

ABSTRACT

Title of Document: THE EFFECTS OF EXPERIMENTALLY
INDUCED ATTACHMENT SECURITY ON
CHILDREN'S FEAR REACTIONS

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2012

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The feeling that an attachment figure is available and responsive when needed (also referred to as attachment security) is an important factor in the activation of the fear system such that attachment security is thought to decrease fearfulness. To date, no study has examined whether attachment security *causes* decreased fearfulness. Adult attachment researchers have used priming techniques to investigate whether increased security causes improvement in various adult psychosocial outcomes (for a review see Mikulincer & Shaver, 2007) and priming techniques have been useful in research with children. As such, attachment security priming may be a valuable research tool to determine whether attachment security reduces children's fear reactions. In addition, mothers' negative and unsupportive responses to children's negative emotions are associated with poor socio-emotional outcomes for children (Eisenberg et al., 1998). As such, maternal negative and unsupportive responses may be linked to children's fear responses. Child temperament is also an important factor in children's

fear reactions such that temperamentally more fearful children may be more influenced by the effects of attachment security and maternal responses to child distress. The present study was designed to extend attachment security priming methods to research with children between 6- and 7-years-of-age by employing a multi-method experimental approach to examine (a) whether experimentally induced attachment security causes less fearful reactions to fear-inducing tasks in children, and (b) whether maternal emotion socialization is associated with the fear reactivity of children randomly assigned to the neutral control group. Additionally, the present study also seeks to examine (a) whether the effects of experimentally-induced attachment security on children's fear reactions vary as a function of children's temperamental fearfulness, and (b) whether the link between maternal emotion socialization and children's fear reactivity is moderated by children's temperament fearfulness. After having been exposed to subliminally presented attachment security picture primes, six- and seven-year-old children had lower physiological fear reactions during observations of fear-inducing pictures than children exposed to subliminally presented happy or neutral picture primes. There were no links between maternal responses to child distress and children's fear-reactions. Results did not differ as a function of child temperamental fearfulness.

THE EFFECTS OF EXPERIMENTALLY INDUCED ATTACHMENT SECURITY
ON CHILDREN'S FEAR REACTIONS

By

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Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2012

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Acknowledgements

My husband, Aaron: This project has drained us both financially and emotionally but you have been the glue that has held us and this project together. You have been patient, forgiving, flexible, caring, kind, attentive, supportive, interested, funny, and committed. You were my rock, my safe haven, my motivator, my best research assistant, and my benefactor. I cannot thank you enough for being my partner, but I look forward to having a lifetime with you to try to do so. I love you.

My dog, Charlie: Thank you for being so forgiving of my absence during this project. No matter how long I was away from home, or how crabby I was when I finally showed up, you were always eager to welcome me home with loving wags.

My research assistants: Arya Bagheri, Laurel Brabson, Amy Burkholder, Alycia Busz, Chandeerah Davis, Demetra Dooros, Mike Marks, Rachel Sherman, Elizabeth Rozmaryn, and Lauren Verstandig. You were dependable, reliable, and extraordinary. Thank you for your dedication and commitment to this project.

My labmates: Katie Ehrlich, Laura Sherman, Bonnie Brett, and Jason Jones. You were immensely helpful in designing this project, helping me recruit, letting me bounce ideas off of you, and stepping in to help me out in a pinch. I can't thank you enough for being so generous with your time.

Bonnie Brett: You saved my life by giving up your Saturdays and Sundays to run labs with me. You were the most patient and kind of all. I have loved having you work with me on this project and I want you to know that I am forever indebted to you for doing so.

Kevin O'Grady: Aside from the remarkable amount of advice you gave me on the design and analysis of this project (for which I am grateful), if it hadn't been for you taking a chance and letting a kid like me into DaSAL, I don't think I would have made it this far. You provided a safe haven in the department where I could grow into a confident psychologist. Thank you.

My advisor, Jude Cassidy: You have been a tremendous resource throughout this project. Your thoughtful and caring advice has helped make this project a success. You encouraged me to try something new and to learn new skills. You also reined me in when I bit off more than I could handle. You have been enthusiastic about this project from the start and it helped get me through the struggles of data collection and analyses. Thank you for being my mentor.

My committee: Carl Lejuez, Tracy Riggins, Elizabeth Redcay, and Hedwig Teglas-Golubcow. Your comments and suggestions during the proposal phase helped me make this project something of which I am very proud. Thank you for your invaluable guidance.

My participants: Thank you for finding the time to volunteer to participate in my study. I know you had dozens of other activities you could have chosen to do the day you came in for my study, and I want to thank you for choosing to come to the Maryland Child & Family Development Lab.

Lastly, I want to thank Felicity for keeping me company while I marked events on my physiological data. Although I did not agree with your decision to be with Ben rather than with Noel, by the end, I saw that everything just kept leading back to Ben. The heart wants what the heart wants.

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Chapter 1: Introduction

The Influence of Experimentally Induced Attachment Security on Children's Fear Reactions

Fear is a universal emotion with evolutionary significance (Darwin, 1872). Everyone experiences at least some degree of fear at one time or another and it motivates us to act in ways that increase our chances of survival. The universality and adaptive value of fear underscores how it is entrenched in the human experience, and, for this reason alone, makes fear an important topic of research inquiry that cuts across research disciplines. Research on the normative expression and experience of fear both across people and within the individual has been crucial to our understanding of fear, including how it manifests in our facial expressions and body posture (Rosenberg & Ekman, 2005) to how it ebbs and flows across development (Camras et al., 1994). In addition, research on individual differences in the expression and experience of fear has yielded important insight into the role that fear plays in the individual's biological, psychological, and social adjustment. For example, both overwhelming fear and a lack of a fear response can signal psychopathology as is the case for anxiety disorders which are characterized by pervasive and/or acute fear, anxiety, and worry, and for antisocial personality disorder which is often characterized by a lack of a fear response when one would normally be expected.

Attachment researchers have been especially interested in fear reactions because the fear and attachment systems are thought to have evolved together (Bowlby, 1969/1982, 1973). According to attachment theory, the biological function of fear is protection. It is adaptive to be fearful of certain stimuli that signal an

increased likelihood of danger, including darkness, loud noises, sudden looming movements, loss of physical support, aloneness, and novelty (Bowlby, 1969/1982, 1973). These “natural clues to danger” activate the fear system and the attachment system, such that the experience of fear initiates avoidance and withdrawal from fear-provoking stimuli and approach toward an attachment figure. The intertwining of the fear and the attachment systems in this way increases the likelihood of survival (Bowlby, 1973).

Another behavioral system that is closely linked to both the fear and attachment systems is the exploratory system. The exploratory system is thought to have evolved because it provides a survival advantage by supporting the acquisition of important information about the world (Bowlby, 1969/1982). The exploratory system and the fear system are closely linked such that novel and complex stimuli elicit both exploratory behavior and fearful behavior (Bowlby, 1969/1982). This conflict between the exploratory and fear systems also provides a survival advantage because “unbridled exploration with no attention to potential hazards can be dangerous,” (Cassidy, 2008, p. 8). Thus, the fear system is antagonistic to the exploratory system such that fearfulness decreases exploration. Novelty and complexity, however, permeate children’s daily lives. Therefore, just as unbridled exploration can be dangerous, unbridled fearfulness can also be dangerous. Specifically, unbridled fearfulness in the face of novel and complex stimuli with no attention to opportunities for exploration would severely limit the child’s ability to extract important information from the environment—information that would provide the child with a survival advantage.

The presence of an attachment figure can reduce this tension between fear and exploratory behaviors. Specifically, fear activates the attachment behavioral system and increases proximity to attachment figures. In turn, proximity to an attachment figure ensures protection from potential dangers which assuages fear and facilitates learning to effectively negotiate the environment by supporting exploratory behaviors (Marvin & Britner, 2008). Thus, the presence and availability of an attachment figure is an important factor in the activation of the fear system, such that an available and responsive attachment figure decreases fearfulness.

In addition, individual differences in the organization of the attachment behavioral system contribute to the activation of the fear system (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969/1972). Specifically, the attachment behavioral system is organized based on experiences with an attachment figure. According to attachment theory, those who have experienced their attachment figures as available and responsive to their attachment behaviors tend to develop a sense of secure confidence that their attachment figures will be available and responsive if needed, and they are thought to carry this sense of security with them into their interactions with the world (Bowlby, 1969/1982; Shaver & Fraley, 2000). If, however, attachment behaviors are met with rejection, inconsistent responsiveness, or frightening/frightened behaviors on the part of their attachment figures, a sense of insecurity about the availability and responsiveness of one's attachment figures is likely to develop which is then carried forward into new interactions. Thus, it is thought that attachment security, or mental representations of one's attachment figures as available and responsive when needed, reduces fearfulness compared to

attachment insecurity (i.e., mental representations of one's attachment figures as rejecting, inconsistently responsive, or frightening/frightened when needed).

Consistent with theory, research indicates that attachment security is linked to less fear and anxiety. Recently, research also indicates that the link between attachment security and children's fear reactions may vary as a function of temperamental or genetic factors (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & Linting, 2008; Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008; Gilissen, Koolstra, van IJzendoorn, Bakermans-Kranenburg, & van der Veer, 2007). There are two substantial gaps in this body of literature. First, this body of literature is limited to correlational research; there have been no experimental investigations of the influence of attachment security on fear. Second, most research that has examined the link between attachment security and fear or anxiety has done so with children eight-years-of-age or older (Borelli, Crowley, David, Sbarra, Anderson, & Mayes, 2010; Borelli, David, Crowley, & Mayes, 2010; Brumariu & Kerns, 2008, 2010; Cunha, Soares, & Pinto-Gouveia, 2008; Duchesne, Ratelle, Poitras, & Drouin, 2009; Lee & Hankin, 2009; Muris, Mayer, & Meesters, 2000; Muris & Meesters, 2002; Muris, Meesters, van melich, & Zwambag, 2001; Tremblay & Sullivan, 2010). There have been only three studies examining the link between attachment security and fear or anxiety during infancy and the preschool years (Kochanska, 2001; Shamir-Essakow, Ungerer, & Rapee, 2005; Stevenson-Hinde & Shouldice, 1990) and only four studies that have investigated the link between attachment security and fear or anxiety during early childhood (i.e., ages five to seven: Dallaire & Weinraub, 2005, 2007; Gilissen, Bakermans-Kranenburg, van

IJzendoorn, & Linting, 2008; Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008).

This paucity of research on attachment security and fear in early childhood also extends to investigations of maternal emotion socialization factors that may predict children's fearfulness. The primary attachment relationship provides children with their first exposure to emotion socialization experiences which influence children's emotional capacities—that is, social experiences that shape children's understanding, experience, and expression of emotions. Understanding the socialization of fear is particularly important to understand because of the role that fear plays in children's psychosocial outcomes, including social competence, self-regulatory capacities, and mental health (Himle, Fischer, Lee, & Muroff, 2006; Schmidt & Schulkin, 1999). Research supports the idea that mothers' emotion socialization is an important predictor of children's emotional development (Eisenberg, Cumberland, & Spinrad, 1998), but no study yet has examined how mothers' emotion socialization influences children's fear in particular. Given the role that fear plays in children's psychosocial functioning and psychopathology, it is important to investigate maternal factors that may influence children's fear reactions.

Given the lack of experimental research on attachment security and children's fear reactions, the dearth of research investigating this link in early childhood, and little research on maternal emotion socialization and children's fear, the present study seeks to fill these gaps in the literature. Specifically, the present study seeks to: (a) determine whether experimentally induced attachment security causes decreased fear reactivity in children, and (b) examine how mother's emotion socialization relates to

children's fear reactions. In addition, given the growing body of evidence that suggests that children who have high levels of negative emotionality may be more influenced by the quality of their caregiving environment, the present study will also examine whether these links are moderated by child temperamental fearfulness within the context of the differential susceptibility hypothesis.

Overview

In the remainder of this introduction, I provide a review of the empirical literature on attachment security and fear reactions in infancy, toddlerhood, and childhood. Then, I briefly discuss research that has used priming to experimentally increase attachment security in adults, which has allowed researchers to examine causal links between experimentally induced attachment security and improved psychosocial functioning. I follow this with a review of research that has used priming methods to examine how children's mental representations drive their responses to social information. (A comprehensive review of this literature is provided in Chapter 2.) Next, I review research examining the links between mothers' emotion socialization and children's emotional development. In the last part of this chapter, I describe the present study including the hypotheses and research questions.

After I outline my hypotheses and research questions, I provide a comprehensive review of the literature on attachment security priming and developmental research that has used priming to examine how children's mental representations guide their behavior. Next, I describe my method, followed by my results, then a discussion of my findings.

Developmental Research Examining the Link between Attachment Security and Fear

Two studies have experimentally manipulated the presence and availability of an attachment figure to examine the effects on psychosocial outcomes. Although none have examined the effects of an attachment figure's presence and availability on fear in childhood, these studies suggest that increased attachment security *causes* improved psychosocial outcomes. Sorce and Emde's (1981) seminal experiment examined the effects of mothers' availability and responsiveness on 15-month-olds' exploration and affect, including fearfulness, anger, and sadness. Specifically, 15-month-olds were introduced to a series of novel/unpredictable situations while their mothers remained in the room with them. Half of the mothers were present but unavailable and unresponsive (mothers were instructed to read the newspaper and remain unresponsive to their infants' bids for attention), and the other half were present, available, and responsive (mothers did not read the newspaper, but instead were instructed to monitor their infants and respond empathically and appropriately). The infants whose mothers were unavailable and unresponsive exhibited more distress and were less exploratory compared to infants whose mothers were available and responsive.

Although this study demonstrates that an attachment figure's decreased availability and responsiveness increases negative affect and decreases exploration, these findings speak only indirectly to whether an attachment figure's availability and responsiveness affect fearfulness. Specifically, fear was coded as one of several indicator of distress, including expressions of anger and sadness. As such, it is not

possible to interpret these findings as evidence that the presence of an available and responsive attachment figure decreases fearfulness because fear is confounded with other negative emotions.

Another study found that physical contact with an attachment figure attenuates negative emotion and neural threat responses. Although this study was conducted with adults, given that attachment is a lifespan phenomenon, these findings are clearly relevant to the present study which seeks to determine whether increased attachment security reduces children's fearfulness. Married women were subjected to the threat of a mild electric shock under three conditions: once while holding the hand of their husband, once while holding the hand of an unknown and anonymous male experimenter, and once while holding no hand at all (Coan, Schaefer, & Davidson, 2006). Women's reports of unpleasantness were lowest when they were holding their husbands' hand compared to holding the stranger's hand or no hand. Similarly, functional brain imaging revealed less neural activation in areas of the brain associated with emotional and behavioral threat responses when women were holding their husbands' hand compared to holding the stranger's hand or no hand. In addition, this effect of decreased neural threat response in the spousal hand holding condition increased as marital quality increased (Coan, et al., 2006).

In this same sample, Coan, Schafer, & Davidson (2005) also found that wives' neural activity in response to threat during these three conditions (i.e., holding husband's hand, holding stranger's hand, no hand-holding), varied as a function of both wives' and husbands' self-reported attachment styles. During the husband hand holding condition, wives' security was linked to decreased neural activity in response

to threat in areas of the brain associated with modulation of affect-related arousal, and wives' security was linked to increased neural activity in these same areas of the brain linked to regulation of affect-related arousal when holding a stranger's hand.

Furthermore, during the husband hand holding condition, wives' attachment-related avoidance (discomfort with closeness and intimacy) predicted increased neural activity in response to threat in areas of the brain associated with the regulation of negative affect, and increased activation of these same areas of the brain associated with the regulation of negative affect when holding a stranger's hand. These findings suggest that more secure women are able to use their husbands as a source affect-regulation during times of stress, and women who have greater levels of attachment avoidance are less able to use their husbands as a source of negative-affect regulation.

In addition, Coan and colleagues (2005) also found that during the stranger hand holding condition, wives' whose husbands reported higher levels of attachment anxiety (fear of abandonment) had greater neural activity in response to threat in areas of the brain associated with increased threat response and stress, suggesting that women whose husbands reported higher levels of fear of abandonment were less able to use the social support provided by a stranger to regulate their threat response and stress. Furthermore, husbands' attachment avoidance influenced wives' neural responses to threat. In the husband hand holding condition, women whose husbands had higher levels of attachment avoidance had increased neural activation in response to threat in areas of the brain associated with self-regulatory efforts, suggesting that women whose husbands were uncomfortable with intimacy and closeness relied more on their own self-regulatory abilities.

Similar to Source and Emde (1981), Coan and colleagues' (Coan, et al., 2005, 2006) findings support the idea that the presence and availability of an attachment figure decreases negative emotions. Nonetheless, Source and Emde's and Coan and colleagues' studies do not address the question of whether increased attachment security reduces fear reactivity. As such, a direct examination of the causal link between attachment security and fear has yet to be conducted.

There is correlational evidence, however, to support the idea that attachment security is associated with less fearfulness. Several longitudinal studies have assessed attachment security during infancy in the Strange Situation and found that securely attached infants were less fearful or had lower levels of anxiety at later time points. For example, infants who were classified as securely attached at 14 months were less fearful at 33 months compared to insecurely attached infants (Kochanska, 2001). Infant attachment security assessed in the Strange Situation has also been linked to lower levels of separation anxiety at 6 years-of-age (Dallaire & Weinraub, 2005) and less school phobia at 11 years-of-age (Bar-Haim, Dan, Eshel, & Sagi-Schwartz, 2007) compared to insecurely attached infants. Infant attachment security has also been found to be a protective factor against the effects of negative life events on anxiety. Specifically, negative life events predicted greater levels of anxiety symptoms in first grade for children who were insecurely attached to mother at 15 months, whereas children who were securely attached were protected from the harmful effects of negative life events on anxiety symptoms (Dallaire & Weinraub, 2007). Another study found that higher levels of self-reported attachment anxiety and avoidance using the revised Experiences in Close Relationships inventory (ECR-R; Fraley,

Waller, & Brennan, 2000) each predicted increases in anxiety symptoms over a 5 month period in a sample of 6th through 10th graders.

A larger body of research has found links between concurrently assessed attachment security and fear or anxiety. Two studies have found a link between concurrently assessed attachment and fear. Stevenson-Hinde and Shouldice (1990) reported that 2.5-year-olds who were the most secure during the Strange Situation were also the least fearful of the stranger during the Strange Situation. Borelli, Crowley, et al. (2010) found a link between attachment security and startle response in children between 8- and 12-years-of-age. Specifically, children who were rated as having higher levels of narrative coherence during the Child Attachment Interview (Shmueli-Goetz, Target, Datta, & Fonagy, 2008) initially had a greater startle magnitude which decreased more rapidly during a threatening condition. These findings suggest that children who are able to discuss their attachment relationships more coherently respond initially to a threat with higher arousal but are able to down-regulate more quickly.

Other studies have found concurrent links between attachment security and anxiety. Shamir-Essakow et al., (2005) found that three- and four-year-olds classified as securely attached in a modified Strange Situation had fewer concordantly diagnosed anxiety disorders. Self-reported attachment using Kerns and colleagues' attachment security scale (Kerns, Klepac, & Cole, 1996) has been linked to less anxiety symptoms (Duchesne et al., 2009) and less social anxiety symptoms (Brumariu & Kerns, 2008) in 6th graders. Another study found that security assessed with a story stem completion task (Granot, & Mayseless, 2001) was linked to lower

levels of general anxiety, social phobia, school phobia, and panic/somatic symptoms in 10- to 12-year-olds (Brumariu & Kerns, 2010). Several studies have found a link between concurrently assessed self-reports of adolescents' attachment security and anxiety symptoms such that adolescents who report greater levels of security also report lower levels of anxiety symptoms (see Cunha et al., 2008; Muris, et al., 2000, 2001; Muris & Meesters, 2001; Tremblay & Sullivan, 2010).

The research reviewed above, taken together, indicates that attachment security predicts less fearfulness and less anxiety symptoms both concurrently and longitudinally in infants, preschoolers, children, and adolescents. Recent research suggests that this link between attachment security and fearfulness may vary as a function of biologically-based characteristics of the child. Specifically, Gilissen and colleagues have found that attachment security is linked to lower levels of electrodermal activity in 7-year-olds. In one study, securely attached 7-year-olds had lower levels of electrodermal activity (EDA) during a social evaluative threat task than insecurely attached children (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & Linting, 2008). In another study more secure 7-year-olds had lower EDA levels in response to fear-inducing video clips (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008).

In addition to supporting the idea that attachment security is an important predictor of children's physiological fear reactivity, these studies by Gilissen and colleagues also found evidence that, for biological reasons, some children are more susceptible to the effects of attachment security on their physiological fear reactivity. In particular, the effect of attachment security on EDA during a social evaluative

stress task was moderated by variation in the serotonin transporter allele in the promoter region of the serotonin transporter gene (5-HTTLPR). Specifically, securely attached children with two long alleles showed the lowest levels of EDA during the social stressor compared to children with other variants (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & Linting, 2008).

In addition, the effect of attachment security on physiological fear reactivity increased as children's temperamental fearfulness increased during the fear-inducing video clips. Results were consistent with the differential susceptibility hypothesis, which states that, "[S]ome children, for temperamental or genetic reasons, are actually more susceptible to *both* (a) the adverse effects of unsupportive parenting *and* (b) the beneficial effects of supportive rearing," (Belsky, Bakermans-Kranenburg, & van IJzendoorn, (2007, p. 300, italics in original text). Specifically, temperamentally more fearful children had the lowest levels of fear reactivity when their attachment to their primary caregiver was supportive (i.e., secure) and the highest levels of fear reactivity when their attachment to their primary caregiver was unsupportive (i.e., insecure).

Taken together, this body of research reviewed above indicates that, consistent with theory, attachment security is associated with less fearfulness across development and that this link may vary as a function of biologically-based child characteristics. This research, however, is limited in two ways. First, no study has experimentally examined the causal link between attachment security and reduced fearfulness that is theorized to exist. Second, there are relatively few studies examining the link between attachment security and fearfulness during early

childhood. In what follows, I discuss research that uses priming methods to increase attachment security in experimental research and illustrate how applying attachment security priming methods to research with children would allow researchers to draw initial causal links between increased attachment security and less fear.

Priming as a Way of Experimentally Increasing Attachment Security in Adults

Priming is a technique that is used to activate a particular mental representation of interest by exposing participants to schema-relevant cues (Bargh, 2003, 2006; Bargh & Chartrand, 2000; Hamilton, 2005). Just as it is possible to activate a mental representation of interest by exposing people to schema-relevant stimuli, it is also possible to activate mental representations of attachment security using stimuli that are related to attachment security. Activating mental representations of attachment security using priming methods offers the possibility of exploring how mental representations of attachment drive affect, cognitions, and behavior in attachment-relevant situations in experimental research (Mikulincer & Shaver, 2007a, 2007b). Adult attachment researchers have recently extended the use of priming techniques to investigate whether increased security leads to improved adult psychosocial outcomes—an idea that is central to attachment theory (Bowlby, 1973).

This growing body of research has demonstrated that experimentally enhancing attachment security in adults by priming attachment security causes improvements in a wide-range of psychosocial outcomes including coping response to stressful situations (e.g., Cassidy, Shaver, Mikulincer, & Lavy, 2009; Pierce & Lydon, 1998), prosocial responses (e.g., Mikulincer, Gillath, Halevy, Avihou, Avidan, & Eshkoli, 2001; Mikulincer, Gillath, Sapir-Lavid, Yaakobi, Arias, Tal-

Aloni, & Bor, 2003; Mikulincer, Shaver, Gillath, & Nitzberg, 2005), mood (Mikulincer, Hirschberger, Nachmias, & Gillath, 2001), reactions toward outgroup members (Mikulincer & Shaver, 2001), relationship expectations (Carnelley & Rowe, 2007), and self-esteem (Gillath & Shaver, 2007; see Chapter 2 for a comprehensive review of the attachment security priming literature).

Of particular importance to the present study is evidence that increased security serves as a buffer against increased negative affect in conditions of threat. Mikulincer et al. (2001) conducted a series of experiments to test whether activation of the secure base schema under stressful conditions acts as a buffer against distress and instill calmness and optimism in threatening situations. These studies looked at the effects of experimentally-induced activation of the secure base schema under stressful conditions by randomly assigning participants to either a threatening condition (i.e., subliminal exposure to the word *failure* or the word *death* [Study 5], failure feedback [Study 6], or asking participants to visualize being involuntarily separated from a loved one [Study 7]) or a non-threatening condition (subliminal exposure to the word *hat* [Study 5], no feedback [Study 6], or asking participants to visualize a TV talk show [Study 7]) before rating Chinese ideographs that were preceded by either a security-enhancing priming stimulus (e.g, a black and white Picasso sketch of a mother and her infant, an old couple sitting closely and comfortably) a positive affect prime (e.g., a picture of a treasure chest full of jewels), a neutral prime (a black polygon), or no prime.

Results from these studies by Mikulincer and his colleagues (2001) indicated that in the non-threatening conditions, ideographs that followed security-enhancing

and positive affect enhancing picture primes were rated higher than those that were preceded with either a neutral prime or no prime. In the threatening conditions, however, ideographs that were preceded by an attachment security enhancing prime were liked more than ideographs that were preceded by a control prime stimulus (i.e., positive affect prime, neutral prime, no prime). In addition, ideographs that were preceded by control prime stimulus were no different from each other. Importantly, these studies indicate that in threatening situations when the need for felt security is thought to be more salient because the fear system is activated, security priming has a mood repair effect whereas positive affect priming does not.

In general, adult attachment research that has used priming methods to experimentally enhance security is consistent with attachment theory's predictions that secure mental representations lead to increased positive psychosocial outcomes, including fearful reactions (Bowlby, 1969/1982, 1973; see also, Cassidy & Shaver, 2008, and Grossmann, Grossmann, & Waters, 2005). These findings point to the possibility of extending our knowledge of the causal effects of attachment security on fear reactivity in childhood by randomly assigning children to receive attachment security enhancing primes prior to engaging in fear-inducing activities. The effects of attachment security priming on children have remained relatively unexplored despite clear evidence that priming is an effective method for tapping children's existing mental representations, as I discuss in the next section.

Priming as a Way of Examining How Children's Mental Representations Drive Their Responses to Social Stimuli

There is a substantial amount of developmental research that has demonstrated the utility of priming as a method for investigating how children's mental representations are causally related to neurological and cognitive responses to environmental events. Cognitive developmentalists have employed priming techniques to gain important insights into how children mentally represent numbers, language, and memories of specific events (see Chapter 2 for a discussion of cognitive developmental research that has used priming). A smaller yet still compelling body of developmental research has demonstrated the utility of priming for investigating how mental representations are causally related to responses in reaction to the social environment. Specifically, researchers have employed priming methods with children to gain a better understanding of how children's mental representations drive their reactions toward out-group members, their eating behavior, their information processing of potentially-fear inducing stimuli, and their affiliative behavior.

Two studies have used priming to examine how children's mental representations influence their reactions toward outgroup members. One study found that priming competition with kindergarteners led to preferential allocation of play money to ingroup members (Spielman, 2000; Study 1). Another study found that priming first and fifth graders with positive stimuli or grandparent-related stimuli overrode children's negative mental representations of the elderly by increasing positive evaluations of older individuals compared to negative, elderly, and neutral priming conditions (Hoe & Davidson, 2002).

Researchers have also extended priming methods to research with children to examine the effects of advertising as a “real world” prime on children’s eating behavior. By randomly assigning 7- to 11-year-olds to watch a cartoon that had either food advertisements or non-food advertisements while alone in a room with a bowl of goldfish crackers and a glass of water, researchers were able to establish a causal link between watching food advertisements and increased snack consumption (Harris, Bargh, & Brownell, 2009; Study 1). Specifically, children who watched commercials advertising food (i.e., waffle sticks and syrup, fruit roll-ups, potato chips, and a high sugar cereal) ate 45% more goldfish crackers than children who watched non-food product advertisements (e.g., toys). Moreover, the amount of goldfish crackers that children ate did not vary as a function of the child’s age, body mass index, sex, the length of time that had elapsed since having eaten, or the parent’s reports of the child’s appetite.

Researchers have also used priming to investigate the effects of mental representations of empowerment and helplessness on children’s memory for potentially fear-inducing stimuli. Specifically, children had better recall of a video of a child’s fearful visit to the doctor if they had earlier been primed with empowerment by watching a fairytale in which a child saved his or her parents from disaster compared to children who were earlier primed with helplessness by watching a video of a child’s mother rescuing the child from disaster (Cortez & Bugental, 1995).

Over and Carpenter’s (2009a, 2009b) recent studies provide particularly compelling evidence of the utility of priming as a way to examine children’s social schemas as they influence reactions to social events. One study (Over & Carpenter,

2009a) tested the possibility that there is continuity in development between imitation in early childhood and infancy to mimicry in adulthood as a behavioral strategy to increase affiliation by examining how priming ostracism in 5- and 6-year olds influenced their subsequent imitation of an experimenter's actions. Children primed with ostracism imitated more of the experimenter's actions than children in the control condition. These findings indicate that children, like adults, modify their behavior in ways that increase affiliation after being exposed to social exclusion. Also impressive are Over and Carpenter's (2009b) findings that priming 18 month olds with affiliation leads to increased helpfulness. Specifically, infants exposed to the affiliative prime (two dolls facing each other) were three times more likely to spontaneously help the experimenter during the first 10 seconds after the experimenter dropped a bundle of sticks compared to infants exposed to a neutral prime (two small stacks of blocks) and those exposed to the individuality primes (one doll alone, or two dolls back-to-back).

In addition, one study has shown that repeated priming of children's mental representations of a nurturing and accepting mother has the potential to improve children's self-concept and boost academic performance (Bryant -Tuckett & Silverman, 1984). Specifically, a group of institutionalized, emotionally disturbed children and adolescents (mean age = 15.7, range = 10.8 to 19.3; enrolled in grades 5-12) in a residential treatment school who were below age norms on measures of academic achievement and intellectual ability and had extensive histories of truancy were randomly assigned to receive four trials of either a prime that evokes images of a nurturing and accepting mother (subliminal exposure to "*Mommy and I are one*")

or a neutral prime (subliminal exposure to “*People are walking*”) five times a week for six weeks. At the beginning of each of the 30 priming sessions, students were asked to imagine a tense situation related to school such as the anxiety before a test which served to pair the anxiety-provoking situation with the tension reduction that resulted from the security-enhancing prime. Post-treatment, students who were exposed to the security-enhancing prime had more positive self-concepts than students who were exposed to neutral primes. In addition, repeated subliminal exposure to “Mommy and I are one,” resulted in higher standardized reading and math scores, more frequent homework completion, more time spent working independently in the classroom, and less time spent watching television as recorded by their counselors.

Research using Silverman’s “*Mommy and I are one*” (*MIO*) priming stimulus was designed to activate representations of a nurturing and accepting mother, which in turn, were thought to serve as a gratification for the need to merge with “the good mother of childhood” (Hardaway, 1990). Although the idea that a desire for oneness with mother is security-enhancing has fallen into disfavor, activating representations of a nurturing and accepting mother is consistent with the concept of priming representations of felt security. There is some evidence to support this idea. In particular, the more positive the emotional tone of memories of interaction with mother, the more positive is the response to exposure to *MIO* (see Sohlberg, Claesson, & Birgegard, 2003). Thus, to the extent that activating representations of maternal nurturance and acceptance activates representations of attachment security, Bryant -Tuckett and Silverman’s (1984) findings point to the possibility that

subliminal security priming can be used to test causal links between attachment security and improved psychosocial outcomes.

Given that the causal link thought to exist between increased attachment security and fearfulness has yet to be examined experimentally, security priming may prove to be a useful tool for conducting initial tests of this causal link in children based on the findings on priming with children. In addition, using attachment security priming methods in an experimental design (i.e., random assignment of children to be exposed to either security-enhancing stimuli or control stimuli) will also broaden our understanding of the social factors that influence children's fear reactions more generally. In what follows, I discuss how mothers' emotion socialization may also influence children's fear reactions.

Mothers' Emotion Socialization and Child Emotional Development

Mothers' emotion socialization is guided, at least in part, by her beliefs about emotions (Eisenberg et al., 1998). In general, research indicates that mothers' negative and unsupportive responses to children's negative emotions are associated with poor socio-emotional outcomes for children (Eisenberg et al., 1998). For instance, researchers have found that mothers' emotion socialization responses predicted young children's emotion understanding and awareness of their own emotions. Specifically, mothers' emotion socialization, comprised of mothers' emotional expressivity, responses to her child's emotions, and emotion talk with her child, assessed at child age 4.5 years predicted their children's awareness of their own happiness and sadness a year later (Warren & Stifter, 2008). Analyses revealed that mothers who had supportive emotion socialization responses were more likely to

have children who had high awareness of their own happiness, whereas mothers who had non-supportive emotion socialization responses were more likely to have children who had low awareness of their own sadness. Similarly, Dunsmore and Karn (2004) found that children whose mothers believed in teaching emotion language had greater increases in emotion knowledge during the first semester of kindergarten.

Research has also revealed that mothers' emotion socialization is associated with emotion regulation and depression later in childhood. In particular, in a sample of 11- to 13-year old adolescents whose mothers responded in an invalidating or "dampening" manner toward their positive affect reported using maladaptive emotion regulation strategies more frequently and were rated by observers as displaying more emotionally dysregulated behaviors. In addition, girls whose mothers reported invalidating their positive affect reported more depressive symptoms (Yap, Nicholas, & [Ladouceur](#), 2008).

Of particular importance to the present study is research that has examined mothers' emotion socialization and children's anxiety disorders. Given that fear is the prevalent emotion in anxiety disorders, evidence that mothers of children with an anxiety disorder compared to mothers of non-clinical children differ on measures of mothers' emotion socialization supports the idea that mothers' emotion socialization influences children's fearfulness. For example, in a sample of 8- to 12-year old children with and without an anxiety disorder, researchers found that mothers of children with anxiety disorders, compared to mothers of non-clinical children, spoke less frequently than their child, used fewer positive emotion words, and discouraged their children's discussions of emotion during an emotional interaction task in which

dyads talked about times that the child felt sad, worried, and angry (Suveg, Zeman, Flannery-Schroeder, & Cassano, 2005).

Taken together, these findings, though suggestive of a link between mothers' emotion socialization and children's fearfulness, cannot speak directly to whether mothers' reactions to their children's emotions influence children's fearfulness specifically. Given that fear seems to underlie not only anxiety disorders, but other mental disorders (e.g. avoidant personality disorder, dependent personality disorder, obsessive-compulsive personality disorder, and eating disorders), and other socio-emotional risk-factors, such as behavioral inhibition, it is important for future research to examine how maternal emotion socialization and children's fearfulness is associated with children's fear reactions. In addition, given the growing body of research which suggests that the effects of the caregiving environment on children's developmental outcomes may vary as a function of their temperament, with some children being more or less susceptible to caregiving influences, it is important to extend this body of research to include examinations of children's temperament as a moderator of the link between maternal emotion socialization and children's emotional outcomes. No study yet has examined how children's temperament and maternal emotion socialization interact to predict children's emotion development outcomes.

