RELATIONS BETWEEN ATTACHMENT DIMENSIONS, INTERNAL WORKING MODELS, AND YOUNG CHILDREN'S RESPONSE TO PAIN

by

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Submitted in partial fulfillment of the requirements for
the degree of
Doctor of Philosophy

at

Dalhousie University
Halifax, Nova Scotia
April, 2004

Your file Votre référence
ISBN: 0-612-94037-3
Our file Notre référence
ISBN: 0-612-94037-3

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Abstract

This study examined the relations between attachment dimensions and child pain behaviour following both an everyday pain incident (e.g., bumps and scrapes) and acute pain incident (i.e., immunization). Sixty-six five-year-old children and their mothers were seen at a university psychology department, at which time mothers completed a demographic questionnaire and a measure of their children's emotion regulation behaviour. They were also given everyday pain incident report forms to fill out at home. In a separate testing room, children completed representational measures of attachment (i.e., Separation Anxiety Test and Pain and Relationship Task), an emotional labelling task, and a measure of receptive language. Mothers were reunited with their children at the end of the session and reunions were coded for attachment behaviour. Attachment dimensions were assessed using aggregates of lab-based reunion behaviour, performance on representational measures of attachment, and the measure of emotion regulation. Aggregate measures of security, avoidance, ambivalence, and controlling behaviour were created. During the second session at a medical centre, children were videotaped receiving their medically indicated inoculation shots. Child pain behaviour and child-parent verbalizations during the immunization were rated by blind coders. Following the needles, both mothers and children provided ratings of subjective pain intensity and pain behaviour. The results showed the ambivalence and controlling attachment were differentially related to child pain behaviour. Specifically, children with either more ambivalent or controlling attachment had a relatively greater reaction to both the immunization procedure and everyday pain incident. Children with more controlling attachment also took more time to calm down following the immunization, displayed greater anger, and reacted with more resistant behaviour during the immunization. Security and avoidance, however, were not systematically related to child pain behaviour. The results are discussed in terms of Bowlby's theory of attachment relationships and pain as an important distress signal to children.

Abbreviations and Symbols

ANOVA	Analysis Of Variance
ß	Beta Weight
c	Contingency Coefficient
CAMPIS-R	Child Adult Medical Procedure Interaction Scale - Revised
CFCS	Children's Facial Coding Scale
CPPP	Charleston Pediatric Pain Pictures
df	Degrees of Freedom
DaPTP	Diphtheria, Pertussis, Tetanus, and Poliomyelitis
ELT	Emotional Labelling Task
E-PIRF	Everyday Pain Incident Form
ERC	Emotion Regulation Checklist
F	F-test
FPS	Faces Pain Scale
M	Mean
MCAST	Manchester Child Attachment Story Task
MMR	Measles-Mumps-Rubella
M-PIRF	Medical Pain Incident Form
N	Number of Participants
p	Probability or Alpha Level
PART	Pain and Relationship Task
P/CRI	Parent/Child Reunion Inventory

PPVT-III,	Peabody Picture Vocabulary Test – third edition
r	Correlation Coefficient
R^2	Squared Multiple Correlation Coefficient
S	Skewness Statistic
SD	Standard Deviation
s_s	Standard Error for Skewness
SAT	Separation Anxiety Test
SES	Socioeconomic status
t	t-test
VAS	Visual Analogue Scale
z	Z-Score

Acknowledgements

The successful completion of my dissertation research is the result of the unwavering support, assistance, and guidance of many people. I wish to thank my friend and partner, Scott Rowlings for his continual love, support, and encouragement throughout this endeavour. Throughout my graduate student years you have shared the highs and the lows; my successes as well as my disappointments and frustrations. Yet, in spite of the often tumultuous times, you have always been a source of support and comfort.

I would also like to express my gratitude to my supervisors and mentors, Dr. Patrick McGrath and Dr. Doug Symons. Their enthusiasm, inspiration, direction, and knowledge have contributed both to the completion of this dissertation and to my development as a researcher. Thank you very much for pushing me, and accepting nothing less than my full potential.

