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## Attachment and Attention: An investigation of biases in attention as they relate to attachment security in infancy and adulthood

Paul J. Mainz, *The University of Western Ontario*

Supervisor: Dr. Greg Moran, *The University of Western Ontario*

A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Psychology

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September 2014

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ATTACHMENT AND ATTENTION:  
AN INVESTIGATION OF ATTENTIONAL BIASES AS THEY RELATE TO  
ATTACHMENT SECURITY IN INFANCY AND ADULTHOOD

(Thesis format: Integrated Article)

By

Paul Meinz

Graduate Program in Psychology

A thesis submitted in partial fulfillment of the requirements  
for the degree of  
Doctor of Philosophy

The School of Graduate and Postdoctoral Studies  
The University of Western Ontario  
London, Ontario, Canada

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# Abstract

The idea that aspects of cognition may be organized within early relationships plays a prominent role within contemporary attachment theory. The studies described within this dissertation provide support for the idea that individual differences in attachment correspond with differences in the way people attend to certain forms of stimuli. In particular, with differences in the way they attend to certain forms of stimuli. Mothers and children in the studies described here were first assessed for individual differences in attachment security. They were then administered the probe paradigm in order to assess attention to infant pictures with varying emotional expressions (distressed, calm, and happy) versus pictures of neutral objects. Children classified as avoidant at one year of age rapidly attended towards infant picture stimuli and then moved their attention away to neutral object stimuli. By contrast, children classified as ambivalent at one year of age generally attended to infant picture stimuli over neutral object stimuli. Moreover, mothers that were more dismissive of attachment were more likely to attend towards neutral objects than to crying infant pictures. Taken together, these findings provide support for the notion that individual differences in attachment are associated with differences in how children and adults attend to certain forms of stimuli.

## Keywords

Attachment, Attention, Mother-Child Relationships, Cognition, Selective Attention, Security.

## Acknowledgements

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## Chapter 1

### 1 General Introduction

At the advent of attachment theory, John Bowlby hypothesized that cognition might be shaped by early experiences with primary caregivers (Bowlby, 1980). This idea—that aspects of cognition may be organized within our foundational attachment relationships—still plays a prominent role in contemporary attachment theory (Dykas & Cassidy, 2011). Some have argued that differences in cognition can be inferred from the way an infant acts to obtain care from a primary caregiver (the pattern of attachment; Ainsworth, Blehar, Waters, & Wall, 1978) or from the way an adult discusses experiences in early attachment relationships (Main, Kaplan, & Cassidy, 1985). For example, some infants appear to focus on feelings of need when frightened in order to heighten the expression of distress, whereas other infants appear to focus on exploration in order to inhibit the same behavior (Main, 1990). Similarly, some adults appear to focus on angering and confusing aspects of attachment experience when discussing attachment relationships, whereas others appear to ignore the negative aspects of childhood in favor of a more positive image (Main, Kaplan, & Cassidy, 1985). The propositions regarding the link between attachment and cognition, described in detail in the subsequent section, have an elegant and intriguing theoretical basis (e.g. Main, 1990) but these propositions have rarely been tested (e.g. Emmichoven, van IJzendoorn, Rutter, & Bross, 2008). With this in mind, the studies described herein were designed to test the relationship between attachment and cognition, particularly the relationship between attachment and biases in attention—in childhood and adulthood.

In infancy, patterns of attachment are typically assessed with the Strange Situation Procedure at one year of age (SSP; Ainsworth et al., 1978). In the SSP, the reunion behavior of infants is observed after a brief separation from an attachment figure (usually the mother). Infant attachment behavior upon reunion in the SSP can be categorized into three distinct patterns: secure, insecure avoidant, and insecure ambivalent. Infants classified as secure approach the mother, maintain contact until calm, and then return to play. These babies are thought to be in secure attachment relationships because they can gain a sense of safety from their mother when distressed. By contrast, infants classified as insecure avoidant actively ignore and avoid the mother upon reunion, and infants classified as insecure ambivalent mix strong proximity seeking and contact maintenance with resistance to contact. Infants displaying avoidant or ambivalent behavior are thought to be in insecure relationships because they seemingly do not feel safe in the presence of their mother. Avoidant infants do not or cannot approach their mother in a frightening circumstance (See Bowlby, A Natural Clues to Danger; Bowlby, 1969) and ambivalent infants do not calm despite a strong propensity to approach and seek comfort.

Observations in the home performed by Ainsworth and colleagues (Ainsworth et al., 1978) revealed that secure or insecure infant attachment relationships, assessed using the SSP, were associated with differences in the quality of maternal interactive behavior. The mothers of secure infants displayed high levels of maternal sensitivity, whereas mothers of insecure infants did not. Namely, mothers of secure infants were capable of receiving an infant signal, interpreting it properly, and responding promptly and appropriately. Avoidant infants tended to have mothers that were consistently rejecting, and ambivalent infants tended to have mothers that were unpredictably neglecting.

or accessible without being rejecting. In Ainsworth's first investigation of the SSP, the overall effect size in predicting attachment security from maternal sensitivity was large,  $r(24) = 0.78$  (Ainsworth, Bell, & Stayton, 1971; Ainsworth et al., 1978; Wolff & van IJzendoorn, 1997), and subsequent meta-analysis revealed that the effect of maternal sensitivity has been replicated, although the overall effect was much more modest,  $r = .26$  (Wolff & van IJzendoorn, 1997).

Differences in offspring attachment security have also been associated with a mother's state of mind with respect to attachment. State of mind with respect to attachment is assessed using the Adult Attachment Interview (AAI), a semistructured interview that probes an individual's attachment experience (Main et al., 1985). Individuals are placed in one of three states of mind regarding attachment on the basis of how they discuss early experiences: secure/autonomous, dismissing, and preoccupied (Main, Goldwyn, & Hesse, 2002). Discourse indicative of a secure/autonomous state of mind with respect to attachment is characterized by an ability to discuss attachment experience in a valuing and coherent fashion. Coherent discourse is seemingly honest, clear, provides enough (not too little, or too much) information, and is relevant to the discussion topic. On the other hand, the discourse indicative of dismissing and preoccupied states of mind with respect to attachment is incoherent. Specifically, dismissing discourse is marked by idealization of attachment figures, an insistence on the inability to recall attachment experiences, or—in some cases—a strong derogation and devaluing of attachment related events or emotions. Preoccupied discourse, on the other hand, is marked by an apparent inability to fruitfully discuss attachment experience, characterized by excessive angry dismissal of negative attachment related experiences or

passive, vague, and confusing speech when discussing attachment relationships (Main & Goldwyn, & Hesse, 2002)

The behaviors observed in the SSP and the discourse qualities observed in the AAI are associated with organizations of behavior and cognition with respect to attachment (Main, 2000). According to Bowlby (1969), attachment behavior is a behavior used in obtaining care from an attachment figure when frightened (e.g., crying, calling, clinging, etc) is organized in a particular context with regards to a representation of the relationship with a specific attachment figure (see also Sroufe & Waters, 1977). This internal working model is thought to organize the way a child obtains proximity and caregiving on the basis of past interactions with a particular attachment figure (Bowlby, 1969). For example, infants who are rejected by their attachment figure are thought to develop a concurrent representation of the attachment figure as rejecting. So that one year of age, these infants avoid the attachment figure in order to avoid rejection in a frightening circumstance (Main, 1981). By contrast, infants who experience inconsistent responsiveness develop a concurrent representation of the attachment figure as unpredictable. In the SSP at one year of age, these infants exaggerate expressions of distress and attempt to stay engaged with the attachment figure in order to increase the likelihood of caregiving from an unpredictable attachment figure (Main, 1990). Thus, the internal working model can be seen as organizing a child's behavior in a given environmental context within a particular quality of attachment relationship (Main et al., 1985).

Patterns of cognition are also thought to be organized with respect to the internal working model of attachment. Contemporary attachment theory suggests that the

and ambivalence are conditional strategies for obtaining caregiving in threatening circumstances (Main, 1990). In order to employ a conditional strategy, an insecure infant must use cognitive mechanisms to inhibit, alter, or prevent the active of the propensity to seek proximity to the attachment figure. Specifically, the avoidant infant is thought to attend away from feelings of need and the mother so as to inhibit a propensity to express distress, whereas the ambivalent infant is thought to focus on feelings of need and/or the mother to exaggerate their signs of distress and remain engaged with the attachment figure. Thus, the internal working model is also thought to organize cognition with respect to attachment.

The states of mind with respect to attachment can be seen as reflecting parallel organizations of cognition to those inferred from patterns of attachment in infancy. The insecure states of mind with respect to attachment are thought to reflect biases in cognition with regards to attachment experiences organized with respect to an insecure internal working model. By contrast, the secure state of mind with respect to attachment is thought to reflect cognition organized with respect to a secure internal working model (Main, 2000). The dismissing state of mind is thought to indicate cognition that would be used in the maintenance of an avoidant strategy. In other words, dismissing is thought to indicate bias in cognition used in childhood to inhibit or prevent approach to the attachment figure. The preoccupied state of mind is thought to indicate cognition that would be used in the maintenance of an ambivalent strategy. In other words, preoccupied discourse is viewed as indicating bias in cognition used in childhood to exaggerate distress, and heighten proximity seeking, while resisting contact. Secure discourse, on the other hand, presumably indicates absence of cognitive biases.

This is because security, as proposed by Main (1990), does not require the manipulation of a naturally occurring behavioral propensity through cognitive mechanisms. Therefore, attachment theory implies that cognition associated with a secure state of mind with respect to attachment will be biased due to an insecure internal working model of attachment.

In summary, then, current attachment theory suggests that the patterns of attachment observed in the SSP and the discourse patterns observed in the AAI correspond with organizations of cognition. Specifically, the predominant theory suggests that differences in attachment are associated with differences in the deployment of attention to attachment-related stimuli (Main, 2000; Main et al., 1985) – defined narrowly here as feelings of needing and or expressions of needing another individual (Bowlby, 1969). The dismissing state of mind and the avoidant attachment pattern are thought to correspond with a tendency to direct attention away from attachment-related stimuli. The preoccupied state of mind and the ambivalent attachment pattern are thought to correspond with excessive attention to attachment-related stimuli. The secure state of mind and the secure attachment pattern are thought to be unbiased regarding deployment of attention to attachment-related stimuli. With these propositions in mind, the primary goal of this dissertation was to test these propositions regarding attachment and attention to attachment-related stimuli in both mothers and children.

## 1.1 Adopting a Model of Attention

The studies described herein were necessarily interdisciplinary as attachment research and theory do not provide a definition of attention that was adequate for

the purposes of this research. The methodology used in assessing attention in both mothers and children was therefore informed by a current cognitive model of attention. This cognitive model suggests that an attentional response may reflect an interplay of distinct top-down and bottom-up processes (e.g., Bishop, Duncan, Matthew, & Lawrence, 2004; Corbetta & Shulman, 2002; Fernandez-Duque & Posner, 1997; Jordan & Morton, 2012; Posner & Rothbart, 2007). Bottom-up processes are quickly driven by the qualities of a particular stimulus (Corbetta & Shulman, 2002; Jordan & Morton, 2012). For example, a loud noise may quickly draw an individual's attention, interrupting previous thought and/or attention to other things. Top-down processes, on the other hand, are defined as the slow, effortful and voluntary control of attention (Bishop et al., 2004; Corbetta & Shulman, 2002; Fernandez-Duque & Posner, 1997; Jordan & Morton, 2012; Ochsner & Gross, 2005; Mezzacappa, 2004). For example, an individual may override the effect of threatening information by directing attention away from an anxiety-inducing stimulus.

Adopting this model in which attention is the product of an interplay between top down and bottom-up processes alludes to the possibility that an attentional response may change over time. Research in the area of attention and anxiety suggests that initial bottom-up responses to a stimulus are extremely fast but then may be altered at later stages by various top-down processes (e.g., Bradley, Mogg, Falla, & Hamilton, 1998; Koster, Verschuere, Crombez, & Van Damme, 2004; Mogg & Bradley, 1998; Mogg & Bradley, 2006; Mogg, Millar, & Bradley, 2000). This means that an individual's initial attentional response to a stimulus or set of stimuli may be vastly different from their attentional response at a later time point (Blair et al., 2007; Bradley et al., 1998;

Koster et al, 2004; Mogg & Bradley, 1999; Mogg & Bradley, 2006; Mogg et al (2000). Assessment of attention, therefore, must take into account the idea that an attentional response to a set of stimuli might be different depending on the point of measurement.

In summary, an attentional response may be the product of an interplay between bottom-up and top-down processes, and this interplay may result in change in an attentional response over time (an attentional time-course). As such, when assessing attention one must take into account the fact that (1) an attentional response may be different depending on the time point of measurement, and (2) relatedly, an attentional response might change over time. In order to test a priori hypotheses regarding the association between attachment and attention, a methodology known as the probe paradigm was used to test attention for specific forms of stimuli. The structure and administration of this paradigm is described in detail in the next two chapters as informed by the cognitive model adopted here and was administered to both mothers and children who had been assessed in the AAI and SSP, respectively.

## 1.2 Organization of chapters

Generally speaking, the studies described within this dissertation tested the association between attachment and attention. In Chapter 2, hypotheses were tested regarding the association between individual differences in attachment security in infancy assessed using the SAS and attention to attachment-related stimuli in a sample of seven to eight-year-old children. In Chapter 3, several studies investigated the interrelations among state of mind with respect to attachment, attention to attachment-related

stimuli, and other associated factors. In the first of these studies, hypotheses regarding the association between state of mind with respect to attachment and attention for attachment-related stimuli were tested. The second study tested the hypothesis that cognition corresponding to state of mind regarding attachment is passed on to offspring. The third study tested the idea that attention to attachment-related stimuli might mediate the association between state of mind regarding attachment and form of maternal interactive behavior. Finally, Chapter 4 discusses common themes and integrates findings of the studies reported in Chapters 2 and 3.

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## Chapter 2

### 2 Attentional Biases as They Relate to Attachment Security in Infancy

Attachment theory posits that an individual's cognition with respect to attachment is directly associated with the quality of his or her attachment relationship (Bowlby, 1969; Main, 1990, 2000). In infancy, the quality of an attachment relationship (to a mother, father, parent, etc.) is typically assessed using patterns of behavior observed in the Strange Situation Paradigm at one year of age (SSP; Ainsworth, Blehar, Waters, & Wall, 1979). Observed differences in infant behavior in the SSP are seen as reflecting differences in the way an infant thinks about his or her attachment relationship (to mother, father, etc.; Main, 1990, 2000). Specifically, some have argued that the behavior of an infant in the SSP is indicative of how they attend to the mother and, more generally, to feelings of needing or depending on another person (Bowlby, 1980; Main, 1990; Main, Kaplan, Cassidy, 1985). This proposition regarding attachment and attention has rarely been tested (e.g., Belsky, Spritz, & Crnic, 1996; Main & Cassidy, 1997). The present investigation is an attempt at testing this link between attachment quality and attention in a sample of seven-year-old children who were assessed in the SSP at one year of age.

The gold standard for assessing attachment security in infancy is the Strange Situation Procedure (SSP; Ainsworth et al., 1979). The SSP is a 20-minute procedure involving two separations and two reunions of the mother and child. Ainsworth's observations of infant behavior upon reunion in the SSP yielded three distinct patterns of

infant behavior that were taken as indicative of three categories of attachment relationships—secure, insecure-avoidant, and insecure-ambivalent. These differentiations are based primarily upon the reunion behavior observed between infant and mother following separation episodes. Upon reunion with the mother, infants in secure relationships approach and achieve physical contact, maintain contact until calm, and then return to play. These babies are thought to be in secure attachment relationships because they seemingly gain a sense of safety from their mother when distressed. By contrast, infants in insecure-avoidant attachment relationships avoid the mother upon reunion, and those in insecure-ambivalent attachment relationships seek contact and maintenance with resistance to contact. Infants displaying avoidant or ambivalent behavior are thought to be in insecure relationships because they do not appear to be able to draw a sense of safety from their mother. Avoidant infants do not or cannot approach the mother in a frightening circumstance (See Bowlby's "Natural Clues to Danger," Bowlby, 1969) and ambivalent infants do not calm despite a strong propensity to approach and seek comfort.

Observations in the home performed by Ainsworth and colleagues (Ainsworth et al., 1978) revealed that secure or insecure infant attachment relationships were associated with coherent differences in the quality of maternal interactive behavior. The mothers of secure infants displayed higher levels of sensitivity in interaction than the mothers of infants in nonsecure attachment relationships. Namely, they were capable of receiving an infant signal, interpreting it properly, and responding promptly and appropriately. Avoidant infants tended to have mothers that were more rejecting, and ambivalent infants tended to have mothers that were unpredictable. In Ainsworth's first investigation of the

SSP, the overall effect size in predicting attachment security from maternal sensitivity was large ( $r(24) = 0.78$ ) (Ainsworth, Bell, & Stayton, 1971; Ainsworth et al., 1978; Wolf & van IJzendoorn, 1997). A subsequent meta-analysis revealed that the association between attachment security and maternal sensitivity has been replicated, although the overall effect was much more modest ( $r = 0.26$ ) (Wolff & van IJzendoorn, 1997).

The robustness of Ainsworth's findings led many researchers to conclude that infant attachment behavior is organized by past interactions with the attachment figure. That is, infants adopt organizations of attachment behavior that optimize the likelihood of receiving care given their history of dyadic interactions (Bowlby, 1969; Sroufe & Waters, 1977; Bretherton, 1985; Bretherton & Munholland, 2008). Specifically, an infant who consistently experiences rejection may avoid the attachment figure in order to reduce the likelihood of rejection in a frightening circumstance (Main, 1981), and an infant who experiences inconsistent caregiving may intensify attachment behavior in order to increase maternal responsiveness (Main, 1990). On the other hand, an infant who receives sensitive care will approach the attachment figure and calm easily due to an expectation of a sensitive responsiveness from the mother (Ainsworth et al. 1971; Ainsworth et al. 1979). As such, the three patterns of attachment—secure, insecure avoidant, and insecure ambivalent—are each viewed as the organization of attachment behavior that are functional within a particular type of attachment relationship. In theory, they optimize the likelihood of care given past dyadic interactions (Ainsworth et al. 1979; Main, 1981; Main, 1990; Main et al., 1985).