The Present Study

The present study is designed to add to the understanding of the role that attachment security and maternal emotion socialization play in fear reactions in early

childhood. Specifically, I seek to extend attachment security priming methods to research with children between 6- and 7-years-of-age by employing a multi-method experimental approach to examine (a) whether experimentally induced attachment security causes less fearful reactions to fear-inducing tasks in children, and (b) whether maternal emotion socialization is associated with the fear reactivity of children randomly assigned to the neutral control group. Additionally, the present study also seeks to examine (a) whether the effects of experimentally-induced attachment security on children's fear reactions vary as a function of children's temperamental fearfulness, and (b) whether the link between maternal emotion socialization and children's fear reactivity is moderated by children's temperament fearfulness.

I have chosen to address these questions using 6- and 7-year-old-children because if attachment security priming works in children as young as six, there are many interesting extensions and practical implications for future work that center around developmental outcomes that are of relevance for young children in particular. For example, 6- and 7-year-olds are in a transitional point where they are attending school all day and their social worlds change dramatically as a result (e.g., increased peer interactions, longer separation for family). Increasing attachment security in children of this age may not only reduce fear, but may also increase exploration and improve interactions with teachers and peers, thus supporting academic success. In addition, other outcomes that are of relevance for young children include sociability, internalizing and externalizing problems, social information processing. Each of these has been linked to attachment security in correlational research. As such, attachment

security priming may be able to move these links to the level of causality by examining these links for the first time using an experimental design.

I examine children's fear reactions by collecting their EDA and by asking children to rate their emotions on a visual analog scale. These two assessments will allow me to examine the effects of experimentally enhanced attachment security on both biological and psychological emotional reactions. EDA is an indicator of sympathetic nervous system activity and stress. Increases in EDA is a result of sympathetic nervous system activity which increases sweat in the eccrine sweat glands (located in the palms of the hands and soles of the feet; Dawson, Schell, & Filion., 2003). Eccrine sweat glands respond to psychological stimulation rather than simply to temperature changes in the body (Stern, Ray, & Quigley, 2003). Increases in EDA are the result of increased eccrine sweat gland activity which is the result of increased sympathetic nervous system activity. Thus, increases in EDA are indicators of increased arousal.

Children's fear-reactions were be elicited by presenting pictures taken from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008) using pictures that were rated by children as fear-inducing in studies conducted by the developers of the IAPS (Lang et al., 2008). To differentiate the effects of attachment security priming on children's fear reactions specifically from those of sympathetic nervous system arousal in general, children will also be presented with pictures that are happy excitement inducing using IAPS pictures that were rated as excitement and happiness inducing. By comparing the effects of priming during the arousing and unpleasant fear-inducing pictures and the arousing and pleasant excitement-inducing

pictures, I can examine the effects of attachment security priming on fear specifically rather than on arousal in general. In addition, immediately following the fear- and happy excitement-inducing pictures, children will rate their fearfulness using a visual analog scale.

I will examine the effects of attachment security on children's fear reactions by comparing EDA and self-reported fear in each of three randomly assigned conditions: Security-enhancing condition, happiness enhancing control condition, neutral control condition. I have chosen to include a happy control condition to rule out the alternative explanation that attachment security priming is simply increasing happiness. If the happiness-enhancing control condition does not decrease fear reactions, then I can conclude that the attachment-security enhancing condition was not simply the effects of increased feelings of happiness. In addition, by using pictures of adults with "true" Duchenne smiles, which indicate affiliation and cooperation (see Brown & Moore, 2002; Izard, 1971), as my happy control priming condition I can also distinguish the effects of attachment security priming from those that may have been due to priming affiliation. The experimental manipulation will take place during a game in which children are subliminally exposed to pictures according to the condition they were assigned. Picture primes for children randomly assigned to the attachment-security priming condition will be pictures that evoke mental representations of security (e.g., sketches of a mother having a caring interaction with her infant). Priming pictures for children randomly assigned to the happy control condition were pictures of adult humans smiling from the University of Bolton Affect Recognition Tri-Stimulus Approach (Lawrence, Abdel-Nabi, &

Charlton, May 2011). Priming pictures for children randomly assigned to the neutral control condition were pictures of a neutral valence (e.g., multi-colored polygons).

Hypotheses and Research Questions. I hypothesize that EDA and self-reports of fear will be lower during the fear-inducing pictures than during the excitement-inducing pictures for children in the security-enhancing prime condition compared to children in the happy and neutral control conditions (Hypothesis 1). See Figure 1 for a depiction of my hypothesized results. With respect to the link between maternal emotion socialization and fear reactivity for children randomly assigned to the control group, I hypothesize that children's EDA and reports of feeling scared during the fear-inducing pictures will decrease as their mothers' endorsement of supportive responses to their negative affect increases, whereas children's EDA and reports of feeling scared during the fear-inducing pictures will increase as their mothers' endorsement of unsupportive responses to their negative affect increases (Hypothesis 2). See Figure 2 for a depiction of my hypothesized results.

In addition, the effect of attachment security priming and maternal emotion socialization may not be uniform across children. These effects may be different for different children. As discussed earlier, theory and research suggest that environmental influences on children's outcomes may vary for biological reasons (see Belsky et al., 2007; Belsky & Pluess, 2009). Of particular relevance to the present investigation is research that has found that the influence of attachment security on children's EDA during fear-inducing video clips varied as a function of child temperamental fearfulness (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008). Therefore, the present study also seeks to determine whether the

influence of attachment security priming and maternal emotion socialization on children's fear reactivity varies as a function of child temperamental fearfulness.

There are several ways that an interaction between attachment security priming and child temperament and an interaction between maternal emotion socialization and child temperament could manifest. For example, highly fearful children, compared to less fearful children, could have (a) the best outcomes under supportive conditions, (b) the worst outcomes under unsupportive conditions, or (c) both the best outcomes under supportive conditions and the worse outcomes under unsupportive conditions. Given the various ways that these interactions could present, I pose two research questions aimed at examining whether child temperamental fearfulness moderates the link between environmental influences (i.e., attachment security priming and maternal emotion socialization) in the present study, rather than two hypotheses.

First, I will examine the interaction between temperamental fearfulness and experimental group on children's EDA and reports of feeling scared to determine whether the effects of experimentally enhanced attachment security on children's fear reactivity vary as a function of children's temperamental fearfulness (Research Question 1). Second, using the control group only, I will examine the interaction between temperamental fearfulness and mothers' responses to their children's negative affect to determine whether the link between mothers' responses to their children's negative affect and their children's EDA and reports of feeling scared in the control group vary as a function of children's temperamental fearfulness

(Research Question 2). See Table 1 for a list of study hypotheses and research questions.

In testing these hypotheses and addressing these research questions, the present study contributes to the literature in several important ways. First, this study is the first to test whether experimentally induced attachment security reduces fear reactivity. Second, the present study adds to the relatively sparse body of research examining attachment and fear in early childhood. Third, the present study is the first to examine mothers' emotion socialization as a predictor of children's fear reactions. Fourth, this study adds to the small body of research that has examined whether the effects of experimentally-induced security on child outcomes vary as a function of child temperament. Fifth, this study adds to the small body of research that has examined whether the link between maternal emotion socialization and children's emotional development varies as a function of child temperament. Sixth, this study will be the first to examine whether maternal emotion socialization and child temperament interact to predict children's emotion outcomes.

Chapter 2: Literature Review

A core concept in social development is the idea that children's experiences with their environment are organized into mental representations or schemas and that these mental representations guide children's responses to social stimuli (Dweck & London, 2004). Social development research that explores how children process social information has largely relied on non-experimental designs as the field progresses from describing the associations among children's experiences with the social environment, their social behavior, and their mental representations to explaining the cognitive mechanisms that mediate the link between exposure to social stimuli and children's responses to this social information. The extensive body of observational and correlational research that has accumulated in this progression from description to explanation provides a wealth of descriptive information about the various factors associated with children's processing of social information. What has remained relatively unexplored are the causal links between children's mental representations and their processing and responses to social stimuli. In moving social development research forward, it is critical to build upon the solid empirical base of knowledge provided by this body of descriptive research and begin to address the cognitive causal mechanisms thought to underlie children's processing and responses to social information.

Addressing this gap in our knowledge about how children's cognitive representations influence how they process and respond to social stimuli requires experimental manipulation of children's mental representations. One possibility for

addressing this gap is using priming methods to activate a particular mental representation of interest in an experimental design (i.e., randomly assign children to be exposed to schema-relevant stimuli or to a control group that is either not primed or exposed to neutral or unrelated stimuli). Experimentally activating a mental representation of interest using priming techniques has the potential to expand our understanding of children's social development to include explanations of the causal role that children's cognitive representations play in their responses to social stimuli.

The goal of this paper is to demonstrate how priming offers the possibility for future research in social development to gain important insights into explaining the role of children's mental representations of the social world in their responses to social cues. I begin by providing the theoretical conceptualization underlying priming. In this first section I also describe methods of priming. Second, I use attachment theory as a basis for demonstrating how the extension of priming techniques has allowed attachment researchers to draw initial causal links between representations of attachment security and improved psychosocial functioning. To this end, I present the theoretical underpinnings of attachment security priming followed by a comprehensive review of the research that has used the priming of mental representations of attachment security to disentangle the causal links between attachment security with improved psychosocial functioning. In my review of the attachment security priming literature, I discuss the importance of extending this research to assessments of observed behavioral outcomes and to research with children. Third, I review evidence demonstrating the effectiveness of priming techniques as a way of accessing children's mental representations. In this third part, I

describe how developmentalists who have used priming methods have uncovered important insights into how children mentally represent their world and use these representations to process and respond to environmental cues. Fourth, I discuss how priming can inform future research in social development using research examining attachment, social-information-processing, gender development, and mood and mental health as examples.

Underlying Conceptualization of Priming

According to schema theory, psychological reactions to environmental events are driven by mental representations, or schemas, which are organized knowledge structures of past experiences (Bartlett, 1932; Fiske & Taylor, 1991; Rumelhart, 1980). Thus, environmental events are filtered through mental representations, which, in turn, guide thoughts, feelings, and behavior (Taylor & Crocker, 1981).

Environmental cues can activate relevant mental representations which then serve to guide attention, interpretation, encoding, storage, retrieval, and behavior. Priming is a method for tapping these mental representations that serve as the driving force behind how people respond to environmental cues. Specifically, priming activates a particular mental representation of interest by exposing participants to schema-relevant cues (Bargh, 2003, 2006; Bargh & Chartrand, 2000; Hamilton, 2005). In what follows I describe techniques researchers have developed for exposing participants to priming stimuli.

Methods of Priming

Priming methods can be divided into two categories based on the level at which priming stimuli are perceived and processed. Supraliminal priming techniques

present priming stimuli at or above the threshold of conscious awareness, whereas subliminal priming techniques present priming stimuli below the threshold of conscious awareness. I discuss each of these in turn.

Supraliminal priming. In methods that employ supraliminal priming, participants are consciously aware of the priming stimuli. Supraliminal priming can be accomplished by asking participants to focus on schema-relevant information by recollecting, imagining, reading, viewing, or writing about an event. For example, attachment researchers have primed attachment security by asking participants to write about a close relationship in which they felt secure to examine the effects of increased feelings of attachment security on lying (Gillath, Sesko, Shaver, & Chun, 2010).

Supraliminal priming can also be accomplished more inconspicuously by discreetly priming participants via subtle exposure to the priming stimuli (e.g., by placing schema relevant stimuli in the environment rather than asking participants to focus on the stimuli). One recent example of this method of surreptitious priming exposed participants to the priming stimuli by having the experimenter ask the participants to briefly hold her cup of hot or iced coffee while she recorded their name and the time of their participation during the elevator ride to the fourth floor (Williams & Bargh, 2008; Study 1). This subtle exposure to a hot or cold beverage was designed to prime mental representations of interpersonal warmth and coldness. Participants whose feelings of interpersonal warmth were primed by holding a cup of hot coffee, compared to those whose representations of interpersonal coldness were

primed by holding a cup of iced coffee, later judged a target person's personality as warmer (e.g., generous, caring).

It is also common to consciously but surreptitiously prime participants by incorporating the priming stimuli into the experimental protocol as part of an ostensibly unrelated task. For example, in Williams and Bargh's (2008) second experiment, feelings of interpersonal warmth and coldness were primed by asking participants to hold either a hot or cold therapeutic pad in order to evaluate its effectiveness. The true purpose of the experiment was to determine whether priming interpersonal warmth or coldness influenced participants' generous or self-serving behavior. Participants whose feelings of interpersonal warmth were primed by evaluating a hot therapeutic pad behaved more generously (i.e., they were more likely to choose as their reward for participating in the study a gift for friend rather than a gift for themselves). In comparison, those whose feelings of interpersonal coldness were primed by evaluating a cold therapeutic pad behaved in a more self-serving way (i.e., they were more likely to choose a gift for themselves as opposed to one for a friend).

Another commonly used technique for inconspicuously priming participants is the "scrambled sentence test" (Costin, 1969) in which participants are asked to construct a grammatically correct sentence from each word set they are given. During the sentence construction process, participants are exposed to words that are related to the concept that the experimenter intends to activate. One study that used this priming technique activated mental representations of the elderly by including words such as Florida and wrinkle in the scrambled sentence test (Bargh, Chen, & Burrows, 1996;

Study 2). By temporarily activating the availability of participants' mental representations of the elderly, researchers were able to observe changes in behavior that were consistent with stereotypes of the elderly. Specifically, participants who were exposed to elderly stereotype-related primes walked down the hallway more slowly after leaving the experiment than those in the control condition.

Subliminal priming. Subliminal priming is typically done using the masked priming technique whereby the priming stimuli are presented very briefly (usually less than a tenth of a second) followed by the immediate presentation of a visual mask that is displayed for at least as long as, but preferably longer than, the preceding prime (Bargh & Chartrand, 2000). Despite the priming stimuli being presented too quickly for participants to be able to perceive them consciously, the masked priming paradigm has been found to influence a wide range of psychological outcomes. For example, repeated subliminal exposure to positively valenced words has been found to lead to increased positive mood, which, in turn, resulted in a more heuristic and less effortful information processing style, presumably because the positively valenced stimuli and corresponding positive mood signal that the environment is safe and friendly (Chartrand, van Baaren, & Bargh, 2006). On the other hand, in the same study, repeated subliminal exposure to negatively valenced words was found to result in an increased negative mood, which, in turn, led to a more analytic, cautious, and effortful information processing style, presumably because the negatively valenced stimuli and corresponding negative mood signal that the environment is problematic and that appropriate action needs to be taken.

Long-term effects of subliminal priming have also been reported. For instance, long-term effects for exposure to subliminally presented words related to the concept of intelligence on academic performance have also been reported (Lowery, Eisenberger, Hardin, & Sinclair, 2007; Study 2). Students enrolled in an undergraduate level social psychology class participated in the study as part of a voluntary study session for an upcoming midterm exam for the course. Students were subliminally exposed to words that were either related to intelligence (e.g., smart, brilliant, brainy, genius) or neutral words unrelated to intelligence (e.g., intact, smock, birch, garden). Students who were subliminally primed with intelligence-related words scored higher on both a practice exam taken immediately after the priming session and higher on the actual course exam taken up to four days later.

In addition, brain-imaging research has shown that subliminal priming influences both electrical brain activity and cerebral blood flow in predictable ways. Dehaene et al. (1998) were the first to provide evidence that subliminally presented stimuli can be semantically processed in the cerebral cortex using a combination of behavioral and brain-imaging techniques. Subjects were presented numbers between 1 and 9 and asked to categorize the target numbers as being either greater than 5 or less than 5 by using one hand for greater than 5 and the other for less than 5. Before categorizing each number, subjects were subliminally exposed to a numerical prime between 1 and 9. Dehaene et al. found that primes that were congruent with the target number (i.e., both the prime and the target were greater than 5 or both the prime and the target were less than 5) increased the speed with which subjects were able to categorize the target numbers. Event-related potentials (ERPs) recorded during this

task also revealed a priming effect such that the peak amplitude of electrical brain activity from the onset of the priming mask occurred 24 milliseconds later for incongruent trials (i.e., the prime was greater than 5 and the target was less than 5 or vice versa) compared to congruent trials.

In addition, further analyses from this study revealed that the faster response time observed for congruent trials was due to the prime engaging a response in motor cortex in the same hemisphere that would respond to the target number, whereas for incongruent trials the prime activated a motor response in the hemisphere that was contralateral to the target. Both ERPs and functional magnetic resonance imaging (fMRI) demonstrated that subjects subconsciously applied the task instructions to the subliminally presented primes as indicated by activation of appropriate motor cortex areas. For primes that were greater than 5, the left motor cortex was activated indicating that the subject subconsciously applied the task instructions to the primes and prepared an appropriate right-handed motor response. Similarly, when primes were less than 5, the right motor cortex was activated indicating that subjects prepared a left-handed motor response.

Attachment Security Priming

Recently, the effects of priming have been extended to adult attachment research, with the majority of this research investigating the effects of attachment security priming on outcomes such as response to stress-inducing situations, empathy, altruism, views of the self and others, exploration, concern for self and others, and mood and mental health. I begin this section by presenting the theoretical

underpinning of attachment security priming and then provide a comprehensive review of security priming research.

Theoretical Underpinnings of Attachment Security Priming

In the same way that psychological reactions to environmental events are thought to be driven by mental representations, reactions to attachment-relevant events in particular and social events more broadly are thought to be driven by mental representations of attachment. Thus, according to attachment theory, and consistent with social-cognitive theory (Hamilton, 2005; Schneider, 1991), attachment-related cues and information are filtered through mental representations of attachment, which, in turn, guide thoughts, feelings, and behavior (Bowlby, 1969/1982, p. 81; see also Bretherton & Munholland, 2008). Just as schemas are thought to develop based on past experiences with the world, mental representations of attachment develop based on past experiences in attachment-relevant situations. Experiences with the availability and responsiveness of attachment figures are at the core of the mental representations of attachment that are subsequently brought to bear in novel attachment-relevant situations (Bowlby, 1973). Mental representations of attachment security develop from experiences of one's attachment figures as sensitive and appropriately responsive to one's bids for attention. Mental representations of attachment insecurity develop from experiences of attachment figures as rejecting, unavailable, ineffective, or frightening or frightened behaviors in response to bids for attention (Bretherton & Munholland, 2008; Bowlby, 1969/1982, 1973; Main, Kaplan, & Cassidy, 1985).

Just as it is possible to activate a mental representation of interest by exposing people to schema-relevant stimuli, it is also possible to activate mental representations of attachment security using stimuli that are related to attachment security. Activating mental representations of attachment security using priming methods offers the possibility of exploring how mental representations of attachment drive affect, cognitions, and behavior in social and attachment-relevant situations using experimental methods (Mikulincer & Shaver, 2007a, 2007b). Adult attachment researchers have recently extended the use of priming techniques to investigate whether increased security leads to improved adult psychosocial outcomes— an idea that is central to attachment theory (Bowlby, 1973).

Review of Attachment Security Priming Research

With few exceptions, research has supported the idea that attachment security priming leads to more positive psychosocial outcomes. In this section, I provide a comprehensive review of research in which mental representations of attachment security were primed to disentangle whether attachment security is causally related to improved psychological, social, and emotional outcomes. For the most part, this literature has examined the effects of security priming using adults. Only one study has examined these effects in late adolescence.

Response to Stress-Inducing Information. Pierce and Lydon (1998) examined the effects of secure and insecure mental representations on affect, support seeking, and coping responses to a hypothetical unplanned pregnancy. University women were subliminally exposed to sets of either security-enhancing words (i.e., *caring, helpful, supportive, accepting, and loving*), sets of attachment insecurity-

related words (i.e., *critical, rejecting, nagging, hurtful, and distant*), or sets of random consonants (control group) before listening to a scenario in which they were asked to imagine that they had experienced an unplanned pregnancy. Compared to the control condition, those who received insecurity-related primes reported less positive affect, and those who received security-related primes reported that they would be more likely to seek emotional support and less likely to adopt self-denigration as a coping response. This study provides support for the idea that security increases willingness to seek emotional support and reduces the likelihood of adopting maladaptive coping responses in dealing with a difficult situation.

More recently, Cassidy, Shaver, Mikulincer, and Lavy (2009) tested whether experimentally-enhancing one's sense of security reduces insecure individuals' reliance on defensive strategies to cope with painful emotions. Specifically, Cassidy et al. examined whether subliminal attachment security priming reduced (a) anxious individuals' tendency to heighten their feelings of distress in reaction to painful events and (b) avoidant individuals' tendency to suppress and deny feelings of distress in reaction to painful events. Following an assessment of their dispositional attachment anxiety and avoidance using the Experiences in Close Relationships Scale (ECR; Brennan, Clark, & Shaver, 1998), participants were asked to write about a time that a close relationship partner had hurt their feelings. Afterwards, participants were randomly assigned to receive either security-enhancing subliminal primes (the words *love, secure, and affection*) or neutral subliminal primes (the words *lamp, staple, and building*) before rating 20 pairs of furniture on their similarity. Immediately after the subliminal priming trials, participants were asked to respond to several questions

about the hurtful event that they had described earlier. As expected, security priming reduced anxious individuals' tendency to report less constructive reactions, more intense feelings of rejection, more crying, and more negative emotions in response to the hurtful event. In addition, security priming also reduced avoidant individuals' tendency to report less severe appraisals of the hurtful event, less intense feelings of rejection, less crying, and more defensive and hostile reactions. Thus, this study demonstrates that a greater sense of security reduces insecure individuals' reliance on defensive strategies in response to painful experiences.

Exploration. Green and Campbell (2000) examined whether an increased sense of security causes increased interest in exploring the physical and social environment. Participants were told to become as familiar as possible with a set of 10 sentences, three of which were filler items that were identical in each condition. Those in the security priming condition read sentences such as *Jean comforted her child*; those in the attachment anxiety priming condition read sentences such as *Ellen is constantly worried that her boyfriend will leave her*; and, those in the avoidance priming condition read sentences like *John's mom is cold and distant when he tries to hug her*. After reading the priming sentences for 3 minutes, participants responded to a series of questions designed to assess their immediate reactions to unfamiliar stimuli and interest in participating in novel activities. Participants primed with attachment security expressed greater interest in intellectual exploration compared to those primed with attachment anxiety and those primed with avoidance. Those primed with security also expressed more interest in exploring their physical environment than those primed with attachment anxiety, but not compared to those primed with

avoidance. There were no priming effects for interest in exploring the social environment. These findings are problematic, however, due to the lack of a neutral prime or no prime control group. This lack of a control group precludes being able to determine whether security enhances interest in exploration or insecurity decreases interest in exploration.

Risk-Taking. Taubman – Ben-Ari and Mikulincer (2007) examined the effects of security priming compared to positive affect priming, self-enhancement priming, and neutral priming on Israeli high school students' (aged 17-19 years; Median = 18) probability of engaging in reckless driving. Security was primed in one of three ways: asking students to write about either a poster depicting a young boy saying to his father, "*Even if there is an ocean between us, I know you will be there for me,*" (Study 1); watching a short video in which a young boy and his father recalled times that the father was available and sensitively responsive to his son's needs (Study 2); or reading a story about a person who received sensitive and responsive help from his or her father and sister (Study 3). Following the priming procedure, students first reported the probability that they would drive recklessly in response to 10 hypothetical driving scenarios, then students completed the Experiences in Close Relationships scale (ECR; Brennan et al., 1998). Results indicated that security priming led to a lower probability of reckless driving compared to all other conditions when students reported low levels of attachment anxiety; however, security priming led to a greater probability of reckless driving compared to all other conditions when students reported high levels of attachment anxiety. The

theoretical implications of these findings, however, are difficult to ascertain due to the design of this study.

First, given that attachment anxiety and avoidance were assessed *after* the experimental manipulation of security, it is possible that security priming decreased students' reports of their attachment-related anxiety. Given Carnelley and Rowe (2007) and Gillath and Shaver's (2007) findings (reviewed below) that repeated security priming reduces attachment anxiety, it is possible that, for some students, security priming led to decreased attachment anxiety, which, in turn, led to decreased endorsement of reckless driving. In addition, these findings are muddied by this study's use of the father-child relationship to prime attachment security, which differs from most other attachment security priming research. Specifically, priming is typically done by asking participants to visualize a time that someone responded to sensitively their distress, to visualize a person who serves as a secure base, or by subliminally exposing subjects to security-related stimuli (e.g., the name of a person identified by the participant as making them feel secure, security-related words). By using the father-child relationship to prime security, researchers may not have tapped into participants' secure-base schema. Rather, it is possible that the father-child relationship used to prime attachment security merely increased students' accessibility to representations of their relationship with their father. This is problematic because this priming technique may have increased participants' feelings of security depending on the quality of the relationship they had with their father.

Concern for Self and Others. Mikulincer, Gillath, Sapir-Lavid, Yaakobi, Arias, Tal-Aloni, and Bor (2003) examined the effects of experimentally enhanced

security compared to positive affect and neutral priming conditions on concern for the welfare of close others and concern for the welfare of all humanity and nature.

Security was primed by asking participants to recall and describe a situation in which close others assisted them with solving a problem they could not solve on their own (Studies 1 and 3) or by asking participants to rate a picture depicting a person in distress being comforted by an opposite-sex partner on the extent to which it aroused positive affect and feelings of security (Study 2). Following the priming procedure, participants rated the importance of benevolence (concern for the welfare of close others) and universalism (concern for the welfare of all humanity and nature) in guiding their lives (Studies 1 and 2), or they were asked to generate the 10 most important values that guided their lives (Study 3). Analyses indicated that security priming strengthened participants' endorsement of both concern for close others and concern for all humanity and nature as important values that guided their lives. These findings suggest that increased security led to increased self-reported concern for others.

Similarly, Bartz and Lydon (2004) examined how attachment style affects concern for others and concern for self. Participants were primed by asking them to visualize a person with whom they have an important and meaningful relationship that fit the description they were given. In Study 1, participants were primed with a description of either a secure, avoidant, or ambivalent relationship (based on Hazan & Shaver's [1987] secure, avoidant, and ambivalent attachment types). Results indicated that words related to concern for self were more easily accessible to those primed with an ambivalent attachment orientation compared to those primed with either a

secure or avoidant attachment orientation, whereas words related to concern for others were more easily accessible to those primed with a secure attachment orientation compared to those primed with either an ambivalent or avoidant attachment orientation. In Study 2, participants were primed with a description of either a secure, fearful, dismissing, or preoccupied relationship (based on Bartholomew & Horowitz's [1991] secure, fearful, dismissing, and preoccupied attachment types). Results indicated that participant reports of concern for self were higher for those primed with an insecure attachment orientation (i.e., preoccupied, dismissive, fearful) than those primed with a secure attachment orientation. The lack of a control group in both studies, however, clouds interpretations of these findings. For instance, without a control group to establish a baseline for concern for others and concern for self, it is unclear whether security decreases concern for self or whether insecurity increases concern for self. Likewise it is also impossible to determine whether security increases concern for others or whether insecurity decreases concern for others.

Mikulincer, Gillath, Halevy, Avihou, Avidan, and Eshkoli (2001; Studies 1-4) examined whether experimentally-induced security reduces personal distress and enhances empathy in reaction to others' needs. Attachment security was induced in one of three ways: asking participants to read a story in which a person in distress received sensitive and responsive help from family members (Study 1); inadvertently exposing participants to a picture of a person being comforted by someone of the opposite sex by attaching the picture to the inside cover of a folder that contained a questionnaire that assessed the participants' reactions to others' needs (Studies 2 and

4); or subliminally exposing participants to 60 trials of security-related words (e.g., *love, support, hug, closeness*; Study 3). Results indicated that attachment security priming decreased personal distress and increased empathy in reaction to reading a story about another person in need (Studies 1 -3) and decreased the amount of time required to recall an experience in which they witnessed another person's plight and reacted with empathy (Study 4). These findings not only indicate that increased attachment security leads to increased empathy and decreased personal distress in reaction to someone in need of help, but Study 4 extends our knowledge of the effects of attachment security priming beyond participant self-reports to information processing speed.

Relatedly, Mikulincer, Shaver, Gillath, and Nitzberg (2005) examined the effects of subliminal attachment security priming on willingness to help another in need. Participants were randomly assigned to receive subliminal exposure to the name of their security-providing primary attachment figure (security-priming condition), the name of someone close to them who was not an attachment figure (close-person-priming condition) or an acquaintance (acquaintance-priming condition). Following the priming task, participants watched what they believed was the live performance of another participant. The participants saw an experimenter explain to the woman that she would perform a series of aversive tasks (look at three gory photographs, hold a large lab rat, hold her forearm in ice water for 30 seconds, pet a live tarantula, touch a preserved sheep's eye, pet a snake, and insert her hand into a bag and allow cockroaches to crawl on her hand and arm) and that she was free to stop whenever she chose. Next participants saw the woman agree to proceed and watched as she

became increasingly distressed as she proceeded through the tasks until she was told to pet a live tarantula. The woman was unable to continue and suggested to the experimenter that maybe the other participant could take her place. Then, the television monitor went blank and the experimenter asked the participant to complete a questionnaire including items tapping his or her emotional reactions to the distressed woman and his or her willingness to help her by performing the remaining tasks. Participants who were in the security-priming condition reported more compassion, more willingness to help, and were more likely to agree to replace the distressed woman. These results suggest that increasing accessibility to attachment security-related representations increases compassion and willingness to help another in distress.

Reactions toward Outgroup Members. Mikulincer and Shaver (2001) conducted a series of studies aimed at testing the idea that attachment security decreases fearful reactions to the unfamiliar by examining the effects of attachment security priming on reactions towards outgroup members. Attachment security was induced one of three ways: subliminally presenting security-related words (e.g., *love*, *support*; Studies 1 and 4), asking participants to visualize a situation in which others are sensitive and responsive to their distress (Studies 2 and 5); or asking participants to visualize a person who serves as a secure base (Study 3). Findings indicated that attachment security priming, compared to positive affect and neutral priming, led to more positive evaluations of outgroup members (Studies 1-5), greater willingness to interact with outgroup members (Study 4), and attenuated appraisals of threats posed by outgroup members (Study 3). In addition, the effects of attachment security

priming on evaluations of and willingness to interact with outgroup members persisted even when participants' self-esteem (Study 4) or national identity (Study 5) were attacked.

Extending these findings, Mikulincer and Shaver (2007b) examined whether security priming reduced aggressive behavior toward out-group members. Undergraduates were recruited to participate in a study purported to be on taste preference. Aggressive behavior was assessed as the amount of hot sauce participants gave to a confederate who had indicated a clear dislike for spicy foods. Participants, who were Israeli Jewish undergraduates, met a same-sex student (a confederate of the experimenter) who indicated that he or she was either Jewish or Arab. Then, participants performed a 30-trial computerized word relation task. During each of the 30 trials, participants were subliminally exposed to the name of either their own security-providing attachment figure, the name of a familiar person who did not serve as an attachment figure, or the name of a mere acquaintance. Following the priming procedure, participants were told that they would evaluate either a spicy or non-spicy food after which they completed a taste-preference inventory. Participants were then given the taste preference inventory of the other participant (the confederate) which indicated a clear dislike for spicy foods. Participants were asked to prepare a sample of hot sauce that the other participant would be asked to consume completely. To ensure that participants were aware of how painfully spicy the hot sauce was, they were asked to taste it. Results revealed that a larger amount of hot sauce was sent over to confederates who indicated that they were Arab students compared to those who indicated that they were Jewish students. This increased hostile behavior toward

an out-group member was eliminated by security priming; that is, when participants' sense of security was enhanced, they delivered equally low amounts of hot sauce to the Arab and Jewish confederates. These findings indicate that increased security may decrease aggressive behavior toward out-group members.

Mood and Mental Health. Mikulincer, Hirschberger, Nachmias, and Gillath (2001) conducted a series of experiments to determine whether attachment security increases positive affect. It is important to note that this set of experiments, rather than relying on participant reports, assessed positive affect by examining whether the heightened positive affect that results from priming attachment security increases participants' positive evaluations of neutral stimuli. Participants were presented with a series of neutrally valued Chinese ideographs and rated the extent to which they liked each one. In each trial, immediately before each ideograph was presented, participants were exposed to either a security-enhancing prime (e.g., a black and white Picasso sketch of a mother and her infant, an old couple sitting closely and comfortably) or one of several control primes (e.g., a picture of a treasure chest full of jewels, a black polygon). Studies 1 – 4 revealed that secure priming and positive affect priming increased positive affect which increased participants' preferences for subsequently presented Chinese ideographs.

Studies 5-7 examined another core component of attachment theory: that activation of the secure base schema is particularly relevant under stressful conditions serving to protect against distress and instill calmness and optimism. These studies looked at the effects of experimentally-induced activation of the secure base schema under stressful conditions by randomly assigning participants to either a threatening

condition (i.e., subliminal exposure to the word *failure* or the word *death* [Study 5], failure feedback [Study 6], or asking participants to visualize being involuntarily separated from a loved one [Study 7]) or a non-threatening control condition (subliminal exposure to the word *hat* [Study 5], no feedback [Study 6], or asking participants to visualize a TV talk show [Study 7]) before rating Chinese ideographs that were preceded by either a security-enhancing priming stimulus or one of three control primes. Results from these studies indicated that, similar to the previous studies, in the non-threatening control condition, ideographs that followed security-enhancing and positive affect enhancing picture primes were rated higher than those following the neutral prime or no prime. In the threatening conditions ideographs that followed the security enhancing picture prime were liked more than those that followed the positive affect prime, the neutral prime, and no prime, whereas ideographs that followed these latter three picture primes were no different from each other. Taken together, these studies indicate that enhanced attachment security leads to greater positive affect under both neutral and stressful conditions. Importantly, these studies also differentiate the effects of security priming from priming a state of positivity more generally. That is, under stressful situations when the need for felt security is more salient, security priming has a mood repair effect whereas positive affect priming does not.

Experimentally enhanced security has also been shown to mitigate the effects of posttraumatic stress disorder (PTSD) symptoms on responses to trauma.

Mikulincer, Shaver, and Horesh (2006) selected two groups of participants based on the severity of their self-reported PTSD symptoms: the PTSD group scored in the top

25th percentile, and the non-PTSD group scored in the bottom 25th percentile. Response to trauma was assessed using a Stroop color naming task in which participants were asked to name the colors of 10 terror-related words, 10 negatively valenced words, and 10 neutral words. Longer latencies for naming the colors of the terror-related words indicated greater accessibility of trauma-related thoughts because the saliency of trauma-related thoughts interferes with color naming. Before each trial, participants were subliminally primed with an attachment security related word, a positively valenced word, or a neutral word. As has been the case in correlational research, the PTSD group demonstrated greater accessibility to trauma-related thoughts as indicated by their greater latencies to name the colors of terror-related words compared to the non-PTSD group. This link, however, was moderated by security priming such that this effect was significant only when participants were primed with the positive or neutral words. This study indicates that subliminal attachment security priming ameliorates the effects of PTSD symptoms on increased accessibility to trauma-related thoughts.