I would also like to acknowledge and thank my committee members, Dr. Penny Corkum and Dr. Steve Porter, for their contributions, advice, and support throughout my thesis work. Special thanks are also extended to my external examiner, Dr. Janice Zeman, for taking the time to fit my dissertation into her already busy schedule.

I am grateful to my peers and colleagues in both the Pediatric Pain Research Lab and the Ph.D program at Dalhousie. I would also like to thank Cathy Stewart, Anna Fong, Helen Fong, and Stephanie Dort for the many hours spent helping me to collect and code my data. Special thanks also to Dr. Brad Frankland for answering my numerous statistical questions.

Sincere thanks are also extended to the many children and families who took the time to participate in the study. I would also like to both acknowledge and thank the staff at Dalhousie Health Services, Woodlawn Medical Clinic, Musquodoboit Harbour Medical Clinic, and Sunnyside Mall Medical Clinic for helping me recruit participants and for always making me feel welcome in their clinics. I would especially like to say thank you to Dietland, Nancy, Jane, and Lisa for their continued support and genuine interest in me and my research.

I wish to thank my family for their love and encouragement throughout the extended period of my scholarship. Thank you for always having confidence in my ability and for tolerating the somewhat chaotic lifestyle of a graduate student.

My friends, Alyson, Anna, Carleen, Debbie, and Leanne, have been, and still remain a source of support and friendship to me. I have been very fortunate to have been associated with a group of such bright and caring women. Thank you for helping me get through the difficult times, and for all the emotional support, camaraderie, and entertainment you provided.

Finally, I would like to acknowledge the financial support I received from the Social Sciences and Humanities Research Council of Canada and the Natural Sciences and Engineering Research Council of Canada.

CHAPTER 1. INTRODUCTION

Overview

Pain is a complex, individualized, and subjective phenomenon. By definition, it is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage...each individual learns the application of the word through experience related to injury in early life" (International Association for the Study of Pain, 1994, p.210). Given the individual nature of pain, it is not surprising that children vary greatly in their behavioural response to pain.

While there is clearly a physiological substrate to pain, there is increasing awareness that emotional, experiential, and situational factors are important to understanding individual responses to pain. In addition to examining biological factors such as temperament (Lee & White-Traut, 1996; Young & Fu, 1988), researchers interested in conceptualizing children's differential response to pain have also focused on various psychosocial factors that may account for the variability of children's pain behaviours. These factors include social modeling (Osborne, Hatcher, & Richtsmeier, 1989) and sensitive parenting (Sweet, McGrath, & Symons, 1999).

One psychosocial factor that has been consistently recognized as being particularly important in young children's reaction to pain is caregiver behaviour at the time of the pain. For example, parental humour (Blount, Landolf-Fritsche, Powers, & Sturges, 1991; Frank, Blount, Smith, Manimala, & Martin, 1995) and distraction (Frank et al., 1995; Gonzalez, Routh, & Armstrong, 1993; Manne, Bakeman, Jacobson, Gorfinkle, Bernstein, & Redd, 1992; Sweet et al., 1999) have been correlated with decreased child distress during routine immunizations. Conversely, apologizing, praise,

and admonishing or criticizing (Manne et al., 1992; Frank et al., 1995) were correlated with increased child distress at these times.

Children's pain behaviour may also be related to the general patterns of parent-child interaction that occur on a daily basis. For instance, immunization pain behaviour in late infancy correlated with maternal sensitivity (Sweet et al., 1999). While the importance of interpersonal processes involved in the expression and management of medically-related pain in children has been explored and various psychosocial models have been proposed to account for the observed differences in children's responses to pain, studies have not yet examined how these differences might be related to the nature of a child's relationship, or attachment, to his or her caregiver.

A cornerstone of John Bowlby's (1969/1982) attachment theory is his view that attachment processes in the early relationships between child and caregiver serve as protective mechanisms during encounters with danger and threat. In his view, the attachment system is activated when the child experiences distress, and the goal of the subsequent attachment behaviour is to maintain proximity to a nurturing adult. The caregiver, in turn, is expected to help the child manage the distress and to promote a sense of well-being and security. Attachment theory proposes that these interactions, generalized over many incidents in a child's memory, are encoded in the "internal working models" of relationships — mental representations of the behaviour of the self and other during child-caregiver interactions (Bowlby, 1969/1982). These models, in turn, provide rules for the direction of future social behaviour of children (Bretherton, 1985). As pain is a threat, the individual differences observed in children's understanding and response to pain might, in fact, be related to individual differences in attachment

security. This is the rationale for examining interpersonal processes in the pain behaviour of young children.