Current theory also suggests that these three organizations of attachment behavior are associated with differing cognition regarding attachment. This view is perhaps best illustrated in Main's (1990) discussion of primary and conditional strategies. Main argues that the response of a secure infant in threatening circumstances is to seek proximity to his or her primary attachment figure. This is the biologically predetermined output of the attachment behavior system (defined by Bowlby, 1969). Proximity seeking is, therefore, considered to be the prepotent strategy for receiving caregiving from attachment figure. Avoidance and ambivalence under the same conditions are considered to be conditional strategies for obtaining caregiving and proximity with a particular mother under threatening circumstances. That is, an insecure infant must employ conditional strategy involving cognitive mechanisms (e.g., ignoring feelings of distress) to alter the propensity to seek proximity to the attachment figure. In theory, then, the avoidant infant should direct attention away from attachment-related stimuli (e.g., the mother herself or the infant's own perceived need for attachment) to inhibit proximity seeking in light of a rejecting attachment figure. The ambivalent infant must develop a tendency to focus on attachment-related stimuli in order to heighten expressions of need in light of an inconsistently responsive attachment figure. Thus, the behavioral organization of each infant should be associated with an underlying organization of cognition, and in theory, this organization of cognition is important to the maintenance of an insecure attachment strategy.

Despite the elegance of the theory, the association between attachment in infancy and attention has rarely been tested. In order to evaluate the suggestion that infants develop a way of attending to stimuli as a function of early attachment relationships, one

would need to show that insecure infants (avoidant or ambivalent) demonstrate a preference for processing certain forms of stimuli (not attachment related vs. attachment related, respectively). To date, only two published studies have tested the association between attachment security in infancy and attention to specific stimuli (Belsky, Spritz, & Crnic, 1996; Kirsch & Cassidy, 1997). Belsky, Spritz and Crnic (1996) measured attentional bias by attempting to distract children from various emotional stimuli. Toddlers were trained to look toward a sound made by a clicker device prior to being shown two puppet shows with discrete (four positive and four negative) emotional events. When an affective event occurred, the experimenter made a sound using a clicker device and recorded whether or not the child looked towards the clicker. They found no relation between distractibility and attachment security in the SSP. Next, Kirsh and Cassidy (1997) tested attention and attachment in two preferential looking paradigms. First, children were presented three pictures of a parent and child interacting neutral, one positive, and one angry. Children who were assessed as avoidant in the SSP spent more time attending away from all three pictures than children who were not avoidant. Second, children were presented one of two pictures positive attachment related and one neutral. Children who were assessed as insecure in the SSP looked away from the pictures longer than children who were assessed as secure. Additionally, children assessed as secure at one year of age looked proportionately longer at the attachment picture compared to the insecure children. Thus, Kirsh and Cassidy (1997) found some evidence for the proposed relation between attachment security and attention but Belsky, Spritz and Crnic (1996) failed to do so.

## 2.1 The Present Investigation

These mixed and unclear findings may have been a result of (1) variability in the presentation of stimuli and (2) the lack of an adequately nuanced model of attention. In both of the aforementioned studies, there appears to be ambiguity and variability regarding what constitutes an attachment-related stimulus. Specifically, Belsky, Spritz, and Crnic (1996) used positive and negative affective events, and Kirsh and Cassidy (1997) used emotionally valenced dyadic pictures. In Kirsh and Cassidy (1997), the presentation of stimuli was not informed by contemporary attachment theory. This theory suggests that infants in different attachment relationships should display biases in attention - either towards attachment-related stimuli or towards the environment (Main, 1990) - but Kirsh and Cassidy (1997) presented only dyadic pictures without paired environmental stimuli. Moreover, neither investigation based their assessment of attention on a current cognitive model and thus used markedly different methods of measurement. Belsky, Spritz, and Crnic attempted to distract children from emotional events, a method that seemingly measures a child's ability to disengage from an interesting/salient stimulus. Kirsh and Cassidy used preferential looking to assess attention, a procedure that likely reflects preferential processing for certain forms of stimuli. Such variability in stimuli and method makes it impossible to interpret the distinct outcomes of the two studies.

In light of these deficiencies in the choice of stimuli and methodology, the present investigation used a definition of attachment-related stimuli that is congruent with contemporary attachment theory and a well-established method of assessing attachment that is based in current cognitive theory. Specifically, a methodology known as the dot-

probe paradigm (Macleod, Mathews, & Tata, 1986) was used to assess attention in a sample of seven to eight-year-olds who were previously observed in the SSP at one year of age. Two pictures or two words are presented on each trial of the dot-probe paradigm. These stimuli then disappear and one is replaced by a dot. Participants need to indicate the location of the dot as quickly as possible by means of a button press. In theory, responses will be faster on trials in which the dot replaces the attended stimulus relative to the unattended stimulus. The theoretical model presented here posits systematic differences in child attention towards attachment-related stimuli and/or the environment. Thus, on randomized trials of the dot-probe paradigm children were presented with an attachment-related stimulus (Main, Kaplan, & Cassidy, 1985) paired with a neutral environmental object to assess the presence of such an attentional bias. Development of this dot-probe paradigm used in the present investigation first required a definition of attachment-related stimuli and the identification of an appropriate cognitive model of attention.

First, the fact that the term attachment-related stimulus is not well defined in the attachment literature posed a challenge when selecting relevant stimuli for the dot-probe paradigm. This challenge is perhaps best illustrated by the wide diversity of stimuli used in previous investigations of attachment and attention in childhood (Belsky et al., 1995; Kirsh & Cassidy, 1996) and adulthood (Emmichoven, van Ijzendoorn, Rutter, & Brosschot, 2003; Haydon, Roisman, Marks, & Fraley, 2011). As previously stated, Belsky and colleagues (Belsky et al., 1995) used positive or negative affective events to assess an association between attachment and attention, and Kirsh and Cassidy (1996) used pictures of mother-child dyads with varying affective qualities. In investigations

with adults, Emmichoven and colleagues (Emmichoven et al., 2003) used threatening words in assessing an attentional bias, and Haydon and colleagues (Haydon et al., 2011) used words implying proximity seeking. In light of the many and varied forms of stimuli, a strict definition of attachment-related stimuli was adopted when selecting stimuli for the present investigation. Specifically, they were defined as expressions of need and/or an individual's feelings of needing another person. This definition was derived from Bowlby's (1969) conceptualization of attachment as a biological predisposition to seek out a specific individual when hurt, distressed, or ill. Within this definition of attachment, an expression of needing another person is unambiguously attachment related.

Attention itself is also ambiguously defined in the attachment literature. Main (2000) understandably did not refer to a specific cognitive model of attention when conceptualizing the relation between attachment and attention. In designing the dot probe for the present investigation we chose a cognitive model that suggests that an attentional response may reflect an interplay of distinct top-down and bottom-up processes (e.g., Bishop, Duncan, Matthew, & Lawrence, 2004; Corbetta & Shulman, 2002; Fernandez-Duque & Posner, 1997; Jordan & Morton, 2012; Posner & Rothbart, 2007). Bottom-up processes are automatic, given by the qualities of a particular stimulus and serve to bring a stimulus to the forefront of conscious processing (Corbetta & Shulman, 2002; Jordan & Morton, 2012). For example, a brightly colored object may quickly grab an individual's attention, distracting them from previous thoughts. Top-down processes, on the other hand, are defined as the slow, effortful and voluntary control of attention that may be used when conflicting behavioral propensities arise

(Bishop et al, 2004; Corbetta & Shulman, 2002; Fernandez & Posner, 1997; Jordan & Morton, 2012; Ochsner & Gross, 2005; Mezzacappa, 2004). For example, an individual may override the effect of threatening information by directing attention away from an anxiety-inducing stimulus. A participant may, therefore, display an attentional bias towards a stimulus because (1) a particular set of stimuli are very emotionally arousing, and/or (2) he or she may have difficulty inhibiting or disengaging attention from salient stimuli.

Top-down and bottom-up processes potentially follow distinct time courses, with behavior at any one point in time reflecting varying mixtures of these underlying influences. Indeed, research in the area of attention and anxiety suggests that in bottom-up responses to a stimulus are extremely fast but soon altered at later stages by various top-down processes (e.g., Bradley, Mogg, Falla, & Hamilton, 1998; Koster, Verschuere, Crombez, & Van Damme, 2004; Mogg & Bradley, 1998; Mogg & Bradley, 2006; Mogg, Millar, & Bradley, 2000). The stimuli used in the probe paradigm were presented for different durations in the current study to investigate this potential course of change in attention. Short duration stimuli (e.g., 200 ms) were used to assess the initial reactions, and longer durations (e.g., 1250 ms) to identify any changes in this initial response (Bar-Haim et al., 2007; Bradley et al. 1998; Koster et al, 2004; Mogg & Bradley, 1999; Mogg & Bradley, 2006; Mogg et al, 2000). While neither short nor long duration measures provide a process pure assessment of attention (for discussion, see Bar, 2009; Corbetta & Shulman, 2002), measures collected at short durations can be presumed to reflect a greater influence of bottom-up than top-down processes, whereas measures collected at longer durations can be presumed to reflect a mixture of both.

Understandably, the original propositions regarding attachment and attention do not include accounts of top-down and bottom-up processes or the possibility of an attentional timecourse. These distinctions may, however, be useful in an investigation of attachment security and attention to attachment-related stimuli because differences may be more apparent at the earlier or later phases of an attentional response. The theoretical model described here suggests that insecure infants use attention to inhibit or alter a natural propensity to approach the attachment figure when hurt, distressed, or ill (Main, 1990). This modification or shaping of a potent propensity would suggest the involvement of top-down attention – the slow, effortful and voluntary manipulation of attention in circumstances where conflicting behavioral propensities arise (e.g., Fernandez-Duque & Posner, 1997). It would, therefore, be reasonable to assume that the association between attachment and attention may be more pronounced at the later stages of an attentional response. With this in mind, the present investigation tested two hypotheses concerning the association between attachment and attention:

1. Children who exhibited avoidance in the SSP at one year of age will display a more pronounced bias away from attachment-related stimuli than children who exhibited secure or ambivalent behavior when stimuli are presented for long but not shorter, durations (Hypothesis 1).
2. Children who exhibited ambivalence in the SSP at one year of age will display a more pronounced bias towards attachment-related stimuli relative to children who exhibited secure or avoidant behavior when stimuli are presented for longer, but not shorter, durations (Hypothesis 2).

## 2.2 Method

### 2.2.1 Participants

Participants were 36 (20 female) seven- to eight-year-old children who were being followed as part of an ongoing longitudinal study of attachment relationships. The original sample 66 children and their mothers were seen in the Strange Situation at age 1. These mother-child dyads were mostly low-risk and middle-class. Family incomes ranged from CAN \$10,000 to CAN \$80,000, with the average family making CAN \$50,000 to CAN \$59,999. The average level of maternal and paternal education was 15 years ( $SD = 2$ ), and 14 years ( $SD = 2$ ), respectively. Fifty-one of the mothers were married (73.9%), six were single (8.6%), eight were in common law relationships (11.5%), and one was separated (1.4%). At the time of their first child's birth, mothers' age ranged from 20.20 to 40.70 ( $M = 30$ ,  $SD = 4.88$ ). All children were full-term and healthy at the time of birth.

For the study described here, mothers and children from the original sample were contacted through email or telephone and asked if they would be willing to participate. Those who did not reply were contacted at least four additional times before exclusion from the study. Forty-five percent ( $N = 30$ ) of the sample did not return for the present investigation. Two of the children that did return were coded as 'Cannot Classify' (Hesse, 2008) in the SSP at 13 months of age. Because these children could not be classified in the SSP at one year of age, their data were excluded from the study. Three additional children were excluded: one refused to do separate from their mother; one intentionally guessed the wrong answers during the probe paradigm; and another had

a cold and repeatedly stopped during trials of the dotprobe paradigm<sup>1</sup>. All three were secure in the SSP at 13 months of age.

## 2.22 Materials and Equipment

The goal of the present investigation was to assess attentional bias with regards to attachment-related stimuli. Given the strict definition of attachment-related stimuli proposed earlier, expressions of needing or subjective feelings of needing another person. Ten pictures of infants crying were gathered for use in the dotprobe paradigm. These pictures were selected because infant distress is widely perceived as an expression of needing another person (e.g., Zeskind & Marshall, 1988). Ten pictures of infants smiling and ten pictures of infants with calm expressions were also included for exploratory purposes, as well as 30 pictures of neutral objects for pairing with infant faces on dotprobe trials. This set of neutral object pictures was composed primarily of items that could be found in a North American household (e.g., a spoon, a chair, a cup, a waste basket, etc.). Stimuli were selected from a larger sample of distressed, happy, and calm baby images. Three research assistants ranked each picture from most distressed to least distressed, most happy to least happy, and most calm to least calm, respectively. The ten pictures with the highest average rank for each category were ultimately selected. The dotprobe paradigm was administered with a Dell Latitude D830 laptop with a 15.4 inch display running EPrime software.

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<sup>1</sup> Equipment was sanitized after each lab visit.

## 2.23 Measures

### 2.23.1 Strange Situation Procedure (SSP; Ainsworth et al., 1978)

At 13 months of age, mother-infant dyads visited the lab and were administered the SSP. This 20 minute procedure is composed of episodes, as follows: (1) mother and child are introduced to the testing room (3 minutes); (2) mother and child are alone and the mother is instructed to sit while her infant plays with a set of age appropriate toys (3 minutes); (3) a stranger enters and sits silently (1 minute), talks to the mother (1 minute), and then attempts to play with the infant (1 minute); (4) the mother leaves her infant with the stranger (3 minutes); (5) mother returns and is reunited with her infant and the stranger leaves (3 minutes); (6) mother leaves her infant alone (3 minutes); (7) the stranger enters and attempts to comfort the infant (3 minutes); and, finally, (8) the mother is again reunited with her infant and the stranger leaves. Separation episodes (4 and 6) were curtailed if the infant became too distressed.

All SSPs were classified in the general categories secure, insecure avoidant, and insecure ambivalent and placed in a subcategory within each general category. Sub-categories from the original coding system are described in Table 1 (Ainsworth et al., 1978). SSPs were also coded for attachment disorganization (Main & Solomon, 1990). However, the present investigation did not use disorganization in analyses because hypotheses regarding attachment and attention refer to the secure, insecure avoidant, and insecure ambivalent categories. SSPs were also coded on four continuous seven-point scales: proximity seeking, contact maintenance, avoidance, and resistance by a trained coder in accordance with Ainsworth's system (Ainsworth et al., 1978). Of

the original 66 dyads administered the SSP, 38 (58%) were classified by a second reliability coder. There was 100% agreement between raters secure, avoidant, and ambivalent classification. There was 87% agreement on classification.

Table 1

Descriptions of each SSP classification from Ainsworth et al. (1978)

General Category	Sub-Classification	Description
Avoidant	A1	Characterized by conspicuous avoidance of the mother in reunion episodes 5 and 8. Strongly avoids the mother and does not seek contact.
	A2	Characterized by a mixed reunion response, with tendency to greet intermingled with a strong tendency to avoid. These babies may approach mother upon reunion, but then ultimately abort the approach and move to exploration.
Secure	B1	Characterized by a strong initiative for interaction with the mother from a distance upon reunion. These babies display little to no proximity seeking and may turn away or look away briefly upon reunion.
	B2	Characterized by a tendency to approach the mother but in a fashion that is less active than B3 babies. B2 babies display elevated levels of avoidance in episode 5 but this avoidance gives way to strong proximity seeking in episode 8. These babies resemble B1 infants, but demonstrate more active proximity seeking.
	B3	Characterized by strong proximity seeking and contact maintenance upon reunion. After calm, these babies will return to play. This sub classification is considered to be prototypically secure.
	B4	Characterized by strong proximity seeking and contact maintenance and appear to be wholly preoccupied with the mother throughout and may display high levels of crying. These babies may display some resistance to contact.
Ambivalent	C1	Characterized by strong proximity seeking and contact maintenance upon reunion. However, this strong contact maintaining behavior is contradicted by angry ambivalent behavior. Interactions are unmistakably angry.

	C2	Characterized by conspicuous passivity, and exploratory behavior is limited throughout. These babies demonstrate obvious want for contact upon reunion but do not seek it as actively as C1 babies. Interactions also appear to be less angry.
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The time difference between administration of the SSP at age one and assessment of attention in the dot-probe at seven to eight years of age raises the issue of the stability of attachment security. A recent meta-analysis utilizing studies with time spans of six months to 29 years revealed an overall stability of attachment of .69 (Pinquart, Feubner, & Ahnert, 2013). This correlation is considered moderate by conventional standards. Moreover, there are other practical reasons to use the SSP at age one. First, the SSP is the most consistently validated procedure in attachment research (Walsh & IJzendoorn, 1997). Second, the hypotheses proposed by Main (1990) regarding attachment and attention refer explicitly to behavior observed in the Strange Situation procedure.

### 2.23.2 Dot-Probe Paradigm (Mathews, Macleod, & Tata, 1986)

After separation from the mother, children were seated 50 cm from the computer monitor accompanied by a male experimenter. On each trial, a fixation cross with dimensions 2 x 24 mm was presented for 1000 ms. Then two pictures appeared with dimensions 100 x 100 mm. One was replaced by a dot, and it was incumbent upon the child to press a button corresponding to the side on which the dot appeared. Children completed 10 practice trials followed by 160 experimental trials divided into 40 trial blocks. The preselected infant pictures of a calm, distressed, and happy baby appeared four times and were paired with a new neutral picture in each appearance. Note that each

baby picture was matched as closely as possible for size with a neutral object. Additionally, each 40-trial block contained 10 neutral-neutral pairings so that a baby picture would not appear on every trial. In summary, four experimental blocks were composed of 10 neutral-neutral item pairs, 10 happy-neutral item pairs, 10 distressed baby-neutral item pairs, and 10 calm baby-neutral item pairs. Throughout the task, pictures pairs were presented in random order within each block, infant pictures had an equal probability of appearing on either side of the computer screen (left vs. right), and the dot appeared with equal probability on either side of the screen (left vs. right). Moreover, across all blocks each infant picture appeared four times in all possible picture location (left vs. right) and dot (left vs. right) pairings. Finally, pictures were presented randomly for 200 and 1250 ms in order to describe the attentional response at faster and slower intervals following stimulus onset.

## 2.3 Results

### 2.3.1 Attrition Analysis

As previously stated, thirty children (45%) of those who participated in the previous stage of the study when administered the SSP at age 1 did not return for the dot probe paradigm at seven to eight years of age. These dyads did not exhibit differences in attachment security of the child in the SSP at one year of age,  $\chi^2(1) = 1.76, ns$ , or in gender of the child,  $\chi^2(1) = 1.65, ns$ . They also did not exhibit differences in maternal or paternal years of education,  $t(64) = 1.13, ns$ ,  $t(63) = -0.31, ns$ , respectively. Nor were there differences in the mother's marital status,  $\chi^2(2) = 1.20, ns$ , or the number of caregivers in infancy,  $t(64) = -1.05, ns$ . There was however a difference in income level,

$t(64) = 2.45, p < .05$ . The dyads that did not return had an average family income of 40,000 to 49,999, whereas the dyads that returned averaged 50,000 to 59,999.