Attachment security priming has also been shown to mitigate psychopathological reactions of clinically diagnosed patients. Specifically, Admoni (2006) examined the effects of attachment security priming on heightened preoccupation with food and body shape and distorted body image in a sample of women hospitalized for eating disorders. Access to thoughts about food and body shape was assessed as the latency to name the colors of words related to food and body shape. Distorted body image was assessed by asking participants to adjust a picture of themselves using a graphical interface until their body shape seemed

accurate. Similar to correlational findings, women who were hospitalized for eating disorders had heightened accessibility to food and body shape related thoughts as indicated by their greater latencies to name the colors of food and body shape related words as well as more severe body image distortions compared to a group of age-matched healthy women. When the group of women who were hospitalized for eating disorders was subliminally primed with the name of a security providing attachment figure, compared to when they were subliminally primed with the name of a person who did not serve as an attachment figure, the heightened accessibility to food and body shape related thoughts and distortions in their body image decreased, and the differences in performance between patients with eating disorders and the control group dramatically reduced. These findings indicate that attachment insecurity may be causally linked to eating disorders. Taken together with the findings of Mikulincer et al. (2006) reviewed above, these studies suggest that increased security reduces the dysfunctional cognitive responses characteristic of psychopathology.

Long-Term Effects of Security Priming. Two studies have investigated the long-term effects of security priming. Carnelley and Rowe (2007) examined whether repeated supraliminal priming of attachment security had lasting effects on participants' views of themselves, their relationships, and their self-reported attachment style. At baseline (Session 1) and follow-up (Session 5; 11 days after Session 1), participants reported their general expectations of relationships, self-views (i.e., self-liking and competence), attachment-related anxiety (e.g., fear of abandonment) and avoidance (e.g., discomfort with intimacy and dependency) on the ECR (Brennan et al., 1998), and the extent to which they generally felt safe and

secure. Participants who were randomly assigned to the secure priming condition were asked to write about a close significant other with whom they felt secure (Sessions 2 and 4) and an experience they had in which others were sensitive and responsive to their distress (Session 3), whereas those in the neutral prime were told to write about a coursework writing plan (Session 2), their route to the university (Session 3), and shopping for groceries (Session 4). Results indicated that repeated security priming led to more positive relationship expectations, more positive self views, and decreased attachment anxiety at follow-up.

Gillath and Shaver (2007) examined whether repeated subliminal security priming had long-term effects on self-esteem, mood, compassion, and creativity. At baseline, participants completed self-reports of their self-esteem, positive affect, and compassion toward others, and they were asked to name as many creative uses for a common object as possible. Following baseline assessment, participants came to the laboratory every other weekday morning for three weeks to complete various cognitive tasks during which they were primed with subliminally presented words. Participants randomly assigned to the security priming condition were exposed to 40 trials of subliminally presented security-related words (e.g., *secure*, *embrace*, *love*), whereas those assigned to the neutral priming condition were subliminally exposed to 40 trials of neutral words (e.g., *funnel*, *lamp*). One week after the final priming session, participants completed the measures of self-esteem, mood, compassion, and creativity that they completed at baseline. Results indicated that security priming led to higher self-esteem, positive affect, and compassion toward others at follow-up compared to baseline. Taken together with Carnelley and Rowe's (2007) findings,

these studies indicate that repeated security priming can lead to improvements in one's views of self and relationships, mood, compassion, and attachment-related anxiety that last for days rather than minutes.

Summary and Future Directions

In general, the studies reviewed here are consistent with attachment theory's predictions that secure mental representations lead to increased positive psychosocial outcomes (Bowlby, 1969/1982, 1973; see also, Cassidy & Shaver, 2008, and Grossmann, Grossmann, & Waters, 2005). These studies are the first to report evidence to support causal links between mental representations of security and more adaptive responses to stress-inducing information; enhanced views of self and close others; improved mood; increased concern, compassion, and empathy for others; and less aggressive behavior toward out-group members. Importantly, this body of research also provides evidence that experimentally-enhanced security using simple priming methods can lead to long term improvements in views of self and relationships, mood, and compassion, as well as decreases in attachment-related anxiety. Despite clear evidence that experimentally enhanced attachment security makes people respond as if they themselves were more secure, there are three important ways that this body of research has yet to be extended.

First, several theoretically-relevant outcome domains have yet to be explored including parenting quality, caregiving in romantic relationships, and interactions with close others. Relatedly, it remains unknown whether the effects of attachment security priming extend to observed behavioral outcomes. Given that the quality of close relationships is closely linked to behavior during interpersonal interactions (see

Reis & Rusbult, 2004), it is important for future research to extend security priming techniques to the assessment of observed behavior, especially in the context of interactions with other. Moreover, the idea that internal working models of attachment causally drive affect, cognitions, and behaviors in attachment-relevant situations is a core construct to attachment theory (Bowlby, 1969/1982, 1973; Bretherton & Munholland, 2008; Main et al., 1985). As such, it is important to examine whether the effects of attachment security priming extend to observed behavior in attachment-relevant situations.

Second, future research should further examine how attachment security and mood interact to influence outcomes. Mikulincer and colleagues demonstrated the role that attachment security plays under conditions of threat, but the attachment system reaches more broadly than the fear system. Attachments are entrenched in emotional experiences. As Bowlby states, “Many of the most intense of emotions arise during the formation, the maintenance, the disruption, and the renewal of attachment relationships... Threat of loss arouses anxiety and actual loss gives rise to sorrow; whilst each of these situations is likely to arouse anger. The unchallenged maintenance of a bond is experienced as a source of security and the renewal of a bond as a source of joy,” (Bowlby, 1979). As such, extending investigations of the effects of security during emotionally charged situations beyond fear is important to understanding the role that attachment security plays in emotional experiences and how attachment security and emotions interact to predict other outcomes.

Third, the effects of attachment security priming on children have remained relatively unexplored despite clear evidence that priming is an effective method for

tapping children's existing mental representations, as I demonstrate in the section that follows. Given the salience of the effects of attachment security on developmental outcomes in childhood (see Berlin, Cassidy, & Appleyard, 2008; Grossmann et al., 2005; Thompson, 2008), it is important to determine whether the effects of attachment security priming extend to childhood. More importantly, there is a dearth of experimental research investigating whether attachment security in childhood is causally related to improved outcomes. In fact, there are only two studies that have examined whether infant attachment security is causally related to more positive psychosocial outcomes. van den Boom (1995) reported that infant attachment security at 12 months accounted for the effects of an intervention designed to increase caregiving quality and attachment security on increased positive interactions with an unfamiliar peer at 3.5 years. In contrast, Lyons-Ruth & Easterbrooks (2006) found no evidence that infant attachment security acted as a mediating mechanism of intervention effects on reduced behavior problems at five and seven years of age. Clearly more experimental research is needed. Given the evidence reviewed above that priming is an effective tool for attachment researchers to examine causal links between security and more positive outcomes in adults (see also Gillath, Selcuk, & Shaver, 2008, and Mikulincer & Shaver, 2007b) and evidence that priming is effective with children, future research should look to security priming as a way to fill the void in our knowledge of how attachment representations in childhood drive children's responses to attachment-relevant information. Below, I review empirical evidence that priming is a useful tool for examining how children's mental representations influence their psychological responses to environmental events.

Priming in Childhood

Priming has led to important insights into how children's mental representations of the world influence their responses to environmental stimuli. In this section, I review studies that demonstrate that priming has proven to be a useful tool for developmentalists. I begin by describing research that has used priming to address questions related to cognitive development, followed by research that has used priming methods to address questions related to social development.

Cognitive Development

For the most part, research with children that has used priming techniques has come from cognitive development. Cognitive developmentalists have employed priming techniques to gain important insights into how children mentally represent numbers, language, and memories of specific events. Priming has also been used in conjunction with brain-imaging techniques to examine whether children mentally represent language in the same way that adults do. I consider each of these areas of research in turn.

Numerical representations. Investigations of how numbers are processed have provided evidence that Arabic numbers are represented on a mental number line with each number represented as a distribution around the number's true location (e.g., Cordes, Gelman, Gallistel, & Whalen, 2001; Dehaene, Bossini, & Giroux, 1993). According to the representational overlap hypothesis, these numerical representational distributions increasingly overlap as the distance between the numbers on the mental number line decreases such that the numbers that are closer to each other overlap more than numbers that are farther away from each other (Restle,

1970). Studies with adults have found a priming distance effect such that the processing of a particular number is faster when it is preceded by a number prime that is numerically closer to the target number than when it is preceded by a number prime that is numerically more distant (e.g., Dehaene et al., 1998; Reynvoet & Brysbaert, 1999). This effect is thought to occur because the prime activates the mental representation of the number that was primed and also the numbers that lie numerically close to the prime. This increased activation of surrounding numbers facilitates the processing of subsequent numbers that are numerically close to the prime. This priming distance effect has only just been extended to work with children. Reynvoet, Smedt, and Van den Bussche (2009) found that first, third, and fifth graders were able to determine with increased speed and accuracy whether a number was smaller or larger than 5 when they were supraliminally primed with a number that was numerically close to the target number. On a broader level, this study demonstrates the usefulness of priming as a method to investigate number processing in children and that children as young as 6 can be effectively primed with subliminally presented stimuli.

Linguistic Representations. Priming has also proven to be a useful paradigm to investigate the development of linguistic representations in children. Several studies have assessed the effects of priming a particular syntactic structure on children's descriptions of target stimuli to determine whether children possess and use mental representations of syntax structures (e.g., Hupp & Jungers, 2009; Huttenlocher, Vasilyeva, & Shimpi, 2004; Miller & Deevy, 2006; Savage, Lieven, Theakston, & Tomasello, 2003; Shimpi, Gámez, Huttenlocher, & Vasilyeva, 2007;

van Beijsterveldt & van Hell, 2009). If children possess mental representations of particular syntactic structures then exposure to them should enhance their accessibility and increase the likelihood that children use the particular syntactic structures when processing subsequent stimuli. Consistent with this prediction, researchers have found that exposure to particular syntactic structures increases children's subsequent use of these structures, some of which are rare in young children's spontaneous speech. In addition, priming has proven to be useful for addressing the debate surrounding this literature as to whether children's early syntactic knowledge is based on frequently used lexical items that develop into abstract mental representations of syntax that are dependent on lexical learning (see Tomasello, 2000, 2003 for a representative theoretical account of this position) or whether children, like adults, possess substantial early grammatical knowledge in the form of abstract mental representations of syntactic structure that are independent of lexical content (Savage, Lieven, Theakston, & Tomasello, 2006; Kemp, Lieven, & Tomasello, 2005).

Priming has also proven useful for investigating visual word recognition in developing readers. Castles and colleagues' research, in particular, has successfully utilized subliminal priming techniques to examine the development of visual word recognition (Castles, Davis, Cavalot, & Forster, 2007; Castles, Davis, & Forster, 2003; Castles, Davis, & Letcher, 1999; see also Pratarelli, Perry, & Galloway, 1994). Their research has led to important insights about how children develop a means for differentiating a written word from all other words in their visual lexicon. For example, Castles et al. (1999) subliminally primed second, fourth, and sixth graders

and adults with either a word that was identical to the target word (i.e., identity prime), a word that was one letter different from the target word (i.e., form prime), or a prime in which all the letters were different from the target word. Participants were asked to decide whether the target was a word or a non-word. Adults' performance was not facilitated by form primes when the target word could form many other words by changing just one letter (e.g., the target word *clap* can become 10 other words by changing one letter [e.g., *slap*, *flap*, *clip*, *clam*], whereas the target word *iron* cannot be made into another word by changing just one letter). Children's performance, however, was facilitated by form priming. These results suggest that in developing readers, word recognition is facilitated by form priming because their visual lexicon is more limited and a smaller set of candidate words are activated.

Another member of Castles's lab (Cavalot, 1998, as cited in Castles et al., 2003) subliminally exposed adults and third graders to transposition primes (e.g., priming the word *sing* with the word *sign*) to examine the effects of letter position in word retrieval. Cavalot (1998) found that, compared to the all-letters-different control prime, word recognition was facilitated by transposition priming for third graders but not for adults. In fact, transposition priming was as effective at assisting word recognition as is typically seen in third graders when they are primed with the target word itself. These results suggest that the word recognition system in developing readers tolerates a larger degree of error in letter position when searching for a word in the visual lexicon that matches the target word.

Similarly, Syros (1998, as cited in Castles et al., 2003) primed adults and third graders with word fragments that came from either the beginning or the end of the

target word and with distinctive word fragments that occurred in few or no words other than the target word or word fragments that occurred in many words other than the target word. The control prime was a word fragment that had no letters in common with the target word. Adults' word recognition was facilitated only when the word fragment prime was at the beginning of the target word or the word fragment prime was specific to the target word. Third graders also showed word recognition facilitation when primed with word fragments that appeared in the target word, however, they were less sensitive to the position and distinctiveness of the word fragment prime. These results suggest that the mature word recognition system may be more tuned to respond to features of a word that provide unambiguous and more distinctive information that activates fewer target competitors. Taken together these studies support the view that when attempting to match a written word to its internal representation, the immature word recognition system considers similar looking words as candidates because the developing reader's visual lexicon is limited and activates fewer candidate words, whereas the mature word recognition system is more fine tuned to distinctive orthographic features because the demand to discriminate is greater when the visual lexicon is larger.

Memory. Perceptual priming has also been useful for researchers investigating the development of infant memory. Whether infants can mentally represent an event has been a long-standing debate. Some researchers have argued that infants are not capable of mentally representing an event. For example, Piaget (1952) thought that infants are incapable of representation earlier than 18 months of age, and Nelson (1990) posited that infants cannot remember an event without being

able to rehearse the event by talking about it. Because tasks used to study the development of memory with older infants are often inappropriate for younger infants, methodological issues have stood in the way of experimentally investigating the parameters of infant memory, until recently. When researchers are sure that a particular event has been encountered but might not be remembered explicitly, researchers have employed perceptual priming in empirical work that examines the development of implicit memory (Lloyd & Newcombe, 2009). Rovee-Collier and her colleagues (see Rovee-Collier, 1999) have employed perceptual priming to sidestep the methodological issues that have impeded research on infant memory by training 2- to 6-month-olds to move a mobile by kicking via a ribbon tied to their ankle and the mobile and 6- to 18-month-olds to move a toy train by pressing a lever.

These studies have yielded evidence that not only do infants form memories of the training event, but the length of time that infants retain their memories of the original training event increases linearly across the first year and a half of life, from 1 to 2 days at two months to more than 13 weeks at 18 months (Hartshorn et al., 1998). More impressive, however, is that two of these studies (Hartshorn, 2003; Rovee-Collier, Harshorn, & DiRubbo, 1999) have demonstrated that periodically priming infants with an isolated component of the original training event (e.g., the original cue, such as the mobile or the train) extends infants' memory of the event for up to a year and a half after infants' have forgotten the original task (Hartshorn, 2003; Rovee-Collier et al., 1999). Infants who were initially trained on the mobile task at 2 months and were periodically primed by being exposed to the original mobile maintained their memory of the training event until they were 7.25 months when the

experiment had to be terminated because infants outgrew the mobile training task (Rovee-Collier et al., 1999). Similarly, infants who were initially trained on the toy train task at 6 months and were periodically primed with the original train maintained their memory of the training event until they were 2 years of age (Harshorn, 2003). This body of research suggests that priming infants with an isolated component of a previously encoded event increases infants' accessibility to mental representations of this event, thus providing evidence that calls into question the long held notion that very young infants cannot form mental representations.

Brain-Imaging. As can be seen from the studies reviewed above, priming is a useful tool for investigating knowledge structures in both adults and children. Combining brain-imaging techniques with priming has proven useful in research with adults (e.g., Dehaene et al., 1998). Recently, researchers have investigated infants, toddlers, and young children's mental representations by combining neuroimaging and priming techniques. Negative ERP waves that peak 400 ms after stimulus onset (referred to as the N400) have been linked to the processing of semantic incongruity in adults (see Kutas & Federmeier, 2000, for a review). Larger amplitudes in this latency range are associated with slower reaction times indicating greater semantic incongruence (e.g., Anderson & Holcomb, 1995; Bentin, Maccarthy, & Wood, 1985; Holcomb, 1988; Holcomb & Neville, 1990; 1991; Rossel, Price, & Nobre, 2003). Recently, this N400 response has been found in children as young as 13 months of age (Friedrich & Friederici, 2004, 2005a, 2005b) In these studies, infants were presented with a picture followed by a spoken word that was either congruent or incongruent with the previously presented picture prime while

electroencephalographic (EEG) activity was recorded. These studies found that infants in their second year of life evidence the same N400 effect that has been found in adults. Similarly, von Koss Torkildsen, Syversen, Simonsen, Moen, & Lindgren (2007) found an N400-like effect for spoken pairs of semantically related and unrelated words in 24 month olds. Furthermore, the findings from a longitudinal investigation of the N400 effect in toddlers have implications for identifying children at risk for specific language impairment. Friedrich & Friederici (2006) demonstrated that the occurrence of an N400 effect at 19 months predicted adequate expressive language skills at 30 month of age. The lack of an N400 effect at 19 months, however, predicted poor expressive language skills at 30 months, which has been associated with an enhanced risk of the development of specific language impairment.

Social Development

Although fewer in number than studies that have used priming to address questions related to cognitive development, several studies have demonstrated the usefulness of priming as a method for examining how children's mental representations of the social world influence their reactions to the social environment. In particular, social developmentalists have used priming to gain important insights into how children's mental representations drive their reactions toward out-group members, their eating behavior, information processing of potentially-fear inducing stimuli, affiliative behavior, and self-concept. I consider each of these areas of research in turn.

Reactions toward Outgroup Members. Spielman (2000; Study 1) used priming to investigate ingroup bias in kindergarteners. Ingroup bias, or showing

preferential treatment to one's ingroup members compared to outgroup members, has been widely replicated in adults in the minimal group paradigm, in which people are assigned to groups completely arbitrarily (e.g., coin toss). There is evidence to suggest that this ingroup bias effect may be due to priming mental representations of competition by assigning participants into one of two groups (e.g., Hartstone & Augoustinos, 1995). The research available on ingroup bias in children suggests that children younger than 7 may not show ingroup bias in the minimal group paradigm, perhaps, as Spielman suggests, because assignment to one of two groups does not prime competition in young children. Spielman examined the effects of priming competition on ingroup bias in the minimal group paradigm with kindergarteners to determine whether children younger than 7 have the capacity to demonstrate ingroup bias in the minimal group paradigm and whether ingroup bias is the result of competition. Competition was primed with a story about two children racing each other to the sandbox. As expected, children in the neutral and no-prime conditions did not preferentially allocate play money to ingroup members over outgroup members, however, children primed with competition did. These results suggest that children younger than 7 have the capacity, but not the tendency, to demonstrate in-group bias in the minimal group paradigm and that arbitrary assignment into one of two groups does not prime competition. In addition, this study also suggests that the ingroup bias effects found in adults in the minimal group paradigm may be the result of priming competition by assignment into one of two groups.

Hoe and Davidson (2002) examined how priming influences children's attitudes toward older individuals. First and fifth graders were randomly assigned to

either the neutral priming condition or one of four experimental conditions (i.e., negative, positive, elderly, or grandparent priming) before evaluating ambiguous depictions of older individuals. The priming task was introduced as a memory game in which children were read a list of words that included a standard set of filler words and asked to recall the list of words. Next, children were asked to identify the words from the list words just read to them from several sentences that were read to them. Results indicated that positive and grandparent priming lead to more positive evaluations of older individuals compared to the negative, elderly, and neutral priming conditions. These findings are interesting because they demonstrate that by age 7, children have negative mental representations of older individuals that can be over-ridden when accessibility to mental representations of positive characteristics or grandparents are increased.

Eating Behavior. Harris, Bargh, and Brownell (2009; Study 1) recently examined the effects of advertising as a “real world” prime on children’s eating behavior. Children ranging from 7 to 11 years were randomly assigned to watch a cartoon that included 30 second advertisements for waffle sticks and syrup, fruit roll-ups, potato chips, and a high sugar cereal or the same cartoon with four 30 second non-food advertisements. While children watched the cartoon alone, they were given a bowl of goldfish crackers and a glass of water. Children who saw commercials advertising food during the 14 minute cartoon ate 45% more goldfish crackers than children who saw non-food commercials. Moreover, the amount of goldfish crackers that children ate did not vary as a function of their age, body mass index, gender, the length of time that had elapsed since they had eaten, or the parent’s reports of their

appetite. These results establish that television food advertising is causally related to increased snack consumption and may contribute to childhood obesity.

Information Processing of Potentially Fear-Inducing Stimuli. Priming has also been used to investigate children's processing of social information as a function of the extent to which cues of fear, empowerment, and helplessness are present. Cortez and Bugental (1995) primed kindergarteners with a 6 minute video of a fairy tale in which the child either saved their parents from disaster (empowerment prime) or their mother saved the child (helplessness prime). Following the prime, children watched a 6 minute video of a child's visit to the doctor's office in which the child had either a fearful facial expression or a neutral one. As expected, after exposure to fearful cues, children who were primed with helplessness had poorer recall of the doctor visit sequence compared to children who were primed with empowerment. These results suggest that young children's memory for fear-inducing events may be enhanced by activating mental representations of empowerment.

Affiliative Behaviors. Over and Carpenter's (2009a, 2009b) recent studies provide particularly compelling evidence of the utility of priming as a way to examine children's social schemas as they influence reactions to social events. One study used priming as a way to examine whether children, like adults, employ behavioral strategies to increase affiliation and build rapport when exposed to cues of ostracism. Adults use mimicry as a means by which to affiliate after being socially excluded (e.g., Lakin, Jefferis, Cheng, & Chartrand, 2003). Children, on the other hand, generally do not unconsciously mimic an interaction partner's mannerisms until about 5 or 6 years of age (Over & Carpenter, 2009a). Nonetheless, it has been

suggested that children use imitation as a behavioral strategy to increase affiliation (Carpenter, 2006; Nielson, 2006). Over and Carpenter (2009a) tested the possibility that there is continuity in development between imitation in early childhood and infancy to mimicry in adulthood as a behavioral strategy to increase affiliation by examining how priming ostracism in 5- and 6-year- old children influenced their subsequent imitation of an experimenter's actions. Children were primed with ostracism with two short videos of four shapes moving around a computer screen. The first video depicted 3 pentagons playing as a group and then moving away from a fourth pentagon that attempted to approach the group four times before withdrawing to the far side of the screen. The second video depicted two teardrop shaped objects playing ball to the exclusion of a third teardrop shaped object that attempted to join the game before withdrawing to the far side of the screen as in the first video. Following the priming, the experimenter demonstrated eight different ways of acting on a box with a light in it using three wooden tools before handing the box and the tools to the child. Children in the ostracism condition imitated more of the experimenter's actions compared to children who watched the control videos. These findings indicate that children, like adults, modify their behavior in ways that increase affiliation after being exposed to social exclusion. These results are especially remarkable considering that this effect was observed using an abstract depiction of third party ostracism compared to research with adults in which the participants are socially excluded by conspecifics.

More impressive are Over and Carpenter's (2009b) findings that priming 18 month olds with affiliation leads to increased helpfulness. Infants were primed with

affiliation by showing them eight pictures of familiar household objects in the foreground and two small dolls facing each other in the background. Following priming, an experimenter entered the room with a bundle of sticks which she “accidentally” dropped on the floor. Infants exposed to the affiliative prime were three times more likely to spontaneously help the experimenter during the first 10 seconds compared to infants exposed to neutral prime (two small stacks of blocks) and those exposed to the individuality primes (one doll alone, or two dolls back-to-back).

Self-Concept. Research using Silverman’s “*Mommy and I are one*” (*MIO*) priming stimulus was designed to activate representations of a nurturing and accepting mother, which in turn, were thought to serve as a gratification for the need to merge with “the good mother of childhood” (Hardaway, 1990). Although the idea that a desire for oneness with mother is security-enhancing has fallen into disfavor, activating representations of a nurturing and accepting mother is consistent with the concept of priming representations of felt security. There is some evidence to support this idea. In particular, the more positive the emotional tone of memories of interaction with mother, the more positive is the response to exposure to *MIO* (see Sohlberg, Claesson, & Birgegard, 2003).

Of particular interest to the present argument that priming may be a useful tool for examining how children’s mental representations of the social world drive their reactions to social cues is Bryant-Tuckett and Silverman’s (1984) use of the *MIO* subliminal priming paradigm to examine the effects of activating representations of a nurturing and accepting mother on academic performance. A group of

institutionalized, emotionally disturbed children and adolescents in a residential treatment school ($N = 90$; mean age = 15.7, range = 10.8 to 19.3; enrolled in grades 5-12) who were below age norms on measures of academic achievement and intellectual ability and had extensive histories of truancy were randomly assigned to receive four trials of either a security-enhancing prime (subliminal exposure to “*Mommy and I are one*” which evokes images of a nurturing and accepting mother) or a neutral prime (subliminal exposure to “*People are walking*”) five times a week for six weeks. At the beginning of each of the 30 priming sessions, students were asked to imagine a tense situation related to school such as the anxiety before a test which served to pair the anxiety-provoking situation with the tension reduction that resulted from the security-enhancing prime. Post-treatment, compared to students who were exposed to neutral primes, students who were exposed to the security-enhancing prime had more positive self-concepts. In addition, repeated subliminal exposure to *MIO* resulted in higher standardized reading and math scores, more frequent homework completion, more time spent working independently in the classroom, and less time spent watching television as recorded by their counselors.

This study is noteworthy because most priming studies, regardless of participant age, are conducted in one brief laboratory session. Moreover, the majority of priming studies conducted from a social cognition perspective rely on participant self-report. This study, however, not only looked at the long-term effects of repeated subliminal priming, Bryant-Tuckett and Silverman (1984) also conducted their priming sessions outside of the laboratory. In addition, Bryant-Tuckett and Silverman (1984) assessed the effects of subliminal exposure to a security-related priming

stimulus on an extensive range of outcomes including observed behavior. Thus, these findings not only suggest that repeated exposure to security-enhancing stimuli may improve children's self concepts and academic performance in several domains, these findings show that subliminal security priming may influence actual observed behavior in a child clinical population.

Summary

The literature reviewed above clearly demonstrates that priming is an effective means for exploring the contents and organization of children's mental representations. Research that has employed priming techniques with children is concentrated mainly in cognitive science disciplines. This body of research has led to important insights into how children mentally represent numbers, language, and memories of specific events. This research has also yielded important information about the ages at which priming is effective with children. Rovee-Collier and colleagues' research on infant memory has demonstrated that priming is effective with infants as young as two months of age. Moreover, Reynvoet et al. (2009) demonstrated that subliminal priming is effective with children as young as six years of age, and Castles and colleagues' research (see Castles et al., 2003) on the development of word recognition has shown that subliminal priming is effective with children as young as seven years of age.

A smaller body of research has used priming as a means for examining how children's mental representations of the social world influence their reactions to social information. This body of research has led to important insights into how children's mental representations influence their attitudes and behavior toward out-

group members, information processing of mildly stressful information, affiliative behavior, and self-concept. This body of research has also yielded important information about the power of priming to influence children's social behavior. Over and Carpenter's (2009a, 2009b) research demonstrates that toddlers as young as 18 months can be primed to be more helpful. Bryant-Tuckett and Silverman's (1984) findings demonstrate that repeated subliminal priming of children's mental representations of a nurturing and accepting mother has the potential to improve children's self-concept and boost academic performance. To the extent that activating representations of maternal nurturance and acceptance activates representations of attachment security, Bryant-Tuckett and Silverman's findings point to the possibility that subliminal security priming can have long-term effects on children's observed behavior. I now discuss this possibility, along with future research directions using priming as a method for examining how children's reactions to the social environment are driven by their mental representations.

Future Directions and Conclusions

I have described how priming techniques have allowed researchers to gain important insights into how mental representations of past experiences with the world drive how individuals process and respond to environmental cues by tapping into these existing mental representations. I have reviewed evidence of the usefulness of priming techniques to researchers investigating the causal links between attachment security and more positive psychosocial outcomes. I have also reviewed evidence that priming is an effective and useful tool for research in children. I conclude by providing examples of ways in which priming may serve to inform understanding of

how children's mental representations of the social world drive their responses to social cues. In doing so, I use attachment, social information processing, gender development, and mood and mental health to exemplify some of the possible ways that priming promises to be an informative tool for social developmentalists. I discuss each of these in turn.

Attachment Research

As I mentioned earlier, researchers have adapted the widely used technique of priming to examine causal links between attachment security and theoretically relevant outcomes (see also Mikulincer & Shaver, 2007b, and Gillath et al., 2008). In particular, this body of research has found that activating mental representations of security leads to more adaptive responses to stress-inducing information, increased concern for others, and improved mood and mental health-related outcomes. These findings, however, are limited to research with adults and older teenagers. There are two main reasons to believe that security priming will prove to be as fruitful for developmentalists who research attachment as it has been for adult attachment researchers, if not more so.

First, attachment security, although a phenomenon that spans from the "cradle to the grave" (Bowlby, 1979, p. 126), is particularly important during early development, especially infancy through early childhood (Bowlby, 1973, Chapter 22). As such, it is reasonable to suggest that the effects of activating mental representations of security on children's responses to attachment relevant-information will be as strong as those found in adults, if not stronger.

Second, there is little experimental research examining the causal effects of security in childhood. Correlational evidence and theory suggest that security may contribute to less fear in the face of novel objects, environments, and people; greater willingness to explore the physical and social environment (e.g., see Thompson, 2008); more harmonious relationships with others (see Berlin et al., 2008); less reliance on hyperactivating and deactivating strategies of emotion regulation (see Mikulincer & Shaver, 2007a, 2008); and more positive views of the self (see Thompson, 2008). Security priming offers researchers the possibility of addressing the tantamount question of whether security enhances psychosocial functioning using an experimental design that targets representations of security directly, rather than targeting parental caregiving quality.

The potential for using security priming as a method for targeting mental representations of attachment directly is underscored by research that suggests that security priming specifically targets representations of security rather than positive affect more generally. Evidence that security priming increases feelings security and decreases feelings of insecurity in both the short and long-term indicate that security priming activates secure mental representations (Carnelley & Rowe, 2007, 2010; Gillath, Hart, Nofle, Stockdale, 2009). In fact, these effects and the effects of security priming on increased positive affect in the face of threat, decreased defensiveness, and increased prosocial responses are not replicated when positive affect, self-esteem enhancing, or self-affirmation primes are used (Gillath et al., 2005; Mikulincer, Hirschberger, et al., 2001; Mikulincer & Shaver, 2001; Mikulincer, Shaver, Gillath, & Nitzberg, 2005). These findings indicate that security priming is

not enhancing positive psychosocial outcomes simply by increasing positive affect more generally. Rather, these findings suggest that security priming enhances positive psychosocial outcomes by increasing mental representations of security. Thus, given this evidence that priming has proven to be an effective means for experimentally enhancing security (see also Mikulincer & Shaver, 2007b, and Gillath et al., 2008) and that priming is effective with children, toddlers, and infants, security priming seems especially suited for exploring whether the link between representations of security and improved psychosocial functioning is causal.

It is important to note that the effects of security priming may depend on past experiences of attachment security. For instance, it is possible that security priming may be more effective for children who have had more experiences of their caregivers as available and sensitively responsive when needed. Thus, it is possible that security priming may be most effective for children who are chronically secure given their likely more frequent experiences of sensitive responsiveness from their caregivers. It is also possible that security priming may be relatively ineffective at enhancing positive psychosocial outcomes for children who are chronically secure compared to those who are chronically insecure because there is more room for improvement for those who are insecure. In addition, it is also possible that security priming is ineffective for those who have very few or no experiences of others as sensitively responsive because there is no secure base script to activate with priming.

On the other hand, it may be the case that the effects of security priming do not depend on past experiences and hence also do not depend on dispositional attachment. Specifically, Main has posited that infants are born with the expectation

that their bids for attention will elicit caregiving that effectively alleviates their distress. When their bids are rebuffed, infants experience rejection and increased feelings of anxiety at the prospect of losing proximity to their caregiver. The anxiety and the pain of rejection in the face of the infant's repeated experiences of the infant's signals of distress not resulting in eliciting effective caregiving are thought to lead to the infant organizing his attachment behaviors in a way that minimize the possibility of rejection and abandonment. If it is the case that infants come into the world with a very basic knowledge of a secure base script (e.g., "Alerting others that I am distressed will elicit their caregiving response which will alleviate my distress."), security priming may tap into this basic secure base script and, thus, may not depend on dispositional security.

The same logic can be applied to security priming in adults, however, the effects of security priming as a function of dispositional attachment security seem to be the exception rather than the rule. Though definitive conclusions are not possible without more rigorous and direct tests of the possibilities described above, the infrequency with which dispositional security and security priming interact in the adult literature seems to suggest that increases in dispositional security neither increase nor decrease the effectiveness of security priming as a general rule. This finding, however, may not extend to childhood. For example, it is possible that, compared to children, adults have had more experiences of their needs for comfort being met by a sensitively responsive other because they have more opportunities for intimacy outside of their relationships with their parents. As such, it may be rather uncommon to reach adulthood without having experienced one's needs for comfort

and security being met by another, and it may be relatively more common for children to have very few or no experiences of their needs for comfort and security being met by another. Thus, dispositional security may interact with security priming in childhood and this possibility should be kept in mind as attachment researchers design studies that extend security priming to childhood.

Social-Information Processing Research

Dodge and his colleagues (Dodge & Crick, 1990; Crick & Dodge, 1994) proposed that children's behavioral responses to problematic social events are mediated by a series of cognitive processes whereby children (1) encode the event, (2) interpret the event, (3) formulate a goal or select a desired outcome, (4) generate strategies to achieve the desired outcome, (5) evaluate the likelihood that the strategies generated will achieve the desired outcome, and finally, (6) behaviorally enact the selected strategy. Children's mental representations or schemas of the social environment are thought to serve as the cognitive mechanism through which children proceed from one step to the next. Specifically, children draw on their mental representations of past social experiences to guide their attention when encoding the event, their interpretation of the event, the goal they formulate, the strategies they generate, and their evaluation of these strategies.

A large body of research has emerged in support of this model of social information processing (see Dodge & Pettit, 2003, for a review). Only two studies, however, have tested this model experimentally. Rabiner and Coie (1989) examined the effects of rejected children's expectations of being liked and accepted on their behavioral competence in joining a group of unfamiliar peers and the opinions that

these unfamiliar peers form of them. Rejected children in the experimental group who were led to expect a positive interpersonal experience were preferred by their unfamiliar peers over rejected children in control group and behaved more competently (girls only; Study 2). Slaby and Guerra (1988) examined the effects of social information processing on aggressive behavior in adolescents incarcerated for violent offenses. Adolescents in the experimental group who participated in a 12-week intervention aimed at increasing their ability to attend to nonhostile social cues, generate a variety of responses, and evaluate the potential responses in terms of their effectiveness in achieving a legal and nonviolent outcome were rated by staff as having less aggressive behaviors. Rabiner and Coie's study, although able to causally link expectations of positive interactions with improved outcomes in the peer group, does not, as theory suggests, answer questions as to whether and how mental representations drive social information processing. This evidence, although suggestive of mental representations as the cognitive mechanism driving children's social information processing, is far from conclusive and further experimental research is needed.