The primary objective of this thesis was to assess whether children's attachment security, and associated internal working models, could be used to predict their response to and behaviour following either everyday pain incidents, such as bumps and scrapes, or an acute pain incident such as an immunization. The use of both a medical pain and an everyday pain permitted examination of factors influencing children's reaction to different types of pain. Further elucidation of the potential contributing factors may help to limit the pain experienced during immunization procedures and other painful events, as well as advance an understanding of the impact of relationship processes on pain behaviour.

Attachment Theory Overview

Before proceeding with a discussion of the potential relations between attachment and pain and the existing interpersonal models of pain in children, a brief overview of attachment theory is required. In the following sections, basic definitions and discussion of the interpersonal processes involved in the development of attachment will be presented. In addition, a discussion of the current measures of attachment across childhood will be offered.

Attachment System and Internal Working Models

According to Bowlby's (1969/1982) theory of attachment, an infant's relationship to a parent begins as a set of innate signals or behaviours that direct adult attention towards an infant in times of distress. As time passes, and under normal circumstances, an affectionate bond develops, which is supported by new cognitive and emotional

capacities, as well as a history of consistent, sensitive, responsive care by the parent. This enduring affectional bond with caregivers enables a child to use attachment figures as a secure base across time and distance, from which the child feels safe to explore and master the environment when there is no apparent threat. The caregiver also serves as a safe haven to which the child can turn for reassurance and comfort in situations where the child perceives a threat in the immediate environment (i.e., "security distress"). That is, the secure child is likely to seek proximity to the caregiver. To re-establish proximity, the child will engage in any of several attachment behaviours, such as calling, seeking, crying, gazing, or touching. Once proximity is achieved, the child will alter his or her behaviours to those designed to maintain proximity, such as hugging, clinging, and smiling. The attachment system is then deactivated once the child feels safe. Thus, the goal of the attachment system is twofold. From the viewpoint of the observer, the goal is to regulate behaviours designed to establish or maintain contact with the attachment figure. From the viewpoint of the child, however, the goal of the attachment system is "felt security" (Ainsworth, Blehar, Waters, & Wall, 1978; Waters, 1978).

Two key features of the attachment system are (1) the child's appraisal of the threat and (2) the responsiveness and availability, both physical and psychological, of the attachment figure (Bretherton, 1985). According to Bowlby (1969/1982), however, the features are not appraised completely afresh every time something happens. Rather, in order to activate and deactivate the attachment system effectively and efficiently, the child develops "internal working models". These are mental representations or cognitive schemas of the attachment figure, and of the self and other in interaction with the attachment figure (Bowlby, 1969/1982). These working models develop during the

child's first few years of life and are based on the repeated daily experiences with the primary caregiver, wherein the child creates mental representations of the, properties, characteristics, and behaviour of attachment figures, self, others, and the social world (Bowlby, 1969/1982). In other words, the models function to assess the situation and plan future behaviour. These models are conceptualized as both stable across time, as well as amenable to change in a lawful fashion (Waters, Merrick, Treboux, Crowell, & Albersheim, 2000).

Internal working models are theorized to be relatively stable constructs that operate outside awareness, and include both cognitive and affective representations of self and others (Main, Kaplan, & Cassidy, 1985). Taken together, these models provide rules for the direction of behaviour (Bretherton, 1985). For the cognitive component, these models organize a child's memory about attempts to gain comfort and security, the typical outcomes of those attempts, and the direction and organization of attention and memory (Kirsh & Cassidy, 1997; Main et al., 1985). In terms of attention, internal working models direct individuals to pay attention to certain aspects of the environment and to ignore other aspects (Belsky, Spirtz, & Crnic, 1996; Kirsh & Cassidy, 1997; Main et al., 1985). What individuals selectively attend to depends on the accessibility of particular constructs contained in their working models. In terms of memory, internal working models create biases in memory encoding and retrieval that affect inference and explanation.