### 2.3.2 Primary Analysis

Errors and responses of latency greater than 2000 ms and/or 3 standard deviations above each child's mean were excluded. Bias scores were then calculated from the remaining data for each child by subtracting the average reaction time when a particular infant picture (distressed, happy, or calm) appeared in the opposite location of the dot from the average reaction time when both appeared together. Thus, if a child was quicker on trials where the dot appeared in the opposite location, this calculation would yield a positive score, indicating a bias towards neutral object pictures. If a child was quicker on trials where the dot and face appeared in the same location, this calculation would yield a negative score, indicating a bias towards a particular infant picture. Bias scores for each child were then submitted to a univariate ANOVA with Trial Duration (200 or 1250 ms) and Infant Picture (distressed, happy, and calm) as repeated measures factors and SSP (Avoidant, Secure, and Ambivalent) as a between subjects factor. Table 2 presents average bias scores by SSP classification and trial condition.

Table 2  
Average Bias Scores for Each Condition by Strange Situation Classification

<u>Avoidant (n = 7)</u>				
Infant Picture				
<u>Trial Duration</u>	<u>Distressed</u>	<u>Happy</u>	<u>Calm</u>	<u>Average</u>
200 ms	-31.67 (32.23)	-11.31 (21.14)	-56.58 (22.73)	-33.18 (14.74)
1250 ms	44.16 (25.80)	21.09 (21.23)	39.09 (16.54)	34.78 (12.00)
Average	6.24 (22.45)	4.89 (15.07)	-8.74 (18.93)	0.80 (10.78)
<u>Secure (n = 19)</u>				
Infant Picture				
<u>Trial Duration</u>	<u>Distressed</u>	<u>Happy</u>	<u>Calm</u>	<u>Average</u>
200 ms	-20.61 (10.25)	-7.41 (9.93)	-28.14(18.06)	-18.72 (7.62)
1250 ms	-16.40 (13.30)	-5.71(13.40)	8.10(13.48)	-4.67 (7.71)
Average	-18.50 (8.29)	-6.56 (8.22)	-10.02 (11.50)	-11.70 (5.44)
<u>Ambivalent (n = 5)</u>				
Infant Picture				
<u>Trial Duration</u>	<u>Distressed</u>	<u>Happy</u>	<u>Calm</u>	<u>Average</u>
200 ms	-7.62 (24.80)	-22.59 (24.05)	3.46 (7.61)	-8.91 (11.28)
1250 ms	-1.32 (37.35)	-54.07 (20.02)	-17.27 (24.28)	-24.22 (16.29)
Average	-4.47 (21.35)	-38.33 (15.65)	-6.91 (12.48)	-16.57 (9.84)
<u>Average (n = 31)</u>				
Infant Picture				
<u>Trial Duration</u>	<u>Distressed</u>	<u>Happy</u>	<u>Calm</u>	<u>Average</u>
200 ms	-21.01 (10.03)	-10.74 (24.05)	-29.47(12.49)	-20.41 (6.01)
1250 ms	-0.29 (12.09)	-7.46 (10.62)	11.01 (10.11)	1.09(6.32)
Average	-10.69 (7.90)	-9.10 (6.71)	-9.23 (8.38)	-9.66 (6.17)

Note A positive average bias score indicates a bias away from face stimuli and negative scores indicate a bias towards. Standard errors are presented in parentheses.

Two predictions were made regarding the aforementioned 2 x 3 x 3 ANOVA on the basis of the present study's two hypotheses. Hypothesis 1 stated that children who were assessed as avoidant in the SSP at one year of age would indicate a more pronounced bias away from attachment-related stimuli relative to children assessed as secure or ambivalent when stimuli are presented for longer durations. Applying this hypothesis to the present analysis, it was predicted that the avoidant group would have larger positive bias score as compared to the secure and ambivalent groups for the distressed infants within 1250 ms condition. The distressed infant pictures are attachment-related stimuli within the definition adopted here, and therefore, in order for Hypothesis 1 to be supported avoidant children must at least exhibit biases in attention for these stimuli. This hypothesis would be supported by a significant Infant Picture x Trial Duration x SSP, where the avoidant group has a more positive bias score for distressed infant pictures in the 1250 ms condition. This pattern of findings would suggest that avoidant children attend to neutral objects over distressed infant pictures at a later stage in their attentional response. Support would also be provided by a significant Trial Duration x SSP interaction, where the avoidant group has more positive bias score for all infant pictures in the 1250 ms condition. This pattern of findings would suggest that avoidant children attend to neutral objects over all types of infant pictures at a later stage in their attentional response.

Hypothesis 2 stated that children who were assessed as ambivalent in the SSP at one year of age would indicate a more pronounced bias towards attachment-related stimuli relative to children in the secure and avoidant groups when stimuli are presented for longer durations. Applying this hypothesis to the present analysis, it was predicted

that children classified as ambivalent would have more negative bias scores as compared to the avoidant and ambivalent group for at least the distressed infant pictures in the 1250 ms condition. Support for this hypothesis would come from a significant Trial Duration x Infant Picture x SSP interaction, where the ambivalent group has a more negative bias score for the distressed infants within the 1250 ms condition. This pattern of findings would suggest that ambivalent children preferentially attend to distressed infant pictures at a later stage in their attentional response. Support would also come from a significant Trial Duration x SSP interaction, where the ambivalent group has a more negative bias score for all infant pictures. This pattern of findings would suggest that ambivalent children preferentially attend to all infant pictures at a later stage in their attentional response.

The Trial Duration x Infant Picture x SSP interaction was not significant ( $F(4, 56) = 0.53, ns$ ), suggesting that an effect of SSP was not moderated by Trial Duration within each Infant Type condition. The Trial Duration x SSP interaction was significant ( $F(2, 28) = 4.08, p < .05, R^2 = .20, r = .44$ ), suggesting that an effect of SSP was moderated by Trial Duration (Figure 1). Both the Infant Picture x Trial Duration and Infant Type x SSP interactions were not significant ( $F(2, 56) = 2.055, ns$   $F(4, 56) = 0.73, ns$ ), respectively. There was no main effect of SSP ( $F(2, 28) = 1.02, ns$ ) or Infant Picture ( $F(2, 56) = 0.01, ns$ ). There was however a significant main effect of Trial Duration such that children irrespective of attachment group were more biased towards the infant stimuli in the 200 ms condition than those of the longer duration ( $F(1, 28) = 4.08, p < .05, R^2 = .12, r = 0.35$ ).

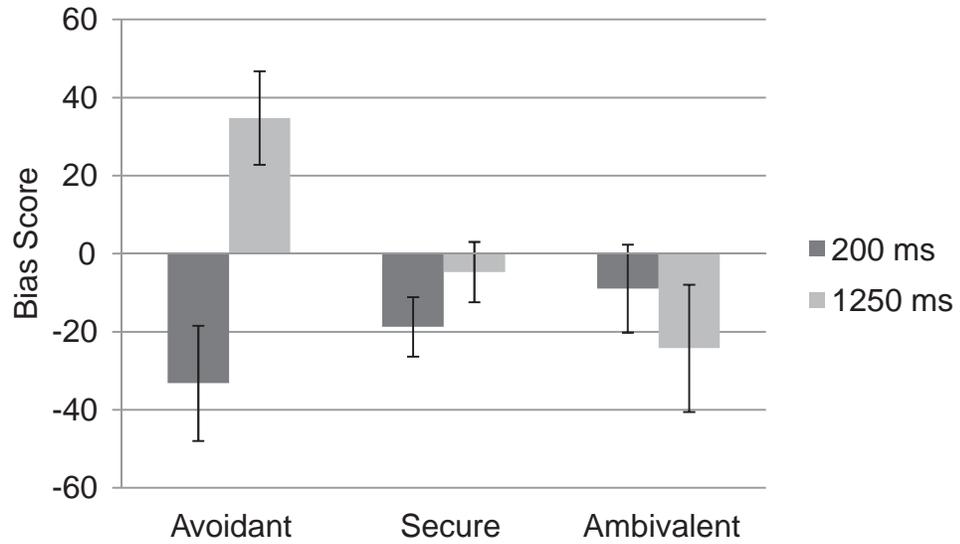


Figure 1. Depiction of the significant duration x SSP interaction. Bias score averaged across all infant picture types is on the axis. A positive scores indicate a bias away from all face types and a negative score indicates a bias towards. Bars depict standard error.

To better understand the Trial Duration x SSP interaction, the simple main effects of SSP classification within each level of Trial Duration were analyzed. There was a significant simple main effect of SSP within the 1250 ms condition,  $F(2, 28) = 5.29, p < .05, d = 1.24$ . Planned comparisons were then performed within the 1250 ms condition. First, the mean bias score of the avoidant group was compared to the combined mean for the secure and ambivalent groups. This comparison was significant,  $F(1, 28) = 9.05, p < .01, d = 1.14$ . The avoidant group had a significantly more positive average bias score than the secure and ambivalent groups, providing support for Hypothesis 1. Second, the mean bias score of the ambivalent group was compared to combined mean for the secure and avoidant groups. This comparison was also significant,  $F(1, 28) = 7.29, p < .01, d = 1.02$ . The average bias score for the ambivalent group was significantly more negative than the secure and avoidant groups, providing support for Hypothesis 2. The simple main effect of SSP within the 200 ms duration was not significant,  $F(2, 28) = 1.74, ns$ .

The simple main effects of Duration within SSP were then analyzed. Within the avoidant group, there was a significant difference between the short and long levels of Trial Duration,  $F(1, 28) = 11.49, p < .01, d = 1.28$ , such that a negative bias score in the 200 ms condition was contradicted by a positive bias score in the 1250 ms. The simple main effects of Trial Duration were not significant within the secure or ambivalent groups,  $F(1, 28) = 1.33, ns$ ,  $F(1, 28) = 0.42, ns$ , respectively.

In summary, then, there was a significant Trial Duration x SSP interaction. Within the simple main effect of SSP in the 1250 ms condition, the avoidant group had a significantly more positive bias score than the secure and ambivalent groups, suggesting a relative bias away from all infant pictures for the avoidant group and supporting

Hypothesis 1. Moreover, within the 1250 ms condition, the ambivalent group had a significantly more negative bias score than the avoidant and secure groups, suggesting a relative bias towards all infant pictures for the ambivalent group and supporting Hypothesis 2. Finally, within the avoidant group, there was a significant shift from a negative bias score to positive a positive bias score across the 200d 1250 ms conditions. This suggests that the avoidant group first focused on the infant pictures and then moved attention away towards the neutral object pictures.

The effect sizes for the planned comparisons in the previous analysis were large by conventional standards. These effects were also robust across characterizations of attachment and attention. To demonstrate this, two additional analyses were performed within the 1250 ms condition one using continuous scores to describe behavior and another using a categorical approach to describe attention. Because there was no evidence in the results of the initial analyses for a difference in response across infant picture types, these analyses used each child's 1250 ms bias score across all types. First, continuous scores representing a continuum from avoidant to ambivalent were generated using the SSP-classifications. All children receiving a B3 sub classification received a 0, because in theory the B3 classification is unbiased (Main, 1990). Next, the B2, B1, A2, and A1 sub classifications were assigned -2, -3, and -4, respectively, from some avoidant (-2) to most avoidant (-4). The B4 group was assigned a 1 for some ambivalence. The C1 and C2 classifications were both assigned the number 2 for most ambivalent because it is unclear which sub is the most prototypically ambivalent (Fraleley & Spieker, 2003a). Average bias scores in the 1250 ms condition were then regressed onto the aforementioned continuous scores.

Continuous Score was a significant predictor of bias scores,  $F(1, 29) = 8.29, p < .01, R^2 = .22, r = .47$ , such that higher scores (more ambivalent) predicted more negative bias scores, and lower scores (more avoidant) predicted more positive bias scores (Figure 2).

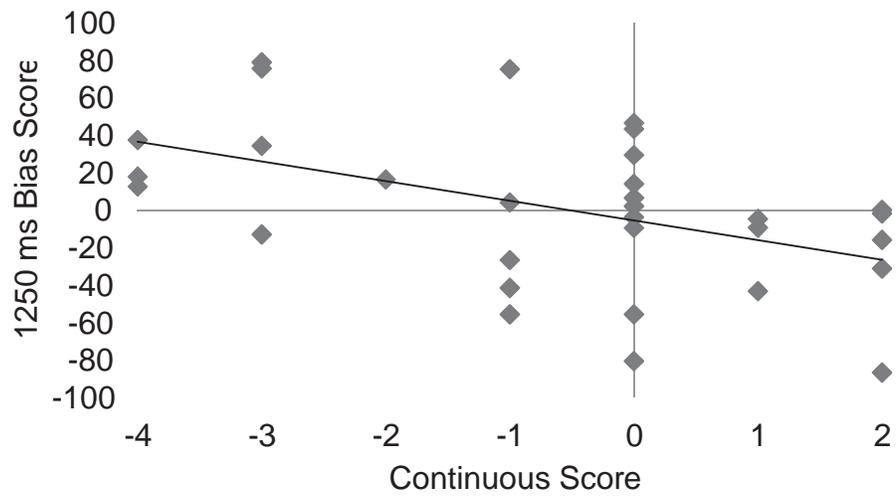


Figure 2 Average 1250 ms bias score regressed onto continuous scores generated from SSP subclassifications. A negative SSP continuous score indicates more avoidance and a positive SSP continuous score indicates more avoidance. As previously stated, a positive bias score indicates a bias towards the neutral stimuli.

Data were then analyzed with a categorical characterization of attention. An child's attention was categorized as towards the faces when their average bias score was negative and towards neutral objects when their average bias score was positive. Next, children with subclassifications from A1 to B2 were categorized as more avoidant because these classifications usually indicate some avoidant children in the B3 were put into a group alone because they are thought to be unbiased. Finally, children B4, C1, and C2 were put into a more ambivalent group because these sub classifications indicate some ambivalence. A 2 (Attention; towards faces, towards neutral objects) x 3 (Subclassification Grouping; more avoidant, B3, more ambivalent) Fisher's Exact test was then performed (Table 3). There was a significant association between the two categorical distinctions, Fisher's Exact,  $p = 0.05$ ,  $W = 0.47$ . Nine of the 13 more avoidant children (69%) indicated bias towards the neutral object stimuli, whereas a full seven of the eight more ambivalent children (87.5%) indicated a bias towards the face stimuli. In the B3 group ( $n = 10$ ), six were biased away and four were biased towards the face stimuli.

Table 3  
Frequencies within Each Attention Grouping by SSP Classification Grouping

Attention	SSP SubClassification Grouping		
	More Avoidant	B3	More Ambivalent
Infant Pictures	4 (30.7 %)	4 (40.0 %)	7 (87.5 %)
Neutral Objects	9 (69.3 %)	6 (60.0 %)	1 (13.5%)
Total	13	10	8

Note Infant Pictures = The child's bias score indicates a bias for infant pictures, Neutral Objects = The child's bias score indicates a bias towards neutral objects. More Avoidant = A1, A2, B1, and B2 subclassifications, B3 = B3 children, More Ambivalent = B4, C1, and C2 children.

In summary, continuous scores derived from SSP classifications significantly predicted average bias score in the 1250 ms condition. Lower SSP scores (indicative of avoidance) were associated with more positive bias scores and higher SSP scores (indicative of ambivalence) were associated with more negative bias scores. This finding provides support for Hypotheses 1 and 2. Additionally, the categorical analysis also supported Hypothesis 1 and 2: Nine of 13 children in the core avoidant group indicated a bias towards the neutral object stimuli, and 7 of 8 children in the ambivalent group indicated a bias towards the infant picture stimuli. In conclusion, the findings of the planned principle analyses appear to be robust across analyses using different conceptualizations of attachment security and attention.

## 2.4 Discussion

The present investigation tested the association between attachment security, assessed in the SSP at one year of age, and attention to attached stimuli. Children assessed as avoidant in the SSP at one year of age were more biased towards the neutral object pictures as compared to children in the secure and ambivalent groups in the 1250 ms condition, providing support for Hypothesis 1. Moreover, children assessed as ambivalent in the SSP at one year of age were more biased towards the infant pictures as compared to children in the secure and avoidant groups, providing support for Hypothesis 2. Two additional analyses—one using continuous scores and another using a categorical approach—also provided support for Hypotheses 1 and 2. Continuous scores generated from subscale classifications of SSP behavior along a spectrum of avoidant to ambivalent significantly predicted attentional response in the 1250 ms condition. Higher avoidance was associated with positive bias scores, indicating a bias towards the

neutral object pictures, and higher ambivalence was associated with negative bias scores, indicating a bias towards the infant pictures. Finally, using a categorical approach, nine of the 13 more avoidant subclassifications indicated a bias towards the neutral stimuli, and seven of the eight more ambivalent subclassifications indicated a bias towards the infant stimuli.

The evidence supporting Hypothesis 1 is consistent with propositions regarding avoidance and attention (Main, 1990) and current cognitive models of attention (e.g., Bishop, Duncan, Matthew, & Lawrence, 2004; Corbetta & Shulman, 2002; Fernandez Duque & Posner, 1997; Jordan & Morton, 2012; Posner & Rothbart, 2007). Specifically, Main suggests that avoidant infants in the SSP at one year of age focus on exploring the environment in order to inhibit a natural propensity to approach the attachment figure. Within the cognitive model of attention adopted here (e.g., Corbetta & Shulman, 2002), Main's propositions imply influence of top-down, voluntary, effortful, and slow control of attention in order to inhibit a propensity to seek comfort from the attachment figure. Consistent with this assertion, the effects of avoidance were observable in the 1250 ms condition where top-down control of attention is thought to influence an attentional response (Bradley et al. 1998; Koster et al, 2004; Mogg & Bradley, 1998; Mogg & Bradley, 2006; Mogg et al. 2000), and not in the shorter duration condition. Thus, the present investigation provides support for Main's assertions regarding avoidance within a current cognitive model of attention.