Priming offers researchers another methodological tool for determining whether the link between children's mental representations direct how they attend to, encode, and interpret social events, and how they draw upon their social schemas to formulate a goal and to generate and evaluate strategies for achieving their goal. For example, future research could examine the effects of increased accessibility to mental representations of aggression and benevolence on children's social information processing by priming these concepts. Using benevolence as an example,

if children draw upon their mental representations to process social information, increased accessibility to benevolent mental representations should lead to greater encoding of schema-consistent information (e.g., greater recall of friendly behavior on the part of others), interpreting others' behaviors as more benevolent, formulating more prosocial goals, and generating more prosocial strategies. In addition, bringing to mind times that children behaved in a benevolent manner should influence their evaluations of the strategies they generate. For instance, children should have greater confidence in their ability to enact more prosocial responses.

From a social information processing perspective, chronic aggression is the result of hypervigilance to hostile social cues, attributing hostile intentions to others' behavior, formulating a hostile goal, accessing fewer competent responses and more incompetent responses, and more positive evaluations of aggressive responses. It is thought that this aggressive social information processing is driven by chronically activated mental representations of the social environment as hostile, self-defensive goals, and aggressive responses based on their experiences interacting with the social environment (Crick & Dodge, 1994; Dodge & Crick, 1990). To date, no study has examined whether aggression is the result of increased accessibility to mental representations of aggression and hostility. Increasing accessibility to mental representations that inhibit aggressive and hostile schemas by priming prosocial mental representations would provide an initial examination of this unexplored area of research. Findings that chronically aggressive children, after being primed with prosocial-related stimuli, are less attentive to hostile social cues, are less ready to attribute hostile intentions to others' behaviors, formulate more prosocial goals,

access more competent and fewer incompetent responses, evaluate aggressive responses more negatively, and behave more competently would provide initial evidence that children's aggressive behavior is the result of increased accessibility to aggressive and hostile mental representations.

In addition, priming may generate important insights into whether emotions, gender schemas, and mental representations of attachment play an integrative role in children's social information processing. For example, Crick and Dodge (1994) posit that anger might lead to the formation of a retaliatory goal, or anxiety might lead to the desire to remove oneself from the situation. Affective priming would afford researchers the ability to address these questions experimentally. Recently, Ostrov and Godleski (2010) have built upon social information processing theory by pointing to gender schemas as particularly important mental representations that influence children's encoding, interpretation, goal formulation, and generation and evaluation of strategies to achieve their goals. Increasing accessibility to mental representations of gender using priming could address whether and how children's gender schemas influence social information processing. Furthermore, research and theory suggest that social information processing mediates the link between mental representations of attachment and social and emotional outcomes (see Dykas & Cassidy, in press, for a review). Priming offers the possibility of examining whether social information processing serves as the causal mechanism for the influence of attachment on psychosocial outcomes using an experimental design. If mental representations of attachment drive social information processing which, in turn, drives psychosocial outcomes, increasing accessibility to representations of security using priming should

lead to improved social information processing, which, in turn, should lead to improved social and emotional outcomes.

Gender-Related research

According to gender schema theory (see Martin & Ruble, 2004; Martin, Ruble, & Szkrybalo, 2002), children's mental representations of gender-related concepts about themselves and others (i.e., their gender schemas) influence their information processing and behavior. In particular, gender schema theory posits that the emergence of gender identity (i.e., realizing that they are either a girl or a boy), leads to increased motivation to selectively attend to and recall information about their own gender group and to behave in gender consistent ways (Martin et al., 2002). Experimental evidence has emerged indicating that, consistent with theory, children's gender schemas do indeed influence children's information processing and behavior (see Martin & Dinella, 2001, for a review). This research has employed the use of gender-labeling of novel non-gender-typed toys or activities to examine the direct link between gender stereotypes and children's responses. In these studies, the novel gender-neutral toys were labeled most often by experimenters telling the children that most girls or most boys like a particular toy or do well at a particular task. This vein of research has demonstrated that children pay more attention to, have better memory for, have better performance with, and have greater expectations of success with toys and activities that were labeled by experiments as appropriate for their sex. These studies, however, are few, and interpretation is made difficult due to methodological limitations.

One methodological limitation is the demand characteristics inherent in overtly labeling toys or activities as “for girls” or “for boys” (Martin et al., 2002). Some studies have attempted to fix this methodological limitation by labeling an activity in a more covert manner (e.g., Davies, 1986, 1989; Hargreaves, Bates, & Foot, 1985). For instance, Hargreaves et al. (1985) told children that the motor steadiness task they were about to complete was either a test to see how good they were at mechanics or operating machinery or a test to see how good they would be at sewing and knitting. Results were consistent with expectations that when the task was labeled as sex-appropriate, children made fewer errors.

Priming offers researchers the opportunity to determine how children’s mental representations of gender influence their information processing and behavior in a manner that is much more covert than those currently described in the literature. For instance, placing children in a waiting room with either dolls or trucks or having children watch a cartoon depicting gender stereotyped behavior or characters prior to entering the lab would activate children’s gender schemas in a more subtle manner than methods previously used to determine the degree to which demand characteristics may account for previous findings. When examining the effects of gender schemas on older children’s behavior, subliminal priming, which has shown to be effective with children as young as six (Reynvoet et al., 2009), would more definitively rule out interpretations that findings from studies employing overt manipulations were not due to demand characteristics or other active strategies on the part of the participants (Bargh & Chartrand, 2000). For example, researchers could subliminally expose children to gender stereotyped words or pictures of gender-typed

objects and assess how children's knowledge of gender stereotypes colors their interpretation of gender-neutral stimuli. In particular, researchers could examine how subliminally exposing children to gender cues influences how they categorize and further process and respond to novel non-gendered objects, people, and events.

Furthermore, priming children's mental representations of gender would address Martin et al.'s (2002) suggestion that the links between children's gender schemas and behavior may be more apparent when stereotypes are salient. Priming would allow researchers to make children's gender schemas salient and assess whether this activation leads to more gender consistent behavior. As such, it stands to reason that future research using priming to examine how representations of gender drive children's information processing and behavior may prove particularly useful in ruling out alternative interpretations and addressing unanswered questions.

Mood and Mental Health Research

Beck's (1967) cognitive theory of depression suggests that depression is the result of heightened accessibility to negative self-schema, and much empirical support exists for this proposition (Clark, Beck, & Alford, 1999; Lakdawalla, Hankin, & Mermelstein, 2007). In particular, research with children has revealed a robust inverse relationship between their self-reports of self-esteem and depression (Garber & Hilsman, 1992). What is lacking, however, is experimental research examining whether increases in negative self-schema are causally related to the development of depression. It stands to reason that increased accessibility to positive self-schema would serve to reduce depression. As such, research that increases accessibility to positive mental representations of the self with priming seems particularly well-suited

to determine whether self-schemas are causally related to depression. Findings that depressive symptomatology decreases for children exposed to positive self-schematic cues would provide initial evidence that children's views of themselves directly influence their level of depressive symptoms.

In addition, an internal locus of control—perceptions of oneself as able to control one's own life events through positive attributes or effort—is thought of as a protective factor against depression and anxiety. At the other end of the locus of control continuum is an external locus of control—perceptions that one's life is controlled by outside forces like powerful others, chance, or luck—which has been associated with increased vulnerability toward depression and anxiety in children and adolescents (Chorpita & Barlow, 1998; Ostrander & Herman, 2006). To date, no study has examined whether external locus of control is causally related to either depression or anxiety in children. Future research that increases perceptions of oneself as in control of one's own life events by activating mental representations of empowerment using priming techniques would provide the opportunity to examine whether locus of control is causally related to the development of depression and anxiety.

Conclusions

I have presented evidence that priming offers social developmentalists the opportunity to gain important insights into how children's mental representations of the social world drive their responses to social cues. I described the theoretical conceptualization underlying priming and priming techniques. I used attachment theory as a case to demonstrate how the extension of priming techniques has allowed attachment researchers to draw initial causal links between representations of

attachment security and more adaptive responses to stress-inducing information, enhanced views of self and others, improved mood, increased concern and empathy, and less aggressive behavior toward out-group members. In my review of the attachment security priming literature, I discussed the importance of extending this research to assessments of observed behavioral outcomes and to research with children. Next, I reviewed evidence demonstrating the effectiveness of priming techniques as a way of accessing children's mental representations. This review described the ways in which developmentalists have used priming methods to uncover important insights into how children mentally represent their world and use these representations to process and respond to environmental cues. In concluding, I have used attachment, social-information-processing, gender development, and mood and mental health research as examples of ways that priming can inform future social development research. Given the important insights that have already been gained by applying priming techniques to psychological research, it is reasonable to believe that social developmentalists will also gain important insights into how children mentally represent their social world and use these representations to guide their responses to social cues by employing priming techniques in future research.

Chapter 3: Method

Participants

Ninety mothers and their 6- to 7-year-old children (46.7% girls) were recruited to participate in a study about mothers' and children's reactions to social and emotional events. An a priori power analysis assuming a small effect size with Power (1- β) set at 0.80 indicated that a sample size of 90 is sufficient to detect a significant interaction between child temperament and priming condition. Dyads were recruited from the Washington, D.C. greater metropolitan area using flyers and emails (see Appendix A for the recruitment flyer). Mothers' reports of their children's race and ethnicity were as follows (mothers could choose as many of the following races and ethnicities that applied): 50% were Black/African American, 49.3% were White, 17.1% were Hispanic or Latino, 3.9% were Native American, 2.6% were Asian, 1.3% were Native Hawaiian or Other Pacific Islander, and 1.1% were Middle Eastern. Mother's mean age was 38.39 years (SD = 5.458, Range: 25 - 47). Children's mean age was 6.95 years (SD = 0.61; Range: 6.00 – 7.93). Most mothers were married (65.8%). The median household income was between \$79,000 and \$99,000 per year. Most mothers were native English speakers (89.5%), and most children were also native English speakers (98.7%). The only exclusionary criterion was that mothers and children were fluent in English and were able to complete the protocol in English.

Procedure

The present study is a 3 (Prime: Secure Prime vs. Happy Control Prime vs. Neutral Control Prime) \times 2 (Valence: Fear-Inducing Pictures vs. Excitement-Inducing Pictures) \times 2 (Order: Fear-Inducing Pictures First vs. Excitement-Inducing Pictures

First) repeated measures experimental design that is part of a larger study on children's socio-emotional development (see Table 2). The priming condition (Secure Prime vs. Happy Prime vs. Neutral Prime) was randomly assigned prior to the start of the lab. Both the experimenters and participants were blind to the priming condition assigned to each child. The order of the presentation of the pictures was counterbalanced across participants so that 45 children saw the fear-inducing pictures first and 45 children saw the excitement-inducing pictures first. Experimenters were advanced undergraduate research assistants and graduate students. Priming was administered during a computer game (see Experimental Manipulation: Secure Prime vs. Happy Control Prime vs. Neutral Control Prime). Below, I describe how children were randomly assigned to a priming condition and order condition and how the priming condition to which children were assigned remained concealed from both the participants and the experimenters. Then, I describe how I experimentally manipulated attachment security followed by the order of the tasks that mothers and children completed during the visit to the laboratory.

Randomization and Priming Condition Concealment. Thirty participant identification numbers were assigned randomly without replacement to each of the three conditions (30 participant identification numbers \times 3 conditions = 90 participants). Using *Research Randomizer* (Urbaniak & Plous, 2011), an online computer program that creates customized sets of randomly generated numbers that researchers can use for random assignment to experimental conditions, I specified one set of unique random numbers between 1 and 90 be generated. The first 30 participant identification numbers in this list were assigned to the Security Prime Condition; the

second set of 30 participant identification numbers in this list were assigned to the Happy Control Prime Condition; the third set of participant identification numbers were assigned to the Neutral Control Condition. The results of this randomization are presented in Appendix B.

I entered the results of this randomization into a text file that listed each participant identification number and the condition to which it had been assigned. This text file was then saved as the autostart file for the MediaLab (Jarvis, 2010a) experiment that I developed for the purposes of presenting the study protocol and recording participants' responses. MediaLab then used this autostart file to assign the participant identifications number and the condition automatically prior to each session. This process keeps the participant's condition concealed from both the experimenters and the participant.

Experimental Manipulation: Secure Prime vs. Happy Control Prime vs. Neutral Control Prime. The experimental manipulation occurred during a computer game in which children determined whether each picture in a series of 20 randomly presented pictures was an animal (e.g., cow, deer) or a plant (e.g., dandelion, ivy; see Appendix C for these cover pictures that children judged). The computer game was completed prior to viewing each of the three fear-inducing picture presentations and each of the three excitement-inducing picture presentations, for a total of six times throughout the lab. Prior to viewing each cover picture, children were exposed to a picture prime.

The picture prime was presented subliminally for 15 milliseconds, which is below the threshold of conscious awareness). The picture prime was forward and

backward masked by an image of multi-colored television static. This mask was presented for 500 milliseconds immediately before the picture prime and for 500 milliseconds immediately after the picture prime. Cover pictures were then presented until children told the experimenter whether the picture was an animal or a plant. All children were able to follow this protocol. See Figure 3 for a visual depiction of the order and duration that stimuli are presented. Children were instructed by an experimenter on how to play the computer game during a training session. During the training session, children saw only the mask and the cover picture. No priming pictures were presented during the training period. Children were told that the mask was “the computer picking the picture to show on the screen.”

Picture primes for children randomly assigned to the attachment-security priming condition were pictures that evoke mental representations of security (e.g., sketches of a mother having a caring interaction with her infant; See Appendix D for the security priming stimuli). Priming pictures for children randomly assigned to the happy control condition were pictures of adult humans smiling from the University of Bolton Affect Recognition Tri-Stimulus Approach (Lawrence, Abdel-Nabi, & Charlton, May 2011; See Appendix E for a list of the pictures used and example pictures for the happy priming condition). Priming pictures for children randomly assigned to the neutral control condition were pictures of a neutral valence (e.g., multi-colored polygons; See Appendix F for the neutral priming stimuli).

Order of Tasks. Here, I describe the order of the tasks that mothers and children completed during their visit to the laboratory, however, not all of these tasks are part of the present study. As such, in the Measures section, I describe only the

tasks that are part of the present study. In Table 2, I provide a visual representation of the procedure that shows the order of each task, when the mother and child are together and when they are separated, and the length of each task. The tasks that are bold are tasks that are part of the present study. After informed consent was obtained (see Appendix G for a copy of the IRB approval letter and Appendix H for a copy of the IRB approved informed consent form), an experimenter attached three sets of psychophysiological monitors to both mother and child (EDA, electrocardiogram, and respiratory effort). Placement of the sensors took approximately 3-minutes. Next, mothers and their children completed several tasks in separate, adjacent rooms. During this first separation, children completed an assessment of their language ability, which is not part of the present study. This language ability assessment, which lasts approximately 10-minutes, involves the child telling a story using a picture book that has no words (Justice, Bowles, Pence, & Gosse, 2010). Second, children completed an assessment of their secure-base script knowledge, a measure that is not part of the present study. This 10-minute assessment of children's secure-base script knowledge involved children finishing a set of story stems and a set of dolls. Children were told the beginning of the story and told to tell the rest of the story. Third, children were asked to sit quietly with their eyes closed and try to clear their mind of all thoughts for 2-minutes. The purpose of this brief rest period was to establish the child's baseline EDA, ECG, and respiratory effort. These baseline measures were not used in the present study. After the rest period, children completed an emotions labeling task during which children will labeled the expressions of six photographs of a child displaying a discrete emotion (Durbin, 2010). This 10-minute task served two

purposes. First, this task ensured that each child could identify accurately the emotions depicted in the photographs that were used to assess children's emotions throughout the lab session. Second, this task served as a baseline assessment of children's self-reported emotions. Following the emotions labeling task, children were reunited with their mother for 3- to 5-minutes to take a short break. After this brief reunion, children were separated from their mother for a second time.

During this second separation, children played the computer game and saw several sets of pictures. First, children saw a set of 20 neutral pictures to assess their baseline EDA. For the Fear-Inducing Pictures First group, children saw three sets of 20 fear-inducing pictures were presented followed by a set of 20 neutral pictures to bring children back to baseline after which they saw three sets of 20 excitement-inducing pictures. For the Excitement-Inducing Pictures First group, children saw three sets of 20 excitement-inducing pictures followed by a set of 20 neutral pictures to bring children back to baseline after which they saw three sets of 20 fear-inducing pictures. Following each fear-inducing and each excitement-inducing picture set, children rated how the pictures made them feel using a visual analog scale. Children completed the computer game prior to the start of each fear- and excitement-inducing picture set. The child experimenter script is provided in Appendix I.

While the children were completing their tasks, mothers were in an adjacent room completing several tasks (see Table 2 for summary and order). During the first separation, mothers answered demographic questions about herself and her child (5-minutes). Then mothers were asked to sit upright, close their eyes, and try to clear their mind of all thoughts. This rest period lasted 3-minutes. The purpose of this brief

rest period is to establish a baseline for the psychophysiological assessments that will be collected throughout the laboratory session. The mothers' psychophysiological responses are not part of the present study. Following the brief rest period, mothers reported on their child's temperamental fearfulness using three subscales (Discomfort, Fear, and Shyness) of the Children's Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershey & Fisher, 2001). These subscales of the CBQ took approximately 20-minutes to complete. Then, mothers completed two adult attachment assessments, each of which takes approximately 10-minutes to complete. First, mothers completed the Adult Secure Base Script assessment (Waters and Waters, 2006). Second, mothers completed the Experiences in Close Relationships inventory (ECR; Brennan, Clark, & Shaver, 1998). Then, mothers were reunited with their child for 3- to 5-minutes to take a short break after which mothers were separated from their child for a second time.

During the second separation, mothers completed several tasks designed to assess their caregiving information processing. First, mothers' reactions to infant distress were assessed by having mothers watch video clips of infants crying and having them answer questions related to these videos (Leerkes, 2010; Leerkes & Siepak, 2006). Second, mothers' completed the Coping with Children's Negative Emotions questionnaire (CCNES; Fabes, Eisenberg, & Bernzweig, 1990). Lastly, mothers' ability to tolerate infant crying was assessed using the CryBaby a computerized game adapted from the Behavioral Indicator of Resiliency to Distress (BIRD; Lejuez, Daughters, Danielson, & Ruggiero, 2006). I describe each of these

tasks that mothers and children completed that are part of the present study in detail below.

Measures and Materials

Demographics. Mothers were asked to report on the age and sex of all members of their household and each person's relationship to themselves and their child, their annual household income, whether they and their children are native English speakers, their marital status, their child's race and ethnicity, and the month and year of their child's birth. Additional demographic information was collected that were not intended to be part of the present study (see Appendix J for complete demographics questionnaire).

Picture Presentations. Children's fear, happy excitement, and baseline emotional reactions were elicited by presenting pictures selected from the IAPS (Lang et al., 2008). The IAPS is a large set of emotionally-evocative color photographs that has been widely used in psychophysiological research (Bradley, Codispoti, Cuthbert, & Lang, 2001; Bradley, Codispoti, Sabatinelli, & Lang, 2001) and has been used successfully in research with children (McManis, Bradley, Berg, Cuthbert, & Lang, 2001). This set of pictures has undergone a rigorous affective norming and rating process in order to establish it as a standardized set of materials for researchers to use in the study of emotion. From the IAPS I selected three sets of pictures to show children: a set of fear-inducing pictures, a set of excitement-inducing pictures, and a set of neutral pictures. I describe each set of pictures below.

Fear-Inducing Pictures. I selected pictures from the animal attack category from the IAPS (Lang et al., 2008) to use as fear-inducing stimuli. I selected this

category because it had been rated by adults as making them feel afraid or anxious (Bradley, Codispoti, Sabinelli, & Lang, 2001) and this category had been rated as having high unpleasant valence and high arousal by children between 10-12 years-of-age (Lang et al., 2008). Children were shown three sets of 20 fear-inducing pictures (i.e., 60 different pictures). Each picture was presented for 3-seconds. See Appendix K for a list of the IAPS pictures that I used for fear-inducing stimuli.

Happy/Excitement-Inducing Pictures. I selected pictures from the adventure, sports, and food categories to use as excitement-inducing stimuli. I selected these categories because they had been rated by adults as making them feel excited and happy (Bradley, Codispoti, Sabinelli, & Lang, 2001) and they had been rated as having high pleasant valence and high arousal by children between 10-12 years (Lang et al., 2008). Children were shown three sets of 20 fear-inducing pictures. Each picture was presented for 3-seconds. See Appendix L for a list of the IAPS pictures that I used for happy excitement-inducing stimuli.

Neutral Pictures. I selected pictures from the household objects category and other pictures rated by children between 10 and 12 years of age as having low levels of arousal and mid-range on the scales for pleasantness-unpleasantness and dominance. These pictures were used to assess children's baseline reactivity and to bring children back to baseline between the fear- and excitement-inducing picture sets. Children were shown one set of 20 pictures to assess their baseline reactions after the break, and they were shown a second set of 20 pictures between the fear-inducing and excitement-inducing pictures to reduce carry-over effects. Each picture

was shown for 3-seconds. See Appendix M for a list of the IAPS pictures that I used as neutral stimuli.

Children's fear reactivity. Children's fear reactivity was assessed in two ways. Children's physiological fear responses were assessed by measuring the child's EDA. In addition, children reported the intensity of their fear. I describe each of these measures in turn.

Children's EDA. An experimenter applied an odor-free, hypo-allergenic silver chloride gel to the silver chloride electrodes. An experimenter attached these two electrodes to the palmar surfaces of the index and middle finger on the second phalanges of children's non-dominant hand using double-sided adhesive discs and elasticized Velcro bands (one electrode on the index finger and the other on the middle finger) to assess children's EDA. To prevent the electrodes from moving, experimenters also taped the electrodes to participants' fingers.

EDA was assessed continuously using a Biopac MP 150 system and AcqKnowledge v4.1. The system was calibrated to zero before the start of each session. EDA was sampled at a rate of 1000 samples per second at a gain of 5 $\mu\Omega/V$ and 10 Hz. Phasic skin conductance was calculated using a smoothing baseline removal. The baseline used to calculate the phasic skin conductance was taken from the 2-minute rest period during which children sat still and quiet. Using the phasic skin conductance, skin conductance responses (SCRs) were calculated using a threshold of 0.02 μS . SCRs under 10% of the maximum were rejected. SCRs were used as an indicator of children's sympathetic nervous system responses to the picture presentations because they represent increases in the skin conductance level as a

result of environmental stimuli. Prior to examining the data, I chose to operationalize children's physiological fear reactions as children's skin conductance responses for a conceptual/methodological reason. Specifically, I chose to use SCRs as a marker of physiological fear responses because they are derived from the phasic EDA, which takes into account children's baseline EDA. (Additions are in bold typeface).

After children's SCRs were calculated, the number of SCRs in each of the 8 picture presentations (3 fear-inducing picture sets, 3 excitement-inducing picture sets, 2 neutral picture sets) were counted. After the number of SCRs during each picture presentation was calculated, videos of the children during the picture presentations were viewed to identify times that the child's hand with the EDA electrodes moved and segments during which extra-experimental factors occurred (e.g., construction noise). If the child's hand moved during a picture presentation or an extra-experimental factor occurred, the EDA activity during that segment was dropped from the dataset. Of the 720 possible SCRs data points (90 participants \times 8 pictures presentations = 720 possible data points), children's hands moved and/or an extra-experimental factor occurred during 54 segments resulting in 54 EDA segments that were deleted from the dataset.

Children's Self-Reported Emotions (Durbin, 2010). To circumvent problems that may be present due to the verbal abilities of young children, I used Durbin's (2010) protocol that allowed children to indicate their emotional state using a visual analog scale and a set of six pictures of children displaying facial expressions of discrete emotions. Given that children vary in their ability to recognize facial

expressions of emotions (Widen & Russell, 2003), I conducted a training session that ensured that they were able to identify each emotion accurately.

During the training session, children viewed six photographs of a child who is approximately 10-years old and the same sex as the child. Five of these photographs were of a child displaying a facial expression of a discrete emotion (i.e., happiness, sadness, anger, fear, and surprise). The sixth photograph was of a child with a neutral expression. The experimenter showed children each picture and asked them to label the expression. If children correctly labeled the photograph, the experimenter acknowledged that they were correct and continued to the next photograph. Forty-one (45.6%) of the children were able to identify all five discrete emotions on the first attempt. Of the 49 children who incorrectly labeled at least one emotion on the first attempt, 35 incorrectly labeled only one emotion (happiness = 0, sadness = 1, anger = 4, fear = 25, and surprise = 5). Only 6 children incorrectly labeled more than one emotion.

If children incorrectly labeled the photograph, the experimenter did three things. First, the experimenter provided the child with the correct label. Second, features of the facial expression that define the correct emotion were pointed out to the child (e.g., “See how her eyes and mouth are open wide? She is feeling surprised.”). Third, the experimenter provided the child with a brief scenario describing a situation that would elicit the emotion (e.g., “Maybe she is happy because she got a present she really likes.”) Then, children were asked to label the expression again. All children were able to identify the emotion on the second attempt.

After children were shown the emotional expression pictures, they were then shown a drawing of five thermometers: one 5% full, one 25% full, one half full, one 75% full, and one completely full). The experimenter labeled each thermometer (“almost none or very, very little,” ; “a little bit,” “ medium,” “ a lot,” and “very, very much or a whole, whole lot,”). Children were asked to repeat the labels. The experimenter explained that the thermometers were going to be used to talk about how much of each feeling the child was feeling. See Appendix N for the pictures of the facial expressions and the thermometers. Then, the experimenter showed the child a “How I Feel” worksheet that had each of the six pictures on it with a set of thermometers under each picture presented in a random order. Children were ask to think about how they felt and to circle or point to the thermometer that matched how happy, sad, surprised, scared, angry, and okay they felt. Children completed the How I Feel worksheet following the baseline neutral picture presentation and following each fear- and excitement-inducing picture presentation. Intensity was scored as follows: not selected = 0, “almost none or very, very little,” = 1; “a little bit,” = 2; “ medium,” = 3; “ a lot,” = 4; and “very, very much or a whole, whole lot,” = 5. The full script for the emotions labeling task is included in the child experimenter script (Appendix I).

Photographs were provided by Linda Camras and Emily Durbin. These photographs have been used in previous studies of children’s facial expression identification (Camras, Ribordy, Hill, Martino, Sachs, Spaccarelli, & Stefani, 1990). The photographs displaying the five emotions were judged to represent prototypical expressions of happiness, sadness, anger, fear, and surprise using Ekman and

Friesen's (1978) facial action coding system (FACS). Durbin (2010) developed and validated this method of measuring children's self-reported emotions with a sample of children between 3- and 6-years-old. Durbin reported that children's reports of their emotions during a series of tasks from the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1995) were consistent with the emotions that the tasks were designed to elicit and were correlated with observers' ratings of children's affect across the laboratory tasks.

Child Temperamental Fearfulness (CBQ; Rothbart, et al., 2001). The CBQ is a caregiver report measure designed to assess 15 aspects of temperament in children between 3 and 7-years-of-age. Mothers completed three subscales of the CBQ, which is a parent-report measure of temperament for children between 3- and 7-years-of-age. Parents respond on a 7 point scale ranging from 1 "extremely untrue of your child" to 7 "extremely true of your child." The Discomfort (12 items), Fearfulness (12 items), and Shyness (13 items) subscales will be used (37 items total). The Discomfort subscale assesses the amount of negative affect children have in response to light, movement, sound, and texture. The Fearful subscale assesses the amount of negative affect (e.g., unease, worry, nervousness) children have in anticipation of pain, distress, and potentially threatening situations. The Shyness subscale assesses children's slow or inhibited approach in novel or uncertain situations (see Appendix O).

Internal consistency for ratings of 6- to 7-year-old children for the items in each of the three subscales included in the present study range from .67 to .92. Furthermore, these subscales have demonstrated high test-retest reliability between 5-

and 7-years with correlations ranging from .50 to .79 for the Fear, Discomfort, and Shyness subscales. In addition, children's scores on these subscales are consistent across different raters as indicated by the moderate correlations between mothers' scores and fathers' scores. (Rothbart et al., 2001).

Following Gillissen et al. (2007), children's standardized scores on the Fear, Discomfort, and Shyness subscales were averaged to create an overall temperamental fearfulness score. Previous research has found these subscales to load highly onto the same factor (Rothbart et al., 2001; Gillissen et al., 2007). This temperamental fearfulness composite has also demonstrated to have adequate internal consistency (Gillissen et al., 2007). Internal consistency in the present study was high ($\alpha = .90$). The reliability for the Discomfort subscale was high ($\alpha = .79$). Reliability for the Fear subscale was high ($\alpha = .73$). Reliability for the Shyness subscale was also high ($\alpha = .93$). Following Gillissen et al. (2007), children's standardized scores on the Fear, Discomfort, and Shyness subscales were averaged to create an overall temperamental fearfulness score. Previous research has found these subscales to load highly onto the same factor (Rothbart et al., 2001; Gillissen et al., 2007). This temperamental fearfulness composite has also demonstrated adequate internal consistency (Gillissen et al., 2007). Internal consistency in the present study was high ($\alpha = .90$). In addition, the Discomfort subscale was correlated with the Fear ($r = .66, p < .01$) and Shyness ($r = .26, p = .014$) subscales, and the Fear and Shyness subscales were correlated ($r = .29, p = .005$). The overall reliability for all 37 items used in the composite temperamental fearfulness scale was high ($\alpha = .82$).

Mothers' Responses to Child's Negative Emotions (CCNES; Fabes et al., 1990). Mothers' responses to their children's negative emotions will be assessed using the CCNES which was designed to assess how parents typically respond to their young children's (preschool or early elementary school) negative emotions. This self-report measure presents parents with 12 hypothetical scenarios in which their child is upset or angry (e.g., "If my child is panicky and can't go to sleep after watching a scary TV show, I would:"). Six possible ways of responding to the child's negative emotions are provided for each scenario [e.g., (a) "encourage my child to talk about what scared him/her," (b) "get upset with him/her for being silly," (c) "tell my child that he/she is over-reacting ," (d) "help my child think of something to do so that he/she can get to sleep (e.g., take a toy to bed, leave the lights on)," (e) "tell him/her to go to bed or he/she won't be allowed to watch any more TV," (f) "do something fun with my child to help him/her forget about what scared him/her"]. Parents are asked to rate the likelihood that they would respond to the scenario in each of the six possible ways provided on a 7 point scale ranging from 1 "very unlikely" to 7 "very likely" (Fabes et al., 1990; see Appendix P for the instructions and items).

Each of the six responses corresponds to one of the six subscales that are derived reflecting the degree to which parents respond to their children's distress by becoming distressed themselves (Distress Reactions), verbal or physical punishment (Punitive Reactions), validation or acceptance of their child's negative emotional displays (Expressive Encouragement), providing the child with strategies to help the child feel better (Emotion-Focused Reactions), helping the child solve the problem

that caused the child's distress (Problem-Focused Reactions), and discounting the seriousness of the situation or devaluing the child's problem or distressful reaction (Minimization Reactions; Fabes et al., 1990).

The results of a study aimed at investigating the psychometric properties of the CCNES indicate that it is both a reliable and valid instrument. Specifically, the six subscales derived from the CCNES have demonstrated acceptable internal consistency with alpha coefficients ranging from .69 to .85. Test-retest reliability across four months is also high with correlations between scores at both time points ranging from .62 to .83 for each of the six subscales (Fabes et al., 1990). Internal consistency for the present study was good ($\alpha = .80$).

Correlations between the six CCNES subscales and other self-report parenting indexes generally support this measure's construct validity. Specifically, correlations between parents who reported higher levels of empathic concern and perspective taking indicated that they would be more likely to respond to their children's negative emotions with supportive reactions (i.e., Emotion-Focused and Problem-Focused Reactions) and would be less likely to respond to the children's negative emotions with harsh and non-supportive reactions (i.e., Minimizing and Punitive Reactions). In addition, parents who reported feeling more anger when children are annoying or misbehave reported a greater likelihood of responding to their child's negative emotions with Punitive, Minimizing, and Distress Reactions. Furthermore, parent who reported using more harsh parenting practices also reported more harsh and non-supportive responses to children's negative emotions (Punitive and Minimizing Reactions).

Factor analysis of the six subscales revealed that Minimizing Reactions and Punitive Reactions loaded together reflecting a harsh negative and non-supportive response style, and Emotion-Focused Reactions and Problem-Focused Reactions loaded together reflecting a supportive response style that is focused on helping the child cope with his or her distress and the cause of it. As such, these six subscales were combined in a way to reflect this two factor structure (See Table 3 for the correlations matrix for this measure). That is, Minimizing and Punitive Reactions scores were combined to create a Non-Supportive/Harsh Reactions score and Emotion-Focused and Problem-Focused Reactions were combined to create a Supportive Reactions score. In order to examine whether high maternal supportive responses and low maternal harsh responses to child distress were linked to children's fear reactions, I combined the Supportive and Harsh subscales into one Maternal Emotion Socialization score by subtracting mothers' Harsh scores from their Supportive scores. See Appendix P for the directions and items of this measure.

Chapter 4: Results

Data Management and Preliminary Analyses

Data were examined prior to analyses to assure that the condition that each child was assigned to was delivered properly. Videos of each session were reviewed to verify the order in which the participants received the anxiety-inducing and excitement-inducing pictures. DirectRT (Jarvis, 2010b) recorded both the priming stimuli that were presented and the length of time that each priming stimulus was presented. These data logs were examined for each participant to verify both (a) the priming condition of each participant and (b) that the priming stimuli were presented below the threshold of conscious awareness. All participants were shown the correct stimuli and all priming stimuli were presented below the threshold of conscious awareness (mean presentation time 24.53 ms, $SD = .11$ ms). In addition, data were examined to ensure that each response logged in the data file was a possible response. Specifically, the range of each variable was examined to determine that each response fell within the possible range of the scores. SCRs do not have a pre-specified maximum possible score that would indicate whether a response is an impossible score. As such, videos during the picture presentations were examined to ensure that the response was not an artifact of excessive movement or some other disturbance (e.g., loud, sudden noises that are not part of the protocol but are outside of the control of the experimenter can cause changes in SCRs). SCRs responses that were determined to be the cause extra-experimental factors were discarded. Six SCRs were removed due to loud construction noise and 48 SCRs were removed due to children's movement during the picture presentations. Additionally, 11 SCRs were missing due

to two children who were unable to complete the study. Thus, of the 720 possible SCRs (90 participants \times 8 picture presentations = 720) 65 (9.03%) were missing, resulting 655 SCRs available for data analyses. Of these 655 SCRs, the mean was 4.56 ($SD = 10.10$; Range: 0 – 79). Descriptive statistics of children's SCRs during each picture presentation are presented in Table 4. Because of the extensive data cleaning, extreme scores, defined as scores that were more than 2.5 standard deviations away from the mean (also referred to as outliers), were maintained in the dataset. In this dataset, there were 19 SCRs identified as extreme scores ranging from 2.67 to 6.06 standard deviations from the mean.