For the affective component, these models organize a child's emotional experience and provide the rules for regulating emotion, and for processing or failing to process certain kinds of attachment-relevant information (Kobak & Sceery, 1988). The

desire to maintain a set goal of felt security is universal (Bowlby, 1969/1982, 1973), but the specific strategies used to achieve this goal are contingent on the individual's history of regulating distress with the attachment figure (Kobak & Sceery, 1988). If the attachment figure is available and responsive to the child's distress signals (Ainsworth et al., 1978), then the child learns that he or she can effectively regulate distressing emotions and experiences with strategies that involve active seeking of comfort and support from that figure (Kobak & Sceery, 1988).

In less optimal circumstances, however, the parent may be rejecting the child's bids for comfort, or be inconsistently available and/or ineffective at comforting the child (Ainsworth et al., 1978; Crittenden, 1992). In these cases, the child learns that the experience of distress is associated with negative outcomes and alternative, non-optimal modes of coping with distress may consequently evolve (Kobak & Sceery, 1988). For instance, a child whose attachment efforts are consistently met with rejection may develop a strategy of minimizing his or her emotions, and thereby minimizing the importance of the caregiver as a source of comfort (Cassidy, 1994). Conversely, a child whose attachment efforts are inconsistently met may develop a strategy of heightening his or her emotions in an attempt to increase bids for attention, and thereby heightening the importance of the caregiver as a source of comfort and increasing the dependence on the caregiver (Cassidy, 1994). Thus, the link between the experience of negative emotions and certain maladaptive behaviour reflects maladaptive efforts to regulate negative emotions (Cooper, Shaver, & Collins, 1998; Cummings & Davies, 1996).

Individual Differences in Attachment

The way in which the accessibility and responsiveness of the attachment figure and complementary aspects of the self are encoded in the internal working model will determine a child's attachment style. Attachment styles are best thought of as terms referring to particular types of internal working models of relationships that direct feelings, thoughts, and behaviours in times of security distress (Main et al., 1985). Three attachment styles initially identified by Ainsworth et al. (1978) in their well-known Strange Situation research were secure, avoidant, and anxious-ambivalent. In addition, one style, disorganized and/or controlling, was more recently identified by Main and Solomon (1986). In non-clinical child populations, approximately 55-60% of children are classified as secure, 20% as avoidant, 10-15% as anxious-ambivalent, and 10-15% as disorganized and/or controlling (Ainsworth et al., 1978; Van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999). These styles will be briefly summarized.

A secure attachment style (B classification of Ainsworth et al., 1978) is thought to develop when the child's security needs are met over time with acceptance and warmth, so that the child learns to express these needs fluently, confidently, and calmly. Because the experience of security distress becomes associated with expectations of amelioration, it becomes less threatening, and over time, the child may develop the ability to temporarily tolerate it (Cooper et al., 1998). At the same time, the child may develop a view of itself as able to cope (Bowlby, 1973). Moreover, as the attachment figure is seen as a source of comfort and reassurance (Ainsworth et. al., 1978), a securely attached child should have little hesitation in seeking comfort or assistance from the attachment figure in more stressful situations.

The avoidant attachment style (A classification of Ainsworth et al., 1978) develops when security distress is consistently met with rejection from the attachment figure, and the child learns to avoid expressing or to deny security needs and the emotions attendant on those needs (anxiety, anger, sadness; Cassidy, 1994). As a result, while the importance of the source of distress itself is dismissed, the attachment figures become more threatening and the child adopts what Bowlby (1973) termed "compulsive self-reliance" which serves to maintain distance from the attachment figure in times of distress.

An anxious-ambivalent attachment style (C classification of Ainsworth et al., 1978) may arise when the attachment figure responds inconsistently to security needs, being sometimes unavailable or unresponsive, while at other times, intrusive or overly affectionate. As a result, the child learns to over-express needs in order to increase the chances of a response (Cassidy, 1994). Because the experience of security distress does not become associated with expectations of amelioration (Kobak & Sceery, 1988), it may become more threatening, irreversible, and uncontrollable. As a result the child may adopt a clinging and hypervigilant attitude towards the source of distress and the attachment figure that inhibits the development of autonomy and self-confidence (Kobak & Sceery, 1988).

