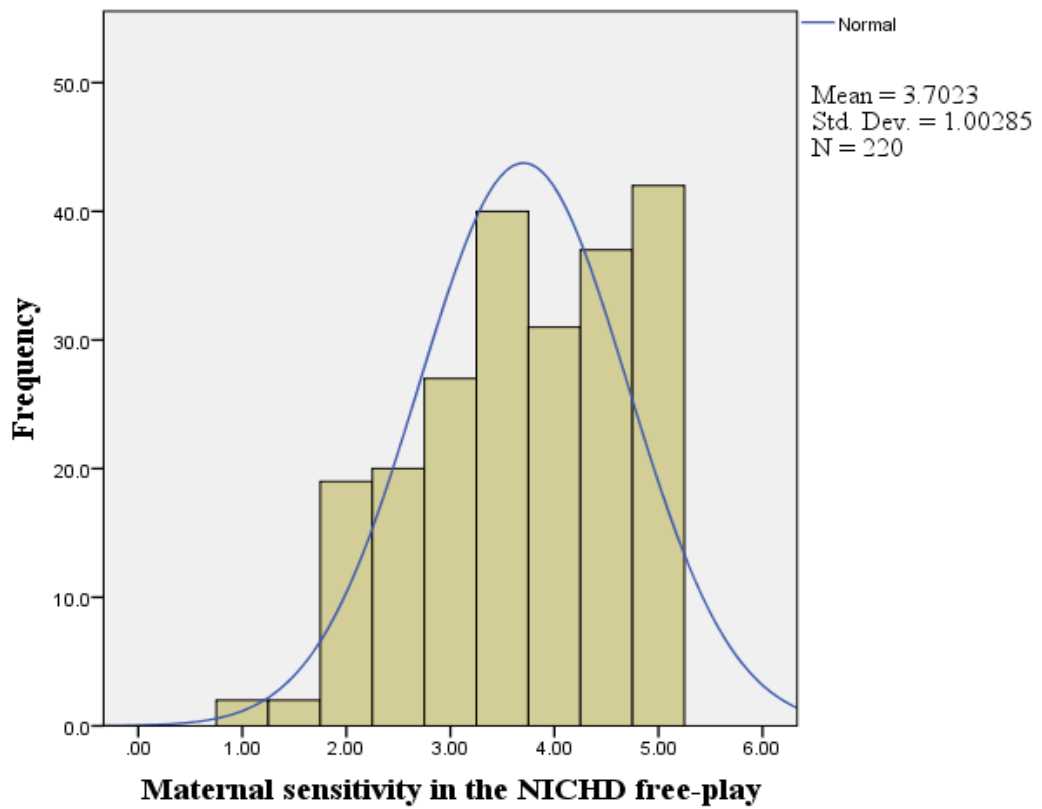
**6a. Maternal sensitivity scores in the reunion episode of the Still-Face**



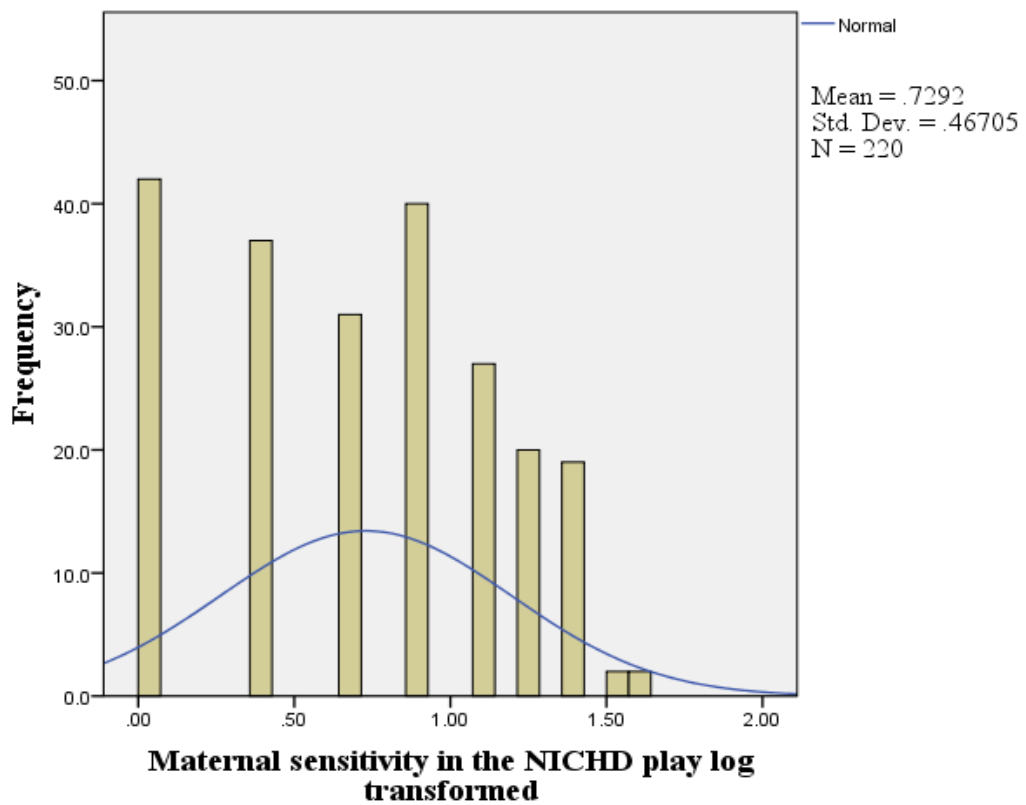
**6b. Maternal sensitivity in the reunion episode of the Still-Face transformed scores**