After examining my data for impossible values, but prior to conducting my primary analyses, I examined my data for missing values. None of the CBQ mean scores were missing. Only one mother did not complete the CCNES. Her scores were not imputed because her child was in the happy prime condition and her scores were not needed for analyses. Of the 720 possible How I Feel worksheets (90 participants \times 8 How I Feel worksheets), 11 were missing because two children were unable to complete the procedure and one child was missing all 8 worksheets because he did not cooperate with the experimenter throughout and scribbled on top of his responses, thus making his data indecipherable. Thus, 19 (2.64%) of the children's self-reported emotions were missing. As stated above, 65 (9.03%) SCRs were missing. Data were missing completely at random as indicated by a Little's MCAR test ($\chi^2 (5669) = 210.69, p = 1.000$). The missing SCRs and children's self-reported emotions were imputed using the Multiple Imputation module in SPSS. I imputed missing values to create 40 complete datasets using all available data. The original dataset and the 40

complete datasets were used to conduct my primary analyses (next section). Each analysis was run with each dataset, then the parameter estimates, estimated marginal means, and their standard errors obtained from these analyses were pooled. Inferential tests of my hypotheses and research questions were conducted using these pooled statistics allowing me to do so with improved power and unbiased parameter estimates compared to other methods for handling missing data, including listwise deletion and single imputation (Graham, 2009). Given that Generalized Estimating Equations (GEE), which is the statistical analysis technique that I used to test my primary hypotheses, does not assume either normality or linearity, the last step prior to conducting my primary analyses was to determine how children's SCRs were distributed. Given that SCRs are frequency count data, and based on the shape of the distribution, I determined that the data best fit a negative binomial or Pascal distribution. The negative binomial distribution was specified in my GEE analyses for SCRs.

There were no sex differences in children's SCRs ($F_{(1,89)} = 1.43, p = .236$). There were differences in children's self-reported fear ($F_{(1,89)} = 10.26, p = .002$) such that girls ($M = 1.69, SD = 1.39$) reported being more scared than boys ($M = .88, SD = .97$). As such, an additional set of analyses for children's self-reported fear, was performed that included the effect of sex, in addition to the variables already specified. For the analysis with all three conditions that tested the effects of priming on children's self-reported fear, none of the main effects was statistically significant [Condition: $\chi^2(2) = 4.04, p = 0.133$; Order: $\chi^2(1) = .73, p = 0.394$; Valence: $\chi^2(1) = .70, p = 0.401$; Sex: $\chi^2(1) = 2.00, p = 0.157$; Temperament: $\chi^2(1) = .002, p = 0.962$].

There were also no significant two-way interactions [Condition \times Order: $\chi^2(2) = .21$, $p = 0.901$; Condition \times Valence: $\chi^2(2) = 3.629$, $p = 0.163$; Condition \times Sex: $\chi^2(2) = 3.37$, $p = 0.185$; Condition \times Temperament: $\chi^2(2) = 3.72$, $p = 0.156$; Order \times Valence: $\chi^2(1) = .67$, $p = 0.412$; Order \times Temperament: $\chi^2(1) = .48$, $p = 0.487$; Order \times Sex: $\chi^2(1) = 1.58$, $p = 0.208$; Valence \times Sex: $\chi^2(1) = .01$, $p = 0.929$; Valence \times Temperament: $\chi^2(1) = .23$, $p = 0.635$; Sex \times Temperament: $\chi^2(1) = .000$, $p = 0.998$].

There were no significant three-way interactions [Condition \times Order \times Valence: $\chi^2(2) = .05$, $p = .974$; Condition \times Order \times Sex: $\chi^2(2) = 2.77$, $p = .251$; Condition \times Valence \times Temperament: $\chi^2(2) = 3.138$, $p = .208$; Condition \times Sex \times Temperament: $\chi^2(2) = 2.27$, $p = .323$; Order \times Valence \times Sex: $\chi^2(2) = 2.77$, $p = .251$; Order \times Valence \times Temperament: $\chi^2(1) = 1.98$, $p = .160$; Order \times Sex \times Temperament: $\chi^2(1) = .56$, $p = .453$; Valence \times Sex \times Temperament: $\chi^2(1) = .06$, $p = .812$]. There were no significant four-way interactions [Condition \times Order \times Valence \times Sex: $\chi^2(2) = .19$, $p = .909$; Condition \times Order \times Valence \times Temperament: $\chi^2(2) = .24$, $p = .889$; Condition \times Order \times Sex \times Temperament: $\chi^2(2) = 2.89$, $p = .236$; Condition \times Valence \times Sex \times Temperament: $\chi^2(2) = 1.80$, $p = .406$; Order \times Valence \times Sex \times Temperament: $\chi^2(1) = .18$, $p = .669$]. The five way interaction between Condition, Order, Valence, Sex, and Temperament was also not significant ($\chi^2(2) = .33$, $p = 0.848$).

Similarly, for the analysis using only the neutral control condition to determine the effects of maternal emotion socialization, none of the effects were statistically significant. There were no significant main effects present [Order $\chi^2(1) = .152$, $p = .697$; Valence: $\chi^2(1) = .637$, $p = .425$; Sex: $\chi^2(1) = .601$, $p = .438$;

Temperament: $\chi^2(1) = .010, p = .920$]. There were also no significant two-way interactions [Sex \times Valence: $\chi^2(1) = .125, p = .723$; Sex \times Maternal Emotion Socialization: $\chi^2(1) = .223, p = .637$; Sex \times Temperament: $\chi^2(1) = .031, p = .860$; Valence \times Maternal Emotion Socialization: $\chi^2(1) = .622, p = .430$; Valence \times Temperament: $\chi^2(1) = 1.238, p = .266$; Maternal Emotion Socialization \times Temperament: $\chi^2(1) = .554, p = .457$]. These were also no significant three-way interactions [Sex \times Valence \times Maternal Emotion Socialization: $\chi^2(1) = .348, p = .555$; Sex \times Valence \times Temperament: $\chi^2(1) = .762, p = .383$; Sex \times Maternal Emotion Socialization \times Temperament: $\chi^2(1) = .278, p = .598$; Valence \times Maternal Emotion Socialization \times Temperament: $\chi^2(1) = .238, p = .626$]. Lastly, the four-way interaction between Sex, Valence, Maternal Emotion Socialization, and Temperament was not significant [$\chi^2(1) = .432, p = .511$].

In order to determine whether SCRs among the security, happy, and neutral priming groups differed as a function of the order in which children watched the fear-inducing and excitement-inducing pictures, I conducted a full-factorial generalized estimating equations (GEE) analysis. The main effects of Condition (Secure Prime vs. Happy Prime vs. Neutral Prime), Valence (Fear-Inducing Pictures vs. Happy/Excitement-Inducing Pictures), and Order (Fear-Inducing Pictures First vs. Happy/Excitement-Inducing Pictures First) were entered as between subjects factors, as were all possible two-way interactions (i.e., Condition \times Valence, Condition \times Order, Valence \times Order), and the three-way interaction between Condition, Valence, and Order. This analysis was conducted separately for each of the following outcome variables: (a) children's SCRs, and (b) self-reported fear.

Primary Analyses

The present study was designed to address two hypotheses and to address two research questions. In order to test my two hypotheses and address my two research questions, I conducted three sets of analyses (see Table 1 for my Hypotheses and Research Questions).

Order Effects. First, in order to determine whether changes in SCRs between the security, happy, and neutral priming groups differed as a function of the order in which children watched the fear-inducing and excitement-inducing pictures, I conducted a full-factorial generalized estimating equations (GEE) analysis for children's SCRs. The main effects of Condition (Secure Prime vs. Happy Prime vs. Neutral Prime), Valence (Fear-Inducing Pictures vs. Happy/Excitement-Inducing Pictures), and Order (Fear-Inducing Pictures First vs. Happy/Excitement-Inducing Pictures First) were entered as between subjects factors, as were all possible two-way interactions (i.e., Condition \times Valence, Condition \times Order, Valence \times Order), and the three-way interaction between Condition, Valence, and Order. The main effect of Order was not significant ($\chi^2(1) = 2.70, p = .100$). The Condition \times Order interaction was not significant ($\chi^2(2) = .29, p = .865$), but the the Valence \times Order interaction was significant ($\chi^2(1) = 6.32, p = .012$). Post-hoc probing indicated that during the Fear-Inducing pictures, SCRs were higher when the Happy/Excitement-Inducing pictures ($Mean = 6.97, SE = 1.254$) were presented first compared to when the Fear-Inducing pictures ($Mean = 2.44, SE = .635$) were presented first (Mean difference = -5.12, $SE = 1.546, p = .001$). Similarly, during the Happy/Excitement-Inducing pictures, SCRs were higher when the Happy/Excitement-Inducing pictures ($Mean =$

6.07, $SE = 1.150$) were presented first compared to when the Fear-Inducing pictures ($Mean = 2.13, SE = .565$) were presented first (Mean difference = $-4.22, SE = 1.39, p = .002$). There was not a difference in SCRs between the Fear-Inducing pictures and the Happy/Excitement-Inducing pictures when the Fear-Inducing pictures were presented first (Mean difference = $.37, SE = .223, p = .096$). When the Happy/Excitement-Inducing pictures were presented first, SCRs were higher during the Fear-Inducing pictures compared to during the Happy/Excitement-Inducing pictures (Mean difference = $1.27, SE = .482, p = .008$). The Condition \times Valence \times Order ($\chi^2 (1) = 1.51, p = .469$).

Analyses of whether there were any effects of Order for children's self-reports of fear indicated that the main effect of Order was not significant ($\chi^2 (1) = 1.53, p = .261$). The Order \times Valence interaction was also not significant ($\chi^2 (1) = 333, p = .564$). Because the main effect of order was significant in the analyses with SCRs, this variable will be included in GEE analyses involving the effect of Condition. Order will not be included in analyses that are conducted with only the Neutral Control condition due to inadequate power to test a model that included this additional effect.

Hypothesis 1 and Research Question 1. To test hypothesis 1 and address research question 1, I conducted a full-factorial GEE analysis as follows. Order, Condition and Valence were entered as between subjects factors and Temperament was entered as a covariate to examine the main effects. In addition, all possible two-way interactions (i.e., Condition \times Valence, Condition \times Temperament, Valence \times Temperament, Condition \times Order, Valence \times Order, Temperament \times Order), all three-

way interactions (i. e., Condition \times Valence \times Order, Condition \times Temperament \times Order, Valence \times Temperament \times Order, Condition \times Valence \times Temperament), and the four-way interaction between Order, Condition, Valence, and Temperament were examined. This analysis was conducted twice: once with SCRs as the outcome variable, and again with children's self-reported fear as the outcome variable. See Tables 5 and 6 for the tests of the omnibus model effects for SCRs and children self-reported fear, respectively.

Hypothesis 1: Children who are exposed to security-enhancing primes will have lower EDA and will report feeling less scared or anxious during the anxiety-provoking tasks compared to children in the control condition. Pairwise comparisons of the pooled Estimated Marginal (EM) means obtained from GEE analysis described above were used to test Hypothesis 1 by examining differences in SCRs and self-reported feelings of fear between children in the Secure priming, Happy priming, and Neutral Control priming conditions. The omnibus effect of the interaction between Condition and Valence was significant for analyses of SCRs ($\chi^2(2) = 7.634, p = .022$). Post-hoc testing indicated that SCRs for children during the Fear-Inducing pictures were lowest for children in the Secure priming condition compared to children in both the Happy priming (mean difference = -2.82, $p = .036$, one-tailed) and Neutral priming (Mean difference = -3.93, $p = .012$, one-tailed) conditions. In addition, SCRs for the Happy priming condition and Neutral priming condition did not significantly differ (Mean difference = -1.11, $p = .700$, one-tailed) during the Fear-Inducing pictures.

Post-hoc tests of SCRs for children during the Happy/Excitement-Inducing pictures indicated that SCRs were not significantly different for children in the Secure priming condition compared to children in the Happy priming (Mean difference = 2.04, $p = .092$, one-tailed) and Neutral priming Conditions (Mean difference = 1.25, $p = .232$, one-tailed). SCRs were not significantly different during the Happy/Excitement pictures for children in the happy priming condition and children in the neutral priming condition (Mean difference = -0.79, $p = .729$). See Table 5 for the tests of the omnibus effects. See Figure 2 for a depiction of the pairwise comparisons of the pooled EM means.

For analyses of children's self-reported fear, neither the Condition \times Valence ($\chi^2(2) = 1.124$, $p = .570$) nor the Condition \times Valence \times Order ($\chi^2(2) = .416$, $p = .812$) interactions were significant. See Table 6 for the tests of the omnibus effects.

Additional comparisons. To further probe the interaction between Condition and Valence for SCRs, I examined within group differences. Because there were no a priori hypotheses regarding within group tests, I use two-tailed tests of significance. Within group comparisons of SCRs indicated that children in the secure priming group had lower SCRs during the Fear-Inducing pictures compared to the Happy/Excitement-Inducing pictures (Mean difference = -2.55, $p = .004$, two-tailed). The opposite emerged when probing within group differences for the Happy and Neutral Priming conditions in which SCRs were higher during the Fear-Inducing pictures compared to the Happy/Excitement-Inducing pictures (Mean difference for Happy Priming group = 2.31, $p = .014$, two-tailed; Mean difference for the Neutral Priming condition = 2.64, $p = .002$, two-tailed). See Figure 2 for a depiction of the

pairwise comparisons for the Condition \times Valence interaction that emerged for children's SCRs. Furthermore, there was a marginal main effect for composite child temperamental fearfulness that indicated that children who were rated by their mothers as less temperamentally fearful had more SCRs than children who were rated by their mothers as less temperamentally fearful ($\chi^2 (1) = 3.143, p = .076$).

Research Question 1: Does child temperamental fearfulness moderate the effect of attachment-security priming on children's EDA and self-reported fear during the anxiety-provoking tasks? I addressed Research Question 1 according to the specifications of the differential susceptibility hypothesis (see Belsky et al., 2007, and Belsky & Pluess, 2009) by probing the highest order interaction including the effects of Condition, Valence, and Temperament (i.e., Condition \times Valence \times Temperament or Condition \times Order \times Temperament \times Valence). For analyses of children's SCRs, neither the Condition \times Valence \times Temperament ($\chi^2 (2) = .521, p = .771$) nor the Condition \times Order \times Temperament \times Valence ($\chi^2 (2) = .690, p = .708$) interactions were significant. See Table 5 for the tests of the omnibus effects.

For analyses of children's self-reported fear, neither the Condition \times Valence \times Temperament ($\chi^2 (2) = .954, p = .621$) nor the Condition \times Order \times Temperament \times Valence ($\chi^2 (2) = .689, p = .709$) interactions were significant. See Table 6 for tests of the omnibus effects.

Hypothesis 2 and Research Question 2. Tests of Hypothesis 2 and Research Question 2 were conducted using a full-factorial GEE analysis with the Neutral control group only. Valence was entered as a between subjects factor and Maternal Emotion Socialization and Temperament were entered as covariates to examine the

main effects. In addition, all possible two-way interactions (i.e., Maternal Emotion Socialization \times Valence, Maternal Emotion Socialization \times Temperament, Valence \times Temperament), and the three-way interaction between Maternal Emotion Socialization, Valence, and Temperament. See Tables 5 and 6 for the tests of the omnibus model effects for analyses with SCRs and children's self-reported fear, respectively.

Hypothesis 2: In the control group only, children's EDA and reports feeling scared or anxious during the anxiety-provoking tasks will decrease as their mothers' endorsement of supportive responses to their negative affect increases, whereas children's EDA and reports feeling scared or anxious during the anxiety-provoking tasks will increase as their mothers' endorsement of unsupportive responses to their negative affect increases. None of the interactions of interest was statistically significant. For children's SCRs, neither the Maternal Emotion Socialization \times Valence interaction for the analysis with SCRs was significant ($\chi^2 (1) = .780, p = .377$; see Table 7) nor was the Maternal Emotion Socialization \times Valence interaction for children's self-reports of fear significant ($\chi^2 (1) = .147, p = .702$; see Table 8).

Research Question 2: In the control group only, does child temperamental fearfulness moderates the link between mothers' responses to her child's negative affect and her child's EDA and self-reported fear? None of the interactions of interest were statistically significant. For children's SCRs, neither the Maternal Emotion Socialization \times Valence \times Temperament ($\chi^2 (1) = 1.24, p = .265$; see Table 7) interaction with SCRs was significant nor was the Maternal Emotion Socialization

× Valence × Temperament interaction for children's self-reports of fear significant (χ^2
(1) = .023, $p = .880$; see Table 8).

Chapter 5: Discussion

The present study was designed to determine whether experimentally enhanced attachment security causes decreased fear reactivity in children and to examine how mothers' emotion socialization relates to children's fear reactions. I also sought to examine how children's temperament may serve as a moderator of these links. Based on attachment theory and previous research, I proposed that attachment security priming would decrease fear reactions compared to children in the control conditions. Based on emotion socialization theory and research, I hypothesized that increased maternal supportive reactions and decreased maternal unsupportive/harsh reactions to their children's distress would be linked to lower fear reactivity in children. Based on the differential susceptibility hypothesis, I examined whether children with more fearful temperaments were more influenced by the effects of priming and the effects of maternal emotion socialization.

I assessed children's fear reactions using both skin conductance responses and children's self-reports. Only analyses of children's SCRs data supported my hypothesis that experimentally-enhanced attachment security reduces fear responses. Specifically, as expected, I found that the effects of attachment security priming caused lower SCRs during the Fear-Inducing pictures compared to both the happy control priming and neutral control priming conditions. Also as expected, there were no differences among the attachment security priming, happy control priming, and neutral control priming conditions during the Happy/Excitement-Inducing pictures. I did not find any differences in children's self-reported fear as a function of priming

condition. I discuss these findings further in the context of attachment and developmental research. I conclude by suggesting areas of future investigation.

Attachment Security and Fearfulness

A central tenet of attachment theory is that the feeling of security and safety that is derived from the presence of an available and responsive attachment figure reduces fearfulness in children (Bowlby, 1969/1982, 1973). As such, I hypothesized that attachment security priming, which momentarily activates mental representations of security, would reduce children's fear responses. As I expected, I found that children who were exposed to attachment security enhancing primes had lower physiological fear responses than children who were exposed to happiness enhancing primes and children exposed to primes of a neutral valence. Previous studies with infants have examined how increased accessibility to mother increases exploration (Carr, Dabbs, & Carr, 1975), and decreases negative emotions (Sorce & Emde, 1981). These findings, however, provide the first experimental evidence to support the idea that increased attachment security reduces fearfulness. Moreover, because this study included a happiness enhancing control condition, I can say that these findings are not due simply to increased positive affect. Also as expected, I found no differences among the attachment security priming, happy priming, and neutral priming conditions during observation of the Happy/Exciting pictures. These findings support the idea that attachment security decreases fearfulness specifically, as opposed to arousal in general.

Interestingly, unexpected within group differences emerged. Specifically, I found that for the Happy priming and Neutral Control priming groups, children had

more SCRs during observation of the Fear-Inducing pictures compared to the Happy/Excitement-Inducing pictures. In contrast, within the security priming group, children had *fewer* SCRs during observation of the Fear-Inducing pictures compared to the Happy/Excitement-Inducing pictures.

In contrast to the findings discussed above, results for data analyses of children's self-reported fear reactions were not statistically significant. Specifically, there were no differences in children's self-reported fear among the attachment security priming, happy priming, and neutral control priming conditions. There are several reasons that may explain why attachment security priming influenced children's physiological fear responses but did not influence children's self-reported fear. First, children were asked to indicate how scared the pictures made them feel *after* the presentation of the pictures, whereas children's SCRs were assessed continuously throughout the picture presentations. It is possible that by the time the picture presentations were over, the effects of priming had waned. Future research that examines how children's skin conductance responses at the start of the picture presentations and at the end of the picture presentations map onto their self-reported fearfulness will be able to address the possibility that the effects of priming had waned by the time children reported on their feelings.

Second, because the effects of attachment security priming were subconscious (i.e., priming was subliminal), it is possible that attachment security priming reduced the non-conscious measure of SCRs whereas priming did not influence the conscious subjective ratings of fear. It is possible that attachment security priming effects may emerge for children's self-reports in a study that uses priming stimuli of which

participants are consciously aware. For example, children could be primed by looking at a picture book with the priming stimuli. This picture book priming technique has been successful in Over & Carpenter's (2009a, 2009b) work which found that this priming technique changes children's overt and conscious behavior. Research by Cassidy et al., (2009) suggests that it is possible to use a subliminal prime to change participant self-reports, however, this study is more of an exception rather than a rule. For the most part, attachment security priming studies that have changed participant self-reports or conscious behavior have by and large used explicit priming (Mikulincer et al., 2005; Mikulincer & Shaver, 2007b; Taubman – Ben-Ari & Mikulincer, 2007]).

Demand characteristics may have been another reason that children's self-reports of fear were not lower in the attachment security priming condition compared to the happy and neutral priming conditions. For example, because children were tested on their knowledge of the various emotions that were assessed after each picture presentation at the beginning of the experiment, they may have over-reported their fear because they wanted to get the answer "right". If children over-reported their fear, this may have created a ceiling effect. This explanation seems plausible given that a substantial proportion of children reported to have the highest level of fear in response to the pictures.

Another possibility is that characteristics of the child may have biased their self-reported fear. For example, it is possible that children's constitutional attachment quality may be linked to their self-reported fear. Previous research and attachment theory would support this possibility such that people who are have an Avoidant or

Dismissing attachment style are thought to be more likely to minimize their negative emotional responses, whereas people who have an Ambivalent or Preoccupied attachment style are thought to be more likely to maximize their negative emotional responses (Cassidy, 1994; Mikulincer & Shaver, 2008). As such, it is possible that children who had an Avoidant attachment minimized their expressions of fear, whereas children who had an Ambivalent attachment maximized their expressions of fear. Future research that assesses children's constitutional attachment quality using a separation-reunion procedure will be able to address this possibility.

It is important to note that the effects of security priming may depend on past experiences of attachment security. For instance, it is possible that security priming may be more effective for children who have had more experiences of their caregivers as available and sensitively responsive when needed. Thus, it is possible that security priming may be most effective for children who are chronically secure given their likely more frequent experiences of sensitive responsiveness from their caregivers. It is also possible that security priming may be relatively ineffective at enhancing positive psychosocial outcomes for children who are chronically secure compared to those who are chronically insecure because there is more room for improvement for those who are insecure. In addition, it is also possible that security priming is ineffective for those who have very few or no experiences of others as sensitively responsive because there is no secure base script to activate with priming.

On the other hand, it may be the case that the effects of security priming do not depend on past experiences and hence also do not depend on dispositional attachment. Specifically, Main (1990) has posited that seeking proximity to an

attachment figure under threateneing situations is a primary biologically based behavioral strategy with which infants are born. If this is the case, then it could be argued that infants come into the world with a very basic knowledge of a secure base script (e.g., “Alerting others that I am distressed will elicit their caregiving response.”). Thus security priming may tap into this basic secure base script and may not depend on dispositional security.

The same logic can be applied to security priming in adults, however, the effects of security priming as a function of dispositional attachment security seem to be the exception rather than the rule. Though definitive conclusions are not possible without more rigorous and direct tests of the possibilities described above, the infrequency with which dispositional security and security priming interact in the adult literature seems to suggest that increases in dispositional security neither increase nor decrease the effectiveness of security priming as a general rule. This finding, however, may not extend to childhood. For example, it is possible that, compared to children, adults have had more experiences of their needs for comfort being met by a sensitively responsive other because they have more opportunities for intimacy outside of their relationships with their parents. As such, it may be rather uncommon to reach adulthood without having experienced one’s needs for comfort and security being met by another, and it may be relatively more common for children to have very few or no experiences of their needs for comfort and security being met by another. Thus, dispositional security may interact with security priming in childhood and this possibility should be kept in mind as attachment researchers design studies that extend security priming to childhood.

Within the attachment security priming literature, the present study meshes with previous related research conducted with adults. Mikulincer and others (2005) found that attachment security priming, compared to close person priming and acquaintance priming, increased participants' compassion, willingness to help, and likelihood of agreeing to replace a distressed woman who participants thought was going to have to pet a live tarantula. Similar to Mikulincer and colleagues (2001), the present study's findings also indicate that attachment security priming is specific to threatening situations. Mikulincer et al. (2001; Studies 5-7) found that attachment security primes and positive affect enhancing primes increased participants' positive affect compared to neutral primes under non-threatening condition. Under threatening conditions, however, attachment security primes increased participants' positive affect more than both the positive affect enhancing and neutral primes). In the present study, during observation of the Fear-Inducing pictures, children's SCRs were fewer in the attachment security priming condition compared to the happy priming and neutral control priming conditions, but there were no differences between priming condition groups during observation of the Happy/Excitement enhancing condition. These findings, like those of Mikulincer et al. indicate that attachment security priming reduces physiological arousal during times of threat.

Not only does the present study mesh with previous attachment security priming findings, it also extends this literature. Specifically, I included a social affiliative positive affect condition because the adult security priming literature has not excluded the possibility that exposure to a social positive affect prime may account for the effects of attachment security priming. The adult attachment priming

literature found that the effects of attachment security priming are not simply the result of positive affect, but the primes that have been used are not necessarily social in nature. For example, Mikulincer and colleagues (2001) used a picture of an overflowing treasure chest or a picture of a smiley face drawing. These positive affect primes do not rule out the possibility that a social positively valenced picture may reduce fearfulness. The present study has been able to rule out this possibility. In addition, because the present study used happy control primes of people with “true” Duchenne smiles, which signal affiliation and cooperation (see Brown & Moore, 2002; Izard, 1971), the present study is also able to rule out the possibility that attachment security priming is simply priming affiliation. Moreover, the argument could be made, especially in work with children, that the attachment priming pictures reduced fear simply because there was an available, affiliative, and cooperative adult. Given that the present study used pictures of smiling adults for the social happiness primes, this possibility has also been ruled out.

On a broader developmental level, these findings are only the second to demonstrate that a subliminal social prime influences children’s outcomes. The only other study, conducted by Bryant-Tuckett and Silverman (1984), found that fifth through twelfth graders subliminally exposed five times a week for six weeks to the phrase, “*Mommy and I are one*” had more positive self-reported self-concepts, higher standardized reading and math scores, more frequent homework completion, more time spent working independently in the classroom, and less time spent watching television as recorded by their counselors, compared to children who were subliminally exposed to a neutral prime (“*People are walking*”) five times a week for

six weeks. The present study is the first to find that a subliminal social prime changes children's physiological responses. Given the important theoretical and practical implications of the findings of the present study, it seems possible to make many other important gains in our understanding of children's social development by incorporating priming techniques in future research. I discuss some areas of future research below in Future Directions.

Maternal Emotion Socialization and Children's Fear Reactions

I hypothesized that mothers who reported high supportive and low unsupportive/harsh reactions to their child's distress would have children who had lower fear reactions. Both the SCRs and children's self reports were not supportive of this hypothesis. There are several possibilities for this lack of an association between maternal emotion socialization and children's fear reactions. One reason that the predicted link may have failed to emerge is that the maternal emotion socialization is not the appropriate measure to predict children's fearfulness. It is possible that aspects of parenting that were not assessed in the present study are related to differences in children's fear reactions.

For example, it is possible that maternal attachment representations are an important factor for predicting children's fear responses. Given that parental attachment representations are linked to children's representations (see De Wolff & van IJzendoorn, 1997), and children's attachment representations are linked to children's outcomes (see Weinfield, Sroufe, Egeland, & Carlson, 2008), future research may do well to examine whether maternal attachment is linked to children's fear reactions. Furthermore, given that there are several important aspects of maternal

attachment representations, research that assesses maternal attachment representations using more than one attachment measure (for example, secure base script knowledge, self-report attachment, Adult Attachment Interview) may prove fruitful.

Relatedly, it remains possible that a behavioral measure of maternal responses to children's distress may show the hypothesized link to children's fear reactions. For example, observations of mothers' behavior in the home or during a structured lab task may demonstrate the hypothesized link between maternal responses to children's distress and children's fear reactions.

It is also possible that children's fear reactions may be predicted by mothers' physiological reactions to children's distress. For example, studies that examine mothers' skin conductance, heart rate, or respiration during stressful caregiving-related situations may be linked to children's fear reactions. This possibility is underscored by research that found a link between mothers' physiological reactions to infant crying during pregnancy to their infant's attachment security in toddlerhood (Leerkes, Parade, & Gudmundson, 2011).

Despite the links between maternal emotion socialization and children's fear reactions (assessed as SCRs and self-reported fear) not emerging, it is possible that another indicator of children's fear may emerge in future research. For example, future work that examines other measures of physiology, like heart rate, respiration, blood pressure, or skin temperature, may find support for the idea that mothers' reactions to child distress predicts children's fear reactions. Relatedly, research that includes more than one assessment of physiology would be able to speak to whether attachment security priming influences physiological regulation in response to fear-

inducing stimuli, as opposed to reactivity, which is what the present study assessed. The present study examined children's physiological fear reactivity (changes in physiology that are the result of a specific event) as opposed to physiological regulation, which is changes in physiology that are meant to maintain homeostasis. Given that research on maternal emotion socialization has found links between invalidating or "dampening" maternal responses toward their adolescents' positive affect and adolescents' dysregulated behavioral emotion regulations strategies (Yap et al., 2008), it seems plausible that maternal emotion socialization may influence children's physiological regulation.

Another possibility that remains to be tested is whether a behavioral marker of children's fearfulness would be predicted by maternal emotion socialization. For example, one study has found links between parental emotion socialization and children's emotional expression have used behavioral observations of children's emotional expressions (e.g., Kochanska, Aksan, & Joy, 2007). As such, it might be the case that children's facial expressions of behaviors during their observation of the picture presentations are linked to maternal emotion socialization. Future research that codes children's emotional expressions and behaviors during tasks designed to elicit children's emotions may prove fruitful to future research.

It is also important to note that the measure of maternal emotion socialization that was used in the present study (i.e., CCNES; Fabes et al., 2002) has only four hypothetical scenarios that relate to children's fear, anxiety, or nervousness; the other eight scenarios are about other emotions including anger, sadness, pain, embarrassment, and annoyance. It is possible that the link between maternal

responses to child distress and child fearfulness did not emerge because mother's responses to child fear would be a better predictor of children's fear responses. Future research could develop a questionnaire that asks mothers about her responses to her child's fear and examine whether maternal responses to child fear links to children's fear responses.

Lastly, it is also possible that maternal responses to children's distress are more important in predicting children's expressions of emotions other than fear. For example, it is possible that maternal reactions to child distress are linked to children's happiness, anger, or sadness. In fact, research has found links between emotion socialization and children's happiness and sadness (Warren & Stifter, 2008; Yap et al., 2008). Future studies that are designed to elicit these emotions would address this possibility.

The present study was designed, at least in part, to determine for the first time whether maternal emotion socialization predicts children's fear. The rationale behind examining for the first time whether maternal emotion socialization is linked to children's fear was based on research indicating that maternal emotion socialization is linked to children's anxiety disorders (Suveg et al., 2005). However, given that no study has shown a link between maternal emotion socialization and children's fear, and the present study failed to find the link, perhaps there is a file drawer problem that exists in that this issue has been examined, but has failed to emerge as significant. If a file drawer problem exists, a meta-analysis that asks researchers to report null findings would be able to determine if this is the case.

Child Temperament as a Moderator

Based on the differential-susceptibility hypothesis, I sought to determine whether children who were rated by their mothers as having a more fearful temperament would be more influenced by the effects of priming and by the effects of maternal emotion socialization on their fear reactions than children whose mothers rated them as less fearful. The results indicated that temperamental fearfulness did not moderate the links between priming and children's fear reactions or the links between maternal emotion socialization and children's fear reactions.

The present study used the Shyness, Fear, and Discomfort subscales of the CBQ (Rothbart, et al., 2001) to assess temperamental fearfulness based on previous research that used these subscales (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & Linting, 2008; Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008; Gilissen, et al., 2007). Using the Shyness, Fear, and Discomfort subscales of the CBQ, Gilissen and colleagues (Gilissen, et al., 2007; Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008) found that the link between attachment security and lower levels of EDA in children was moderated by child temperamental fearfulness such that attachment security was more strongly linked to lower EDA for children rated by their mothers as more temperamentally fearful. In addition, other studies have found that temperamental fearfulness moderates the link between the environment and child outcomes (Leve, Kim, & Pears, 2005; Kochanska et al, 2007; Volling & Feagans, 1995). Thus, given the parallels between the design of Gilissen and colleagues' work (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008) and the present study, other previous research that has used temperamental fearfulness, and that I had to reduce participant burden (the full CBQ

takes an hour to complete), I chose to assess temperamental fearfulness in the way that Gilissen and colleagues did.

Nonetheless, I did not find that temperamental fearfulness moderates the links between priming and children's fear reactions or the links between maternal emotion socialization and children's fear reactions. Despite several indicators that the assessment of temperament that I chose may prove useful, there are several possibilities for this failure to find that temperamental fearfulness serves as a moderator of the link between priming and children's fear reactions and maternal emotion socialization and children's fear reactions. First, the differential-susceptibility hypothesis states that children should vary in their susceptibility to environmental influences. It does not predict, however, that more temperamentally fearful children will be the children who are more susceptible (Belsky & Pluess, 2009). Many researchers, including myself, have chosen to examine elements of a negatively emotional temperament which could be such elements as temperamental fearfulness, difficulty, or irritability because Belsky (2005) and colleagues (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007; Belsky & Pluess, 2009) made an empirical observation that children with more negatively emotional temperaments are often most susceptible to environmental influences (see Belsky & Pluess, 2009 for a review). Temperamental fearfulness is only one aspect of a negatively emotional temperament. Thus, other elements of negatively emotional temperament may moderate the links between priming and children's fear reactions and the links between maternal emotion socialization and children's fear reactions. As such, it is possible that the present study did not find that temperamental fearfulness moderates

the links between either priming and children's fear reactions or the links between maternal emotion socialization and children's fear reactions because another aspect of temperament that was not assessed in the present study may serve as the moderator of these links.

In particular, temperamental difficulty may be an important temperamental element to consider in future research given that several studies that have assessed temperamental difficulty have found evidence of differential susceptibility. van Aken, Junger, Verhoeven, van Aken, and Dekovic (2007) found that the link between maternal sensitivity and externalizing problems was stronger for toddler boys with difficult temperaments compared to toddler boys who did not have difficult temperaments. Bradley and Corwyn (2008) found that the link between parenting quality and teacher-reported problems was moderated by the child's difficult temperament such that this link was stronger for children with difficult temperaments compared to children with less difficult and easy temperaments. Given these findings and others (see Dopkins Stright, Cranley Gallagher, & Kelley, 2008; Pluess & Belsky 2009, 2010), future research that assesses temperamental difficulty may find that it moderates the links between priming and children's fear reactions and the links between maternal emotion socialization and children's fear reactions may be useful.

Another alternative is to use observational measures of child temperament. Maternal reports of child temperament can be biased by maternal perceptions of her child (Gartstein & Marmion, 2008; Leerkes & Crockenberg, 2003). As such, a standardized observational assessment that removes the biases introduced by maternal reports may find the hypothesized moderating effect of temperament. For example,

research has found that neonatal infant irritability assessed with the Neonatal Behavioral Assessment Scale twice in the first 30 days post-partum moderated the effect of a parenting intervention between 6-9 months on infant attachment security at 12 months (Cassidy, Woodhouse, Sherman, Stupica, & Lejuez, 2011).