Not only are the findings for avoidance consistent with Main's hypotheses, the attentional response described for avoidance mimics the inhibition avoidance attentional responses evident in some anxiety disorders. Studies of individuals with

specific phobias and social anxiety disorders suggest that an initial attentional vigilance for anxiety invoking stimuli is later contradicted by a shift of attention away (Amir, Foa, & Coles, 1998; Derakshan, Eysck, & Myers, 2007; Mogg & Bradley, 2006; Mogg, Bradley, Miles, & Dixon, 2004; Vassilopoulos, 2005). This vigilance avoidance response is thought to contribute to the maintenance of anxiety because the pattern of attention prevents an individual from fully processing an anxiety invoking stimulus (Mogg & Bradley, 2006). In the present investigation, children within the avoidant group exhibited a significant shift from an initial vigilance for the infant stimuli to attending towards the neutral object pictures. Thus, the attentional response associated with avoidance appears to mimic the vigilance avoidance pattern observed in studies of anxiety.

Like the findings for avoidance, the attention response associated with ambivalence was also consistent with theoretical propositions regarding ambivalence and attention (Main, 1990) and with current cognitive models of attention. Specifically, Main suggests that ambivalent infants in the SSP at one year of age focus on the caregiver's feelings of needing in order to exaggerate expressions of distress in a frightening circumstance. Within the cognitive model of attention adopted here (e.g., Corbetta & Shulman, 2002), Main's proposition implies influence of top-down control of attention in order to facilitate or exaggerate the expression of distress. Consistent with this assertion, the effects of ambivalence were observable in the 1250 ms condition (Bradley et al., 1998; Koster et al. 2004; Mogg & Bradley, 1998; Mogg & Bradley, 2006; Mogg et al. 2000). Thus, the findings regarding ambivalence also provide support for Main's assertions regarding ambivalence within a current cognitive model of attention.

Despite evidence for an attentional bias associated with ambivalence, future investigations might focus on cognitive factors that are downstream of attention. For example, both the B4 subclassification of the secure group and ambivalent general classification have been described as having a preoccupation with the mother throughout the SSP (Ainsworth et al., 1978). Interestingly, within the more ambivalent group for the categorical analysis is composed of B4, C1, and C2 subclassifications— all but one child indicated a bias towards the infant stimuli. The sample sizes are, of course, too small to statistically distinguish between the B4 subclassification ( $n = 3$ ) and the ambivalent classification ( $n = 5$ ). However, if the B4 and C classifications are associated with similar attentional patterns, something downstream of attention may explain the differences in behavior observed for these groups. Specifically, a B4 infant might focus on the mother and remember instances of sensitivity resulting in strong expressions of distress that are uncomplicated by resistance to contact. A C infant might focus equally on the mother but recall instances where she was unpredictable resulting in the expression of angry resistance to contact. This notion that infants might recall different aspects of attachment experience is consistent with theoretical proposals (Main et al., 1985) and empirical investigations regarding attachment memory (Belsky et al., 1996).

Unlike their insecure counterparts, children who were assessed as secure in the SSP at one year of age appear to be less biased in the slower duration condition. It is difficult to affirm the null hypothesis and conclude that children with secure attachment histories are unbiased. Nevertheless, two pieces of evidence from the present investigation appear to support the notion that children in the secure group are less biased

than their insecure counterparts. First, the significant linear trend in the continuous score analysis suggests that the secure children fall in between more avoidant and ambivalent children. Second, children within the B3 group in the categorical analysis were nearly evenly distributed between indicating a bias towards the neutral objects (60%) and a bias towards the infant pictures (40%). The categorical finding is interesting because the B3 group is thought to be the most prototypically secure. In theory, B3 infants do not require cognitive manipulations in order to maintain a conditional strategy for obtaining care from the attachment figure (Main, 1990, 2000). It is therefore intriguing that they would not indicate a particular bias in any direction at least as a group.

Despite the intriguing trends suggesting that children in the secure group might be unbiased, the present investigation did not test this proposition directly. Thus, any conclusions regarding the unbiased attention of secure children should be made with caution. A direct test would require the repeated measuring of an attentional bias across many dot-probe paradigms. If children classified as secure in the SSP were truly unbiased, then their attentional response would change or vary randomly across dot-probe paradigms. It might also be proposed that secure children might be invariant in attentional response across paradigms. For example, a secure child may consistently demonstrate a bias towards the neutral objects over repeated administrations of the dot probe. This pattern of findings would suggest that children in the secure group can be biased, but the bias is not dependent on their attachment classification.

Future investigations might also focus on context as it relates to attachment related attentional biases. Interestingly, in the home visits infants who are avoidant in the SSP at one year of age are the least tolerant and express the highest levels of distress

to brief separations (Ainsworth et al., 1978; Pederson & Moran, 1996). The idea that avoidant infants might express distress only in certain circumstances suggests that attentional biases like those observed here in the probe might be contextual in nature. For example, attentional biases might only be active in circumstances where the child is afraid or cautious. e.g., when separated from an attachment figure or when participating in the dot-probe with a new and strange adult. Additionally, organizations of attachment behavior, and cognition therein, are thought to be relationship specific (Bowlby, 1969; Bretherton, 1985). Meta-analytic findings have shown that an infant's attachment security with the mother is only slightly associated with attachment security with the father (Fox, Kimmerly & Schafer, 1991). This finding is intriguing because it suggests that infants exhibit differing organizations of attachment behavior with different attachment figures, and as such, might also exhibit different organizations of cognition with different attachment figures. For example, if an infant is avoidant with the mother, he or she may exhibit biased attention away from attachment-related stimuli in the mother's presence. However, if the same infant is secure with the father, he or she may not exhibit a bias away from attachment-related stimuli in the presence of the father. In light of this, future investigations might study the association between attachment and attention as it relates to SSP classification for mother and father.

In addition to context, this study's results suggest that the nature of stimuli likely to be associated with attachment-related attentional bias requires further investigation. This study found that avoidance was associated with a preferential attention towards neutral objects in the slow duration condition no matter what infant picture was presented. Moreover, ambivalence was associated with preferential attention towards all

infant stimuli in the slow duration condition. With this in mind, it is possible that avoidance and ambivalence at one year of age might be associated with biases in attention for face or social stimuli generally, and not just attachment-related expressions. Follow up studies should include other face stimuli such as adult and animal faces to test this hypothesis. If the same patterns of findings were yielded from animal faces, it would suggest that the attentional biases associated with avoidance and ambivalence might extend to face processing generally. It may therefore be informative and useful to replicate the procedure described here with additional forms of stimuli.

Finally, due to the relatively small sample sizes, the need to replicate the findings presented must be stressed. The strength of the findings reported here should not be underestimated on the basis of sample size, however. The attentional biases associated with avoidance and ambivalence were prospectively predicted and are consistent with current theory on attachment and attention (Main, 1990), current cognitive accounts of attention (Corbetta & Shulman, 2002), and findings regarding vigilance in anxiety disorders (Amir et al. 1998; Derakshan et al. 2007; Mogg & Bradley, 2006; Mogg et al., 2004; Vassilopoulos, 2005). It is also important to note that error variability was likely inflated for the primary analysis. The secure group contained the smallest sample size and the largest group variance in bias scores, a circumstance that leads to an inflated estimate of error variability in a between subjects design (Boneau, 1960). Moreover, there was negative correlation between a child's average bias score in the 200 ms condition and a child's average bias score in the 1250 ms condition (25), a circumstance that would inflate error variance in a repeated measures design. Therefore, the findings reported here are unlikely to be a product of chance.

Moreover, the biases in attention described within this report can be used to generate hypotheses about other cognitive mechanisms that vary with attachment security. These cognitive mechanisms of attention among them could be used to explain and predict the many and varied sequelae of attachment security and insecurity (see Weinfield, Sroufe, Egeland, & Carlson, 2008, for a review of the developmental outcomes of attachment security and insecurity).

In summary, then, the present investigation was an initial attempt at using cognitive methodology and current models of attention to explore hypotheses regarding attachment and attention (Main, 1990). The findings presented here are the first to support the widely held notion that differences in attachment security are associated differences in attending to specific forms of information. Namely, avoidant children appeared to preferentially attend to neutral objects in spite of an initial vigilance for infant picture stimuli, and ambivalent children appeared to preferentially attend to infant stimuli. More generally, the findings described herein provide support for the idea that thought about attachment is directly related to attachment security (Main, 2000; Bowlby, 1969). As such, the present study and others like it advance the goal of understanding the lasting and profound effects of our most important relationships.

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## Chapter 3

### 3 Associations Between State of Mind with Respect to Attachment and Attention to Attachment-Related Stimuli

An individual's state of mind with respect to attachment is thought to reflect a way of thinking about attachment experiences (George, Kaplan, & Main, 1985). Three states of mind regarding attachment can be inferred from responses to AAI queries: secure/autonomous, dismissing, and preoccupied. Individuals with a secure/autonomous state of mind are collaborative, valuing, and clear when discussing attachment experiences. By contrast, individuals with a dismissing state of mind make frequent claims to a lack of memory for attachment experience and maintain a positive general image of childhood, and individuals with a preoccupied state of mind are seemingly confused by attachment and discuss angering experiences at inappropriate times. These three discourse patterns are thought to correspond with an individual's way of thinking about attachment experience or their state of mind regarding attachment (Main, Kaplan, & Cassidy, 1985; Main 2000). Of particular interest to the present investigation is the idea that the three states of mind with respect to attachment correspond with a way of attending to attachment-related experience and stimuli (Main, 2000). With this in mind, the studies presented in this chapter broadly investigate the association between state of mind with respect to attachment, attention to attachment-related stimuli, and maternal behavior.

An individual's state of mind with respect to attachment is assessed with the Adult Attachment Interview (AAI), a semi-structured interview designed to probe early

attachment experience (Main et al., 1985). The AAI protocol begins with a few warm up queries regarding where an individual grew up, whether her/his grandparents are alive, and what his or her parents did for a living. Questioning then progresses to specific probes regarding an individual's relationship with his or her parents, beginning with a request to provide five adjectives describing the relationship with each parent. This question is followed by a call to support each adjective with specific memories or events, then by queries regarding specific instances of illness, injury, distress, and separation and, finally, by probes concerning loss or trauma, changes in existing conditions in attachment relationships, and their current relationship with offspring (George et al. 1985).

The way an individual responds to AAI queries is thought to indicate one of three states of mind regarding attachment: secure/autonomous, dismissing, and preoccupied (Main, Goldwyn, & Hesse, 2002). Classification focuses on how a person discusses attachment experience and not on the actual content of an individual's description of their experience. Discourse indicative of a secure/autonomous state of mind with respect to attachment is characterized by collaborative, valuing, and coherent discussion of attachment experience. Coherent discourse is clearly, seemingly honest, provides just enough information, and remains on topic. On the other hand, the discourse indicative of a dismissing or preoccupied state of mind with respect to attachment is characterized by incoherence. Specifically, dismissing discourse is marked by idealization of attachment figures, an insistence on the inability to recall attachment experience, and sometimes derogation and devaluing of attachment-related events or emotions. Moreover, preoccupied discourse is marked by angry discussion of negative attachment-related

experiences or passive, vague, and confusing speech when discussing attachment relationships.

The discourse associated with each state of mind with respect to attachment thought be the product of an internal working model or representation of attachment experience (Main, 2000; 1990). Bowlby (1969) originally proposed the idea of an internal working model to explain differences in the way an infant organizes attachment behavior. For example, infants who experience rejection develop a representation of the attachment figure as rejecting. As a result they may avoid their attachment figure distressed in order to reduce the likelihood of rejection in a frightening circumstance (Main, 1981). Moreover, infants who experience inconsistent responsiveness develop an expectation that the attachment figure will be unpredictably available. When distressed these infants express ambivalence heightening and prolonging expressions of need and anger in order to increase the likelihood of responsiveness from their attachment figure (Main, 1990). In both circumstances of ambivalence and avoidance the expectation or representation of the attachment figure's responsiveness is thought to guide infant behavior.

Of particular interest to the present discussion is the idea that the internal working model might guide thought and cognition with respect to attachment. Specifically, avoidance and ambivalence are thought to be conditional strategies for obtaining caregiving and proximity in threatening circumstances. In order to employ a conditional strategy, an insecure infant must ignore or focus on feelings of distress in order to alter a natural propensity to seek proximity to his or her attachment figure. Infants that exhibit avoidance must direct attention towards the environment and away from the mother.

order to inhibit the urge to approach the rejecting attachment figure, and infants exhibiting ambivalence must focus excessively on the mother (and feelings of need) in order to heighten expressions of need. Thus, the internal working model is a representation of the attachment relationship that is thought to organize the way an individual thinks about attachment.

With the preceding in mind, state of mind with respect to attachment is similarly thought to represent an individual's way of thinking about attachment. It is presumably organized with regard to an representation, expectation, or internal working model of attachment experience (Main, 2000). The insecure states of mind with respect to attachment are thought to reflect biased cognition organized with respect to an insecure internal working model. Specifically, these insecure states of mind are thought to reflect cognition that is analogous to that used in the maintenance of an insecure (conditional) attachment strategy in childhood (e.g., Main, 1990). The word analogous is used here because recent meta-analytic evidence suggests that attachment is not stable from infancy to adulthood, and therefore, state of mind with respect to attachment cannot reflect cognition used in childhood (Pinquart, Feubner, & Ahnert, 2013). In the case of preoccupied and dismissing states of mind, cognition is thought to be organized with respect to an insecure internal working model of attachment. The dismissing state of mind is thought to indicate cognition analogous to avoidant children (Main, 2000). In other words, dismissing discourse by an adult may indicate a bias in attention away from attachment-related stimuli (the mother, feelings of need, etc.) that would be used by an avoidant child to inhibit or prevent approach to the attachment figure. Similarly, the preoccupied state of mind in adulthood is thought to indicate analogous cognition to

ambivalent children (Main, 2000) and may indicate a similar tendency to direct attention towards attachment-related stimuli. Therefore, the current theory implies that cognition in the case of an insecure state of mind with respect to attachment will be a biased function of an insecure internal working model.

In spite of the elegance of the theory, the propositions regarding state of mind with respect to attachment and cognition have rarely been tested. As a first step in addressing this gap, the studies described within this chapter investigate the association between state of mind regarding attachment, attention to attachment-related stimuli, and maternal behavior. The first study is a direct test of the hypothetical association between state of mind regarding attachment and attention to attachment-related stimuli. The second study investigates whether biases in attention corresponding with maternal state of mind with respect to attachment are transmitted or passed on to offspring. Finally, the third study investigates whether differences in attention to attachment-related stimuli are a means by which state of mind regarding attachment influences maternal interactive behavior.

### 3.1 Study 1: Testing the association between state of mind with respect to attachment and attention to attachment-related stimuli

To review, the two insecure states of mind with respect to attachment are thought to be associated with biased attention for attachment-related stimuli (Main, 1990; 2000). A dismissing state of mind is indicative of a bias in attention away from attachment-related stimuli, and a preoccupied state of mind is indicative of a bias in attention towards attachment-related stimuli. These cognitive biases are thought to be analogous to those used in the maintenance of an avoidant or ambivalent strategy in childhood, respectively.

(Main, 1990). With these propositions in mind, Study 1 tested a hypothetical association between state of mind with respect to attachment and attention to attachment related stimuli

Only two previous studies have provided support for the association between state of mind with respect to attachment and differences in attention for certain forms of stimuli. Both used the emotional Stroop task (Williams, Mathews, & Macleod, 1996) to investigate attention to emotionally valenced stimuli among individuals with differing states of mind with respect to attachment. In the first, participants who had or had not been diagnosed with an anxiety disorder (patients vs. control groups, respectively) were presented neutral and emotionally valenced words written in varying font colors (Emmichoven, van IJzenoorn, De Ruiter, & Brosschot, 2009). Participants were instructed to name the font color and ignore word meaning. To assess attention to the stimuli, the authors measured an interference effect, quantified as the difference in response time to stimuli with emotional words versus neutral words. Among patients, individuals classified as secure showed larger interference effects to threatening words compared to individuals classified as insecure. However, among controls, interference effects for threatening words were the same for individuals classified as secure autonomous or insecure (preoccupied or dismissing). No differences were found regarding positively valenced words. These findings suggest that insecure individuals have cognitive strategies that help in managing an anxiety disorder, providing modest support for Main's (2000) propositions. The findings are particularly supportive of the notion that dismissing individuals, at least those with anxiety disorders, can more effectively attend away from threatening stimuli. However, it is unclear as to why

preoccupied individuals performed similarly to dismissing individuals. In the second study that provided support for the association between state of mind and attention (Haydon, Roisman, Marks, & Fraley, 2011) participants were presented with words that implied emotional distance (e.g., *abandon*) or implied emotional proximity (e.g., *clinging*, *hugging*) or were emotionally neutral (e.g., *wire*). Compared to all other groups, dismissing individuals displayed quicker color naming times when presented with proximity words. No differences were found for distance words. These findings partially support Main's propositions because dismissing speakers appear more capable of ignoring, or attending away from, the meaning of proximity related words thus avoid interference effects in the task.

Although the results were mixed, investigations using the Stroop task have provided some evidence (Emmichoven et al., 2003; Haydon et al., 2011) to suggest that individuals with a dismissing state of mind may have a greater tendency to direct attention away from attachment-related stimuli than individuals with other states of mind regarding attachment. However, other investigations of information processing and attachment complicate the story further. Maier and colleagues (Maier et al., 2005) investigated the association between state of mind with respect to attachment and perceptual processing of faces and social interactions. Participants were presented with pictures of human and animal faces and social interactions for varying durations of time. They were asked to identify the content of each picture. Dismissing dimension scores, derived from the AAI qualitative rating scales of idealization and insistence on lack of recall (Main, Hesse, & George, 2002) were associated with faster identification of male faces with positive expressions, female faces with negative expressions, and positive and

negative social interactions. Preoccupied dimension scores derived from the AAI qualitative rating scales of passivity and preoccupied anger, associated with the quicker identification of female faces with negative expressions. These findings are consistent with the idea that preoccupation is associated with biased attention towards certain stimuli. However, in an apparent contradiction of the previously described Stroop studies, the findings reported by Maier suggest that a dismissing state is associated with vigilance for, rather than avoidance of, certain forms of stimuli.

Given the diversity of these findings, the current study began by identifying a well-established method of assessing attention in an attempt to (1) provide additional support for an association between state of mind and attention and (2) shed light on the mixed findings regarding a dismissing state of mind. The propositions regarding state of mind with respect to attachment and attention were tested in a sample of mothers using methodology known as the dot-probe paradigm (Macleod, Mathews, & Tata, 1986). A trial of the dot-probe paradigm proceeds in several steps. First, pictures or words are presented. Second, these stimuli disappear and one is replaced by a dot. Finally, once the dot is presented, the participant must note its location as quickly as possible by button press. A participant will be quicker at locating a dot if it replaces the picture on which his or her attention focused. The administration of the dot-probe is relatively straightforward, its development for the present investigation required overcoming several ambiguities in the theory regarding attachment and attention. These ambiguities are described next in conjunction with methodological decisions regarding the dot-probe paradigm.