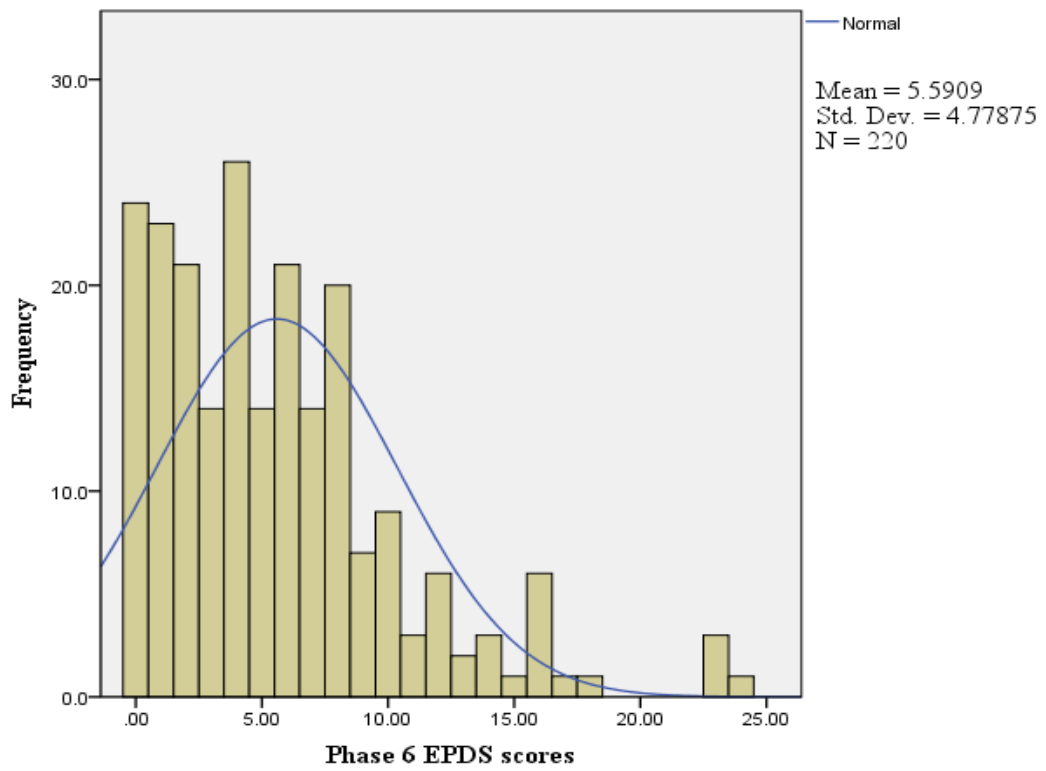
**7a. Maternal sensitivity in the NICHD free-play**



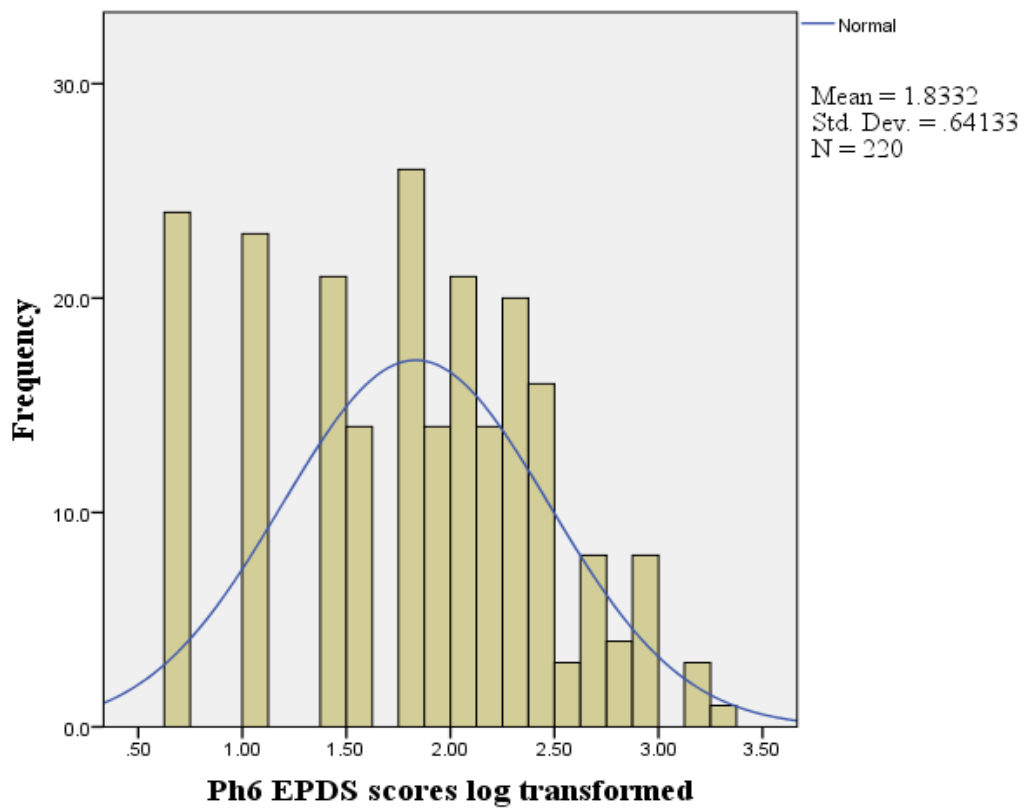
**7b. Maternal sensitivity in the NICHD free-play transformed scores**