The age at which Cassidy et al. (2011) assessed temperament points to another alternative for finding differential susceptibility for the links between priming and children's fear reactions and the links between maternal emotion socialization and children's fear reactions. It is also possible that the hypothesized moderating effect of temperament would be present in a study that assesses temperament at an earlier age or an assessment that is less influenced by environmental factors. Given that temperament is known to be a product of both biology and the environment (Rothbart & Derryberry, 1981, 2002; Bridgett, et al., 2009), and the differential-susceptibility hypothesis is based on the idea that some children may be more or less susceptible to environmental influences due to evolutionary reasons, it seems that, a more biologically-based measurement of temperament may show evidence of the proposed interaction between temperament and priming or temperament and maternal emotion socialization. For example, a future study that assesses temperament in early infancy may find differential susceptibility.

It is also possible that temperamental fearfulness may moderate the link between environmental influences and children's social fear or social anxiety. Studies that are designed to elicit social anxiety, perhaps by using the Trier Social Stress Test (Kirschbaum, Pirke, & Hellhammer, 1993) may show that temperamental fearfulness moderates the link between environmental influences and children's social anxiety.

Given that temperamental fearfulness includes shyness as an element, it seems reasonable to think that temperamental fearfulness may moderate the link between maternal emotion socialization and children's fear during social situations.

Lastly, it is also possible that the reason I did not find differential susceptibility when Gilissen et al. (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008) did is that children who are highly negatively emotional are not differentially susceptible to the influence of attachment security priming on their fear responses. Gilissen et al. assessed constitutional attachment security at 4 and 7 years of age which developed over the course of years from repeated daily interactions with the primary caregiver. They found that higher constitutional attachment security predicts lower EDA in response to fear-inducing stimuli and that this link was strongest for children who were highly temperamentally fearful. It is possible that temperamentally more fearful children in Gilissen et al.'s study were the least fearful when they had a secure attachment and the most fearful when they had an insecure attachment because more temperamentally fearful children were afraid more frequently and as a result, approached their parent for comfort more frequently. The feeling of fear would have then been paired with their parent's response to their fear frequently making the pathway stronger for temperamentally fearful children. If this were true, then the present study, which experimentally manipulated security only briefly in the lab using priming, may not have found differential susceptibility because the more frequent pairing between fear and the parent's response that might have happened for temperamentally fearful children in Gilissen et al.'s study would not have occurred in the present study.

It is also important to note that the interaction being tested was between child temperamental fearfulness and the effects of priming. I tested this interaction because Gilissen, Bakermans-Kranenburg, van IJzendoorn, and van der Veer (2008) found that the child's constitutional security interacted with child temperamental fearfulness. Priming attachment security is different than constitutional attachment security because constitutional security develops over the course of years of interactions between the child and caregiver. Attachment security priming, as it was executed in the present study, only temporarily increased accessibility to mental representations of attachment security. As such, the present study was not a replication of Gilissen et al. (2008) and it remains possible that had the present study assessed constitutional attachment security, an interaction with child temperamental fearfulness and differential-susceptibility would have emerged.

Future Directions

The present study found that subliminal attachment security primes result in lower physiological fear reactions in children compared to children in a happiness priming and neutral priming condition. These findings are important to both attachment research and social development research in general. Below I discuss several directions for future research based on the finding that attachment security priming decreases fear.

Implications for Attachment Research

Until the present study, the large body of attachment security priming research findings has been limited to research with adults and older teenagers. The present study demonstrates that attachment security priming is, indeed, a useful method for

determining whether increased attachment security is causally linked to child development outcomes. We now have experimental evidence that increased attachment security decreases fear, as attachment theory, correlational research, and Sorce and Emde's (1981) seminal study have suggested. I chose to start with fear as an outcome because of its centrality to attachment theory, but future research should extend attachment security priming work to include research that investigates other important outcomes of increased attachment security.

Some important areas to begin future inquiry include the link between attachment security and exploration. Attachment security is thought to provide the child with a secure base to explore the world by decreasing fear. The present study has demonstrated that attachment security priming decreases physiological fear responses. The next logical step is to move our understanding of the role that attachment security plays in children's development forward by exploring whether attachment security causes decreased exploration. Specifically, future research should determine whether decreases in fearfulness that were the result of experimentally-enhanced attachment security lead to increases in exploration.

Examining whether attachment security priming increases exploration could advance the field of attachment not only by determining whether increased security causes increased exploration but also by extending our knowledge of how attachment security priming changes observed behavior. To date, only one study has assessed the effects of attachment security priming on observed behavior. Mikulincer and Shaver (2007b) found that people in the attachment security priming group put equally low amounts of hot sauce on an out-group member's food. Thus, to date only aggressive

behavior has been studied in the context of attachment security priming. In addition, this finding extends only to adults. Other types of behaviors have yet to be examined to determine if attachment security priming influences them in theoretically predictable ways. There are several types of observed behavior that are central to attachment theory including interaction quality, exploratory behavior, and caregiving behavior that future research should examine to determine if attachment security priming changes these behaviors.

There is experimental evidence that simple priming techniques have the power to change a wide range of observed behavior. For example, priming the concept of “old age” makes adults walk slower (Bargh, et al., 1996; Study 2), and priming the concept of affiliation makes toddlers more likely to assist a stranger (Over & Carpenter, 2009b). Given these compelling examples of priming changing actual behavior (also see Chapter 2, herein), and the data from the present study which indicate that subliminal attachment security priming reduces children’s physiological fear responses, it seems logical to think that attachment security priming may change observed of children’s fear expressions. In addition, attachment security priming may also increase the quality of interactions with other and caregiving quality. If attachment security priming does turn out to change parenting quality and observed behavior in interactions with others, there are many important clinical implications (one of which I discuss immediately below). As such, an important next step for attachment security priming research is to extend our understanding of how attachment security priming changes observed behavior.

Given that the present study has demonstrated attachment security priming to be a useful tool for reducing children's physiological fear reactions, extending attachment security priming methods to research on anxiety symptomatology and anxiety-related disorders is a logical future research direction for attachment security priming that has important clinical applications. It is possible that attachment security priming may reduce anxiety symptomatology or that repeated attachment security priming may reduce anxious behavior.

Additionally, using attachment security priming as a first step in determining whether attachment security improves psychosocial outcomes may have important clinical implications. Specifically, very little research has examined whether attachment security is causally-linked to improved psychosocial functioning. The paucity of this research is likely due to the costly nature of traditional randomized control trials in which researchers attempt to increase attachment security through expensive and time-consuming therapeutic or parenting interventions. Initial research that uses attachment security priming to momentarily increase attachment security in the lab to observe changes in psychosocial functioning may prove to be useful in establishing initial causal links between attachment security and the outcome of interest prior to embarking upon costly traditional randomized control trials. Furthermore, attachment security priming may prove useful in grant writing to establish a causal link between attachment security and the outcome of interest using experimental evidence.

Implications for Social Development Research

The present study meshes with previous research in social development that has used priming as a way of examining how children's mental representations of the social world drive children's thoughts, feelings, and behaviors. For example, studies have shown that priming children with food increases food consumption (Harris et al., 2009; Study 1), priming children with affiliation increases helping behavior (Over & Carpenter, 2009b), and priming children with ostracism increases imitation (Over & Carpenter, 2009a). The present study adds to this small body of literature which demonstrates the utility of priming as a technique for determining how child development outcomes are influenced by their mental representations. As such, it is important that researchers consider priming as a technique to incorporate in future studies to add to our understanding of how children's social schemas drive affect, cognitions, and behavior.

For example, social-information processing research may benefit greatly from the application of priming techniques in future research. Dodge and his colleagues (Crick & Dodge, 1994; Dodge & Crick, 1990) proposed that children's behavioral responses to problematic social events are mediated by a series of cognitive processes whereby children (1) encode the event, (2) interpret the event, (3) formulate a goal or select a desired outcome, (4) generate strategies to achieve the desired outcome, (5) evaluate the likelihood that the strategies generated will achieve the desired outcome, and finally, (6) behaviorally enact the selected strategy. Children's mental representations or schemas of the social environment are thought to serve as the cognitive mechanism through which children proceed from one step to the next. Specifically, children draw on their mental representations of past social experiences

to guide their attention when encoding the event, their interpretation of the event, the goal they formulate, the strategies they generate, and their evaluation of these strategies. A large body of research has emerged in support of this model of social information processing (see Dodge & Pettit, 2003, for a review). Only two studies, however, have tested this model experimentally (Rabiner & Coie, 1989; Slaby & Guerra, 1988).

Priming offers researchers an alternative to lengthy and costly intervention studies for determining whether the link between children's mental representations direct how they attend to, encode, and interpret social events, and how they draw upon their social schemas to formulate a goal and to generate and evaluate strategies for achieving their goal. For example, future research could examine the effects of increased accessibility to mental representations of aggression and benevolence on children's social information processing by priming these concepts.

Lastly, the present study chose to use 6 and 7 year old children because this age range was the youngest in which subliminal primes had been used. Cognitive developmentalists have used subliminal priming of numbers in first graders (Reynvoet et al., 2009). As such, I chose to use 6 and 7 year olds for the present study as a starting point for future research. Given that subliminal attachment security priming works in children as young as 6, it seems logical to believe that subliminal attachment security priming works in older children as it did in Bryant-Tuckett and Silverman's (1984) study with children enrolled in grades 5-12. What remains unknown, is whether subliminal priming is a useful technique for children younger

than 6. Future research that examines the effects of priming in progressively younger children will be able to address this question.

Conclusions

The present study found that increased mental representations of attachment security decreased children's physiological fear reactions. In doing so, this study is the first to provide experimental evidence that supports one of the most central tenets of attachment theory: that increased attachment security reduces fear. Future research should employ attachment security priming as a technique to examine the ways that increased attachment security influences child development outcomes in experimental studies. More broadly, this study suggests that priming techniques are a useful methodological tool for social development research aimed at determining how children's mental representations of the social world influence developmental outcomes.

Table 1

Hypotheses and Research Questions for the Present Study

Hypothesis 1: Children who are exposed to security-enhancing primes will have lower EDA and will report feeling less scared or anxious during the fear-inducing pictures for children in the security-enhancing prime condition compared to children in the happy and neutral control conditions.

Research Question 1: Does child temperamental fearfulness moderate the effect of attachment-security priming on children's EDA and self-reported fear during the anxiety-provoking tasks?

Hypothesis 2: In the control group only, children's EDA and reports feeling scared or anxious during the fear-inducing pictures will decrease as their mothers' endorsement of supportive responses to their negative affect increases, whereas children's EDA and reports feeling scared or anxious during the fear-inducing pictures will increase as their mothers' endorsement of unsupportive responses to their negative affect increases.

Research Question 2: In the control group only, does child temperamental fearfulness moderate the link between mothers' responses to her child's negative affect and her child's EDA and self-reported fear?

Table 2

Order of Laboratory Tasks

MOTHER & CHILD Informed Consent (5 min) GSR, ECG, and RSP electrodes on MOTHER (3 min) GSR, ECG, and RSP electrodes on CHILD (3 min)	
MOTHER <input type="checkbox"/> Mother and Child Demographics (5 min) <input type="checkbox"/> Rest period (3 min) <input type="checkbox"/> CBQ (10 min) <input type="checkbox"/> Secure Base Script Knowledge (10 min) <input type="checkbox"/> ECR (10 min)	CHILD <input type="checkbox"/> Language Ability Assessment (10 min) <input type="checkbox"/> Secure Base Script Knowledge (10 min) <input type="checkbox"/> Rest Period (2 min) <input type="checkbox"/> Emotion Labeling Task (10 min)
MOTHER & CHILD (5 min)	
MOTHER <input type="checkbox"/> Reactions to Crying Infants (20 min) <input type="checkbox"/> CCNES (20 min) <input type="checkbox"/> CryBaby (10 min)	CHILD <input type="checkbox"/> Neutral Picture Set 1 (1 min) <input type="checkbox"/> How I Feel (3 min) <input type="checkbox"/> Computer Game Training (3min) <input type="checkbox"/> Computer Game 1 (2 min) <input type="checkbox"/> Fear Picture Set 1 (1 min)* <input type="checkbox"/> How I Feel (3 min) <input type="checkbox"/> Computer Game 2 (2 min) <input type="checkbox"/> Fear Picture Set 2 (1 min)* <input type="checkbox"/> How I Feel (3 min) <input type="checkbox"/> Computer Game 3 (2 min) <input type="checkbox"/> Fear Picture Set 3 (1 min)* <input type="checkbox"/> How I Feel (3 min) <input type="checkbox"/> Neutral Picture Set 2 (1 min) <input type="checkbox"/> Computer Game 4 (2 min) <input type="checkbox"/> Exciting Picture Set 1 (1 min)* <input type="checkbox"/> How I Feel (3 min) <input type="checkbox"/> Computer Game 5 (2 min) <input type="checkbox"/> Exciting Picture Set 2 (1 min)* <input type="checkbox"/> How I Feel (3 min) <input type="checkbox"/> Computer Game 6 (2 min) <input type="checkbox"/> Exciting Picture Set 3 (1 min)* <input type="checkbox"/> How I Feel (3 min)
MOTHER & CHILD GSR, ECG, and RSP electrodes off (5 min)	

Note. Tasks in bold typeface are tasks that are included as part of the present study. Tasks presented in separate boxes indicate that mother and child are separated in adjacent rooms. *Counterbalanced

Table 3

Correlation Matrix of the CCNES Subscales

	1.	2.	3.	4.	5.	6.	7.	8.
1. DR								
2. EE	0.07							
3. EFR	0.34†							
4. MR	0.21	-0.28	0.09					
5. PFR	0.25	0.56*	0.63*	-0.29				
6. PR	0.13	-0.23	-0.20	0.69*	-0.22			
7. Supportive	0.26	0.79*	0.81*	-0.21	0.89*	-0.26		
8. Harsh	0.59*	-0.20	0.10	0.85*	-0.12	0.81*	-0.09	
9. CCNES	-0.25	0.65*	0.45*	-0.74*	0.66*	-0.74*	0.71*	-0.77*

Note. DR = Distress Reactions; EE = Expressive Encouragement; EFR = Emotion Focused Reactions; MR = Minimization Reactions; PFR = Problem Focused Reactions; PR = Punitive Reactions; Supportive = Mean of EE, EFR, and PFR; Harsh = Mean of DR, MR, PR.

Table 4

Descriptive Statistics for Children's SCRs

	<i>Mean</i>	<i>SD</i>	<i>Range</i>
Neutral 1	4.14	9.57	0 - 52
Fear 1	4.53	10.27	0 - 56
Fear 2	5.40	10.83	0 - 71
Fear 3	6.35	11.12	0 - 57
Neutral 2	2.65	6.26	0 - 27
Happy/Excite 1	3.27	7.88	0 - 37
Happy/Excite 2	4.77	11.25	0 - 79
Happy/Excite 3	5.41	12.22	0 - 78

Table 5

Omnibus Model Effects from GEE Analysis Predicting Children's SCRs

Variable	Wald χ^2	df	p-value
Condition	3.751	2	.153
Order	2.701	1	.100
Valence	1.747	1	.186
CBQ	3.143	1	.076
Condition \times Order	.291	2	.865
Condition \times Valence	7.634	2	.022
Condition \times CBQ	4.491	2	.106
Order \times Valence	6.316	1	.012
Order \times CBQ	.561	1	.454
Valence \times CBQ	.414	1	.520
Condition \times Order \times Valence	1.514	2	.469
Condition \times Order \times CBQ	1.011	2	.603
Condition \times Valence \times CBQ	.521	2	.771
Order \times Valence \times CBQ	5.687	1	.017
Condition \times Order \times Valence \times CBQ	.690	2	.708

Note. Omnibus model effects are from analyses using only the original (not imputed) dataset because omnibus model effects are not able to be calculated using the pooled imputed datasets. Wald chi-square statistics were tested using Type III sum of squares approach, two-tailed. GEE = generalized estimating equations.

Table 6

Omnibus Model Effects from GEE Analysis Predicting Children's Self-Reported Fear

Variable	Wald χ^2	df	p-value
Condition	3.514	2	.173
Order	1.532	1	.216
Valence	.199	1	.656
CBQ	.355	1	.551
Condition×Order	.085	2	.959
Condition×Valence	1.124	2	.570
Condition×CBQ	2.711	2	.258
Order×Valence	.904	1	.342
Order×CBQ	1.352	1	.245
Valence×CBQ	1.110	1	.292
Condition×Order×Valence	.416	2	.812
Condition×Order×CBQ	.328	2	.849
Condition×Valence×CBQ	.954	2	.621
Order×Valence×CBQ	4.946	1	.026
Condition×Order×Valence×CBQ	.689	2	.709

Note. Omnibus model effects are from analyses using only the original (not imputed) dataset because omnibus model effects are not able to be calculated using the pooled imputed datasets. Wald chi-square statistics were tested using Type III sum of squares approach, two-tailed. GEE = generalized estimating equations.

Table 7

Omnibus Model Effects from GEE Analysis Using Neutral Control Group Only to Predict Children's SCRs

Variable	Wald χ^2	df	p-value
Valence	2.345	1	.126
CBQ	.386	1	.535
CCNES	1.035	1	.309
Valence \times CBQ	2.036	1	.154
Valence \times CCNES	.780	1	.377
CBQ \times CCNES	.981	1	.322
Valence \times CBQ \times CCNES	1.244	1	.265

Note. This analysis was conducted using only data from the Neutral Control Group. Omnibus model effects are from analyses using only the original (not imputed) dataset because omnibus model effects are not able to be calculated using the pooled imputed datasets. Wald chi-square statistics were tested using Type III sum of squares approach, two-tailed. GEE = generalized estimating equations.

Table 8

Omnibus Model Effects from GEE Analysis Using Neutral Control Group Only to Predict Children's Self-Reported Fear

Variable	Wald χ^2	df	p-value
Valence	.256	1	.613
CBQ	.160	1	.689
CCNES	.171	1	.679
Valence \times CBQ	.149	1	.700
Valence \times CCNES	.147	1	.702
CBQ \times CCNES	.132	1	.716
Valence \times CBQ \times CCNES	.023	1	.880

Note. This analysis was conducted using only data from the Neutral Control Group. Omnibus model effects are from analyses using only the original (not imputed) dataset because omnibus model effects are not able to be calculated using the pooled imputed datasets. Wald chi-square statistics were tested using Type III sum of squares approach, two-tailed. GEE = generalized estimating equations.

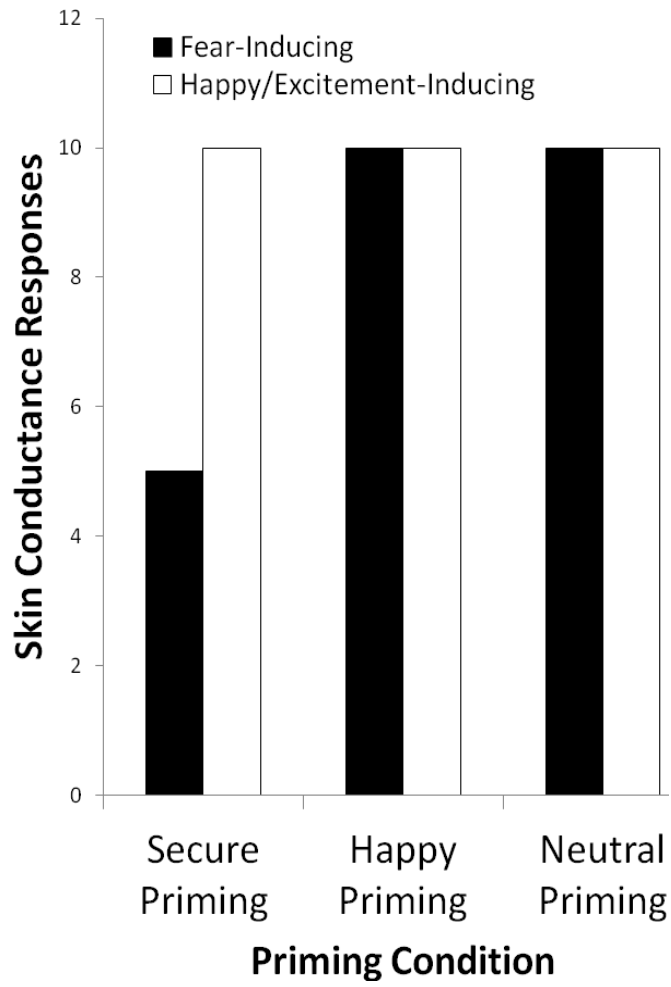


Figure 1. Depiction of Hypothesis 1.

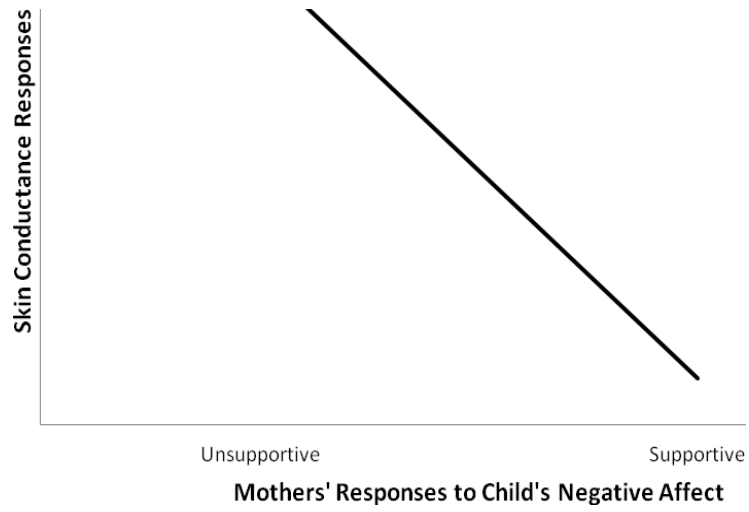
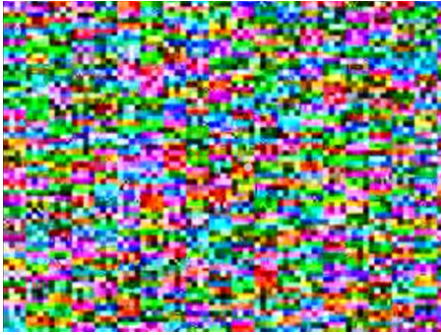


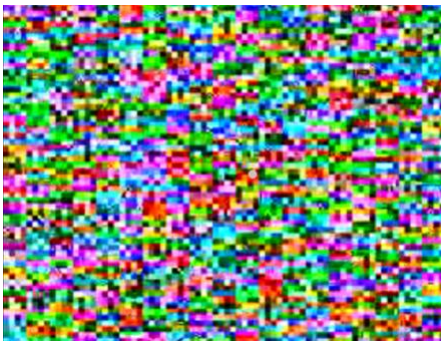
Figure 2. Depiction of Hypothesis 2.



Mask (500 ms)



Prime (24 ms)



Mask (500 ms)



Cover Picture (until response)

Figure 3. Depiction of a trial of the computer game.

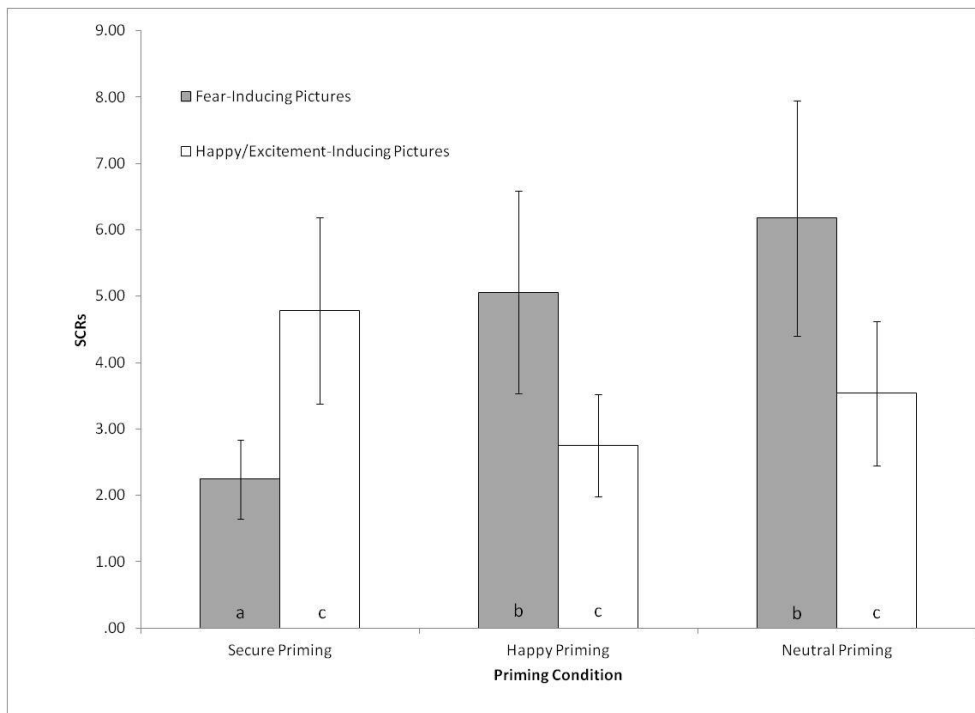


Figure 4. Children’s skin conductance responses as a function of their priming condition and the picture valence. Within each picture valence, bars with different subscripts differ significantly from each other. Within each condition, bars with different subscripts differ significantly from each other.

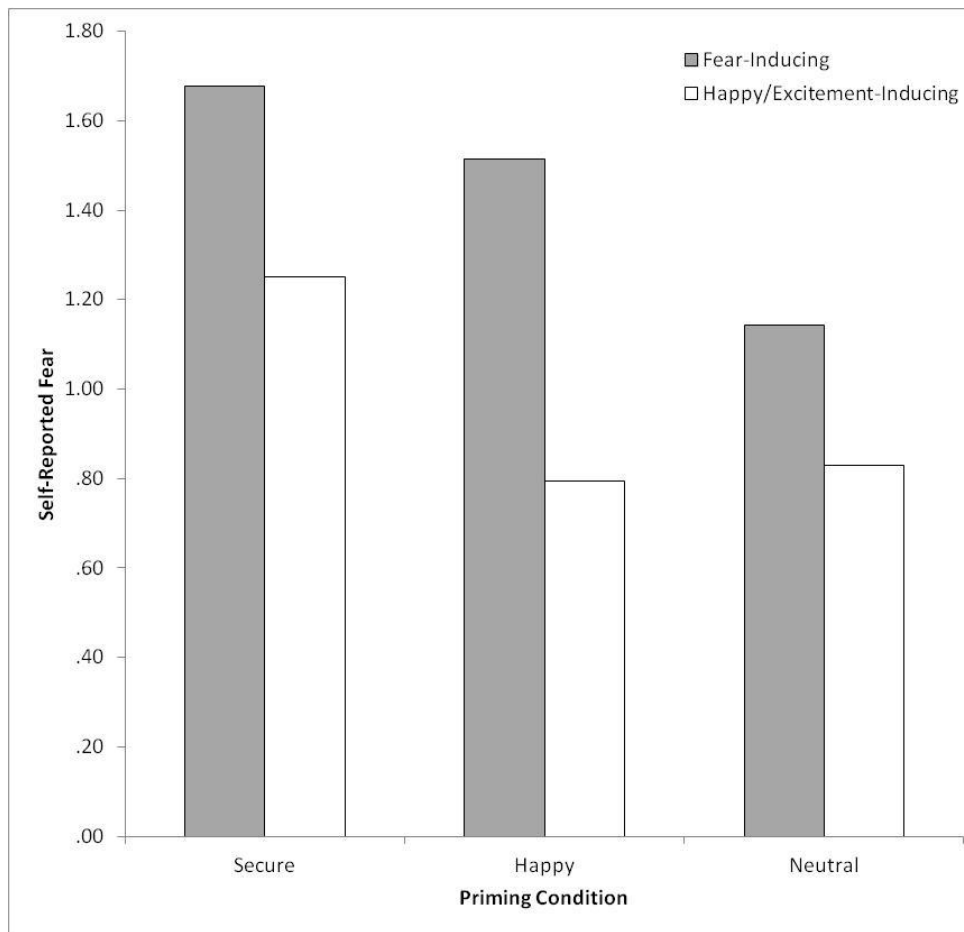


Figure 5. Children's self-reported fear as a function of their priming condition and the picture valence.

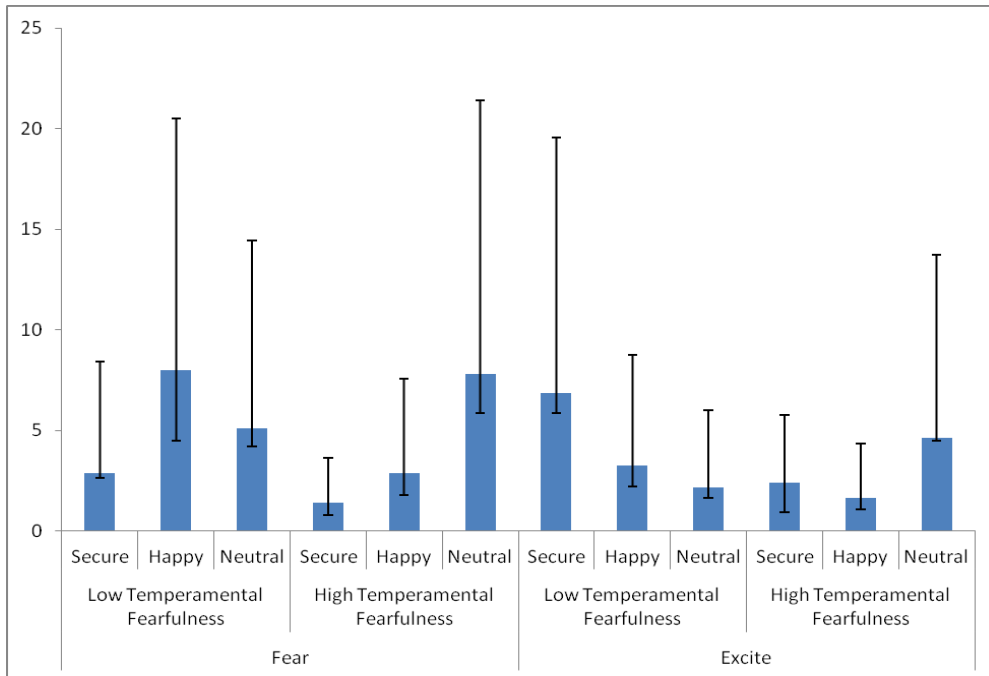


Figure 6. Children's SCRs as a function of temperamental fearfulness, condition, and picture valence.

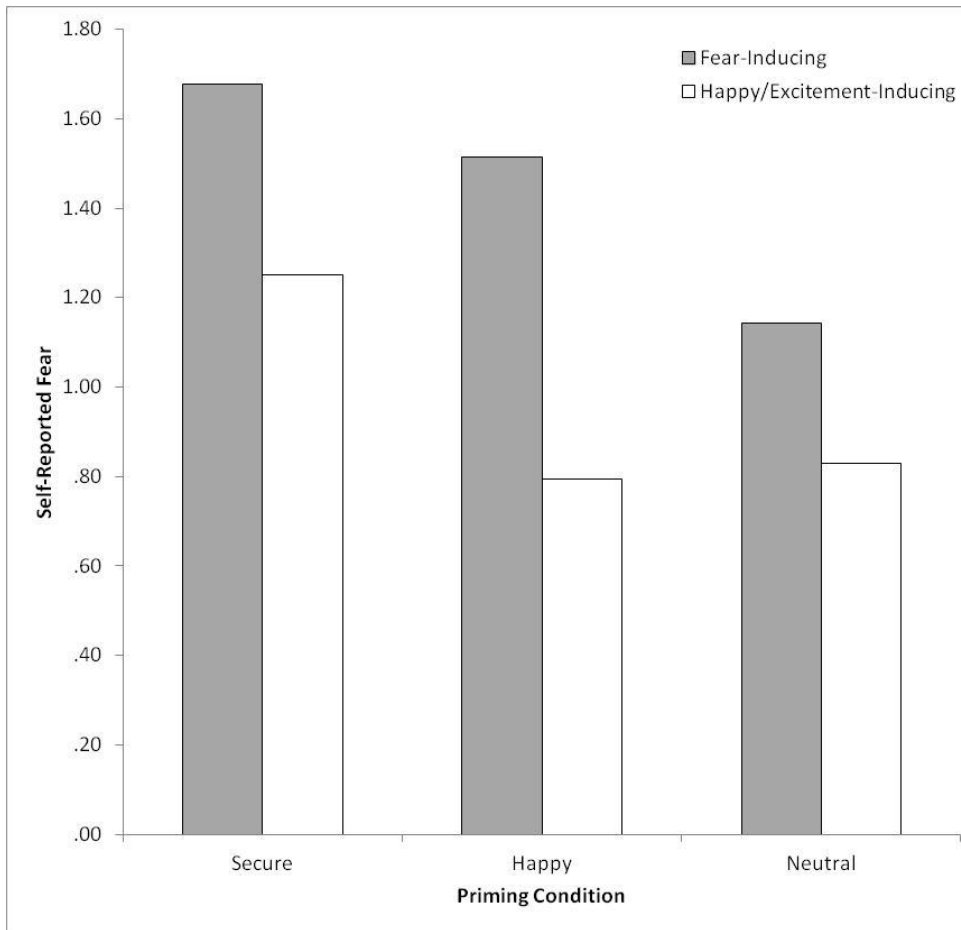


Figure 7. Children's self-reported fear as a function of their priming condition and the picture valence.

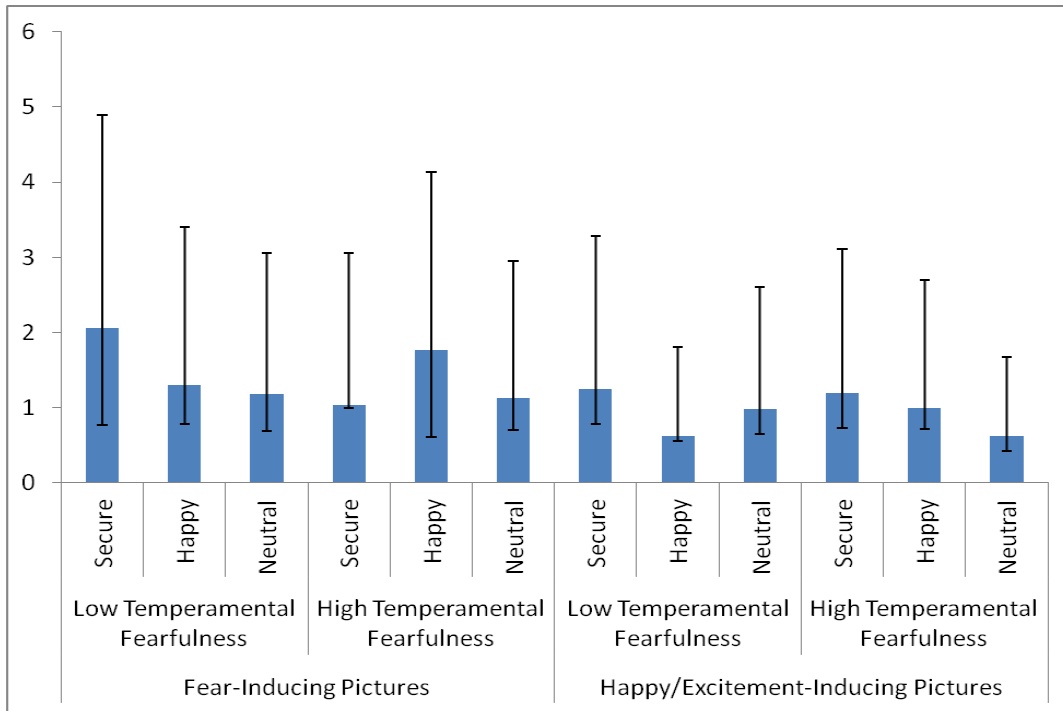


Figure 8. Children's self-reported fear as a function of temperamental fearfulness, condition, and picture valence.