In the current investigation, on randomized trials of dot-probe paradigm mothers were presented with attachment-related stimulus (Main, Kaplan, & Cassidy, 1985) paired with a neutral object to assess an attentional bias. Nevertheless, the fact that the term attachment-related stimulus is not well defined in the attachment literature posed a challenge for selecting relevant stimuli for the dot-probe paradigm. The diversity of stimuli used in previous investigations of attachment and attachment in childhood illustrates this ambiguity (Belsky, Spritz, & Crnic 1995; Kirsh & Cassidy, 1996) and adulthood (Emmichoven et al., 2003; Haydon et al. 2011). Belsky and colleagues (Belsky et al., 1995) used positive or negative affective events and Kirsh and Cassidy (1996) used pictures of mother-child dyads with varying affective qualities in investigations with adults. Emmichoven and colleagues (Emmichoven et al., 2003) used threatening words in assessing an attentional bias, whereas Haydon and colleagues (Haydon et al., 2011) used words implying proximity seeking.

In light of varied forms of stimuli administered in past studies and the apparent ambiguity regarding the definition of attachment-related stimuli, a strict definition of attachment-related stimuli was adopted when selecting stimuli for the present investigation. Specifically, they were defined as expressions of need and/or an individual's feelings of needing another person. This definition was derived from Bowlby's (1969) conceptualization of attachment as a relationship wherein one individual is biologically predisposed to seek out a specific other person when hurt, distressed, or ill. Within this definition of attachment, an expression of needing another person is definitely attachment-related. Applying this definition to the selection of stimuli for current investigation, pictures of crying infants were selected as attachment

related stimuli because infant distress is widely perceived as an expression of needing another person (e.g. Zeskind & Marshall, 1988)

Attention itself is also not clearly defined in the attachment literature. Specifically, attention to attachment-related stimuli likely reflects an interplay between quick bottom-up processes and slower top-down processes (e.g., Bishop, Duncan, Matthew, & Lawrence, 2004; Corbetta & Shulman, 2002; Derryberry & Reed, 2002; Fernandez Duque & Posner, 1997; Jordan & Morton, 2012; Posner & Rothbart, 2007). Therefore, differences in attention to attachment-related stimuli could be evident in an immediate response to a stimulus, or later in time, after a stimulus has been more fully processed. As implied by the terms, bottom-up processes are thought to be automatic and driven by the qualities of a stimulus (e.g., when a stimulus is shiny or loud; Jordan & Morton, 2012), whereas top-down processes are slow, effortful and voluntary. The former support rapid responses to attachment-related stimuli whereas the latter regulate conflicting behavioral propensities (Bishop et al., 2004; Corbetta & Shulman, 2002; Derryberry & Reed, 2002; Fernandez Duque & Posner, 1997; Jordan & Morton, 2012; Ochsner & Gross, 2005; Mezzacappa, 2007). The relative quickness of bottom-up processes, and the slower influence of top-down processes, suggests that attentional responses could change over time with an initial bottom-up attentional response later being modified by slower top-down processes.

In order to assess this potential time-course of attention to attachment-related stimuli, the stimuli used in the dot-probe paradigm were presented for different durations in the current study (e.g., Bradley, Mogg, Falla, & Hamilton, 1998; Koster, Verschuere, Crombez, & Van Damme, 2004; Mogg & Bradley, 1998; Mogg & Bradley, 2006; Ogil,

Millar, & Bradley, 2000). Short durations (e.g., 200 ms) assess an initial reaction to stimuli and long durations (e.g., 1250 ms) evaluate whether the initial response has changed (e.g., due to slower top-down influences; Bar-Haim et al., 2007; Bradley et al., 1998; Koster et al., 2004; Mogg & Bradley, 1999; Mogg & Bradley, 2006; Mogg et al., 2000). While neither short nor long duration measures provide a process pure assessment of attention (for discussion, see Bar, 2009; Corbetta & Shulman, 2002), measures collected at short durations can be presumed to reflect a greater influence of bottom-up than top-down processes, whereas measures collected at longer durations can be presumed to reflect a mixture of both.

Previous propositions regarding attachment and attention did not include the consideration of top-down and bottom processes. These distinctions may, however, be useful in an investigation of the relation of state of mind with respect to attachment to attention to attachment-related stimuli. That is, it may be that differences between groups may be more apparent at the earlier or later phases of an attentional response. For example, the theoretical model described here suggests that the cognition associated with a preoccupied state of mind is analogous to that of ambivalent infants and cognition inferred from a dismissing state of mind is analogous to that of avoidant infants. Avoidant and ambivalent infants are thought to use attention to inhibit or alter a natural propensity to approach the attachment figure when hurt, stressed, or ill (Main, 1990). Such modification or shaping of a prepotent propensity would suggest the involvement of top-down attention. The slow, effortful and voluntary manipulation of attention in circumstances that may be used when conflicting behavioral propensities arise (e.g., Fernandez-Duque & Posner, 1997). Because the insecure states of mind are thought

exhibit analogous cognition that of insecure infants, it would be reasonable to propose that the association between state of mind and attention may be more pronounced at the later stages of an attentional response.

In addition, consideration of the potential operation of both top-down and bottom-up cognitive process provides a basis for interpreting the seemingly contradictory research on the association between attachment and attention. This is previously described study by Maier and colleagues (Maier et al., 2005), dismissing individuals quickly identified face and social stimuli suggesting vigilance for certain forms of stimuli. However, the opposite findings by Haydon and colleagues (Haydon et al. 2011) suggest an attentional bias away from attachment-related stimuli. Within the cognitive model adopted here one that includes a time course of attention the aforementioned results are not necessarily contradictory. A dismissing state of mind might be associated with an initial vigilance for attachment-related stimuli followed by a defensive move of attention away

In summary then, differences among states of mind with respect to attachment are likely to be most readily observable at the later stages of an attentional response. Moreover, as argued here the dismissing state of mind with respect to attachment might be associated with specific changes in attention across time. With these propositions in mind, the present investigation tested three hypotheses:

- 1) A dismissing state of mind with respect to attachment will be associated with a bias away from attachment-related stimuli relative to the secure and preoccupied states of mind when stimuli are presented for longer durations

- 2) A dismissing state of mind will also be associated with an initial vigilance for attachment-related stimuli prior to the aforementioned shift in attention away
- 3) A preoccupied state of mind with respect to attachment will be associated with a bias towards that attachment-related stimuli relative to the secure and preoccupied states of mind in the longer duration condition of the probe. This bias will not be evident in the short duration condition of the probe where top-down processes are less influential.

### 3.1.1 Method

#### 3.1.1.1 Participants

Two samples of mothers participated in the present investigation, both were recruited from separate waves of the same longitudinal study. In the first sample (Sample 1), thirty-seven mothers from an original sample of 70 mothers were administered the dot-probe when their child was seven to eight years old. Within this sample average maternal age at the time of the AAI was 30.0 years ( $SD = 4.9$ ). Fifty-three of these mothers were married (75.7%), five were single (7.1%), and 12 were in common law relationships (17.2%). Families were, on average, low-risk and middle-class with incomes ranging from CAN \$10,000 to CAN \$80,000 or more, with the average family earning CAN \$50,000 to CAN \$59,999 per year. Average maternal education was 15 (SD = 2). In the second sample (Sample 2) thirty-five mothers from an original sample of 46 mothers were administered the dot-probe when their child was 27 months of age. Within this sample average maternal age at the time of the AAI was 30.2 years (SD = 4.9). Thirty-two of the mothers were married (69.6%), 6 mothers were single (13.2%), 7

were in common law (15%), and 1 was separated (2%). Families were, on average, middle class with income ranging from CAN \$10,000 to CAN \$80,000 or more, with the average family earning CAN \$50,000 to CAN \$59,999, and average maternal education was 15 (SD = 2). At the time of AAI administration these samples did not differ on maternal state of mind with respect to attachment ( $\chi^2(2) = 2.15, ns$ ), marital status, Fisher's Exact, ns, income level,  $F(1, 112) = 0.39, ns$ , maternal education,  $F(1, 113) = 0.41, ns$ , or maternal age,  $F(1, 114) = 0.04, ns$ . Given these similarities, the samples were combined for the purposes of statistical analyses.

Mothers were contacted through email or telephone and asked if they would be willing to participate. Those who did not reply were contacted at least four additional times before exclusion from the study. In the first sample, thirty-three mothers did not return (47.1%) from the original sample of 70 mothers. Additionally, three mothers from this sample were categorized as cannot classify in the AAI (Hesse, 2008) and were excluded because they had not been assigned a single state of mind with respect to attachment. In the second sample, eleven of the mothers did not return for the present investigation from the original sample of 46 (23.9%). Additionally, one mother was excluded because she was categorized as cannot classify, and another was excluded because her AAI could not be transcribed due to poor audio quality. Therefore, analyses were performed on a combined sample of 67 mothers.

### 3.1.1.2 Materials and Equipment

The stimuli used in the present investigation were the same as those used in Chapter 2 of this dissertation. Ten pictures of crying infants were gathered for use in the

dot-probe paradigm. As previously stated, these pictures were selected because infant distress is widely perceived as an expression of needing another person (e.g. Zeskind & Marshall, 1988). Ten pictures of infants smiling and 10 pictures of infants with calm expressions were also included for exploratory purposes. Additionally, 30 pictures of neutral objects were collected for pairing with the infant faces on probe trials. This set of neutral object pictures was composed primarily of items that typically be found in the home of a North American family (e.g., a spoon, a chair, a cup, a waste basket, etc.). Stimuli from a larger sample of distressed, happy, and calm baby images were ranked by three research assistances on the three dimensions: distressed to least distressed, most happy to least happy, and most calm to least calm, respectively. The ten pictures with the highest average rank for each category were ultimately selected. The dot-probe paradigm was administered with a Dell Latitude D830 laptop with a 15.4 inch display running E-Prime software.

### 3.1.1.3 Measures

#### 3.1.1.3.1 Adult Attachment Interview (AAI; Main, Kaplan, & Cassidy, 1985)

The AAI was administered to mothers in the home when their child was three months of age. Each AAI was transcribed verbatim, excluding any nonverbal utterances (laughter, giggling, crying). AAIs were classified (dismissing, secure/autonomous, or preoccupied) in accordance with the Main, Goldwyn, and Hesse (2002) coding system. In addition to dismissing, secure/autonomous, or preoccupied classification, transcripts were also assigned an Unresolved or Not unresolved classification for loss or trauma

(Main, Goldwyn, and Hesse, 2002). These unresolved classifications were not used in the present analyses because hypotheses regarding attachment and attention refer explicitly to dismissing, secure-autonomous, and preoccupied categories (Main, 2000).

Finally, AAI were assigned scores on eight 9-point continuous rating scales designed to assess state of mind with respect to attachment (Main, Goldwyn, & Hesse, 2002). Four of these rating scales assess various discourse qualities associated with a dismissing state of mind. Idealization assesses the disparity between the positive general description of an attachment figure and the evidence from specific memories used to support this image. A score is assigned for all attachment figures discussed during the AAI. Insistence on lack of recall assesses a mother's tendency to block discussion by claiming a lack of memory for attachment experiences. Derogation indexes a mother's tendency to devalue attachment-related feelings or experiences for specific attachment figures. Like idealization, a derogation score is assigned to all attachment figures discussed during the AAI. Fear of loss assesses a mother's reported tendency to act on a fear of losing her child through death. Two scales assess various discourse qualities associated with a preoccupied state of mind. Preoccupied anger assesses a mother's capacity for angry, lengthy, irrelevant and unclear discussion of offensive attachment experiences, and passivity assesses a mother's vagueness when discussing attachment experience. Preoccupied anger scores are assigned for all discussed attachment figures. Finally, two scales are used to assess discourse qualities associated with a secure state of mind with respect to attachment. Coherence of transcript refers to a speaker's ability to stay on topic, provide evidence for their assertions, discuss experiences clearly, and provide just enough information. Coherence of mind assesses a mother's ability to be

coherent and logically consistent. Note that derogation and fear of loss were not used in the present investigation because only four AAls exhibited scale scores above three on derogation, and only six AAls exhibited scores above three on fear of loss.

A total of 27 AAls (20%) were coded by a second reliability coder. The inter-rater agreement on classification was 96%. Correlation coefficients for inter-rater reliability on the continuous scales are presented in Table 4. Sufficient inter-rater reliability was achieved on all rating scales.

Table 4

## Inter-Rater Reliability Correlations for Continuous AAI Subscales

<u>AAI Scale</u>	<u>Reliability</u>
Idealization Mother	0.86***
Idealization Father	0.84***
Insistence on lack of Recall	0.74***
Preoccupied Anger Mother	0.96***
Preoccupied Anger Father	0.97***
Passivity	0.88***
Coherence of Mind	0.91***
Coherence of Transcript	0.93***

Note \*\*\* =  $p < .001$

Analyses for the present investigation treated state of mind with respect to attachment as both a categorical variable (secure, autonomous, dismissing, and preoccupied) and a continuous variable (e.g. Roisman, Fraley, & Belsky, 2000) in order to characterize state of mind continuously. Scores for idealization and insistence on lack of recall were summed to create a dismissing score for each mother. These scores were summed because they are thought to assess the dismissiveness of an individual (Main, Goldwyn, & Hesse, 2002). Derogation and fear of loss were excluded because very few participants exhibited elevated scores on these scales. Moreover, scores for passivity and preoccupied anger were summed to create a preoccupied score for each mother. These scores were summed because they are thought to index the preoccupation of an individual (Main, Goldwyn, & Hesse, 2002). As previously stated, scores for preoccupied anger and idealization are assigned to each attachment figure discussed within an AAI. For the purposes of the present analysis, the largest assigned score for idealization or preoccupied anger was used in calculating dismissing and preoccupied scores. This was done to mirror the categorical coding practice whereby the largest score is used when determining maternal state of mind with respect to attachment (Main, Goldwyn, & Hesse, 2002).

### 3.1.1.32 Dot-Probe Paradigm (Mathews, Macleod, & Tata, 1986)

The dot-probe paradigm was previously described in Chapter 2. Mothers were separated from their child during a lab visit and were seated 50 cm in front of the computer monitor. On each trial of the dot-probe paradigm, a fixation cross with dimensions 24 x 24 mm was presented for 1000 ms. The cross disappeared and two pictures appeared with dimensions 100 x 100 mm. One of these pictures was then

replaced by a dot, and the child was asked to press a button corresponding to the side on which the dot appeared. Mothers completed 10 practice trials followed by 160 experimental trials. The 160 experimental trials were divided into 40-trial blocks. The preselected infant pictures (calm, distressed, and happy) appeared four times and were paired with a new neutral object picture in every appearance. In all cases, each infant picture was matched as closely as possible for size with neutral object. Infant pictures were matched with neutral objects because the theory concerns attention towards or away from attachment-related stimuli (e.g. towards attachment-related stimuli or towards the environment) (Main, 1990, 2000). Additionally, each block contained 10 neutral-neutral pairings so that an infant picture would not appear on every trial. Thus, all four experimental blocks had the following composition: Ten neutral-neutral item pairs, 10 happy infant-neutral item pairs, 10 distressed infant-neutral item pairs, and 10 calm infant-neutral item pairs. Throughout the task, pictures pairs were presented in random order within each block for each participant. All infant pictures had an equal probability of appearing on either side of the computer screen (left vs. right) and they appeared with equal probability on either side of the screen (left vs. right). Moreover, across all blocks each infant picture appeared four times in all possible picture location (left vs. right) and dot (left vs. right) pairings. Finally, pictures were presented randomly for 200 and 1250 ms in order to describe the attentional response at faster and slower intervals following stimulus onset.

## 3.1.2 Results

### 3.1.2.1 Attrition Analysis

Forty-four mothers (33 from Sample 1 and 11 from Sample 2) did not return for the present investigation. These mothers did not differ from the returning participants in state of mind with respect to attachment ( $\chi^2(2) = 4.81$ , ns), maternal years of education ( $t(112) = 0.64$ , ns) or marital status (Fisher Exact). They did however differ in average income ( $t(111) = 2.18$ ,  $p < .05$ ), such that the attrition group fell on average within the \$50,000 to \$59,999 income range and the returning group fell on average within the \$60,000 to \$69,999 income range.

### 3.1.2.2 Primary Analysis

Data from dot-probe trials were excluded when a mother's response was incorrect, when reaction times were greater than 2000 ms, and/or when reaction times were more than 3 standard deviations above each mother's mean. Bias scores were calculated from the remaining data for each mother by subtracting the average reaction time when a particular infant face (crying, smiling, or neutral) appeared in the opposite location of the dot from the average reaction time when both appeared in the same location. Thus, if a mother was quicker on trials where the dot appeared behind the neutral object picture, this calculation would yield a positive score indicating a bias towards neutral object pictures. Conversely, if a mother was quicker on trials where the dot appeared behind a particular infant picture, this calculation would yield a negative score indicating a bias towards the infant picture. These bias scores were then submitted to two separate analyses one where state of mind was characterized

categorically and another where state of mind was categorized continuously. When using the categorical AAI approach, bias scores were submitted to a 3x2 ANOVA with State of Mind (Dismissing, Secure/Autonomous, Preoccupied) as between subjects factor and Trial Duration (200 ms, 1250 ms) and Infant Picture (Distressed, Happy, and Calm) as repeated measures factors. When the AAI was characterized continuously, bias scores were submitted to a four-way ANCOVA, with Preoccupied and Dismissing as between subjects factors and Infant Picture and Trial Duration as repeated measures factors.

The study's previously proposed hypotheses give rise to three predictions that were assessed by way of these analyses. First, Hypothesis 1 stated that mothers who were assessed as dismissing would indicate a more pronounced bias away from attachment-related stimuli relative to mothers classified as secure/autonomous or preoccupied when stimuli were presented for longer durations. Applying this hypothesis to the present analysis, it was predicted that dismissing mothers, or mothers with elevated dismissing scores, would have more positive bias scores for at least the distressed infant pictures relative to non-dismissing mothers within the longer duration of the probe. The distressed infant pictures are attachment-related stimuli within the definition adopted here, and therefore, support for Hypothesis 1 requires that dismissing mothers exhibit biases in attention at least for these stimuli. Support for this hypothesis would also come from a significant Trial Duration x Infant Picture x State of Mind (categorical or continuous) interaction, where dismissing mothers or mothers with high dismissing scores have more positive bias scores for the crying infant pictures within the 1250 ms condition. This pattern of findings would imply that dismissing mothers are more

towards neutral object pictures relative to distressed infant pictures at a later stage in their attentional response. Support would also come from a significant Trial Duration x State of Mind interaction, where dismissing mothers have more positive bias scores for all infant pictures in the 1250 ms condition. This pattern of findings would imply that dismissing mothers attend more towards neutral objects relative to distressed infant pictures and all other infant pictures at a later stage in their attentional response.