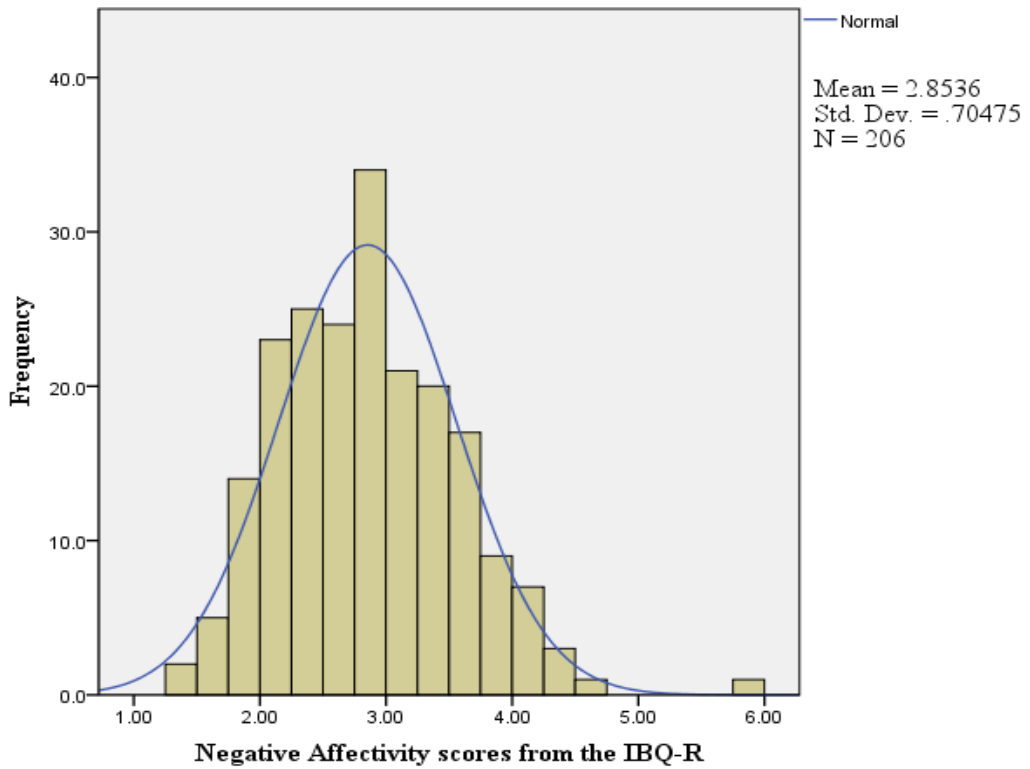
**8a. Phase 6 EPDS scores**



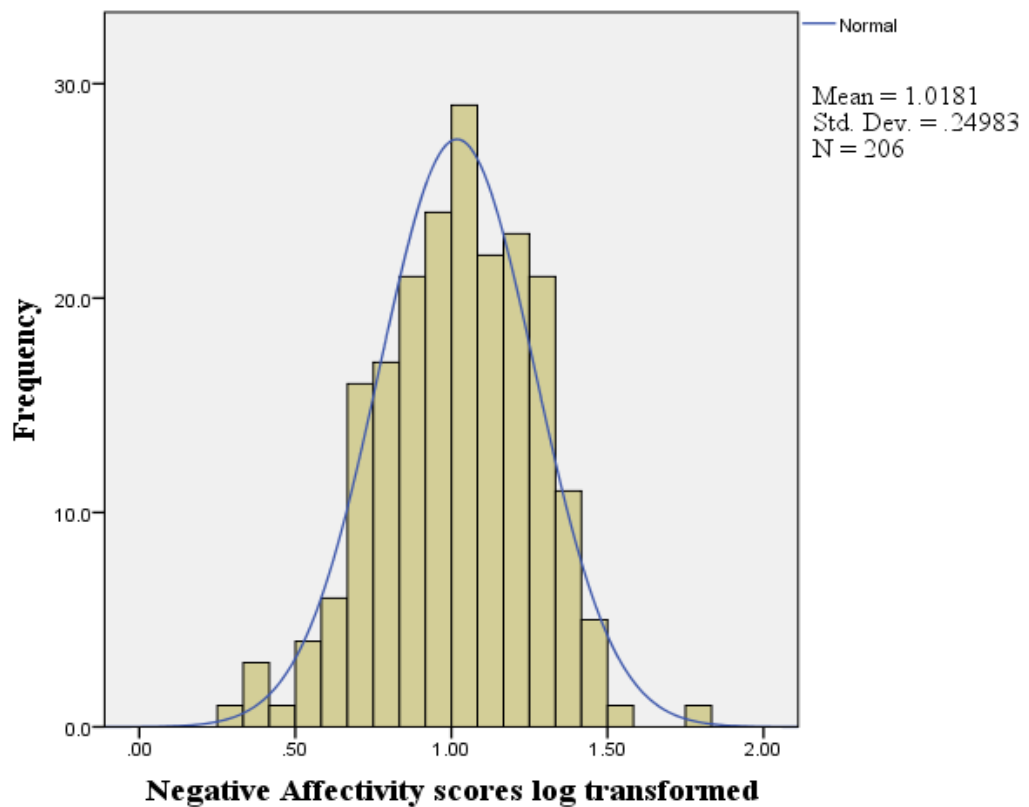
**8b. Phase 6 EPDS scores log transformed**