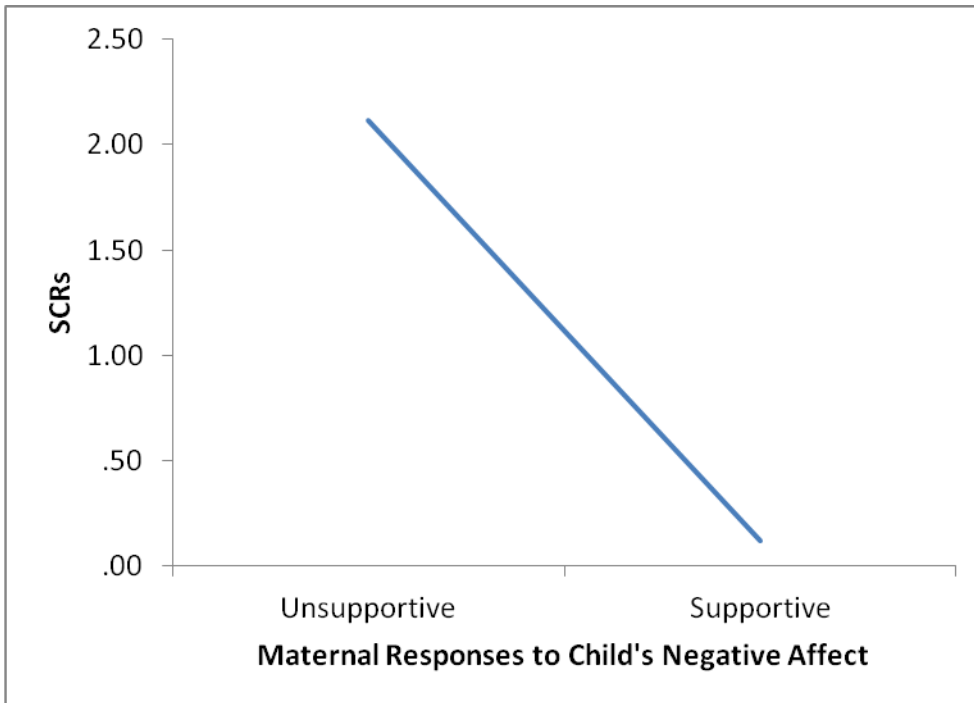


Figure 9. Children's SCRs as a function of maternal responses to child's negative affect.

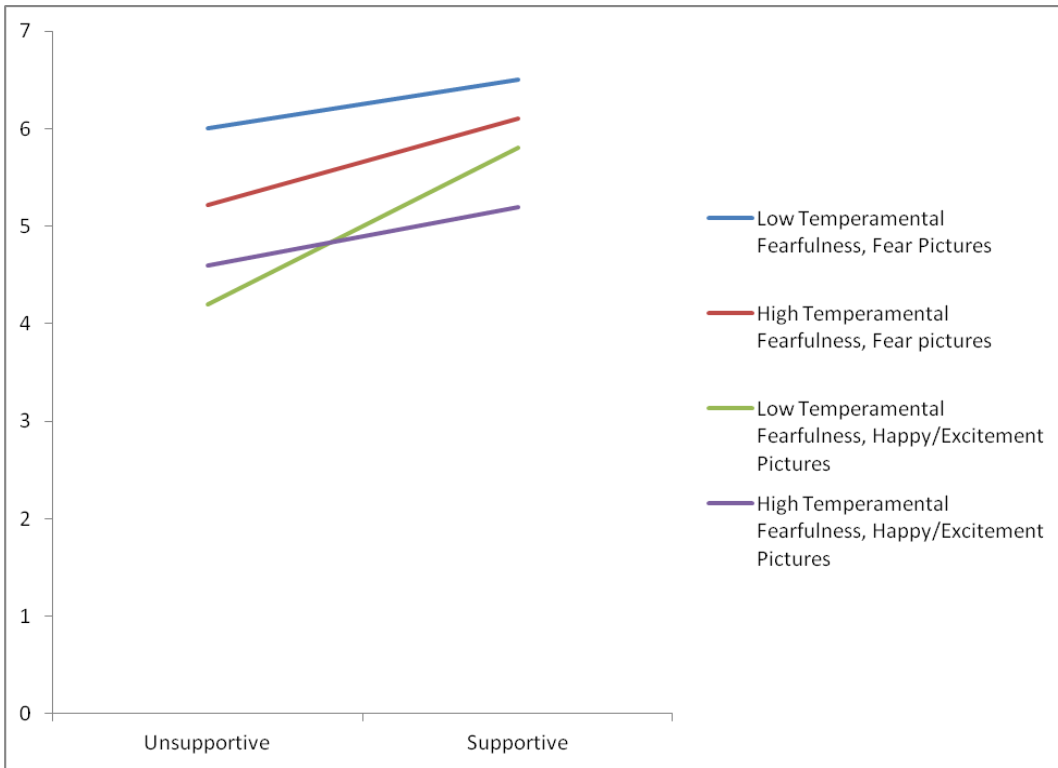


Figure 10. Children's SCRs as a function of maternal responses to negative affect and child temperamental fearfulness.

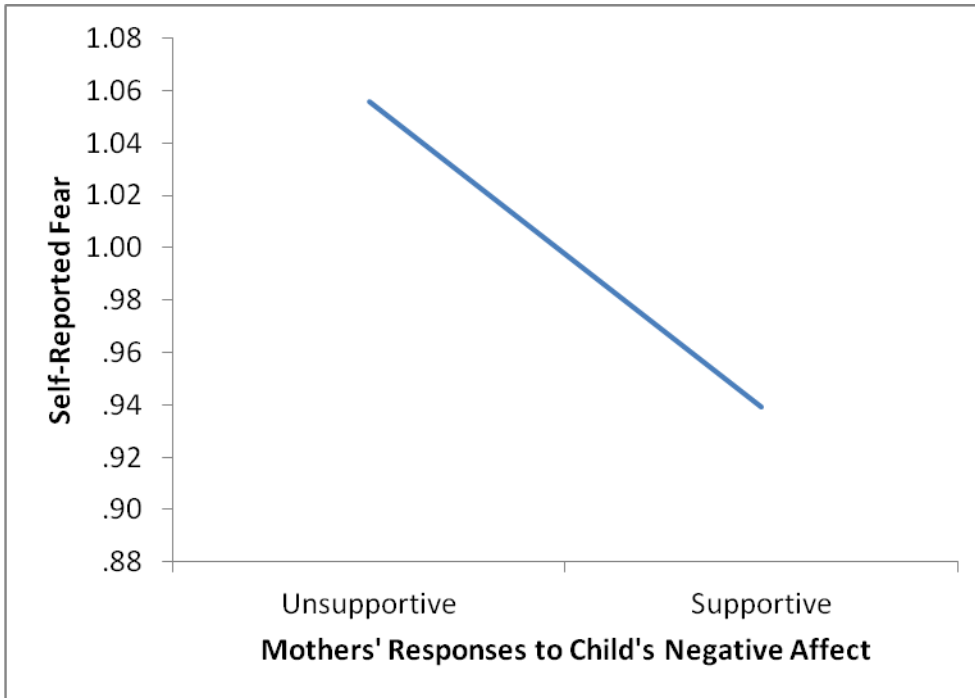


Figure 11. Children's self-reported fear as a function of maternal responses to child's negative affect.

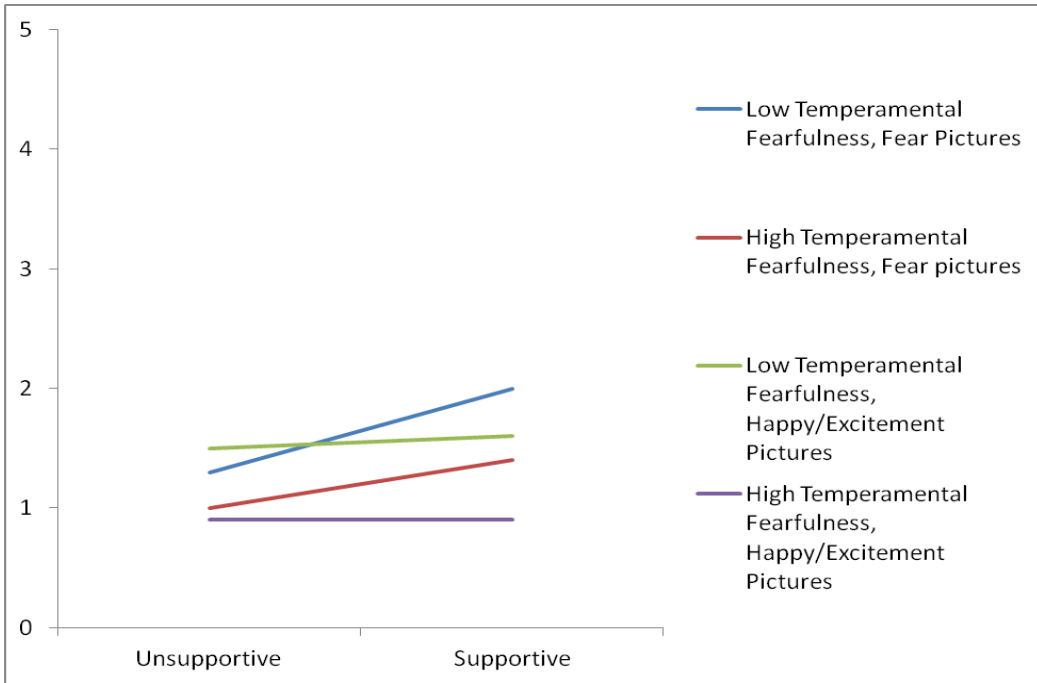


Figure 12. Children’s self-reported fear as a function of maternal responses to child’s negative affect and child temperamental fearfulness.

Appendices

Appendix A.

Recruitment Flyer



Are you the mother of a 6-7 year old child?

The Maryland Child & Family Development Laboratory at the University of Maryland is looking for 6- to 7-year-old children and their mothers to participate in a study about social and emotional experiences.

Participation requires one 2-hour visit to the University of Maryland campus in College Park.

- ✓ Interesting and Educational
- ✓ Flexible Scheduling, including evenings and weekends
- ✓ Free Parking Provided
- ✓ Receive a picture of you and your child in the study
- ✓ Children receive a certificate of participation

E-mail, call, or go to our website if you are interested:

mdchildfamilylab@gmail.com

301-405-0009

www.cassidylab.org

Tell a friend too!

Appendix B.

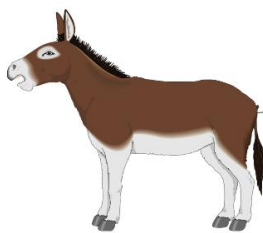
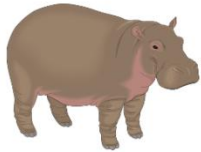
Table of Participant Identification Numbers Randomly Assigned to Each Condition

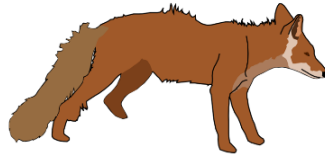
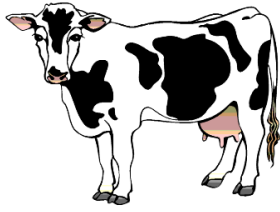
(*N* = 90)

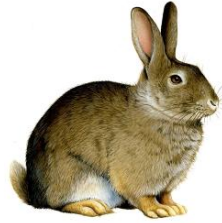
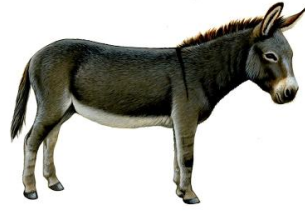
Security Condition (<i>n</i> = 30)	Happy Control Condition (<i>n</i> = 30)	Neutral Control Condition (<i>n</i> = 30)
3	2	1
6	4	5
11	8	7
14	10	9
17	13	12
20	16	15
22	19	18
24	23	21
28	25	26
31	29	27
35	30	32
36	34	33
41	37	38
43	39	40
45	44	42
48	46	47
52	49	50
54	53	51
58	55	56
59	57	60
61	62	63
65	64	67
68	66	71
69	70	74
73	72	75
76	77	79
80	78	82
81	83	84
85	88	86
87	90	89

Appendix C.

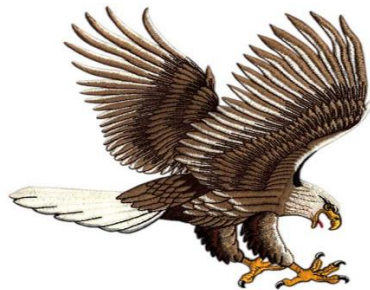
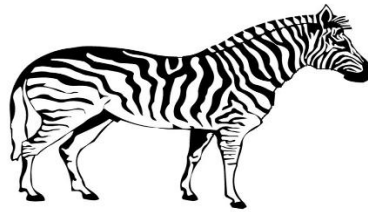
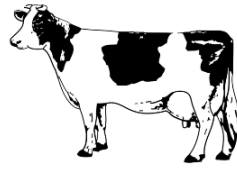
Cover Pictures for Computer Game





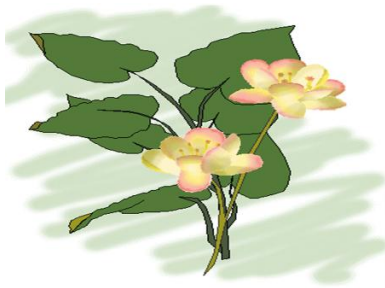










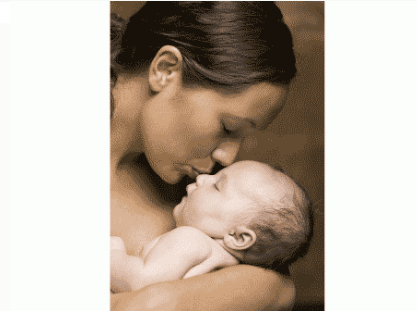
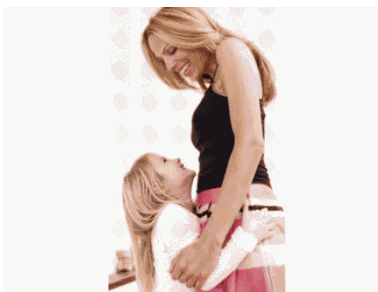




Appendix D.

Security Priming Stimuli for Computer Game









Appendix E.

List of Happy Photographic BARTA Pictures Used for Happy Control Priming

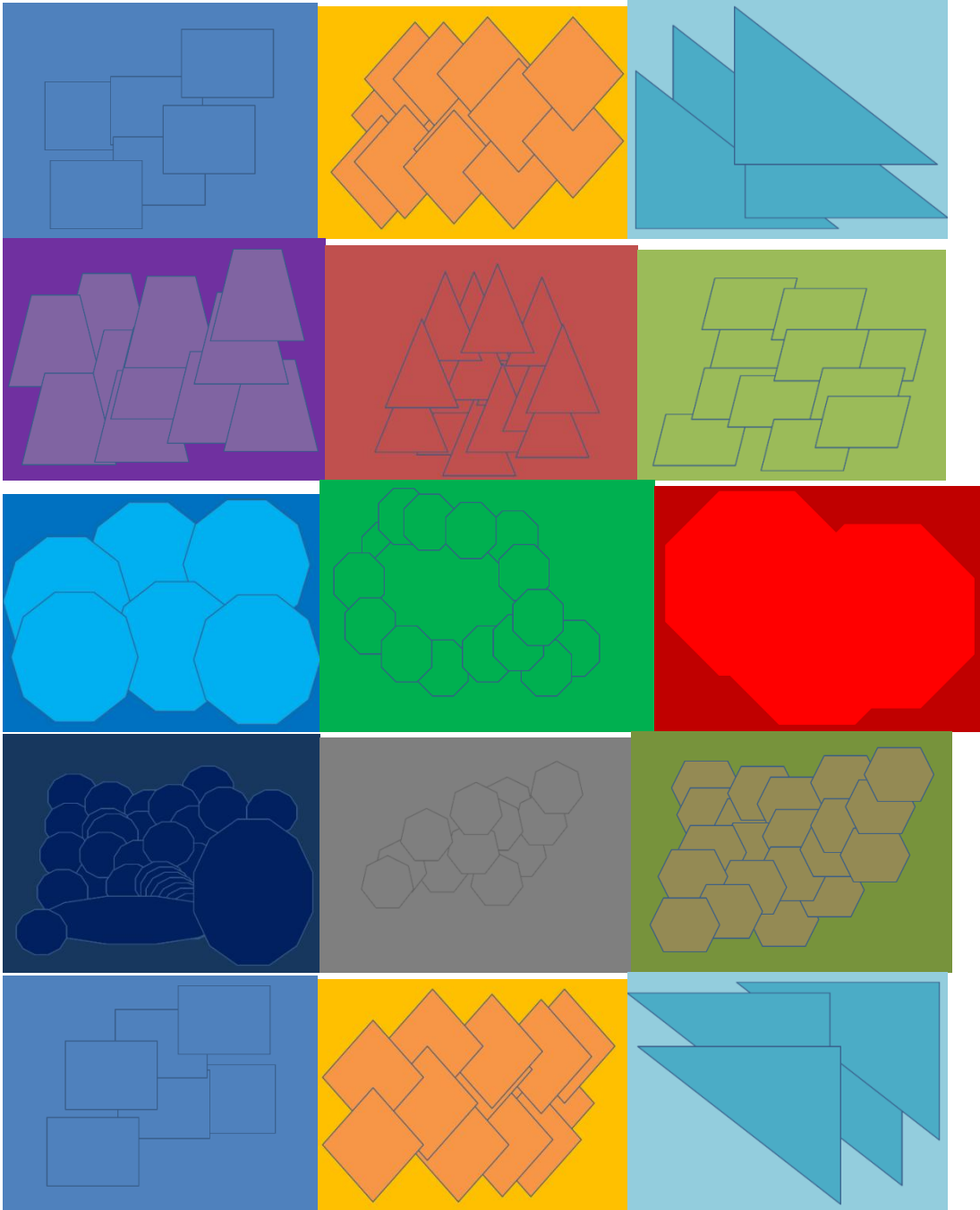
Condition and Pictures Examples

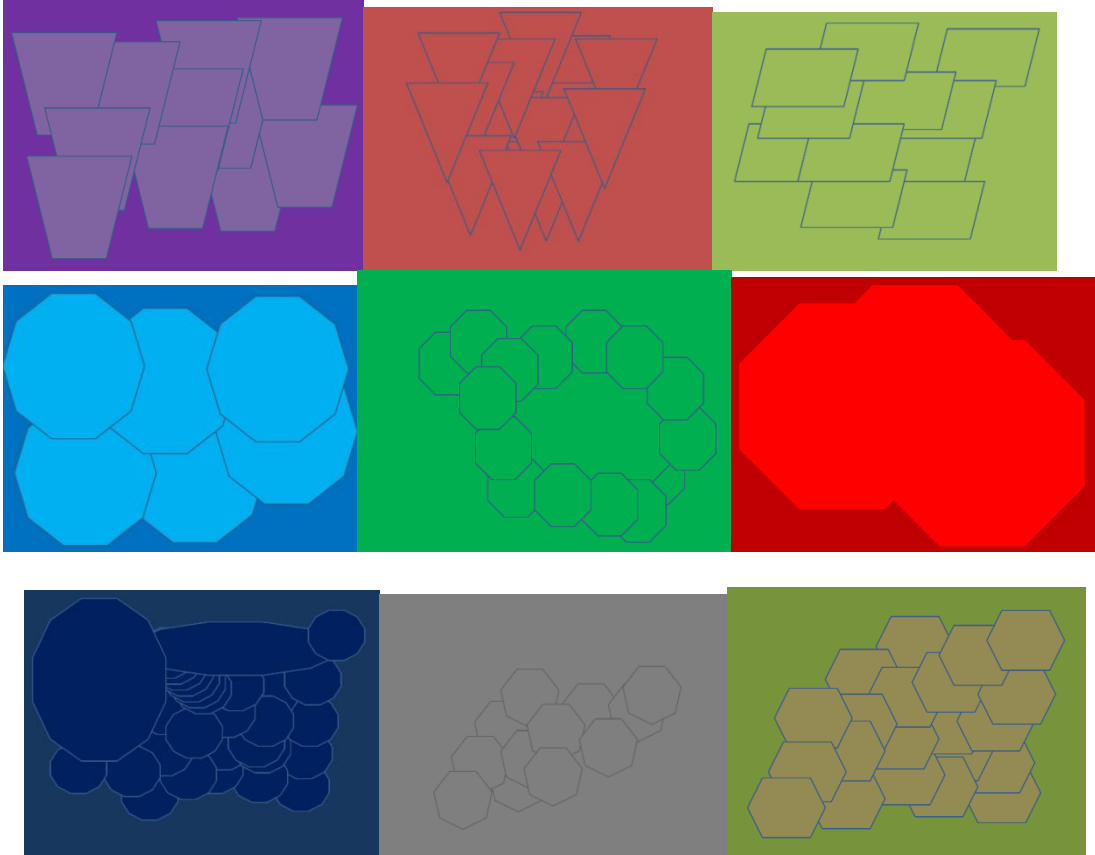
Mandy, Jaz ,Diana ,Sammy, Howler, Norm, Buddy, Milo, Bert, Lady, Paul, Amy,
Bob, Cal, Stefan, Charlie, Ben, Emma, Sue, Sal, Sam, Kay, Claire, Jack, Bob, Mike



Appendix F.

Neutral Control Priming Pictures





Appendix G.

Institutional Review Board Letter of Approval

IRB Renewal Approval

2 messages

University of Maryland IRB <no-reply@umresearch.umd.edu>

Sun, Dec 18, 2011 at 3:17 PM

To: Brandi Shawn Stupica <bstupica@umd.edu>, Jude Anne Cassidy <jcassidy@umd.edu>



Renewal Application Approval

DO NOT REPLY TO THIS EMAIL ADDRESS AS IT IS UNMONITORED

To: Principal Investigator, Dr. Jude Anne Cassidy, Psychology
Student, Brandi Stupica, Psychology

From: James M. Hagberg
IRB Co-Chair
University of Maryland College Park

Re: IRB Protocol: 11-0014 - Mothers' and children's responses to social and emotional experiences

Approval Date: December 18, 2011

Expiration Date: January 11, 2013

Application: Renewal

Review Path: Expedited

The University of Maryland, College Park Institutional Review Board (IRB) Office approved your Renewal IRB Application. This transaction was approved in accordance with the University's IRB policies and procedures and 45 CFR 46, the Federal Policy for the Protection of Human Subjects. Please reference the above-cited IRB Protocol number in any future communications with our office regarding this research.

Recruitment/Consent: For research requiring written informed consent, the IRB-approved and stamped informed consent document will be sent via mail. The IRB approval expiration date has been stamped on the informed consent document. Please note that research participants must sign a stamped version of the informed consent form and receive a copy.

Continuing Review: If you intend to continue to collect data from human subjects or to analyze private, identifiable data collected from human subjects, beyond the expiration date of this protocol, you must [submit a Renewal Application](#) to the IRB Office 45 days prior to the expiration date. If IRB Approval of your protocol expires, all human subject research activities including enrollment of new subjects, data collection and analysis of identifiable, private information must cease until the Renewal Application is approved. If work on the human subject portion of your project is complete and you wish to close the protocol, please [submit a Closure Report](#) to irb@umd.edu.

Modifications: Any changes to the approved protocol must be approved by the IRB before the change is implemented, except when a change is necessary to eliminate an apparent immediate hazard to the subjects. If you would like to modify an approved protocol, please [submit an Addendum request](#) to the IRB Office.

Unanticipated Problems Involving Risks: You must promptly report any unanticipated problems involving risks to subjects or others to the IRB Manager at [301-405-0678](tel:301-405-0678) or jsmith@umresearch.umd.edu

Additional Information: Please contact the IRB Office at [301-405-4212](tel:301-405-4212) if you have any IRB-related questions or

concerns. Email: irb@umd.edu

The UMCP IRB is organized and operated according to guidelines of the United States Office for Human Research Protections and the United States Code of Federal Regulations and operates under Federal Wide Assurance No. FWA00005856.

1204 Marie Mount Hall
College Park, MD 20742-5125
TEL [301.405.4212](tel:301.405.4212)
FAX [301.314.1475](tel:301.314.1475)
irb@umd.edu
<http://www.umresearch.umd.edu/IRB>

Appendix H.

Informed Consent Form Approved by the Institutional Review Board

University of Maryland College Park

Page 1 of 4

Initials _____ Date _____

Project Title	<i>Mothers' and children's responses to social and emotional experiences</i>
Purpose of the Study	This research is being conducted by Jude Cassidy and Brandi Stupica at the University of Maryland, College Park. We are inviting you and your child to participate in this research project because you have a 6-7 year old child. We are interested in learning about mother-child relationships and how mothers and their children respond to social and emotional experiences.
Procedures	<p>The procedures involve attaching monitors to you and your child to measure your physical reactions to various tasks. We will attach small monitors to two of your fingers and two of your child's fingers. We will place a small amount of gel on these monitors before we attach them to your fingers using elastic Velcro and tape. We will also place a small monitor on each of your collarbones and on each of your child's collarbones using tape. We will also place a monitor around your chest and your child's chest over your clothes with an elastic Velcro strap.</p> <p>After we place the monitors on you and your child, you and your child separately will complete several tasks in different rooms of the lab. You will create stories from word sets, watch videos of crying infants and answer questions about these videos, play a game on the computer, and answer questions about yourself and your child.</p> <p>Your child will watch several picture presentations and answer questions about the pictures. The pictures will be of things that can be exciting (like roller coasters, sports cars, or fireworks), things that can be scary (like snakes, spiders, or barking dogs), and things that can be calming (like flowers and nature scenes). Your child will also complete stories from a set of story stems, and answer some questions about themselves and how they feel. You and your child will take a short break together about half-way through the lab visit.</p> <p>While your child is looking at the picture presentations, your child will be shown pictures of children with their parents, people smiling, or shapes. These pictures will be presented for less than a quarter of a second, which is too quickly for your child to be aware of them.</p> <p>You and your child will be videotaped and audiotaped during the lab visit. These video and audio recordings are being made so we can measure behavior later.</p>
Potential Risks and Discomforts	<p>There may be some risks from participating in this research study.</p> <p>We are using a hypoallergenic gel and tape to attach the monitors, but because about 2 % of people react to any adhesives and gels put on their</p>

University of Maryland College Park

	<p>skin, you or your child's skin may react to the gel and/or tape adhesive. If you or your child experience any physical discomfort caused by the monitors or react to the gel or tape, tell the experimenter who will help remove them. If you or your child feels it necessary to take off the monitors for any reason you or your child are free to do so at any time without penalty.</p> <p>You or your child may feel uncomfortable or frustrated during some of the activities you will be doing. If you decide to participate in this research, you may stop participating at any time without penalty. We will be showing your child pictures that may be scary, such as snakes, spiders, and barking dogs. Your child may get nervous or anxious while looking at these pictures. You and your child can withdraw from the study at any time without penalty.</p> <p>The entire lab visit will last about an hour. You and your child will be videotaped and audiotaped during the lab visit. These video and audio recordings are being made so we can measure behavior later. Only the research staff will see these videos unless you give separate permission below for these video and audio recordings of you and your child to be shown for educational purposes.</p>
Potential Benefits	<p>This research is not designed to help you or your child personally, but the results may help the investigator learn more about mother-child relationships and how mothers and their children react to social and emotional events.</p>
Confidentiality	<p>Any potential loss of confidentiality will be minimized by storing data, including audio and video, in a locked office and on password-protected computers. Your names will never be used to identify your materials. We will assign a numerical code to identify your materials and your child's materials. If we write a report or an article about this research project, your identity and your child's identity will be protected to the maximum extent possible. Your information and your child's information may be shared with representatives of the University of Maryland, College Park, or governmental authorities if you or someone else is in danger or if we are required to do so by law.</p>
Medical Treatment	<p>The University of Maryland does not provide any medical, hospitalization or other insurance for participants in this research study, nor will the University of Maryland provide any medical treatment or compensation for any injury sustained as a result of participation in this research study, except as required by law.</p>
Right to Withdraw and Questions	<p>Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you or your child may stop participating at any time. If you decide not to participate in this study or if you stop participating or your child stops participating at any time, you and your child will not be penalized or lose any benefits to which you otherwise qualify.</p>

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	<p>If you or your child decide to stop taking part in the study, have questions, concerns, or complaints, or need to report an injury related to the research, please contact Brandi Stupica, Graduate Researcher at: Department of Psychology, University of Maryland, College Park, MD 20742, 301-405-0009, bstupica@psyc.umd.edu or the investigator, Jude Cassidy at jcassidy@psyc.umd.edu.</p>
<p>Participant Rights</p>	<p>If you or your child have questions about your rights as a research participant or wish to report a research-related injury, please contact:</p> <p align="center"> University of Maryland College Park Institutional Review Board Office 0101 Lee Building College Park, Maryland, 20742 E-mail: irb@umd.edu Telephone: 301-405-0678 </p> <p>This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.</p>
<p>Video and Audio Consent for Educational Purposes</p>	<p>By participating in this study, you agree to allow us to videotape and audiotape you and your child during your visit today so that research staff can measure behavior later. We now request permission to present the information that we gather from you and your child during your visit today for educational purposes, including the video and audio recordings of you and your child. Sometimes we use these materials to educate other researchers and students, as in a classroom or at professional meetings.</p> <p>This consent does not affect you or your child's participation in the study. You may choose to allow us to present these materials or not. We will never use your names or any identifying information when we present these materials. There is a risk that someone you know or someone your child knows will view the video or will hear the audio and will recognize you or your child. Please indicate whether you give permission for the information that we gather from you and your child during your visit today (including the video and audio recordings of you and your child) to be presented for educational purposes by selecting the appropriate statement below.</p> <p>_____ <i>I give my permission for the information that is collected today about me and my child, including video and audio recordings of me and my child, to be presented for educational purposes.</i></p> <p>_____ <i>I do not give my permission for the information that is collected today about me and my child, including video and audio recordings of me and my child, to be presented for educational purposes.</i></p>

University of Maryland College Park

Consent for Future Contact	We now request permission to contact you in the future. We may contact you about other research studies. _____ <i>I agree to be contacted in the future.</i> _____ <i>I do not agree to be contacted in the future.</i>
Statement of Consent	Your signature indicates that: (1) you are at least 18 years of age; (2) you have read this consent form or have had it read to you; (3) your questions have been answered to your satisfaction; (4) you voluntarily agree to participate in this research study; (5) you give permission for your child to participate in this research study; (5) you agree that you and your child can be video and audio recorded for research purposes. You will receive a copy of this signed consent form. If you agree to participate and you give permission for your child to participate in this research study, please sign your name and print your child's name below. YOUR SIGNATURE _____ Date _____ YOUR NAME (PRINT) _____ YOUR CHILD'S NAME (PRINT) _____



Appendix I.

Child Experimenter Script

1st task: Story table

FROG, WHERE ARE YOU?

Look what I have here. [*Show child the book “Frog, Where Are You?”*] **Come sit here so I can show you.** [*Motion for child to sit at the story telling table in the chair that faces the camera.*]

It’s a picture book. It’s called, “Frog, where are you?” Let’s look at the pictures together.

Look at the cover of this book. [*Wait 5-10 seconds for the child to look at the cover.*]

I have an idea. Let’s look at all the pictures together and then you tell me a story about the pictures.

Okay, this first time, we’re just going to look at all the pictures. [*Open the book to the first picture. Hold the book open so that your hands do not cover the pictures.*]

Look at this picture. [*Draw the child’s attention to the picture by circling the page with your finger. Allow about 5–10 s for the child to look at each page before turning to the next page.*]

If it seems that the child is off task or not looking at both pages of the book, you may prompt the child by saying: “Look at this page” or “Now look at this one.” Do not comment about the pictures in any way. If the child offers comments or asks questions, gently remind him/her that you are just looking at the pictures now, and he/she can tell the story the next time you look at the book.

[*When you reach the end of the book, close the book and hand it to the child.*] **Now I want you to tell me a story using the pictures in this book. Make up a story for me that tells me about the pictures in this book. Try to make the story as long as you can. Use the pictures in this book to tell me a story.**

If the child is hesitant to tell a story, or tells you “I don’t know how to read,” you may prompt the child by saying: “This book doesn’t have any words in it, so you can tell any story you want about the pictures. Tell me a story about the pictures”

During the story production, you may provide prompts such as: “Tell me about this page or “What about this page?”

As the child produces a story, you may also repeat exactly what the child says about a picture. This provides an acknowledgement to the child that you are listening, and also will help future coders to understand an utterance that may be unintelligible on video/audio. Do not change what the child says in your repetition, even if there are errors. For example, if the child says “Frog goed in the water,” you repeat “Frog goed in the water.” Do not correct the utterance (e.g., Do NOT say, “Frog went in the water.”).

[*At the end of the book, say*] **Is there anything else you want to add to your story?**

2nd task: Resting chair

REST PERIOD

Okay, good job. Now, you get to sit in the orange circle chair. *[Wait for the child to sit in the resting chair.]*

All settled? For this next part I need you to sit in the orange circle chair with your eyes closed as still and as quiet as you can for two whole minutes. While your eyes are closed and you are resting quietly, I will be watching this timer *[show child the timer]* to know when two minutes have passed. For the two minutes that I am watching the timer, close your eyes and think about your breathing and how your body sinks into the circle chair. This timer beeps to let you know the time starts and stops.

Let's set it for exactly two minutes. Press the 2, now press the zero, and the zero one more time. Good! When I press this start button to start the time, you will hear a beep just like the beeps it made when you pressed the numbers to set it. When you hear the beep I need you to close your eyes and rest. When you hear the second beep, the two minutes is over and you can open your eyes and move again.

What are you going to do when you hear the first beep? Right! You are going to stay very, very still and quiet and close your eyes and think about your breathing and your body sinking into the chair.

What am I going to be doing while you have your eyes closed? Right! I'm going to be watching the timer.

What happens when you hear the second beep? Right! You open your eyes. Are you ready?" *[Wait for the child's response.]*

Okay, when you hear the beep close your eyes and just rest here quietly until the time is up. *[Sit down and watch the child and the clock.]*

If the child opens his or her eyes, is squirmy or wiggly, or talks, gently remind him/her to keep his/her eyes shut and to sit quietly.

[After the timer beeps] **Okay. Good job. You can open your eyes. It's been two minutes.** *[Wait for child to open his/her eyes.]*

Let's stand up and stretch for a moment.