Hypothesis 2 stated that dismissing state of mind would be associated with an initial vigilance for attachment-related stimuli followed by a move in attention away. Applying this hypothesis to the present analysis, it was predicted that bias scores for dismissing mothers in at least the distressed infant picture condition would shift from negative in the 200 ms condition to positive in the 1250 ms condition. This pattern of findings would imply an initial bias for attachment-related stimuli followed by a shift in attention to neutral object pictures. Support for this hypothesis could be reflected by a significant Trial Duration x Infant Picture x State of Mind (categorical or continuous) interaction, where a dismissing state of mind or elevated dismissing score is associated with changes in bias scores for distressed infant pictures across the two duration conditions. Support would also be provided by significant Trial Duration x State of Mind interaction, where a dismissing state of mind or elevated dismissing score is associated with changes in bias scores for all infant pictures across the two duration conditions.

Finally, Hypothesis 3 stated that mothers with preoccupied states of mind would indicate a more pronounced bias towards attachment-related stimuli relative to mothers with secure/autonomous or dismissing states of mind when stimuli are presented for

longer durations. Applying this hypothesis to the present analysis, it was predicted that within the longer duration condition preoccupied mothers or mothers with elevated preoccupied scores would have more negative bias scores for at least the distressed infant pictures relative to nonpreoccupied mothers with low preoccupied scores. Support for this hypothesis would come from a significant Trial Duration x Infant Picture x State of Mind (categorical or continuous) interaction, where preoccupied mothers or mothers with high preoccupied scores have more negative bias scores for the distressed infant pictures within the 1250 ms condition. This pattern of findings would imply that preoccupied mothers attend towards distressed infant pictures at a later stage in their attentional response. Support would also come from a significant Trial Duration x State of Mind interaction, where preoccupied mothers have more negative bias scores for all infant pictures in the 1250 ms condition. This pattern of findings would imply that preoccupied mothers attend towards all distressed infant pictures and all other infant pictures at a later stage in their attentional response.

When state of mind regarding attachment was characterized categorically, the three-way State of Mind x Infant Picture x Trial Duration interaction was not significant,  $F(4, 128) = 1.60, ns$ . The State of Mind x Trial Duration interaction was not significant,  $F(2, 64) = 0.37, ns$ , and the Trial Duration x Infant Picture interaction was not significant,  $F(2, 128) = 0.32, ns$ . However, the State of Mind x Infant Picture interaction was significant,  $F(4, 128) = 2.66, p < .05, R^2 = .08$ , suggesting that the effect of State of Mind changed across the levels of Infant Picture. The main effects of State of Mind,  $F(2, 64) = 0.70$ , Trial Duration,  $F(1, 64) = 0.80, ns$ , and Infant Picture,  $F(2, 128) = 0.11, ns$ , were

not significant. Means, standard errors, and AAI classification frequencies for this analysis can be found in Table 5.

To better understand the State of Mind x Infant Picture interactions, simple main effects of State of Mind within the levels of Infant Picture were analyzed. The simple main effect of State of Mind within the distressed infant condition was not significant  $F(2, 64) = 1.62$  ns. The simple main effect of State of Mind within the calm infant condition was not significant  $F(2, 64) = 1.80$  ns, and the simple main effect of State of Mind within the happy infant condition was also not significant  $F(2, 64) = 1.50$  ns. Thus, no differences in attention for infant stimuli were observed when adult state of mind regarding attachment was characterized categorically.

Table 5

Means and Standard Errors by DDTrobe Condition and AAI Classification

<u>Dismissing (n = 15)</u>				
<u>Infant Picture</u>				
<u>Trial Duration</u>	<u>Distressed</u>	<u>Happy</u>	<u>Calm</u>	<u>Average</u>
200 ms	5.24 (6.37)	-4.47 (6.17)	-10.19 (3.98)	-3.14 (3.31)
1250 ms	6.29 (7.04)	-11.25 (7.60)	-9.32 (9.70)	-4.76 (4.77)
Average	5.77 (4.67)	-7.86 (4.85)	-9.73 (5.15)	-3.94 (2.89)
<u>SecureAutonomous (n = 45)</u>				
<u>Infant Picture</u>				
<u>Trial Duration</u>	<u>Distressed</u>	<u>Happy</u>	<u>Calm</u>	<u>Average</u>
200 ms	-10.04 (4.52)	-2.30 (4.02)	-1.35 (3.66)	-4.56 (2.36)
1250 ms	-2.57 (3.69)	0.36 (3.92)	-2.37 (4.33)	-1.52 (2.29)
Average	-6.30 (2.93)	-0.97 (2.79)	-1.86(2.82)	-3.04 (1.64)
<u>Preoccupied (n = 7)</u>				
<u>Infant Picture</u>				
<u>Trial Duration</u>	<u>Distressed</u>	<u>Happy</u>	<u>Calm</u>	<u>Average</u>
200 ms	-8.30 (7.46)	9.19 (7.07)	2.66 (3.11)	1.18 (3.76)
1250 ms	4.11 (15.69)	2.68 (6.73)	10.21 (6.75)	5.66(5.85)
Average	-2.09 (8.52)	5.93 (4.77)	6.43 (3.72)	3.43(3.45)
<u>Average (n = 67)</u>				
<u>Infant Picture</u>				
<u>Trial Duration</u>	<u>Distressed</u>	<u>Happy</u>	<u>Calm</u>	<u>Average</u>
200 ms	-6.43 (3.49)	-1.57 (3.13)	-2.91 (2.66)	-3.65 (1.79)
1250 ms	0.11 (3.32)	-2.00 (3.23)	-2.61 (3.70)	-1.50 (1.97)
Average	-3.16 (2.42)	-1.79 (2.34)	-2.76(2.27)	-3.68 (3.20)

Note. Standard errors in parentheses.

The ANCOVA using a continuous characterization of state of mind yielded similar results. For dismissing score, the Trial Duration x Infant Picture x Dismissing Score interaction was not significant,  $F(2, 128) = 0.59$ , ns, and the Dismissing Score x Trial Duration interaction was not significant,  $F(1, 64) = 0.77$ , ns. However, similar to the findings reported for the categorical approach, the Dismissing Score x Infant Picture interaction was significant,  $F(2, 128) = 7.04$ ,  $p < .01$ ,  $R^2 = .11$ , suggesting that the effect of Dismissing Score changed depending on the level of Infant Picture. Additionally, the main effect of dismissing score was not significant,  $F(1, 64) = 1.50$ , ns. For preoccupied score, the Trial Duration x Infant Picture x Preoccupied Score interaction was not significant,  $F(2, 128) = 0.71$ , ns. The two-way interactions of Trial Duration x Preoccupied Score,  $F(1, 64) = 0.2$ , ns, and Infant Picture x Preoccupied Score,  $F(2, 128) = 0.15$ , ns, were not significant. The main effect of Preoccupied Score was also not significant,  $F(1, 64) = 0.97$ , ns. Finally, the Trial Duration x Infant Picture interaction was not significant,  $F(2, 128) = 0.78$ , ns, and the main effects of Trial Duration,  $F(1, 64) = 0.79$ , ns, and Infant Picture,  $F(2, 128) = 0.12$ , ns, were not significant.

To further understand the Infant Picture x Dismissing Score interaction, Dismissing score was used to predict bias score within the three levels of Infant Picture. Dismissing Score was positively associated with bias score within the distressed infant condition,  $F(1, 65) = 10.54$ ,  $p < .01$ ,  $R^2 = .14$ ,  $r = .37$ . Thus, relative to other mothers, more dismissive mothers were more likely to attend towards neutral objects over distressed infant pictures (Figure 3). The scatterplot depicting this association nevertheless revealed that four observations may have had undue influence on estimation of the regression line. When these observations were removed, however, the regression

remained significant,  $F(1, 61) = 4.21, p < .05, R^2 = .06, r = .24$ . It therefore cannot be concluded that these observations determined the significance of this association. Finally, dismissing score was not associated with a score in the calm infant picture condition,  $F(1, 65) = 0.53, ns$ , or in the happy infant condition,  $F(1, 65) = 0.01, ns$ .

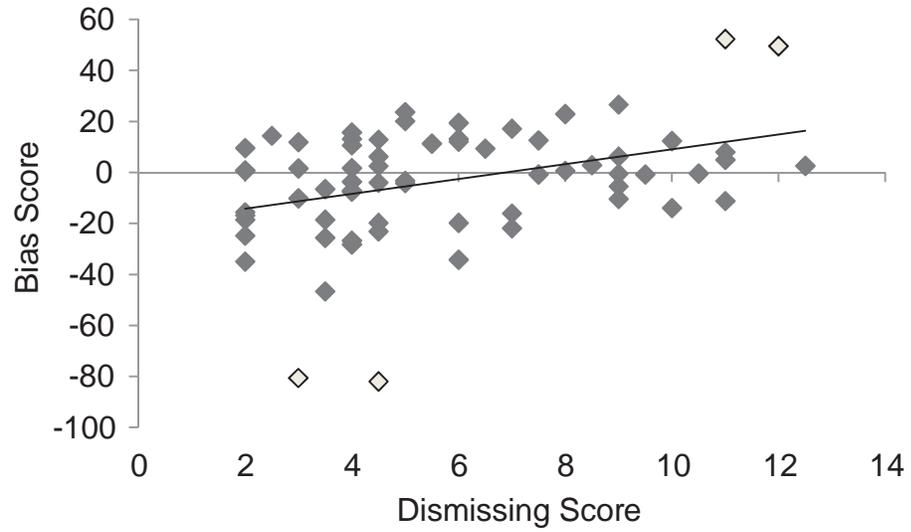


Figure 3 Biasscore distressed infant picture condition regressed to dismissing score  
 A positive bias score indicates attentional deployment to neutral object picture  
 Possible influential observations are depicted in light gray.

In summary, analyses provided nuanced support for Hypothesis 1. Dismissing Score was positively associated with bias score in the distressed infant picture condition. Relative to other mothers, more dismissive mothers were more likely to attend towards neutral objects over distressed infant pictures. These biases were however exhibited regardless of stimulus duration, a finding which is inconsistent with this study's predictions. No support was provided for Hypotheses 2 and 3. Dismissing Score and AAI classification were not associated with an initial vigilance for attachment-related stimuli followed by a move in attention to the neutral object picture. Therefore, findings did not support the idea that a dismissing state of mind is associated with an initial vigilance for attachment-related stimuli followed by a move in attention away. Preoccupied Score and AAI classification were not associated with attentional bias in any condition. Therefore, findings did not support the idea that a preoccupied state of mind is associated with an attentional bias for attachment-related stimuli.

### 3.1.3 Summary and Discussion

In summary, more dismissive mothers were more likely to attend towards neutral stimuli over distressed infant pictures relative to less dismissing mothers. This finding provides partial support for Hypothesis 1 that a dismissing state of mind would be associated with a bias away from attachment-related stimuli (the distressed infant pictures) relative to secure and preoccupied speakers. On the other hand, mothers with dismissing states of mind did not exhibit a change in their attention to attachment-related stimuli over time. Findings were therefore not consistent with the proposition that dismissing individuals would exhibit an initial vigilance for attachment-related stimuli prior to a move in attention away towards neutral stimuli (Hypothesis 2). Mothers with

preoccupied state of mind also did not preferentially attend towards attachment-related stimuli. The third hypothesis of the present investigation was therefore not supported, namely, that mothers with a preoccupied state of mind would preferentially attend to attachment-related stimuli relative to secure and dismissing mothers in the longer duration condition of the dot-probe.

The findings regarding a dismissing state of mind with respect to attachment are consistent with current propositions regarding attachment and attention (Main, 2000) and with previous findings regarding a dismissing state of mind (Emmichoven et al., 2003; Haydon et al. 2011). In theory, individuals with dismissing states of mind exhibit analogous cognition to that of avoidant infants who are thought to attend away from attachment-related stimuli when frightened in order to inhibit propensity to express distress (Main, 1990). This inhibition of a dominant propensity to approach suggests the influence of slow, effortful, and voluntary top-down processes that might be used when competing behavioral propensities arise (e.g. Corbetta & Shulman, 2002). The present investigation therefore tested the proposition that biases associated with dismissing state of mind would be more pronounced in the longer durations of the dot-probe where top-down attentional processes might be influential. This assertion was partially supported. Relative to other mothers, highly dismissive mothers were more likely to attend to neutral objects over distressed infant pictures in the early and later stages of their attentional response. Thus, although the study's results are supportive of the proposal that mothers who are more dismissive tend away from attachment-related stimuli, the speed of this response requires additional investigation and is faster than implied by the theory.

The rapid deployment of attention to neutral stimuli could be a product of a practiced bias away from attachment-related stimuli. Cohen and colleagues (Cohen, Dunbar, & McClelland, 1990) have argued that behavioral responses vary on a continuum of automatic to controlled. When learning a given behavior, an individual may initially monitor or facilitate a given skill using top-down control. For example, a person learning how to golf may initially spend much time focusing on and thinking about the exact procedures for swinging a golf club. With repeated practice of a given behavior, however, the pathways responsible for producing a particular response become stronger and the need for top-down control is reduced. The response becomes quicker and more automatic (e.g., less reliant on top-down facilitation) due to repeated experience performing the behavior in question. The individual in the previous example may be able to swing a golf club with less initial preparation and thought after several months of practice. Applying this reasoning back to the present investigation, the mothers in this study, and adults more generally, may have had many years to practice attending away from attachment-related stimuli. With this extensive practice, more dismissive mothers may be able to rapidly deploy attention towards neutral stimuli when an attachment-related stimulus is present.

The present investigation cannot explain previous contradictory evidence regarding a dismissing state of mind. Findings from Stroop investigations (Emmichoven et al., 2003; Haydon et al., 2011) suggest that a dismissing state of mind might be associated with a bias away from attachment-related stimuli, whereas other investigations of information processing (Maier et al., 2005) suggest that a dismissing state of mind might be associated with vigilance for attachment-related stimuli. To resolve this

apparent contradiction, the present investigation tested the idea that a dismissing state of mind is associated with an initial vigilance for attachment-related stimuli, followed by a tendency to look away. This hypothesis was not supported. Specifically, dismissing mothers did not change in their attentional response over time. One possible explanation for this pattern of findings is that more dismissive mothers may have attended to distressed infant pictures prior to the 200 ms presentation of any infant faces. This initial vigilance may have been contradicted by a rapid practiced move in attention towards the neutral stimulus (e.g., Cohen et al., 1990).

Evidence also did not support the proposition that a preoccupied state of mind is associated with a bias toward attachment-related stimuli, a finding that is inconsistent with current theory regarding attachment and attention (Main, 2000). Theory, preoccupied individuals exhibit analogous cognition to ambivalent infants who presumably attend towards feelings of need and/or other attachment-related stimuli in order to heighten expressions of distress (Main, 1990). This use of attention in order to alter a natural propensity to approach implies the influence of slow top-down processes (e.g., Corbetta & Shulman, 2002). The present investigation therefore tested the proposition that mothers with a preoccupied state of mind might focus on attachment-related stimuli in the longer duration condition of the probe. This hypothesis was not supported. In analyses using both the categorical and continuous characterizations of preoccupation.

In summary, whereas Hypothesis 1 of the present investigation was supported, Hypotheses 2 and 3 were not. Relative to other mothers, more dismissive mothers were more likely to attend to neutral object pictures over distressed infant

pictures at early and later stages of their attentional response. The next study in this chapter was an attempt at demonstrating that this cognition—corresponding with a more dismissive state of mind—is transmitted or passed to offspring.

### 3.2 Study 2 An Investigation of Whether or Not Cognition Corresponding With a Mother's Dismissiveness Is Transmitted to Offspring

One of the most consistently replicated findings from intergenerational investigations of attachment is the association between maternal state of mind regarding attachment and offspring attachment security. In an influential meta-analysis by van IJzendoorn (1995), parental secure/autonomous vs. insecure classification strongly predicted offspring security vs. insecurity ( $d = 1.06$ ). Approximately 75% of mothers who are secure/autonomous in the AAI have secure infants in the SSP. Moreover, dismissing vs. non-dismissing parent AAI classification strongly predicted avoidant vs. non-avoidant infant attachment ( $d = 1.02$ ), and preoccupied vs. non-preoccupied strongly predicted ambivalent vs. non-ambivalent offspring attachment ( $d = 0.93$ ). On the basis of these robust findings, many have suggested that mothers can transmit their own attachment security to their child—either through interactive behavior or by some other means.

On the basis of these meta-analytic findings, one could also propose that mothers transmit cognition characteristic of, or corresponding with, their state of mind regarding attachment. In the introduction to this chapter, each state of mind regarding attachment was described as exhibiting analogous cognition to one of the SSP classifications in infancy (Main, 2000). For example, individuals with dismissing states of mind and

avoidant infants are thought to have analogous cognition regarding attachment, cognition that is used to inhibit a propensity to approach attachment figure when distressed. One might therefore expect that dismissing mothers transmit cognition that is characteristic of their state of mind to their children either through interactions or by some other means because dismissing mothers tend to have avoidant children. This logic can also be applied to the secure and preoccupied mothers who are likely to have secure and ambivalent children, respectively.

The present investigation was therefore an attempt at providing evidence for the proposition that cognition characteristic of, or associated with, a mother's state of mind regarding attachment is transmitted to offspring. In the previous study, more dismissive mothers were more likely to direct attention towards neutral objects than distressed infant pictures. It was therefore hypothesized that this cognition corresponding with a more dismissive state of mind might predict similar offspring attention.

## 3.2.1 Method

### 3.2.1.1 Participants

Because mothers in Sample 1 had children old enough to be administered the dot probe, these dyads participated in Study 2. The characteristics of this sample have been previously described in Study 1. Data from eight dyads were excluded, five were excluded on the basis of the child's behavior at the time of the dot probe or unclassifiable behavior in the SSP (see Chapter 2), and three were excluded because the mother was not classifiable in the AAI. Thus, data were analyzed for a total of 26 mothers and children (17 female).