**9a. Negative Affectivity scores from the IBQ-R at Phase 6**

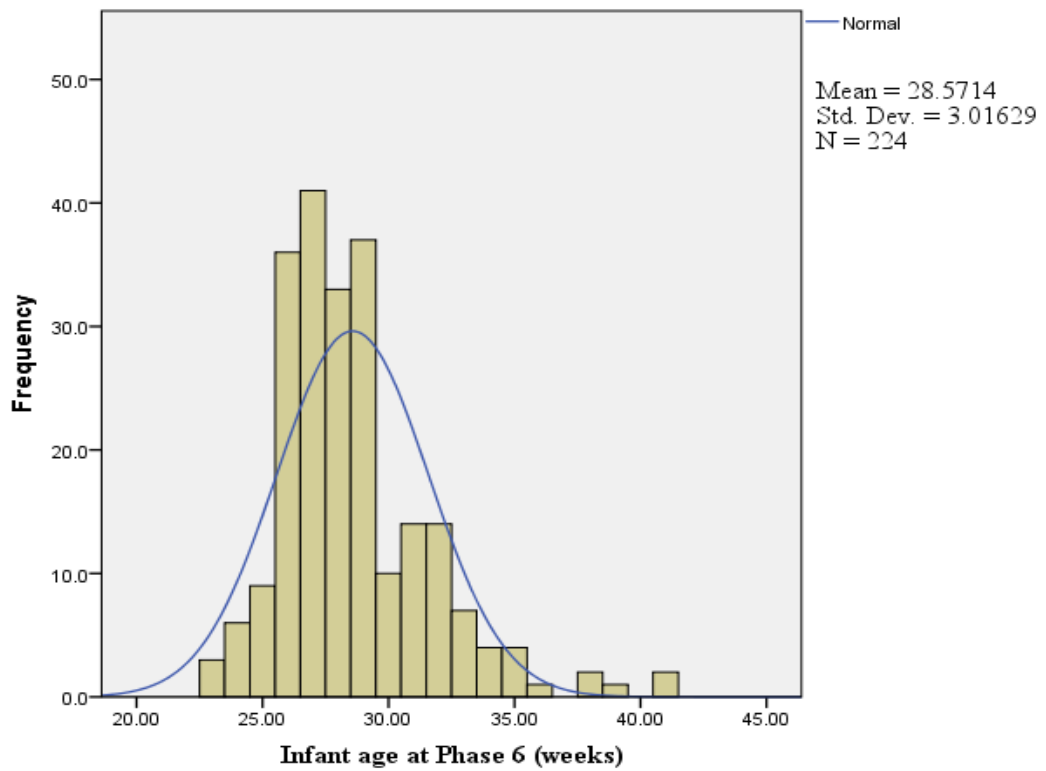


**9b. Negative Affectivity scores from the IBQ-R at Phase 6 log transformed**

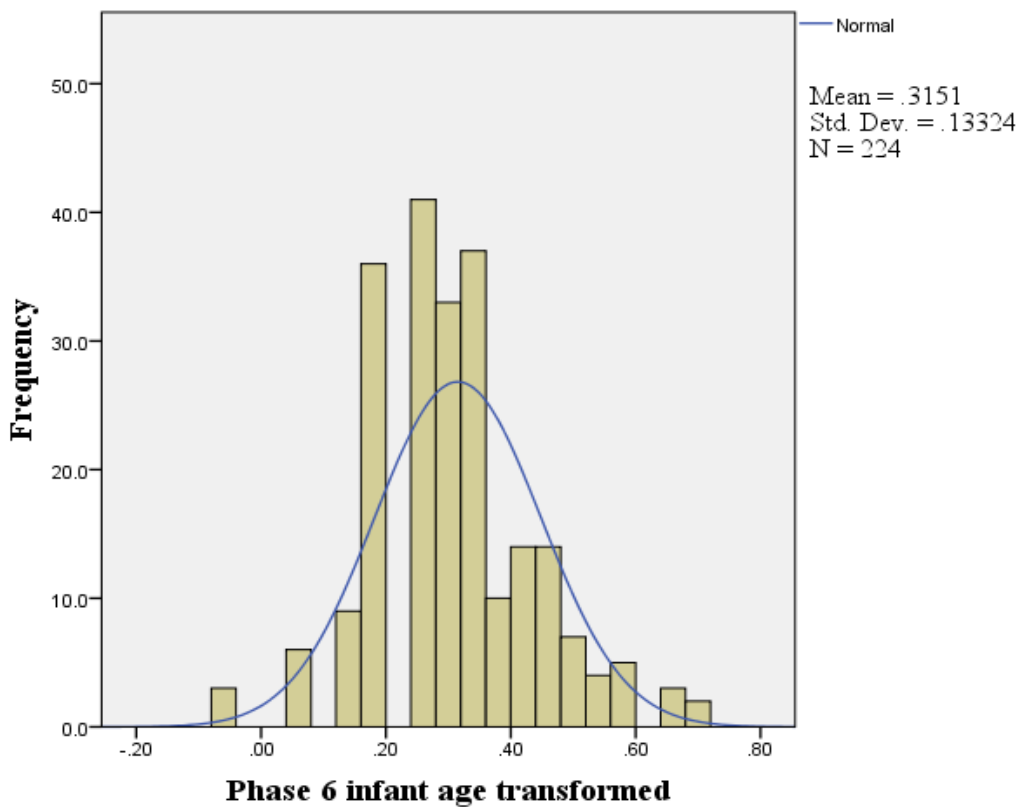




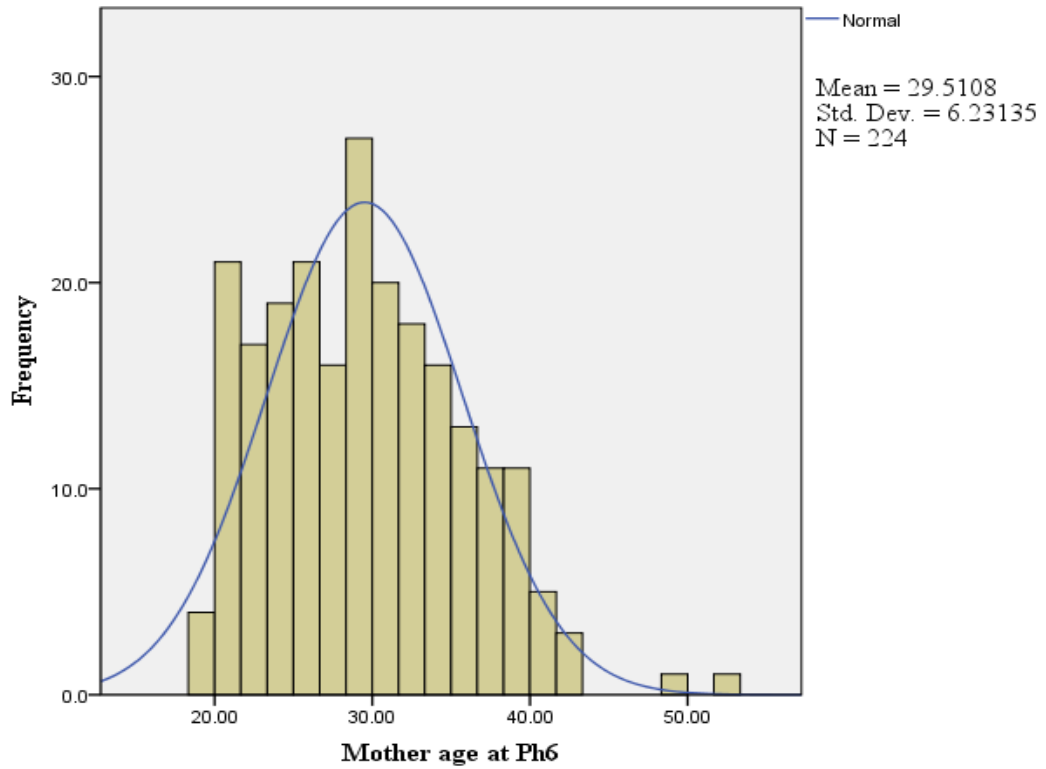
**10a. Infant age at the time of the Phase 6 assessment (weeks)**