[Stand up and stretch a little. While the child is still standing, say]

3rd task: Story table

STORY TELLING WITH DOLLS

Our next activity is going to be at the story telling table again. *[Sit down at the table.]* **Come sit here at the table so I can show you what I have.** *[Motion for the child to sit at the story telling table in the chair that faces the camera. Wait for the child to sit. Get the set of dolls that match the child's sex.]*

I have some dolls that I'd like us to play with together. *[Set up "Janie/Bobby Goes to School," which is the practice story.]*

Let's play a story telling game – I'm going to tell just the very beginning of the story, and your job is to finish the whole big story.

What am I going to do? Right! I'm just going to start the story.

And, what's your job? Right! Your job is to tell me the whole big story.

Let's start. I'm going to start this story. *[Starting with the Janie/Bobby doll, say]*

Okay, this story is called, "Janie [Bobby] Goes to School."

This is Janie [Bobby]. Let's imagine that she [He] has just grabbed her [his] backpack and her [his] lunchbox and has said goodbye to her [his] mom and dad. Now she [He] is waiting for her school bus.

[Bring on school bus.] The school bus is here!

[In an inviting tone of voice, say] **That was just the very beginning of the story. Now you tell me the rest of the story.** *[Let the child hold the doll(s).]*

If the child does not tell a story, ask the child "Can you tell me a story about what happens next?" If the child still does not tell a story, tell a story yourself to demonstrate to the child what to do.

If the child does not address the issue in his or her story, ask the child about it (e.g., the hurt knee, creepy noise, etc. For example, ask the child, "What about the hurt knee?"

If the child uses ambiguous language (e.g., child says, "His knee was bandaged," or says, "She said hello."), ask the child, "Who put the Band-Aid on?" or "Who said hello?"

If the child gives only one response, elicit more elaboration by asking, "Anything else?", "What else?", or "Then what?" unless the child indicated by speech or action that the story was finished (For example, the child says, "The end.").

To verify what the child says and get the child to elaborate, you can repeat what the child says in question form. For example, "The teacher wrote on the chalkboard? And, then what?"

If the child seems to have finished, or becomes repetitive, say: "All done?" or "Let's try another," or "Let's put this book away and get the next book."

[After the child has finished telling the story, say] **Okay, let's put this scene away and set up a new one.**

[Put away the old props and get out, "Janie/Bobby Hurts Her [His] Knee" props.]

This story is called, "Janie/Bobby Hurts Her [His] Knee."

[Set up the yard scene.] **Which one of these do you think is Janie/Bobby? Right!**

This is Janie/Bobby. She [he] is in the backyard with her/his mom and dad. This is Janie/Bobby's dad. Janie/Bobby's dad is raking leaves. This is Janie/Bobby's mom. Janie/Bobby's mom is watering the flowers. Janie/Bobby is running to the swing set. She [he] is going to swing on her swing set.

Uh oh! Janie/Bobby tripped over a rock while she [he] was running. She [he] fell and hurt her [his] knee! "Ouch!"

That was just the very beginning of the story. Now you tell me the rest of the story. *[Let the child hold the doll(s).]*

[After the child has finished telling the story, say] **Okay, let's get out a new scene.**

[Put away the props, and get out "Janie/Bobby Hears a Scary Noise" props.]

This story is called, "Janie/Bobby Hears a Scary Noise."

[Set up the bedroom props.] **This is Janie/Bobby. This is Janie/Bobby's bedroom.**

It is nighttime. Imagine it's dark outside and the moon is out. What is Janie/Bobby doing? Right! Janie/Bobby is asleep in her [his] bed.

[Sit the doll upright. Gasp a little before you say,] **Janie/Bobby woke up because she [he] heard a scary noise!**

That was just the very beginning of the story. Now you tell me the rest of the story.

[After the child has finished telling the story, say] **Okay, let's put this away and I'll get out a different scene.**

[Put away the old props and get out, "Janie/Bobby's Painting Gets Wet" props.]

This story is called, "Janie/Bobby's Painting Gets Wet."

[Set up the kitchen scene.] **This is Janie/Bobby. She [He] is in the kitchen at the table. These are Janie/Bobby's parents. Janie/Bobby's mom and dad are washing the dishes. Janie/Bobby just finished painting this picture that's here on the table. She [He] is really proud of her [his] picture. Of all of the pictures that Janie/Bobby has painted, this picture is her [his] favorite.**

Oh no! As Janie/Bobby was getting up from the table, the glass of water suddenly spilled *all over* her [his] painting! "Oh no!"

That was just the very beginning of the story. You tell me what happens now.

[After the child has finished telling the story, say] **Okay, let's put this away and get out something new.**

[Put away the old props and get out, "Janie/Bobby Gets Lost" props.]

This story is called, "Janie/Bobby Gets Lost."

[Set up the store scene.] **This is Janie/Bobby. This is Janie/Bobby's mom.**

Janie/Bobby is at the store with her/his mom. They say hello to the lady who runs the store, who Janie/Bobby knows because she's their neighbor.

Janie/Bobby is walking behind her mom and looking at all of the different things on the shelves.

"Oh no!" says Janie/Bobby. Janie/Bobby is all by her/himself! Janie/Bobby doesn't see her/his mom *anywhere*!

Now you tell me the rest of the story.

[Now use the counter prop, to provide a more specific scenario.]

Let's tell the story with more details about what happens when "Janie finds her mom."

[Reintroduce elderly female neighbor to the scene.] **The store manager is helping Janie/Bobby find her [his] mom. They walk to the front of the store so they can call for Janie/Bobby's mom on the loudspeakers. When Janie/Bobby and the manager get to the front of the store, they see a woman standing by the counter. When the woman turns around, Jane/Bobby sees that it is her/his mother!**

Now you tell me the rest of the story. What do Janie/Bobby and her/his mom say to each other?

Okay, good job. We're all done with the dolls. Let's stand up and stretch a little bit before we play our next game. *[Stand up and stretch a little with the child.]*

4th task: Computer table

EMOTIONS LABELING TASK

[Prior to child's arrival, select sex of child on computer.]

Our next activity is at the computer table. You sit here and I'll sit here. *[Motion for the child to sit in the chair that faces the monitor].* **We're going to play the faces game.**

For the faces game, I'm going to show you some pictures of a little girl [boy] who is a little bit older than you. In each picture the girl [boy] has a different feeling. After I show you each picture, your job is to tell me how the girl [boy] in the picture is feeling. When I press the button, the first picture will come up. Do you remember what you are going to do when you see the first picture? Right! You are going to say how the girl/boy is feeling.

[Click start] **Look, here's the first picture. How does the girl [boy] in this picture feel?**

[If the child labels the picture correctly the first time, say,] **"That's right. Let's look at the next picture."** *[Press 1. Correct responses are below (accept derivations of these words).]*

<i>Fear</i>	<i>Happy</i>	<i>Sad</i>	<i>Angry</i>	<i>Surprised</i>
fear	happy	sad	angry	surprise
afraid	glad		mad	
anxious	joy			
scared	pleased			
nervous				
frightened				

If the child doesn't label the picture correctly:

1. Provide the child with the correct label. For example, for the fear picture the child says happy, say, "Not quite [You are close, but]. This boy is feeling scared."
2. Point out the facial features that define that emotion. For example, for the fear picture say, "See how his teeth are clenched and his lips are turned down?"
3. Provide the child with a scenario that would elicit that emotion. For example, for the fear picture, say, "Maybe he is scared because he saw something scary that frightened him."
4. Ask the child to label the expression again. For example, "How does this boy in the picture feel?"

Examples for each picture of what to say to children when children respond incorrectly are below.

Fear: "Not quite. This boy is feeling scared. See how his teeth are clenched and his lips are turned down? (alt., See how his eyebrows are pushed together and his teeth are clenched?) Maybe he is scared because he saw something scary that frightened him. (alt., Maybe he is scared because he heard a loud, scary noise.)."

Sad: "Close, but this girl is sad. See how she is frowning? Maybe she sad because she lost her favorite toy (alt., Maybe she is sad because it's raining and she can't go outside and play.)."

Happy: “Very close, but this boy is happy. See how she is smiling? Maybe she is happy because she won a prize. (alt., Maybe she is happy because she got a present she really likes.)”

Anger: “Not quite. This girl is angry. See how her teeth are showing and her mouth is open? Maybe she is angry because something didn’t go her way (alt., Maybe she is mad because someone is teasing her.)”

Surprise: “Not quite. This boy is surprised. See how his eyes and mouth are open wide? Maybe he is feeling surprised because something happened suddenly (alt., Maybe he is feeling surprised because something unexpected happened.”

[If the child correctly labels the emotion the second time, say,] That’s right! [Press 2]

If the child doesn’t label the picture correctly the second time, repeat the process above.]

[If the child labels the picture correctly the third time, say,] That’s right! [Press 3]

If the child doesn’t label the picture correctly the third time, move on to the next picture by saying,] Let’s look at a different picture. [Press 0]

[The neutral picture will be displayed last. When the neutral picture comes up, say,] In this picture, the girl [boy] is neutral. She [He] doesn’t really have any of the feelings that we just talked about. She [He] is okay. She [He] doesn’t have any good or bad feelings. [Press enter on the keyboard when you are done explaining the neutral picture.]

[Next, a picture with six thermometers will come up. Label each thermometer for the child, pointing to the relevant thermometer as you explain,] This thermometer is empty. It means none. The thermometer has only a tiny bit; it means almost none or very, very little; this thermometer means a little bit; this one in the middle means medium; this one means a lot, and this one that is almost all the way to the top is the most full; it means very, very much or a whole, whole lot.

[Ask the child to repeat the labels by pointing to the thermometers starting on the far left,] What does this one mean? [If the child gets one wrong, give the child the correct label and move to the next one, but go back to ones the child missed and ask the child to label them again before proceeding. To proceed, press enter on the keyboard.]

Now let’s look at each face again and talk about it using the thermometers.

[Press enter]

[After the first face/thermometers combination picture appears] **Do you remember what this girl [boy] is feeling? Right!** [Point to empty thermometer.] **This thermometer means not [emotion; that is, happy, scared, surprised, sad, angry].** [Point to next thermometer.] **This thermometer has only a tiny amount, so it means a very, very little bit [emotion]. This thermometer is a little more full so it means a little bit [emotion]. This one means medium [emotion]. Do you know what this thermometer means? Right! It means very [emotion]. And, what does this thermometer mean? Right! It means very, very [emotion] or [emotion] a whole, whole lot.** [Continue through the pictures. Have the child try to generate answer him/herself first.]

Okay, we’re done looking at pictures on the computer for right now. We’ll use the computer again later.

HOW I FEEL

What we're going to do next is called "How I Feel". Here I have the same pictures that we were just looking at on the computer. This time, I want you to look at each picture and pick out the one(s) that show how you feel right now. There aren't any right or wrong answers. We just want to know how you are feeling right now. [Put away the images that the child doesn't select. Get out the thermometer card and the first emotion image that the child selected.] Now, can you point to the thermometer that matches how much you feel [happy/sad/angry etc.] right now?

[If child seems unclear, prompt with:] **Do you feel a little bit happy/scared/etc, or a lot happy/scared/etc?** [Pointing to the appropriate thermometer. If they have selected more than one emotion, repeat process with the subsequent emotions. Record responses on response sheet.]

[After the child is done, say,] **Okay, all done? Good. We're all done at the computer table for now. We'll go back to it in a little bit. Now I thought we would take a break and read in the resting chair.** [Direct the child to sit in the resting chair so that s/he is facing mom when she enters the room. After the child is engaged in the book, open the curtain to signal to Brandi that you are ready for mom to enter.]

.....

CHILD AND MOM TAKE A 3- TO 5-MINUTE BREAK TOGETHER

.....

5th Task: Computer Table

PICTURES AND COMPUTER GAME

Okay, it's time to put the book away now; will you put it back for me? [If the child helps, thank him or her.]

For our next activity, we're going to be at the computer table. Have a seat here, where you were before the break. I have some pictures I want to show you and a computer game that I want you to play.

NEUTRAL PICTURE SET (baseline)

First, I'm going to show you some pictures. Then, you are going to play a computer game. [Press enter. Neutral picture set 1 will play.]

HOW I FEEL (baseline)

[Take out the How I Feel worksheet] **Now I want to ask you, how did those pictures on the computer screen make you feel? I have the "How I Feel" photos like the ones from earlier that I'd like you to look at. Do you remember what you are supposed to do with the "How I Feel" sheet? ...Right! Now, can you point to the thermometer that matches how much the pictures made you feel [happy/sad/angry etc.]? [Repeat process for each emotion photo selected.] Thank you.**

COMPUTER GAME TRAINING AND PRACTICE

[After pictures are done playing and an X appears on the screen, say] **Now it's time to teach you how to play the computer game. The computer is going to pick pictures to show you. I need you to pay very close attention to the computer**

screen because I want you to look at the pictures on the computer screen and tell me if the thing in the picture is an animal or a plant as soon as the picture shows up on the screen.

If the picture is an animal, say **Animal!** If it's a plant, say **Plant!** So, as soon as you can after each picture you are going to say either **Animal!** or **Plant!**

What will you do after you see a picture? **Right!** You are going to say either **Animal!** Or **Plant!**

If you saw a picture of a cow, what would you say? ...**Right!** You would say **Animal!** As fast as you could because cows are animals.

If you saw a picture of a tomato plant, what would you say? ...**Right!** You would say **Plant!** As fast as you could because a tomato plant is a plant.

Let's do some for practice before you play the game.

Okay, look at the X on the screen and remember to watch the screen closely and say either Animal! or Plant! as quickly as you can. [Press enter].

[If the child gets it correct, say] That's right! [If the child gets it wrong explain the correct answer. There are 10 practice pictures. Press the enter key to proceed to the next practice picture. It is very important to make sure that the child is watching the screen very closely for each trial before proceeding to the study trials.]

Okay, good job. Now you are ready to play the computer game. This game is a fast game. It only lasts for two minutes, so it's very important that you watch the screen very closely the whole time. The goal is to say the right answer as fast as you can, so we shouldn't talk during the game other than when you say either Animal! Or Plant!

COMPUTER GAME 1

Okay, remember, watch the screen very closely and say either Animal! or say Plant! as soon as you can. Look at the X on the screen, ready, set, go! [Press enter].

[If the child says ANIMAL, press A. If the child says PLANT, press P. Make sure the child remains focused on the screen and stays on task. At the end of the game, the screen will say END COMPUTER GAME PART 1.]

PICTURE SET 1

[As soon as the instruction screen appears, say,] Now, you are going to look at some pictures. [Press Enter. Randomized picture set will play.]

[Take out the How I Feel worksheet] Now I want to ask you, how did those pictures on the computer screen make you feel? I have the "How I Feel" photos like the ones from earlier that I'd like you to look at. Do you remember what you are supposed to do with the "How I Feel" sheet? ...Right! Now, can you point to the thermometer that matches how much the pictures made you feel

[happy/sad/angry etc.]? [Repeat process for each emotion photo selected.] Thank you.

COMPUTER GAME 2

[After the randomized pictures are done playing, an X will appear on the screen. Prepare the child to play plant/animal game again.] Okay, now you are going to play another round of the computer game.

Do you remember how to play? *[Wait for child's response.]* **Right! You watch the screen very closely and you say 'Animal' if the picture is an animal or you say 'Plant' if the picture is a plant.**

Okay, remember to watch the screen very closely. Ready, set, go! *[Press enter].*
[If the child says ANIMAL, press A. If the child says PLANT, press P. Make sure the child remains focused on the screen and stays on task. At the end of the game, the screen will say END COMPUTER GAME PART 2.]

PICTURE SET 2

Okay, now I have some more pictures for you to look at on the computer. *[Press Enter. Randomized picture set 2 will play.]*

HOW I FEEL

[Take out the How I Feel worksheet] **Now I want to ask you, how did those pictures on the computer screen make you feel? I have the "How I Feel" photos like the ones from earlier that I'd like you to look at. Do you remember what you are supposed to do with the "How I Feel" sheet? ...Right! Now, can you point to the thermometer that matches how much the pictures made you feel**

[happy/sad/angry etc.]? [Repeat process for each emotion photo selected.] **Thank you.**

COMPUTER GAME 3

[After the randomized pictures are done playing, an X will appear on the screen. Prepare the child to play plant/animal game again.] **Okay, now you are going to play another round of the computer game.**

Do you remember how to play? *[Wait for child's response.]* **Right! You watch the screen very closely and you say 'Animal' if the picture is an animal or you say 'Plant' if the picture is a plant.**

Okay, remember to watch the screen very closely. Ready, set, go! *[Press enter].*
[If the child says ANIMAL, press A. If the child says PLANT, press P. Make sure the child remains focused on the screen and stays on task. At the end of the game, the screen will say END COMPUTER GAME PART 3.]

PICTURE SET 3

Okay, now I have some more pictures for you to look at on the computer. *[Press Enter. Randomized picture set 3 will play.]*

HOW I FEEL

[Take out the How I Feel worksheet] **Now I want to ask you, how did those pictures on the computer screen make you feel? I have the "How I Feel" photos like the ones from earlier that I'd like you to look at. Do you remember what you are supposed to do with the "How I Feel" sheet? ...Right! Now, can you point to the thermometer that matches how much the pictures made you feel**

[happy/sad/angry etc.]? [Repeat process for each emotion photo selected.] **Thank you.**

NEUTRAL PICTURE SET 2

Okay, now I have more pictures to show you. *[Press Enter. Neutral picture set 2 will play.]*

COMPUTER GAME 4

[After the randomized pictures are done playing, an X will appear on the screen. Prepare the child to play plant/animal game again.] **Okay, now you are going to play another round of the computer game.**

Do you remember how to play? *[Wait for child's response.]* **Right! You watch the screen very closely and you say 'Animal' if the picture is an animal or you say 'Plant' if the picture is a plant.**

Okay, remember to watch the screen very closely. Ready, set, go! *[Press enter]. [If the child says ANIMAL, press A. If the child says PLANT, press P. Make sure the child remains focused on the screen and stays on task. At the end of the game, the screen will say END COMPUTER GAME PART 3.]*

PICTURE SET 4

Okay, now I have some more pictures for you to look at on the computer. *[Press Enter. Randomized picture set 3 will play.]*

HOW I FEEL

[Take out the How I Feel worksheet] **Now I want to ask you, how did those pictures on the computer screen make you feel? I have the "How I Feel" photos like the ones from earlier that I'd like you to look at. Do you remember what you are supposed to do with the "How I Feel" sheet? ...Right! Now, can you point to the thermometer that matches how much the pictures made you feel [happy/sad/angry etc.]? *[Repeat process for each emotion photo selected.]* Thank you.**

COMPUTER GAME 5

[After the randomized pictures are done playing, an X will appear on the screen. Prepare the child to play plant/animal game again.] **Okay, now you are going to play another round of the computer game.**

Do you remember how to play? *[Wait for child's response.]* **Right! You watch the screen very closely and you say 'Animal' if the picture is an animal or you say 'Plant' if the picture is a plant.**

Okay, remember to watch the screen very closely. Ready, set, go! *[Press enter]. [If the child says ANIMAL, press A. If the child says PLANT, press P. Make sure the child remains focused on the screen and stays on task. At the end of the game, the screen will say END COMPUTER GAME PART 3.]*

PICTURE SET 5

Okay, now I have some more pictures for you to look at on the computer. *[Press Enter. Randomized picture set 3 will play.]*

HOW I FEEL

[Take out the How I Feel worksheet] **Now I want to ask you, how did those pictures on the computer screen make you feel? I have the "How I Feel" photos like the ones from earlier that I'd like you to look at. Do you remember what you are supposed to do with the "How I Feel" sheet? ...Right! Now, can you point to the thermometer that matches how much the pictures made you feel [happy/sad/angry etc.]? *[Repeat process for each emotion photo selected.]* Thank you.**

COMPUTER GAME 6

[After the randomized pictures are done playing, an X will appear on the screen. Prepare the child to play plant/animal game again.] **Okay, now you are going to play another round of the computer game.**

Do you remember how to play? *[Wait for child's response.]* **Right! You watch the screen very closely and you say 'Animal' if the picture is an animal or you say 'Plant' if the picture is a plant.**

Okay, remember to watch the screen very closely. Ready, set, go! *[Press enter].*

[If the child says ANIMAL, press A. If the child says PLANT, press P. Make sure the child remains focused on the screen and stays on task. At the end of the game, the screen will say END COMPUTER GAME PART 3.]

PICTURE SET 6

Okay, now I have some more pictures for you to look at on the computer. *[Press Enter. Randomized picture set 3 will play.]*

HOW I FEEL

[Take out the How I Feel worksheet] **Now I want to ask you, how did those pictures on the computer screen make you feel? I have the "How I Feel" photos like the ones from earlier that I'd like you to look at. Do you remember what you are supposed to do with the "How I Feel" sheet? ...Right! Now, can you point to the thermometer that matches how much the pictures made you feel**

[happy/sad/angry etc.]? [Repeat process for each emotion photo selected.] **Thank you.**

AWARENESS CHECK

"So, you remember the computer game we've just been playing? Now we're going to do something similar. You're going to see some fuzzy images and some real pictures will flash very, very quickly in between them. I want you to tell me if you can see what the real picture is, okay? Do you understand what you're going to do? Tell me. Right, you're going to see if you can see what the pictures are between the fuzzy images. There will be around 10 of these for you to look for. [Start the priming check image series. Note down what the name the images as being.] "Alright, we're done with the computer games now, so let's move the story telling table and work on some coloring until your mom is done. She should be ready soon!"

Appendix J.

Demographics

What is your annual household income?

- \$29,000 or less
- \$30,000 to \$49,000
- \$50,000 to \$74,000
- \$75,000 to \$99,000
- \$100,000 or more

Is English your first language?

- Yes
- No

Is English you child's first language?

- Yes
- No

Highest level of education you have obtained:

- Some High School
- High School/GED
- Some College (less than 2 years)
- Associate Degree
- Bachelor's Degree
- Master's Degree
- Professional Degree or Doctorate Degree

What is your occupation? _____

Highest level of education your child's father has obtained:

- Some High School
- High School/GED
- Some College (less than 2 years)
- Associate Degree
- Bachelor's Degree
- Master's Degree
- Professional Degree or Doctorate Degree

What is your child's father's occupation? _____

What is your marital status?

- Never married
- Married
- Separated

- Divorced
- Widowed
- Domestic Partnership

If you are currently in a romantic relationship, how long have you been with your current partner?

___ Months ___ Years

Your ethnic and racial background (please check all that apply):

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White
- Hispanic or Latino
- Other: _____

Your child's ethnic and racial background (please check all that apply):

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White
- Hispanic or Latino
- Other: _____

What is your child's month and year of birth?

_____ Month _____ Year

What grade is your child in? _____

Please list the age and sex of all the people who live in your household and indicate each person's relationship to you and to your child. Please include yourself and your child in this list.

<i>Age</i>	<i>Sex</i>	<i>Relationship to you</i>	<i>Relationship to your child</i>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Appendix K.

*Table of IAPS Numbers Used as Fear-Inducing Stimuli and Descriptions of the
Photos*

1019	Snake eating frog
1022	Snake
1026	Snake
1030	Snake
1033	Snake
1040	Snake
1050	Snake striking
1051	Snake showing fangs
1052	Snake striking
1070	Snake striking
1090	Snake
1101	Snake
1110	Snake
1111	Snakes
1113	Snake striking
1114	Snake striking
1120	Snake showing fangs
1200	Spider
1202	Spider
1205	Spider
1220	Spider
1230	Spider
1240	Spider
1300	Dog showing teeth
1302	Dog showing teeth
1304	Dog showing teeth
1525	Dog showing teeth
1930	Great white shark
1931	Great white shark
1932	Great white shark feeding

Appendix L.

IAPS Numbers Used as Happy/Excitement-Inducing Stimuli and Descriptions of the

Photos

2650	Boy holding ice cream cone
5450	Space shuttle launch
5470	Astronaut in space
5480	Fireworks
5621	Sky diving
5623	Wind surfing
5626	Hang gliding
5910	Fireworks
7250	Birthday cake
7330	Ice cream sundae
7340	Chocolate ice cream
7390	Popcicles
7400	Chocolate bar
7405	Cupcakes
7410	Chocolate candies
7430	Chocolate candy bar
7508	Ferris wheel
8021	Skiing
8030	Slalom ski jump
8031	Skiing
8032	Ice skating
8041	Skiing
8116	Football
8117	Hockey
8200	Water skiing
8208	Surfing
8490	Roller coaster
8492	Roller coaster
8496	Water slide
8620	Rodeo

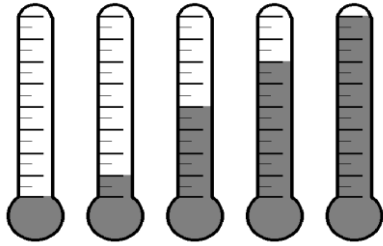
Appendix M.

Table of IAPS Numbers Used as Neutral Stimuli and Descriptions of the Photos

6150	Electrical outlet
7000	Rolling pin
7001	Buttons
7002	Towel
7003	Floppy disk
7004	Spoon
7006	Bowl
7009	Mug
7010	Basket
7012	Rubber bands
7017	VHS tape
7019	Tools
7021	Whistle
7025	Stool
7026	Picnic table
7032	Shoes
7034	Hammer
7040	Dust pan
7041	Baskets
7045	Zipper
7057	Coffee, glasses, and newspaper
7058	Dice and newspaper
7061	Crossword puzzle
7080	Fork
7081	Luggage
7090	Book
7100	Fire hydrant
7150	Umbrella
7165	Bathroom
7175	Lamp

Appendix N.

Emotion Labeling Task Materials



Appendix O.

Children's Behavior Questionnaire (CBQ; Rothbart et al., 2001)

Below you will see a set of statements that describe children's reactions to a number of situations. We would like you to tell us what your child's reaction is likely to be in those situations. There are of course no "correct" ways of reacting; children differ widely in their reactions, and it is these differences we are trying to learn about. Please read each statement and decide whether it is a "true" or "untrue" description of your child's reaction within the past six months. Please rate how true or untrue each statement is of your child. Use the following scale to indicate how well a statement describes your child:

- 1 extremely untrue of your child
- 2 quite untrue of your child
- 3 slightly untrue of your child
- 4 neither true nor false of your child
- 5 slightly true of your child
- 6 quite true of your child
- 7 extremely true of your child

If you cannot answer one of the items because you have never seen the child in that situation, for example, if the statement is about the child's reaction to your singing and you have never sung to your child, then circle NA (not applicable). Please be sure to mark a number or NA for every item.

- 1R. Is not very bothered by pain.
2. Becomes quite uncomfortable when cold and/or wet.
3. Is quite upset by a little cut or bruise.
4. Is bothered by light or color that is too bright.
5. Finds rough materials uncomfortable, such as wool against his/her skin.
- 6R. Is not very upset at minor cuts or bruises.
7. Is bothered by bathwater that is too hot or too cold.
8. Is likely to cry when even a little bit hurt.
9. Becomes distressed when hair is combed.
10. Cries when given an injection.
11. Is bothered by loud or scratchy sounds.
- 12R. Hardly ever complains when ill with a cold.
- 13R. Is not afraid of large dogs and/or other animals.
14. Is afraid of burglars or the "boogie man."
15. Is afraid of loud noises.
- 16R. Doesn't worry about injections by the doctor.
- 17R. Is not afraid of the dark.
18. Is afraid of fire.
19. Is very frightened by nightmares.
20. Is afraid of the dark.

- 21R. Is rarely frightened by "monsters" seen on TV or at movies.
- 22R. Is not afraid of heights.
- 23R. Is rarely afraid of sleeping alone in a room.
- 24. Gets nervous about going to the dentist.
- 25. Sometimes prefers to watch rather than join other children playing.
- 26R. Is comfortable in situations where s/he will be meeting others.
- 27R. Seems to be at ease with almost any person.
- 28. Gets embarrassed when strangers pay a lot of attention to her/him.
- 29R. Acts very friendly and outgoing with new children.
- 30R. Joins others quickly and comfortably, even when they are strangers.
- 31. Is sometimes shy even around people s/he has known a long time.
- 32. Sometimes seems nervous when talking to adults s/he has just met.
- 33. Acts shy around new people.
- 34R. Is comfortable asking other children to play.
- 35R. Talks easily to new people.
- 36. Sometimes turns away shyly from new acquaintances.
- 37R. Seems completely at ease with almost any group.

Please check back to make sure you have completed all the pages of the questionnaire. Thank you very much for your help!

Note. Item number with and "R" indicate that the item was reverse coded for scoring.

The Discomfort subscale is items 1-12. The Fear subscale is items 13-24. The

Shyness subscale is items 25-37.

Appendix P.

Coping with Children's Negative Emotions Scale (CCNES; Fabes et al., 2002)

In the following items, please indicate on a scale from 1 (very unlikely) to 7 (very likely) the likelihood that you would respond in the ways listed for each item. Please read each item carefully and respond as honestly and sincerely as you can.

1. If my child becomes angry because he/she is sick or hurt and can't go to his/her friend's birthday party, I would:

- a. send my child to his/her room to cool off
- b. get angry at my child
- c. help my child think about ways that he/she can still be with friends (e.g., invite some friends over after the party)
- d. tell my child not to make a big deal out of missing the party
- e. encourage my child to express his/her feelings of anger and frustration
- f. soothe my child and do something fun with him/her to make him/her feel better about missing the party

2. If my child falls off his/her bike and breaks it, and then gets upset and cries, I would:

- a. remain calm and not let myself get anxious
- b. comfort my child and try to get him/her to forget about the accident
- c. tell my child that he/she is over-reacting
- d. help my child figure out how to get the bike fixed
- e. tell my child it's OK to cry
- f. tell my child to stop crying or he/she won't be allowed to ride his/her bike anytime soon

3. If my child loses some prized possession and reacts with tears, I would:

- a. get upset with him/her for being so careless and then crying about it
- b. tell my child that he/she is over-reacting
- c. help my child think of places he/she hasn't looked yet
- d. distract my child by talking about happy things
- e. tell him/her it's OK to cry when you feel unhappy
- f. tell him/her that's what happens when you're not careful

4. If my child is afraid of injections and becomes quite shaky and teary while waiting for his/her turn to get a shot, I would:

- a. tell him/her to shape up or he/she won't be allowed to do something he/she likes to do (e.g., watch TV)
- b. encourage my child to talk about his/her fears
- c. tell my child not to make big deal of the shot
- d. tell him/her not to embarrass us by crying
- e. comfort him/her before and after the shot

f. talk to my child about ways to make it hurt less (such as relaxing so it won't hurt or taking deep breaths).

5. If my child is going over to spend the afternoon at a friend's house and becomes nervous and upset because I can't stay there with him/her, I would:

- a. distract my child by talking about all the fun he/she will have with his/her friend
- b. help my child think of things that he/she could do so that being at the friend's house without me wasn't scary (e.g., take a favorite book or toy with him/her)
- c. tell my child to quit over-reacting and being a baby
- d. tell the child that if he/she doesn't stop that he/she won't be allowed to go out anymore
- e. feel upset and uncomfortable because of my child's reactions
- f. encourage my child to talk about his/her nervous feelings

6. If my child is participating in some group activity with his/her friends and proceeds to make a mistake and then looks embarrassed and on the verge of tears, I would:

- a. comfort my child and try to make him/her feel better
- b. tell my child that he/she is over-reacting
- c. feel uncomfortable and embarrassed myself
- d. tell my child to straighten up or we'll go home right away
- e. encourage my child to talk about his/her feelings of embarrassment
- f. tell my child that I'll help him/her practice so that he/she can do better next time

7. If my child is about to appear in a recital or sports activity and becomes visibly nervous about people watching him/her, I would:

- a. help my child think of things that he/she could do to get ready for his/her turn (e.g., to do some warm-ups and not to look at the audience)
- b. suggest that my child think about something relaxing so that his/her nervousness will go away
- c. remain calm and not get nervous myself
- d. tell my child that he/she is being a baby about it
- e. tell my child that if he/she doesn't calm down, we'll have to leave and go home right away
- f. encourage my child to talk about his/her nervous feelings

8. If my child receives an undesirable birthday gift from a friend and looks obviously disappointed, even annoyed, after opening it in the presence of the friend, I would:

- a. encourage my child to express his/her disappointed feelings
- b. tell my child that the present can be exchanged for something the child wants
- c. NOT be annoyed with my child for being rude
- d. tell my child that he/she is over-reacting
- e. scold my child for being insensitive to the friend's feelings
- f. try to get my child to feel better by doing something fun

9. If my child is panicky and can't go to sleep after watching a scary TV show, I would:

- a. encourage my child to talk about what scared him/her
- b. get upset with him/her for being silly
- c. tell my child that he/she is over-reacting
- d. help my child think of something to do so that he/she can get to sleep (e.g., take a toy to bed, leave the lights on)
- e. tell him/her to go to bed or he/she won't be allowed to watch any more TV
- f. do something fun with my child to help him/her forget about what scared him/her

10. If my child is at a park and appears on the verge of tears because the other children are mean to him/her and won't let him/her play with them, I would:

- a. NOT get upset myself
- b. tell my child that if he/she starts crying then we'll have to go home right away
- c. tell my child it's OK to cry when he/she feels bad
- d. comfort my child and try to get him/her to think about something happy
- e. help my child think of something else to do
- f. tell my child that he/she will feel better soon

11. If my child is playing with other children and one of them calls him/her names, and my child then begins to tremble and become tearful, I would:

- a. tell my child not to make a big deal out of it
- b. feel upset myself
- c. tell my child to behave or we'll have to go home right away
- d. help my child think of constructive things to do when other children tease him/her (e.g., find other things to do)
- e. comfort him/her and play a game to take his/her mind off the upsetting event
- f. encourage him/her to talk about how it hurts to be teased

12. If my child is shy and scared around strangers and consistently becomes teary and wants to stay in his/her bedroom whenever family friends come to visit, I would:

- a. help my child think of things to do that would make meeting my friends less scary (e.g., to take a favorite toy with him/her when meeting my friends)
 - b. tell my child that it is OK to feel nervous
 - c. try to make my child happy by talking about the fun things we can do with our friends
 - d. feel upset and uncomfortable because of my child's reactions
 - e. tell my child that he/she must stay in the living room and visit with our friends
 - f. tell my child that he/she is being a baby
-

Scoring and Subscales

* = Reverse Coded

1. **Distress Reactions (DR):** Mean of 1B, 2A*, 3A, 4D, 5E, 6C, 7C*, 8C*, 9B, 10A*, 11B, 12D.

2. **Punitive Reactions (PR):** Mean of 1A, 2F, 3F, 4A, 5D, 6D, 7E, 8E, 9E, 10B, 11C, 12E.

3. **Expressive Encouragement (EE):** Mean of 1E, 2E, 3E, 4B, 5F, 6E, 7F, 8A, 9A, 10C, 11F, 12B.

4. **Emotion-Focused Reactions (EFR):** Mean of 1F, 2B, 3D, 4E, 5A, 6A, 7B, 8F, 9F, 10D, 11E, 12C.

5. **Problem-Focused Reactions (PFR):** Mean of 1C, 2D, 3C, 4F, 5B, 6F, 7A, 8B, 9D, 10E, 11D, 12A.

6. **Minimization Reactions (MR):** Mean of 1D, 2C, 3B, 4C, 5C, 6B, 7D, 8D, 9C, 10F, 11A, 12F.

Supportive: Mean of EE, EFR, PFR

Harsh: Mean of DR, PR, MR

CCNES: Supportive - Harsh

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