### 3.2.1.2 Measures

#### 3.2.1.2.1 Adult Attachment Interview (AAI; Main, Kaplan, & Cassidy, 1985)

The AAI was administered to mothers in Subset 1 when their child was three months old. A detailed description of the AAI coding procedure can be found in the methods section of Study 1. Dismissing scores (a composite of idealization and insistence on lack of recall scores) was used in analyses for the present investigation.

#### 3.2.1.2.2 The Dot Probe Paradigm (Mathews, Macleod, & Tata, 1986)

During a visit to the lab, mothers and their seven-to-eight year old children were administered the dot probe while separated. A detailed description of this dot probe can be found in Study 1. For both mothers and children, bias scores from the distressed infant picture condition were used in primary analyses. This is because only bias scores in the distressed infant picture condition were associated with maternal dismissive bias scores in this condition therefore index cognition corresponding with, or associated with, a more dismissive state of mind. On the basis of the previously described correspondences between AAI and SSP classifications, the cognition that may be transmitted to offspring.

### 3.2.4 Results

Analysis proceeded in two steps. In the first step, dismissing score – a measure of maternal dismissiveness – was used to predict bias score in the distressed infant condition. In this step, dismissing score significantly predicted bias score,  $F(1, 27) = 4.47, R^2 = .14, p < .05$ . Next, the regression equation from the first step was used to calculate each mother's predicted bias score in the distressed infant picture condition of the dot-probe. Statistically, these predicted values represent the variation (or correlation) between dismissing score and bias score. Conceptually, the predicted values represent the differences in attention associated with maternal dismissiveness or the cognition that one would expect to be transmitted to offspring given the previously described correspondence between the AAI and SSP. Thus, in the second step of this analysis, the predicted values from the first step were used to predict the child's bias score in the same condition of the dot-probe – that is, in the distressed infant picture condition. A significant association here would provide support for the idea that a mother transmits cognition associated with her dismissiveness to offspring. This association was not significant,  $F(1, 27) = .26, ns$ .

The previous analysis assumed that dismissive mothers would have children with the same cognition regarding attachment. Dismissive mothers who were likely to attend towards neutral objects over distressed infants regardless of stimulus duration were hypothesized to have children who did the same. Nevertheless, dismissing mothers tend to have avoidant children and avoidant children attend away from infant distress only in the longer duration condition of the dot-probe (Chapter 2). Dismissive mothers therefore cannot have the exact same cognition as their children. Differences in attention

corresponding with maternal dismissiveness could however still predict a child's attention in the longer duration of the dot probe where avoidant children exhibit similar attentional biases. With this in mind, dismissing score was again used to predict each mother's bias score in the distressed infant condition of the dot probe. These values were then used to predict child bias score in the 1250 ms/distressed infant condition of the dot probe. This association was also not significant,  $F(1, 27) = 0.20$  ns. The results thus do not provide support for the proposal that differences in attention associated with a dismissive state of mind are transmitted by mother to their offspring.

### 3.2.4 Summary and Discussion

Study 2 tested the proposal that aspects of cognition associated with a mother's state of mind regarding attachment are transmitted to offspring either through interactions or by some other means. On the basis of the strong associations between maternal state of mind regarding attachment and child SSP classification (van Ijzendoorn, 1995), it was proposed that differences in attention associated with dismissiveness might be passed on or transmitted to offspring. The present investigation nevertheless did not support this hypothesis.

The findings from this study do not preclude the possibility that (1) other forms of maternal cognition associated with state of mind might be transmitted and (2) that differences in attention associated with dismissiveness might be transmitted in other circumstances. First, some have argued that other forms of cognition characterize each state of mind with respect to attachment (e.g., Fonagy, 1991; Main et al., 1985). For example, Main and colleagues (Main et al., 1985) have suggested

that state of mind regarding attachment might correspond with individual differences in memory for attachment-related experiences. A mother who is dismissing may be less capable of recalling memories about her own fear or upset in childhood and her child may exhibit this same absence of memory for attachment-related experiences. Additionally, attention associated with maternal dismissiveness may be passed on to offspring in other samples and circumstances. The correspondence between state of mind regarding attachment and offspring SSP classification was low within this subset (6, compared to  $r$ 's ranging from 0.93 to 1.06 in van IJzendoorn, 1995). This lower correspondence suggests that a mother who is dismissing is less likely to have an avoidant child, and therefore, mother and child could have dissimilar cognition regarding attachment. Differences in attention associated with dismissiveness may predict child cognition in other samples where the correspondence between AAI and SSP is higher. Indeed, investigating the mediating and moderating factors that lead to higher correspondence between AAI and SSP might provide clues as to how a mother might transmit her cognition regarding attachment.

In summary, the present investigation did not support the idea that attention associated with dismissiveness is transmitted to offspring. It is unclear, however, whether or not other aspects of cognition regarding attachment might be passed from mother to child, or whether higher correspondence between the AAI and SSP would have resulted in more promising findings. Infant SSP classification is just one of many outcomes robustly predicted by maternal state of mind regarding attachment. A mother's state of mind regarding attachment also strongly predicts the quality of mother-child interactions (e.g., Pederson, Gleason, Moran, & Bento, 1998). With this in mind, the

next study was an attempt at demonstrating that a mother's dismissiveness, an aspect of state of mind regarding attachment, might influence maternal interactive behavior by determining the way she attends to attachment-related stimuli.

### 3.3 Study 3: Exploring the Possibility that a Mother's Dismissiveness Might Influence Behavior by Determining the Way She Attends to Attachment-Related Stimuli

Maternal state of mind with respect to attachment is robustly associated with the quality of mother-child interactions in the home. Numerous investigations have linked variations in state of mind regarding attachment to differences in maternal sensitivity, a mother's ability to perceive an infant signal and respond promptly and appropriately (Pederson et al., 1998; Simons, Bernard, & Dozier, 2013; Van IJzendoorn, 1995; Ward & Carlson, 1995). Other investigations of mother-child interactions have linked variations in maternal state of mind with respect to attachment to frightening maternal behavior (Scheungel, Bakermans-Kranenburg, & Van IJzendoorn, 1999; Whipple, Bernier, & Mageau, 2011) and atypical maternal behavior with offspring (Goldberg, Benoit, Blokland, & Madigan, 2003). These intriguing and robust associations beg the question of how state of mind regarding attachment influences a mother's interactive behavior with offspring.

Many different mechanisms have been proposed as a means of explaining, or mediating, the robust association between maternal state of mind with respect to attachment and maternal interactive behavior. For example, Fonagy and colleagues (Fonagy et al., 1991) have suggested the construct of reflective functioning, an

individuals' ability and propensity to think about mental constructs might explain how state of mind regarding attachment influences maternal behavior (Fonagy et al., 1991; Meins, 1999). Others have proposed that differences in the way mothers represent their mother-child relationship might explain differences in interactive behavior associated with state of mind regarding attachment (Slade, Belsky, Aber, & Phelps, 1999). These constructs are a good candidate for explaining the association between state of mind and maternal interactive behavior because (1) they are associated with variations in state of mind regarding attachment (Fonagy et al., 1991; Slade et al., 1999) (2) it is easy to conceive of ways that they might influence maternal interactive behavior.

With the previous criterion in mind, a good candidate for explaining association between state of mind regarding attachment and maternal interactive behavior is maternal attention to attachment-related stimuli. Relative to other mothers, others that were more dismissive in Study 1 were more likely to attend to neutral object pictures over distressed infant pictures (attachment-related stimuli). Differences in attention for attachment-related stimuli could conceivably explain differences in interactive behavior associated with dismissiveness. A mother who for instance has a tendency to attend away from infant distress might disengage or be less attentive when her child is upset or expressing distress. Therefore, a dismissive state of mind might influence maternal interactive behavior by predisposing a mother to attend away from infant signals of distress. The goal of the present investigation was to explore this possibility that a mother's dismissiveness influences interactive behavior by determining the way she attends to attachment-related stimuli.

### 3.3.1 Method

#### 3.3.1.1 Participants

The present investigation was exploratory in nature, and therefore only the mothers ( $N = 37$ ) and children (19 female), from Subset 1 were observed. Note that children in this investigation were the same children that were administered the dotprobe in Study 2, and their demographic characteristics have been described in Study 1 Chapter 2. Five dyads were not included in the analyses: two were excluded due to technical failures at the time of video recording, and three were excluded because they were coded as cannot classify in the AAI. Analyses were performed on 32 total dyads.

#### 3.3.1.2 Measures

##### 3.3.1.2.1 Adult Attachment Interview (AAI; Main, Kaplan, & Cassidy, 1985)

A detailed description of the AAI and the procedure for coding of the AAI is provided in Study 1 of this chapter. For each mother, scores on idealization and insistence on lack of care were summed to yield a dismissing dimension score representing the dismissiveness of a particular mother.

##### 3.3.1.2.2 The DotProbe Paradigm (Mathews, Macleod, & Tata, 1986)

Mothers were administered the dotprobe paradigm during a separation from their seven to eight-year-old child. The procedure, administration, stimuli, and structure of

the dotprobe paradigm were also described in Study 1 of this chapter. Bias scores for the distressed infant picture condition, a measure of a mother's attention to attachment-related stimuli, were calculated and used in the analyses presented. These bias scores were associated with maternal dismissiveness in Study 1 of this chapter. Therefore, differences in attention associated with these bias scores are a possible mediator for associations between dismissiveness and maternal interactive behavior.

### 3.3.1.2.3 Observation of Maternal Interactive Behavior

Mothers were reunited with their seven to eight-year-old child after administration of the dotprobe. Each day was then asked to discuss a time when the child was frightened. Specifically, they were asked to discuss how the child felt, what the child thought, and what the child did during this frightening experience. This context of observation was selected because highly dismissive mothers are more likely to attend towards neutral stimuli over infant distress. The reasoning was that mothers who indicate such an attentional bias may also be attentive when their child discussed a frightening experience. Therefore, the aforementioned context of observation was selected because a mother's attentional biases assessed in the probe could conceivably influence behavior. Attention to attachment-related stimuli was therefore a good candidate for mediation in this context because (1) it was previously related to maternal dismissiveness and (2) could conceivably influence a mother's behavior.

Observation of maternal behavior focused on the number of times the mother looked away and the total amount of time she spent looking away. These measures were selected as an index of a mother's attentiveness to her child. For analysis purposes, both

measures were divided by the duration in seconds of the discussion. In the case of number of looks away, this calculation yielded a rate (look away rate). In the case of duration of looks away, this calculation yielded a percentage of total time (percentage of time looking away). Eight (27.5%) of the cases were coded for reliability. Reliability for number of looks away and the duration of looks away was excellent,  $r(7) = .95, p < .001$  and  $r(7) = .97, p < .001$ , respectively.

### 3.3.2 Results

Two mediational analyses were performed. Both of these analyses were exactly the same with exception to the outcome variable: look away rate in the first analysis and percentage of time looking away in the second analysis. In both cases analysis proceeded in three steps in accordance with the outlined by Baron and Kenny (1986) for testing mediation. In the first step, dismissing score was used to predict the outcome variable: look away rate or percentage of time looking away. The goal of this step was to establish an association between dismissing score and the outcome variable. In the second step, bias score was used to predict the outcome variable. Bias score is an index of attention to attachment-related stimuli. It was previously hypothesized to be the mediator variable. If the mediator variable was not associated with the outcome variable, it could not possibly explain the association between dismissing score and the outcome variable. In the final step, both dismissing score and bias score were entered into an equation predicting the outcome variable. If the effect of dismissing score diminished to insignificant, no conclusions could be drawn. First, one could conclude that dismissing score correlated with bias score, suggesting that

variations in dismissiveness result correspond with variations in attention to attachment-related stimuli. Second, one could conclude further that variations in attention to attachment-related stimuli explained the variability previously explained by dismissing score. It could therefore be concluded that the effect of dismissiveness was propagated through, or mediated by, bias score.

The first mediational analysis used look away rate as the rate at which the mother looked away as the outcome variable. In the first step, Dismissing Score was significantly and positively associated with look away rate,  $F(1, 30) = 7.48, p < .05, R^2 = .20$ . In the second step, Bias Score did not significantly predict look away rate,  $F(1, 30) = 0.07, ns$ . Finally, in the third step, the effect of Dismissing Score did not diminish to insignificance,  $t(29) = 2.74, p < .01$ . Therefore, findings did not support a model where Bias Score mediated the effect of Dismissing Score on maternal look away rate. Specifically, Bias Score was not related to look away rate, and the effect of Dismissing Score did not diminish when Bias Score was entered into an equation predicting look away rate.

In the second mediational model, percentage of time looking away was predicted. In the first step, Dismissing Score was significantly and positively associated with percentage time away,  $F(1, 30) = 5.18, p < .05, R^2 = .15$ . In the second step, Bias Score condition did not significantly predict look away rate,  $F(1, 30) = 0.30, ns$ . Finally, in the third step, the effect of Dismissing Score did not diminish to insignificance,  $t(29) = 2.17, p < .05$ . Therefore, findings did not support a model where differences in attention to attachment-related stimuli mediated the effect of maternal dismissiveness

One additional analysis was performed to address possible shortcomings of the Baron and Kenny (1986) method. The Baron and Kenny method for testing mediation does not provide a significant test of the indirect effect of Dismissing Score through Bias Score and may also be underpowered (Preacher & Hayes, 2004). Therefore, a bootstrapped test of the indirect effect was performed in accordance with the method outlined by Preacher and Hayes (2004) for both of the previous analyses. This yields a 95% confidence interval of the difference between the estimated indirect effect of Dismissing Score and the effect expected under the null hypothesis (a null or zero effect). If this confidence interval includes the number zero, the  $p$  value associated with the indirect effect is greater than .05 and not significant. The confidence intervals generated for look away rate,  $CI[-0.0007, 0.03]$ , and percentage time away,  $CI[-0.005, 0.08]$ , both included zero. Therefore, the less stringent test of the indirect effect of Dismissing Score through Bias Score also did not provide evidence for mediation.

### 3.3.3 Summary and Discussion

The goal of the present investigation was to explore the possibility that attention to attachment-related stimuli might be a mechanism by which dismissiveness influences maternal interactive behavior. Maternal attention to attachment-related stimuli did not mediate the association between maternal dismissiveness and a mother's attentiveness to her child while discussing a frightening memory. Specifically, although dismissiveness predicted differences in maternal attention to attachment-related stimuli (Study 1) and maternal attentiveness during interaction (Study 3) attention to attachment-related stimuli (assessed in the dotprobe paradigm) was not associated with attentiveness to both

mediational analyses. It therefore could not explain the association between dismissiveness and interactive behavior.

The results of the current study however, cannot be seen as justifying the conclusion that attention to attachment-related stimuli is not related to or predictive of maternal interactive behavior. The assessment of maternal attentiveness used in the present investigation (e.g., looks away from the child) as a fairly blunt measure of maternal attentiveness during interaction. Studies have demonstrated that overt shifts in the eyes and head do not necessarily accompany shifts in attention (Posner, 1980), so for example, a mother who looks away from her child may be attempting to blunt the conversation while simultaneously attending to her child. If the looking behavior of a mother does not represent an actual shift in attention, differences in attention to attachment-related stimuli might not be predictive of overt looking behavior. One future direction may be to make judgments regarding whether or not the mother is attending to something else in addition to whether or not she is attending to the child. This assessment would be a better index of attentiveness because one could be more certain that looks represent shifts in attention towards the environment or towards the child. Relatedly, a mother may also shift her attention without moving her eyes and head and may act in more subtle ways to divert her attention from her child. It may therefore be prudent to analyze the discourse between mother and child. A mother who is inattentive may, for example, have a tendency to introduce other less emotional or irrelevant facts into the dialogue.

It is important to note that any investigation linking differences in maternal behavior to differences in attention to attachment-related stimuli would still not support a

causal interpretation. One would have to show that a direct manipulation of attentional bias is linked to differences in a mother's attention to her child. Interestingly, two experiments on attention and anxiety have successfully manipulated attentional biases and observed resulting behavioral and self-reported differences in anxiety (Eldar, Ricon, & Bar-Haim, 2008; Macleod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). These investigations used a modified dot probe to train an attentional bias for anxiety provoking stimuli or neutral stimuli. In order to train an attentional bias towards anxiety provoking stimuli, in one group, the dot always appeared behind an anxiety provoking stimulus, whereas in another group, the dot always appeared behind a neutral stimulus to train a bias away from anxiety provoking stimuli. In both studies, individuals trained to attend to the anxiety provoking stimulus reported higher anxiety and exhibited more behavioral indications of anxiety during a difficult problem solving task. Note that participants did not maintain their trained attentional biases in a follow up test. With these investigations in mind, a similar approach might be taken to the investigation of mother-child interactions. One could train temporary attentional biases for infant emotional expressions or neutral stimuli and then observe changes in maternal interactive behavior.

In summary, then, the present investigation did not successfully mediate the association between maternal dismissiveness and interactive behavior with differences in attention to attachment-related stimuli. Specifically, attention to attachment-related stimuli did not predict maternal behavior during interactions with offspring, and therefore, did not act as a mediating variable or explanatory mechanism. The null findings reported here, however, clearly do not mean that attention is not a mechanism for explaining associations between maternal state of mind regarding attachment and

maternal interactive behavior. Attention to attachment-related stimuli may predict other maternal interactive behaviors, and may therefore act as a mediating variable in future investigations.

### 3.4 Conclusion

The investigations carried out in Studies 1, 2 and 3 provided some support for the idea that aspects of a mother's state of mind regarding attachment correspond with a way of thinking about attachment and attachment experience (Main, 2001). Relative to other mothers, mothers who were more dismissive were more likely to attend towards neutral stimuli over attachment-related stimuli later in an attentional response, providing support for propositions regarding cognition associated with dismissiveness and adding to a growing literature regarding the association between a dismissive state of mind and attention (Emmichoven et al., 2003; Haydon, et al., 2011). The findings reported here also provide evidence for a central tenant of attachment theory that cognition and emotion are influenced by attachment security in both childhood and adulthood (Bowlby, 1969). A mother's attention to attachment-related stimuli is seemingly influenced by her attachment security, indexed by her state of mind regarding attachment. In much like a child's attention appears to be influenced by attachment security in infancy (Chapter 2).