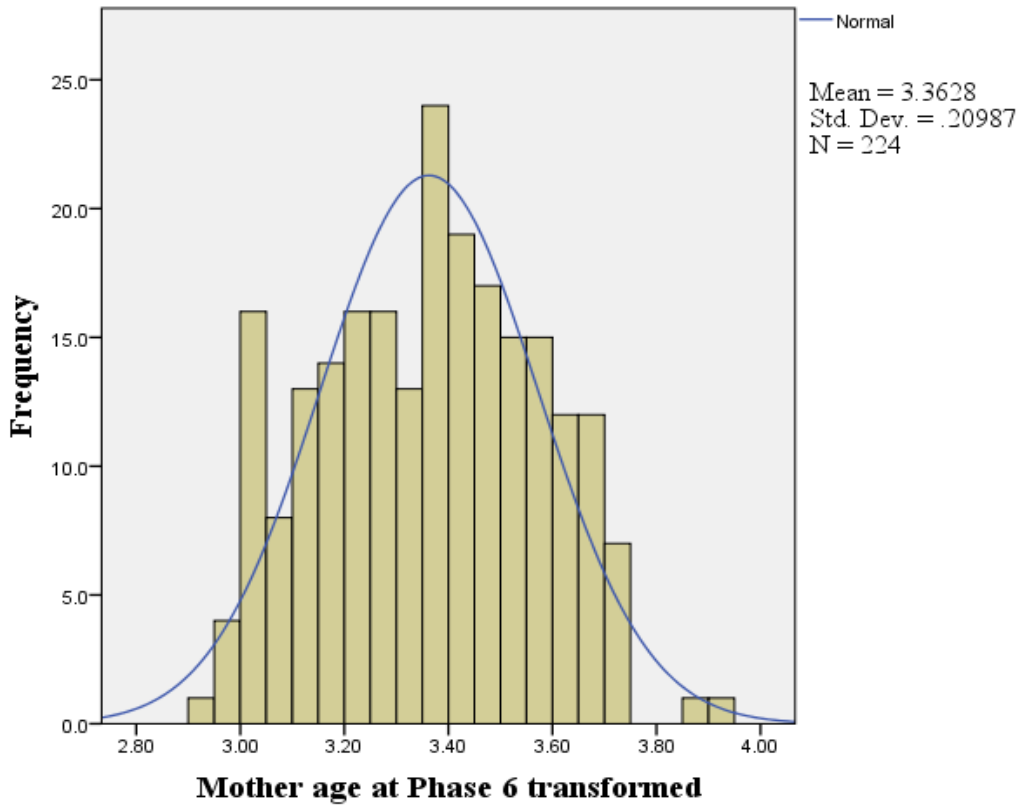
**10b. Phase 6 infant age transformed**



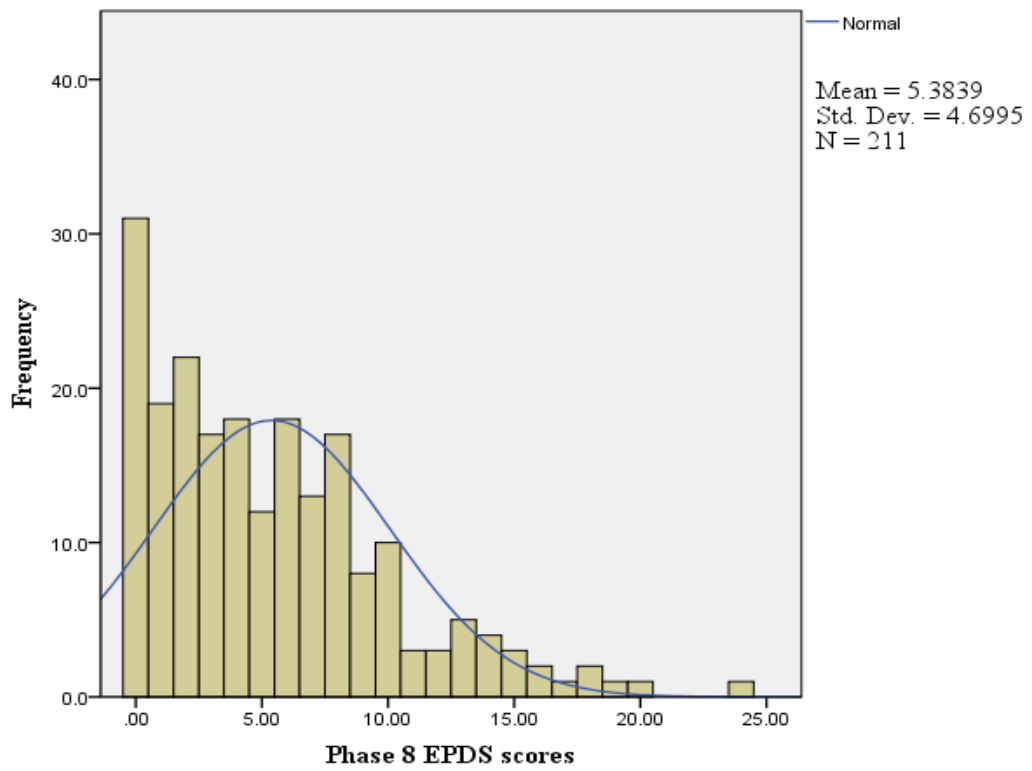
### 11a. Mother age at the time of the Phase 6 assessment