A disorganized and/or controlling attachment style (D classification of Main & Solomon, 1986) may develop when the attachment figure is either unable to exercise adequate parental control or is in some way frightened or frightening to the child. For instance, the parents of children with a disorganized and/or controlling attachment tend to engage with their children in an intrusive or hostile manner (Lyons-Ruth, Bronfman, &

Parsons, 1999). It is believed that the frightening or intrusive behaviour of the parent disrupts or interferes with the formation of a coherent pattern of attachment (Main & Hesse, 1990). As a result, a child with a disorganized attachment style is likely to appraise the source of distress as more threatening than it really is. Moreover, as approach to the attachment figure is also seen as threatening (Main & Solomon, 1986), the child is likely to delay or avoid seeking help. In addition, the child displays disorganized behaviour and thought in times of security distress (Main & Solomon, 1986). For instance, some demonstrate mixtures of avoidant behaviour, openly angry behaviour, and secure attachment behaviour, while others show odd, often uncomfortable and disturbing behaviours (Main & Solomon, 1986).

Assessing Individual Differences in Attachment Across Childhood

This section will review relevant research on the development and assessment of attachment from early to middle childhood. The review will begin with a discussion of the behavioural measures that focus primarily on sensorimotor representations and secure base phenomenon (i.e., support exploration of environment and haven of safety during encounters with threat), followed by a discussion of representational measures that focus primarily on children's overall mode of regulating their thoughts, feelings, and behaviours when processing attachment-related information.

For infants, the quality of the attachment relationship has typically been assessed by examining infants' behaviour prior to, during, and after a separation from a caregiver. In Ainsworth's Strange Situation Procedure, for example, the infant's behaviour upon reunion with the caregiver is thought to reflect the infant's internal working model of the attachment figure (Ainsworth, 1983). Ainsworth et al. (1978) described how infants

classified as securely attached are distressed by separation, seek comfort or close contact upon reunion and explore freely in the presence of their caregiver. Infants classified as insecurely attached-avoidant exhibit little overt distress upon separation and do not seek contact upon reunion, rather, they avoid the returning mother by looking, turning or walking away or by refusing interaction bids. Infants classified as insecurely attached-ambivalent cry more than others, are distressed prior to separation, seem unable to be reassured or comforted and are so preoccupied with their caregiver's availability as to reduce or preclude exploration. Infants classified as insecurely attached-disorganized display a combination of strongly avoidant and resistant reunion behaviour or show a variety of behaviours that do not fit the context (e.g., sudden freezing in the midst of a greeting, very fleeting fear responses as the mother returns; Main & Solomon, 1986).

The Strange Situation is only applicable within a narrow age range (e.g., 12-18 months). To circumvent this limitation, a few studies have modified the procedure in order to examine child-parent reunion behaviour in children after infancy. For instance, Main and Cassidy (1987) devised a procedure for scoring the reunion behaviour of six-year-old children and their parents following a laboratory separation. With this procedure the parent and child are separated for approximately one hour, during which time study assessments may be carried out. At the end of the separation the parent and child are allowed to reunite for approximately 3-5 minutes.

The interactive behaviour between parent and child is subsequently coded on two rating scales, namely security versus insecurity and avoidance. On the security versus insecurity nine-point scale, higher scores are given to a child who initiates a warm, intimate relationship with the parent as manifested by either physical proximity and/or

contact of an affectionate nature, or through eager, responsive, continuing conversation. Lower scores on this scale are reserved for interactions in which the child avoids or rejects the parent, expresses nervousness or feelings of inadequacy, or displays subtly disorganized or parental responses to the parent upon reunion. The seven-point avoidance scale, which is not entirely independent from the security versus insecurity scale, deals with the intensity and persistence of the child's avoidance of physical or emotional interaction, proximity, or contact. Higher scores on this scale reflect greater avoidance. Examples of avoidant behaviour include moving away from the parent, keeping their back turned, attempting to distract the parent's attention to other occupations, objects, or conversations.