The differences in attention reported here, however, did not mediate an association between dismissiveness and maternal interactive behavior, and they did not predict offspring attention to attachment-related stimuli. Thus, an important challenge for future investigations is to identify ways that biases in attention might influence maternal interactive behavior and offspring development. The present investigation therefore

provides some promising support for the association between maternal state of mind and attention and highlights several challenges for future investigations of attachment and attention

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## Chapter 4

### 4 General Discussion

John Bowlby (1969; 1980) hypothesized that cognition might be shaped by experiences in attachment relationships. This idea still plays a prominent role within contemporary attachment theory (Cassidy & Dykas, 2011). The studies described in this dissertation among the first to test John Bowlby's (1969; 1980) suggestion provide support for the idea that attachment security in infancy and adulthood are associated with differences in cognition, particularly with differences in the way that people attend to certain forms of stimuli. Children classified as avoidant in the SSP at one year of age initially attended towards infant picture stimuli and then directed attention to neutral picture stimuli in the deprobe paradigm, and children classified as ambivalent maintained attention to infant picture stimuli. Maternal dismissiveness was also predictive of differences in attention. More dismissive mothers were more likely to attend towards neutral objects than to infant pictures relative to less dismissive mothers. Taken together, these findings provide support for the notion that individual differences in attachment security are associated with differences in attention (Bowlby, 1980; Dykas & Cassidy, 2011; Main, 2000).

It is important to emphasize the possibility that these attachment-related attentional biases may vary depending on the context of measurement, particularly in childhood (Sroufe & Waters, 1977). In recent years, within the attachment literature have argued that individual differences in attachment security in childhood correspond to specific emotional organizations (e.g., Cassidy, 1994; DeOlivera, Bailey,

Moran, & Pederson, 2004). For example, Cassidy (1994) suggests that avoidant children have developed a context invariant emotional style that predisposes them to inhibit emotional expression. Nevertheless, there is reason to believe that the expression of emotion may be context dependent within attachment relationships. Avoidant infants, for example, frequently express discomfort with brief separations in the home but not in the SSP (Ainsworth, et al. 1978; Pederson & Moran, 1996), suggesting that their tendency to express distress might change depending on the context. This change in behavior across contexts suggests that infants might only exhibit attachment-related attentional biases when they are frightened, distressed, or in an unfamiliar and uncertain circumstance (Bowlby, 1969). Applying this logic to the present investigation, the somewhat novel lab environment and even the male experimenter may have made some children anxious causing children to engage in attentional biases employed when frightened or upset. Had these children not been anxious at the time of measurement, they may not have exhibited attachment-related attentional biases.

It is also possible that attachment-related attentional biases vary depending on the attachment figure present during the time of attentional assessment. Research suggests that attachment security is relationship specific thus an infant's SSP classification might vary depending on the caregiver present (Bowlby, 1969; Bretherton, 1985; Fox, Kimmerly, & Schafer, 1991). For example, a particular infant might be avoidant with his or her mother and ambivalent with his or her father in the SSP at one year of age. When administered the probe paradigm (or some other attentional assessment), this child may exhibit attentional biases that are particular to his/her relationship with the attachment figure present in a manner parallel to the way a child changes attachment

behavior depending on the presence of a specific attachment figure. Thus, he or she may attend to stimuli in a manner characteristic of avoidance when the mother is present and may exhibit an ambivalent-like attentional response when the father is present. Interestingly, this same reasoning might apply to adults. The protocol of the AAI assumes that relationship experiences are integrated into one internal working model of attachment (Bretherton, 1985, 1999; Bretherton & Munholland, 2008; Main, 2000); coding of discourse in the AAI makes a similar assumption that each individual has one state of mind regarding all attachment relationships. Nevertheless, if empirical investigations fail to support this assumption, it is possible that an individual could exhibit differing states of mind depending on the attachment figure that is probed in the AAI. Biases in attention could therefore change depending on the attachment figure that is primed, similar to how an individual's state of mind may change depending upon the discussed relationship.

In addition to contextual considerations, the biases in attention associated with maternal state of mind regarding attachment were different from those associated with infant attachment security. This presents a challenge to current theory which states that the same cognition can be inferred from adult state of mind regarding attachment and infant attachment security (Main, 2000). For example, the theory suggests that avoidant infants and individuals with a dismissing state of mind should exhibit analogous forms of cognition (Main, 2000). The findings described within this dissertation nevertheless suggest that avoidant children and more dismissive mothers may exhibit biases for different types of stimuli. Specifically, avoidant children attended towards neutral objects over all infant picture types at a later stage in their attentional response.

2), whereas more dismissive mothers were more likely to attend towards neutral object pictures over distressed infant pictures (Chapter 3). Biases associated with dismissiveness in adulthood may therefore be specific to attachment-related stimuli – e.g., expressions of infant distress. But biases associated with avoidance in infancy might not be this specific. The finding that avoidant children attended towards neutral objects over all infant picture types suggests that they may attend away from social stimuli or faces more generally.

The timecourse of attentional deployment for dismissing mothers and avoidant children was also different. Mothers who were more dismissive did not exhibit a change in their attention to attachment-related stimuli over time – a finding that contradicted previous investigations suggesting that dismissing individuals might quickly focus on attachment-related stimuli (Maer et al., 2005) and shift attention away (e.g., Haydon, Roisman, Marks, & Fraley, 2011). This vigilance-avoidance pattern of attention was observed with avoidant children, however. Findings suggested that these children rapidly attended towards infant picture stimuli and then moved their attention towards neutral objects. On the basis of these differences in course and response to stimuli, one might therefore conclude that cognition associated with dismissiveness in adulthood differs from cognition associated with avoidance in infancy.

Secure infants and individuals with a secure-autonomous states of mind are also thought exhibit analogous cognition (Main, 2000) but the findings presented here do not support this view. Specifically, mothers with secure-autonomous states of mind might be biased to attend towards attachment-related stimuli (e.g., distressed infant pictures) whereas children with secure attachments in infancy may not be. Secure-autonomous

mothers by definition exhibit low dismissiveness in the AAI (Main, Goldwyn & Hesse, 2002). Given the findings regarding maternal dismissiveness, these moms may be more likely to attend towards infant distress pictures over neutral object pictures relative to more dismissive mothers. On the other hand, evidence from Chapter 2 suggests that children with prototypically secure attachment histories might be biased with respect to attachment-related stimuli, at least when stimuli are presented for longer durations. Children who had been assigned to the B3 classification (prototypically secure) in infancy were almost equally likely to exhibit a bias for infant pictures or neutral object pictures when stimuli were presented for longer durations. Therefore, the findings here do not support the idea that security in adulthood and childhood are indicative of analogous cognition, as mothers with secure states of mind may be biased towards attachment-related stimuli and secure children may not be.

Finally, ambivalent infants and individuals with preoccupied states of mind are thought to exhibit analogous cognition, but this assertion was similarly not supported by the present investigation (Main, 2000). Specifically, the findings presented here indicate that ambivalent children were biased towards infant stimuli relative to secure and avoidant children later in their attentional responses, whereas adult preoccupation in of itself was not associated with attentional bias. A finding that was consistent across categorical and continuous characterizations from maternal state of mind.

Thus, the findings presented within this dissertation do not support the assertion that the same cognition can be inferred from adult state of mind regarding attachment and infant attachment security. Indeed, this assertion was originally based on the claim that adult state of mind regarding attachment was the developmental product of attachment

security in infancy (Main, 2000). Avoidant infants, for example, were thought to carry their cognition into adulthood, resulting in the development of a dismissing state of mind. As such, the dismissing state of mind was thought to develop from the same cognition associated with avoidance in infancy. Secure and ambivalent infants were also thought to carry their cognition forward, resulting in the development of a preoccupied or secure state of mind, respectively. Recent meta-analytic findings, however, suggest that adult state of mind regarding attachment is not the developmentally associated with attachment security in infancy (Pinquat, Feubner, & Ahner, 2013). With this in mind, the three states of mind may not be the product of cognition associated with attachment security in infancy and therefore, they could conceivably be associated with different forms of cognition.

The studies described within this dissertation were necessarily interdisciplinary, integrating current attachment theory and cognitive models of attention. The application of a current cognitive model of attention to contemporary attachment theory proved to be quite useful in testing hypotheses regarding attachment and attention. To briefly reiterate, the model of attention adopted here suggests that an attentional response reflects an interplay of distinct top-down and bottom-up processes (e.g., Bishop, Duncan, Matthew, & Lawrence, 2004; Corbetta & Shulman, 2002; Fernandez & Posner, 1997; Jordan & Morton, 2012; Posner & Rothbart, 2007). Bottom-up processes are defined as automatic and driven by the qualities of a particular stimulus (Corbetta & Shulman, 2002; Jordan & Morton, 2012), and top-down processes are defined as the slow, effortful and voluntary control of attention (Bishop et al., 2004; Corbetta & Shulman, 2002; Fernandez & Posner, 1997; Jordan & Morton, 2012; Posner &

Gross, 2005; Mezzacappa, 2004). When applied to contemporary attachment theory, this model was useful in formulating proposals regarding where in the time span of attentional response one might expect biases associated with attachment. For example, it was hypothesized that biases associated with attachment would be more apparent at the later stages of an attentional response. As when top-down processes are likely to be influential. The trials of the dot-probe paradigm were therefore designed taking this hypothesis into account, and attachment-related attentional biases were in fact observed in the longer duration conditions of the dot-probe for both mothers and children. Moreover, the aforementioned cognitive model implied the existence of an attentional time-course where bottom-up processes initially influence an attentional response and slow, top-down processes may be influential later (e.g., Bradley, Mogg, Falla, & Hamilton, 1998; Koster, Verschuere, Crombez, & Van Damme, 2004; Mogg & Bradley, 1998; Mogg & Bradley, 2006; Mogg, Millar, & Bradley, 2000). Designing the dot-probe paradigm to assess this attentional time-course proved to be fruitful, especially when describing the attentional response of avoidant children. The success of the investigations described within this dissertation can therefore be partially attributed to the application of a current cognitive model of attention to contemporary theory regarding attachment and attention. The application of cognitive models to investigate other attachment-related phenomena (e.g., representation of attachment relationships (Main, et al., 1985)) might prove similarly fruitful.

An important challenge for future research is to explain and predict differences in adult and child behavior using attachment-related attentional biases. This challenge is particularly important because the construct of attachment security has been empirically

linked to numerous developmental outcomes and sequelae. Secure attachment relationships in infancy have been associated with higher levels of confidence in the face of adversity (Matas, Arend, & Sroufe, 1978; Sroufe, Carlson, & Shulman, 1993), lower levels of victimization in childhood (Troy & Sroufe, 1987), and higher levels of social competence and leadership ability (Sroufe, Egeland, & Carlson, 1999) among many other positive socioemotional outcomes (Weinfield, Sroufe, Egeland, & Carlson, 2008). Insecure attachment relationships appear to be associated with negative developmental outcomes, at least in Western societies. For example, avoidant attachment relationships in infancy predict the development of conduct disorders later in life (Renken et al., 1989), whereas ambivalent attachment relationships predict the development of anxiety disorders (Warren, Huston, Egeland, & Sroufe, 1997; Troy & Sroufe, 1987). These associations are not limited to attachment security in infancy. State of mind regarding attachment has been linked to numerous developmental outcomes and sequelae (e.g., DeOliviera, Moran, & Pederson, 2005; Hesse, 2008). For example, as stated in Chapter 3, maternal state of mind regarding attachment is a robust predictor of offspring attachment security (van Ijzendoorn, 1995). Researchers have proposed several constructs in order to explain the many and varied associations between attachment security and developmental outcomes (e.g., Fonagy et al., 1991; Meins, 1999). With this in mind, attention may be one of these mechanisms. That is, differences in attention might be useful in explaining behavior associated with attachment security from infancy to adulthood.

In summary, evidence from the studies described in this dissertation suggest that individual differences in attachment security in both childhood and adulthood are

associated with ways of attending to certain forms of stimuli. The findings reported here therefore provide support for the predominant idea that attachment security is associated with individual differences in cognition (Bowlby, 1969). These findings also provide a basis for comparing cognition associated with attachment in childhood and adulthood, and they demonstrate how cognitive models can be successfully applied for the purposes of testing developmental hypotheses in attachment. More generally, the findings described here add to an abundant literature on the developmental outcomes associated with attachment security (Weinfield, Sroufe, Egeland, & Carlson, 2008), ultimately providing evidence for the idea that an cognition might be influenced by our experiences in relationships from childhood to adulthood.

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## Appendices

Appendix A: Ethics Approval

Appendix B Letter of information and consent for mothers









Appendix C Letter of Assent



## Curriculum Vitae

Paul Mainz

### Education

University of Western Ontario	Ph.D. in Psychology August, 2014
University of California, Berkeley	M.A. in Psychology August, 2011 3.97 GPA (4.0 scale)
University of California, Berkeley	B.A., May, 2006, 4.0 GPA (4.0 scale)

### Awards and Honors

Outstanding Graduate Student Instructor Award, University of California, Berkeley

Highest Honors in Letters and Sciences, University of California, Berkeley

SWAN Undergraduate Research Award

### Publications

Meinz, P., Morton, J. B., Pederson, D., & Moran, G. (In Prep). Attachment and Attention: An investigation of biases in attention for social stimuli as they relate to patterns of attachment in infancy.

### Presentations

Meinz, P. (2014). Attachment and Attention: An investigation of biases in attention as they relate to patterns of attachment in infancy. Invited talk at the University of Waterloo.

Meinz, P. (2013). Attachment and Attention. Talk presented at the Annual Home County Attachment Conference, 2012, Montreal, Quebec.

Meinz, P. & Martin, J. (2012). Disorganized Attachment Behavior and Maternal Sensitivity. Talk presented at the Annual Home County Attachment Conference, 2012, Montreal, Quebec.

- Meinz, P. & Morley, T. (2012). An Introduction to Attachment. Invited talk at Lucas Secondary School, London, Ontario.
- Meinz, P. & Main, M. (2011). Individual differences in response to an autobiographical interview: A new representational measure of attachment for toddlers. Poster presented at the Society for Research in Child Development, 2011, Montreal, Quebec.
- Meinz, P. & Main, M. (2011). Evolution of Mary Ainsworth's Understanding of Attachment: Changes in Her Conceptualizations of Security and Its Precursors. Poster presented at the Society for Research in Child Development, 2011, Montreal, Quebec.
- Alfaro, A. U., Meinz, P., Mosrah V., & Orei Bixler, D. (2014). Strange Situation Paradigm Applied to Infants with Visual Impairments and their Caregivers: Initial Findings. Poster Presented at the South American Attachment Conference, Mexico.
- Arter, J., Bunge, S, & Meinz, P. (2009). Mothers' Attachment Classification Predicts Parenting Behavior with Toddlers in Naturalistic Setting. Poster presented at the Society for Research in Child Development, 2009, Denver, CO.

### Formal Training in Data -Analytics

- |   |   |
|---|---|
| Hierarchical Linear Modeling            | Spring, 2013. Course on performing hierarchical linear models for nested data and how to perform HLM in Mplus statistical software. |
| Python for Scientists and Data Analysis | Fall, 2012, Course on coding Python in research settings, e.g. for data analysis data organization purposes.                        |
| Categorical Data Analysis               | Spring, 2011. Course on analyzing categorical data using generalized linear models and how to perform categorical analyses in R.    |

Structural Equation Modeling	Fall, 2010. Course on Structural Equation Modeling, Hierarchical Linear Modeling, as well as how to perform SEM and HLM in R.
Psychological Statistics and Data Analysis	Fall 2008- Spring 2009. Two Semesters of intermediate and advanced statistics using R statistical software. Training included: ANOVA, linear regression, log-linear regression, categorical data analysis, and an introduction to structural equation modeling.

### Special Training and Consultation Experience

Research Consultant at the Singapore Institute of Clinical Sciences, Singapore	January, 2014, assisted in the coding and administration of the Strange Situation Paradigm.
Research Consultant at the University of Miami, USA	January, 2014, assisted in the coding and administration of the Strange Situation Paradigm.
Research Consultant at the University of Ottawa, Canada	January, 2013, assisted in the coding and administration of Adult Attachment Interviews.
Research Consultant at Durham University, UK	May, 2011, Assisted in the coding and administration of Adult Attachment Interviews.
Research Consultant at UC Berkeley, USA	August, 2010, Advised on the coding and administration of Adult Attachment Interviews
Research Consultant at San Francisco State University, USA	May, 2006. Advised on the administration coding of the Adult Attachment Interview.
Strange Situation Coder	April, 2010, Certified in coding an internationally validated instrument for

assessing the quality of child-parent relationships.

Adult Attachment Interview Coder

May, 2006, Certified in coding an internationally validated instrument for predicting a mother's behavior with her child.

### Teaching and Mentoring

Honors student mentor

Advised an undergraduate student on research and writing an honors thesis, Fall, 2013–Spring, 2014.

Teacher's Assistant – Psychological Statistics using Computers

University of Western Ontario, Fall, 2011–Spring, 2014.

Teacher's Assistant – Introductory Psych

University of California, Berkeley, Fall, 2008 (Teaching Evaluation Score: 6.47, Department Mean: 5.87, no standard deviation).

Teacher's Assistant – Research and Stats 2009 for the social sciences (no SD).

University of California, Berkeley, Spring, (Evaluation Score: 6.67 Dept. Mean: 6.22, no SD).

Teacher's Assistant – Research and Stats for the social sciences

University of California, Berkeley, Summer, 2009 (Evaluation Score: 6.39 Dept. Mean: None calculated).

Teacher's Assistant – Attachment and early relationships

University of California, Berkeley, Fall, 2009 (Evaluation Score: 6.37 Dept. Mean: 6.07, no SD).

Teachers Assistant Introductory Psych	University of California, Berkeley, Spring 2010 (Evaluation Score: 6.44 Dept mean: 6.38, no SD).
Teachers Assistant Attachment and early relationships	University of California, Berkeley, Fall, 2010 (Outstanding Graduate Student Instructor Award).
Diversity Student Alliance	Mentorship for undergraduates interested in pursuing graduate school.
<u>Other Graduate Level Coursework</u>	
The Science of Sleep	Fall 2008. An introduction to the study of sleep and proposed functions.
Adult Attachment Interview Protocol	Fall 2008. A training course for administering the Adult Attachment Interview.
Behavioral Neuroscience	Spring, 2009. A course on contemporary research in the field of behavioral neuroscience.
Advanced AAI Coding	Spring, 2009. A course on advanced AAI coding using transcripts from the original Bay Area longitudinal study.
Developmental Psychology Seminar 1	Fall, 2009. A graduate level overview of language and cognitive development with accompanying neurological correlates.
Developmental Psychology Seminar 2	Spring, 2010. A graduate level overview on emotional and social development.
<u>Applied Experience and Training</u>	

Social Worker

2007-2008. Sierra Family and Child Services after training in basic cognitive behavioral intervention and nonviolent restraint.