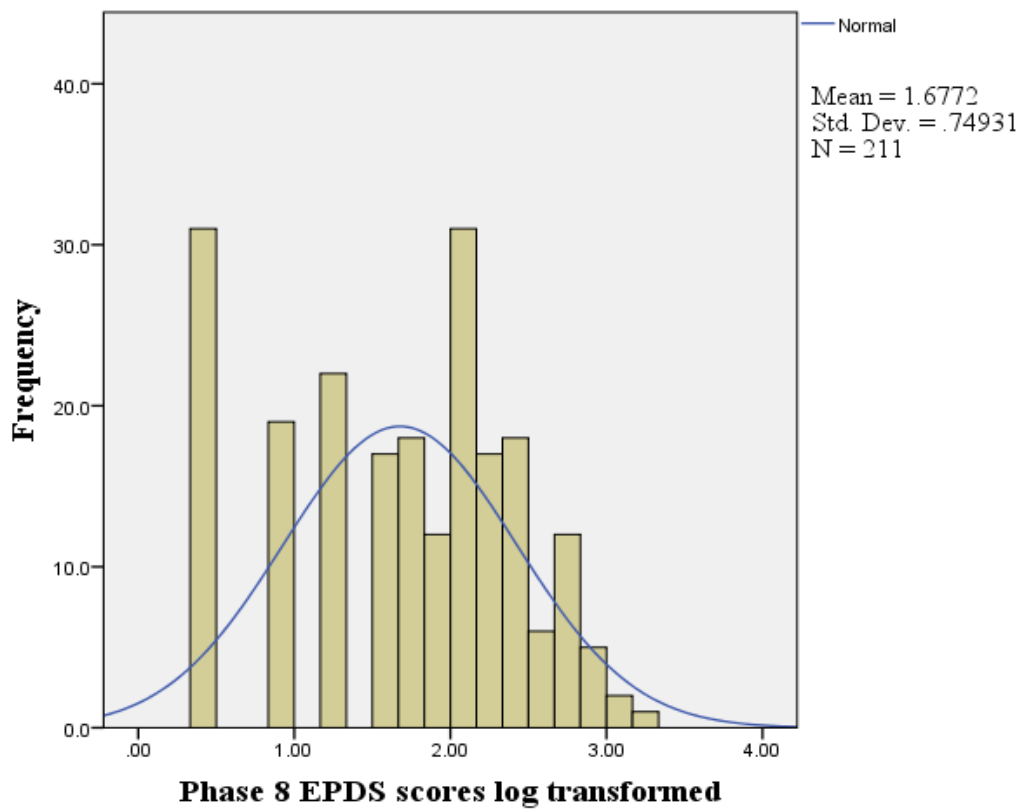
### 11b. Mother age at the time of the Phase 6 assessment log transformed