The parent-child reunion behaviour is also classified in terms of the four patterns of attachment: secure, insecure-avoidant, insecure-ambivalent, and insecure-controlling. Children classified as secure show some genuine pleasure in the parent and are either initiating or responsive to the parent in a calm, relaxed manner. Children classified as insecure-avoidant maintain or increase physical or communicative distance from the parent in a neutral and non-confrontational manner. Children classified as insecure-ambivalent show elements of avoidance, sadness, fear, or hostility and are clearly ambivalent about proximity or contact with the parent. Finally, children classified as insecure-controlling attempt to actively control or direct the child-parent interaction by humiliating, embarrassing, or rejecting the parent; or alternatively acting solicitous and protective toward the parent.

Using this coding system, Main and Cassidy (1988) found that the attachment classifications based on child-mother reunions at age six were highly predictable from

attachment classifications obtained in infancy using Ainsworth's Strange Situation procedure. Specifically, 84% of the six-year-olds were placed in the same attachment category as they had been in infancy. The short-term stability of the coding system was also demonstrated with 76% of the children receiving the same attachment classification across a one-month interval. The stability expected by chance was 28%. More recently, Jacobsen, Hibbs, and Ziegenheim (2000) found significant continuity of attachment classifications from infancy to age six using Main and Cassidy's classification system (Del = 42%, $p < .001$).

While the sixth-year reunion procedure has been used successfully in terms of classifying child-parent attachment, it is reported to be inherently more difficult to code than Ainsworth's Strange Situation. According to Main and Cassidy (1988), the difficulty stems primarily from the child's relatively better-developed repertoire of social skills and language ability, as well as the use of only one reunion procedure and lack of constraints on parental behaviour. Main and Cassidy further suggest that due to these difficulties, classifications based on reunions at age six should be accompanied with a measure tapping the child's representation of attachment.

As a result, investigators interested in studying attachment across the life span have recently developed representational narrative approaches. A range of methods have been used to measure the quality of attachment in school-aged children including family photographs (Main et al., 1985), children's drawings of families (Fury, Carlson, & Sroufe, 1997; Madigan, Ladd, & Goldberg, 2003), story completion tasks (Cassidy, 1988), and depiction of separation tests (Slough & Greenberg, 1990). These representational devices capitalize on children's growing verbal abilities, and are used to

explore children's overall mode of regulating their thoughts, feelings, and behaviours when processing attachment-related information.

The manner in which investigators have used these representational devices to assess individual differences in attachment security has progressed along two lines – content and ease of communication. The first approach relies on Bowlby's view that children form representations that are based on their actual interpersonal environments and are not usually influenced by internal fantasies or distortions (Bowlby, 1969/1982). Thus, it is expected that children construct narratives that characterize their actual relationships. Oppenheim and Waters (1995) proposed that secure children construct narratives describing mostly positive interactions between parent and child, whereas insecure children provide responses describing mostly negative interactions, or incoherent or bizarre responses, perhaps corresponding to those assumed to be related to the specific type of insecurity. In other words, the content of children's responses reveals the content of the internal working model.

The second approach relies on Bowlby's (1980) concept of defensive exclusion, such that images or representations too anxiety-provoking for the child are excluded from awareness and processing. Children who rely on defensive exclusion will therefore have difficulty constructing emotionally coherent responses and will avoid attachment-related material (Bowlby, 1980). Thus, the classification of insecurity is based to a large extent on children's difficulty in communicating attachment and other emotional themes and not only on the content of the responses (Oppenheim & Waters, 1995).

In the first study using a narrative approach, Main et al. (1985) assessed internal working models using two types of projective stimuli in 40 six-year-olds who had

previously had their attachment security classified in infancy. They used an adaptation of Klagsburn and Bowlby's (1976) Separation Anxiety Test (SAT), which consists of six photographs of mild and severe separations between school-aged children and their parents, as well as a family portrait photograph obtained from the parents. The six-year-olds who had been classified as securely attached in infancy gave coherent, elaborated, and open responses to the separation pictures. They also tended to look, smile, and comment on the family photograph. The six-year-olds classified as avoidant in infancy described the children depicted in the SAT as sad, but could not say what the child might do to cope and either turned away from the family photograph, dropped it, or handed it over to the examiner. The children classified as disorganized were usually completely silent or gave irrational or bizarre responses, and showed depressed affect or became disorganized in response to the picture.