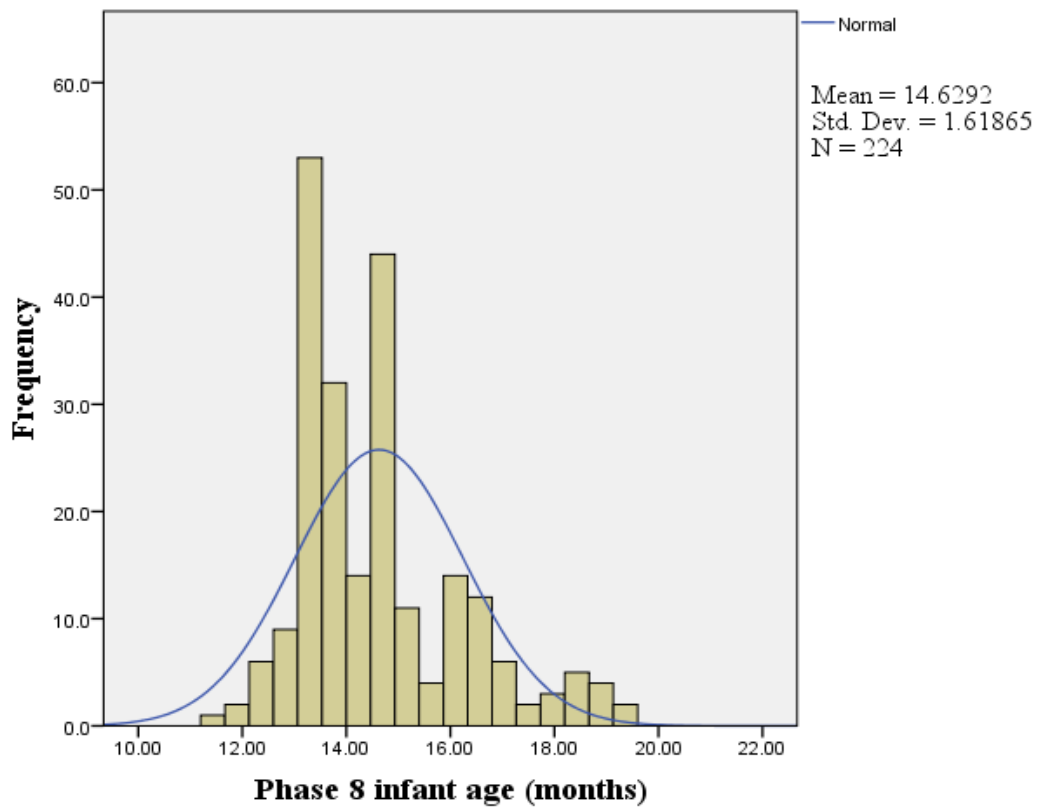
### 12a. Phase 8 EPDS scores



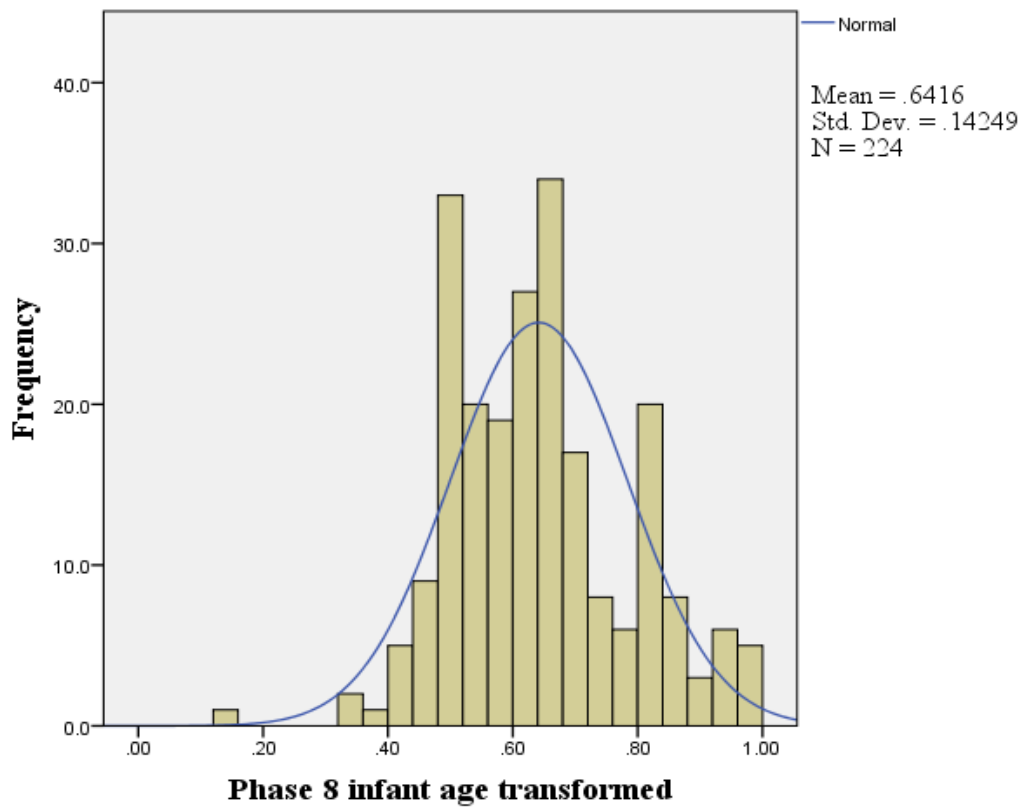
### 12b. Ph8 EPDS scores log transformed



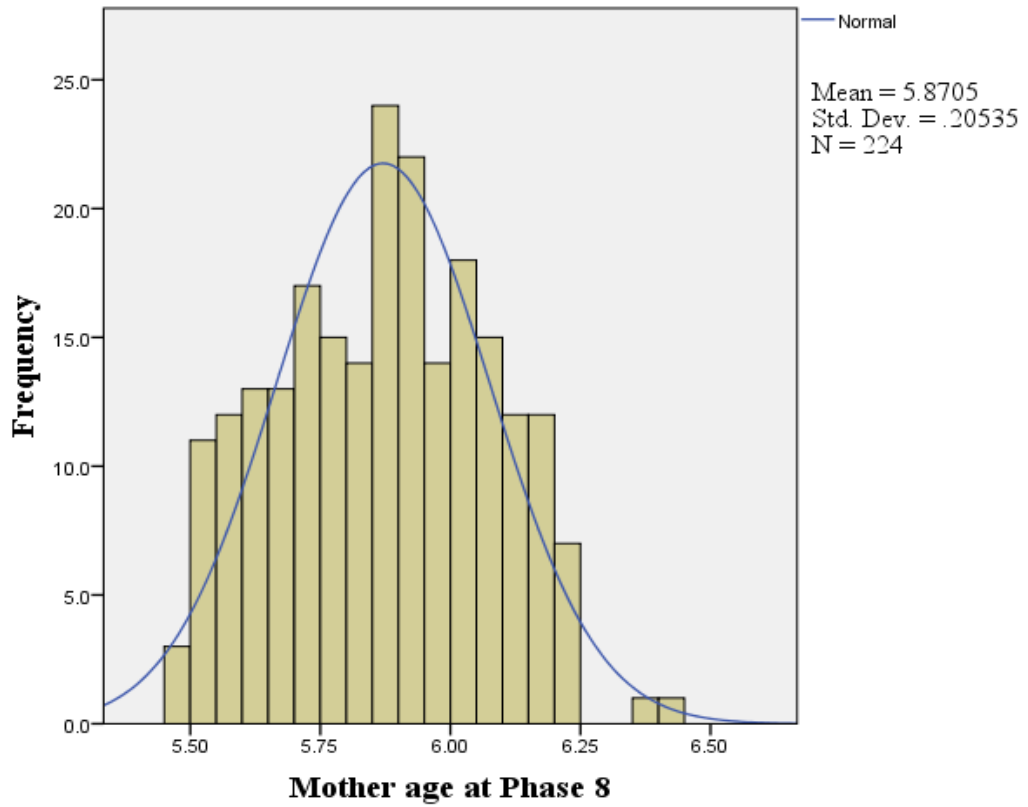
### 13a. Phase 8 infant age



### 13b. Phase 8 infant age transformed



### 14a. Phase 8 mother age



### 14b. Ph8 Mother age transformed