Slough and Greenberg (1990) developed a revised version of this SAT to assess five-year-olds' internal working models of attachment. Their Seattle version of the SAT uses the same six separation situations as the original test but with modernized stimuli. In addition, an effort was made to photograph only the profiles or the backs of the children's heads to help maintain ambiguity in facial expressions. As with the original version, children were presented with a picture of an impending separation with a brief storyline and were asked how the child (i.e., "other") felt and how the child would cope with the separation. These questions were repeated in reference to the child's (i.e., "self") own feelings. Slough and Greenberg (1990) hypothesized that secure children would be able to express confidence during the mild separations and would also be able to express any concerns or feelings of sadness in the more stressful situations. Insecure children,

however, were hypothesized to claim self-reliance in all situations, respond illogically, or avoid the story theme of separation. Their results showed that the children who were rated as more secure on the separation-reunion sequence had SAT responses that were rated higher on attachment (r = .27) and self-reliance (r = .38), and lower on avoidance (r = -.46), particularly when the child was referring to himself or herself. Similarly, children who were rated as more avoidant on the separation-reunion sequence had SAT responses that were rated lower on attachment (r = -.37) and self-reliance (r = -.34), and higher on avoidance (r = .46). A similar but weaker pattern was found when participants were referring to the hypothetical child.

Several conclusions from these studies on the use of representational narratives can be drawn (for fuller discussion see Oppenheim & Waters, 1995; Solomon & George, 1999). First, they point to important associations between children's narratives about attachment and both concurrent and earlier observational assessments of attachment. Second, these results support the notion that young children construct internal working models with respect to attachment and suggest that the representational narratives are valid reflections of these models in children. Third, they point to individual differences in the content of the narratives, with secure children tending to provide more positive descriptions of mother-child interactions than insecure children. Fourth, they suggest that secure children are able to remain organized when confronted with emotionally laden attachment themes, and are able to express a wide range of emotions, including anger and sadness. Insecure children, conversely, experience difficulties in remaining organized when confronted with descriptions of separation and other attachment-related situations, and may provide incoherent responses or may have difficulties regulating their emotions.

Pain and Attachment

Pain is a *salient* threat originally identified by Bowlby (1969/1982) as an elicitor of proximity-seeking attachment behaviour in children. He wrote: "Every mother knows that a child who is tired, hungry, cold, in ill health, or in pain is likely to be especially 'mummyish'. Not only is he reluctant for his mother to be out of sight but often he demands to sit on her knee or to be carried with her" (p. 259). This quotation illustrates how proximity-seeking and other secure base behaviour (e.g., soothability) could arise from pain-related distress.

Pain is also a *common* threat for young children. For example, children can experience numerous medically-related pain including routine immunizations at regular intervals (Megel, Houser, & Gleaves, 1998) and other invasive procedures (e.g., venipuncture) related to diagnosis and treatment of medical conditions (e.g., Fradet, McGrath, Kay, Adams, & Luke, 1990). Moreover, several researchers have reported that children between the ages of 28 to 81 months have one incident of everyday pain every three hours during free play in day care centres (Fearon, McGrath, & Achat, 1996; von Baeyer, Baskerville, & McGrath, 1998). The relatively high occurrence of painful incidents provides the child with a large number of opportunities for learning about pain, particularly within a social context (Fearon et al., 1996). Despite these characteristics and recognition of its potential as a strong precipitant of attachment behaviour, very few studies have examined the relations between attachment dimensions and pain behaviour, particularly in children.

Pain and Attachment in Adults

In the adult pain literature, investigators interested in the individual differences in coping and adjustment to chronic pain have begun to theorize about the relations between attachment and pain behaviour (Anderson & Hines, 1994; Hallberg & Carlsson, 1998; Kolb, 1982; Mikail, Henderson, & Tasca, 1994; Mikulincer & Florian, 1998). Only two studies to date have examined the relations between attachment style and the duration of physical pain (Scott, 1989/1990) and coping with and adjustment to chronic back pain (see Mikulincer & Florian, 1998). Scott (1989/1990) examined the interaction of pain duration and attachment pattern in the development of depression in 42 acute, chronic, and protracted pain patients. Participants completed a pain duration questionnaire, the Beck Depression Inventory, and Hansburg's Separation Anxiety Test. While depression was not related to attachment pattern, duration of pain was related to attachment pattern. The acute pain group met the criteria for a mild anxious attachment pattern, the chronic pain group met the criteria for a hostile attachment, and the protracted pain group met the criteria for a strong anxious attachment.

In another study (see Mikulincer & Florian, 1998), 85 men diagnosed with chronic low back pain and a matched pain-free control sample completed an adult attachment style scale (Hazen & Shaver, 1987), a pain appraisal scale, and a pain coping checklist. The results showed that attachment style was correlated with the appraisal of, and coping with, physical pain. Secure, chronic pain sufferers appraised their back pain in less threatening terms, appraised themselves as being more able to deal with the pain and relied more on problem-focused and less emotion-focused coping strategies than both chronic pain sufferers with avoidant and anxious attachments. These studies, however,

provide no information about childhood pain or potential developmental links between relationship processes and pain behaviour.

Pain and Attachment in Children

Within the child literature, relations between attachment dimensions and pain have primarily been examined indirectly. For instance, over the past decade researchers have used multiple contexts when assessing attachment-related processes (see Cicchetti, Cummings, Greenberg, & Marvin, 1990). For instance, narrative (Bretherton, Ridgeway, & Cassidy, 1990; Green, Stanley, Smith, & Goldwyn, 2000) and behavioural (Stovall & Dozier, 2000) measures have been developed that use a variety of attachment contexts, including pain. For example, Bretherton and colleagues (1990) developed a story-completion task for assessing internal working models of attachment in three-year-olds. With this procedure, children were presented with story stems, enacted dramatically using appropriate dolls and props, involving various attachment-relevant themes (e.g., spilled juice, hurt knee, monster in the bedroom, departure, and separation-reunion). After presenting the story, the child was asked to "show me and tell me what happens next". Based on the structure and content of the child's responses to the various stories, the child's attachment was subsequently classified as secure (e.g., parents were presented as available, interactions were warm, and the child could cope with the stress constructively), as insecure-avoidant (e.g., avoidance of the story issue), or as insecure-disorganized (e.g., incoherent or odd responses). These classifications were later correlated with attachment classifications blindly coded from a separation-reunion procedure. Results showed that while the overall classification of secure or insecure

attachment was consistent across procedures (75% agreement), the children were not systematically classified into the same insecure category across procedures.

George and Solomon (1996a) employed Bretherton's story completion task to examine developmental issues in assessing internal working models. In their study, responses to the separation-reunion story were used to classify the children's attachment in three age groups (three-years, five to six-years, and seven to eight-years) as secure, avoidant, ambivalent, or disorganized based on story content (i.e., confident, casual, busy or frightened for the respective groups) and defensive processes (i.e., undefended, deactivation, disconnection or dysregulated/constricted for the respective groups). Story-based classifications were then validated against a concurrent laboratory Separation-Reunion sequence. The relation between the children's responses to Hurt Knee, Monster, and Separation-Reunion stories were then examined in the developmental samples. For both the five- to six-year-olds and the seven- to eight-year-olds, children who were classified as secure with the Separation-Reunion story enacted Hurt Knee and Monster stories that revealed open threats to attachment (i.e., able to discuss pain and attachment themes). The parents in these stories provided protection or care and the children often resumed activities as the result of the parents' care. Children who were classified as avoidant enacted Hurt Knee and Monster stories that deactivated the threats of being hurt or frightened and parents provided care only if initiated by the child. Children who were classified as ambivalent enacted Hurt Knee and Monster stories that disconnected themes in relation to hurt or fear and often simply ignored the issue. Children who were classified as disorganized enacted Hurt Knee and Monster stories that showed signs of dysregulation or constriction. For the three-year-olds, similar classification profiles were

found for all three stories for the secure and disorganized children. For the avoidant and ambivalent children, however, the stories were harder to classify, particularly for the Separation-Reunion stories.

More recently, Green et al. (2000) developed the Manchester Child Attachment Story Task (MCAST). With this procedure, children are presented with five attachment-related distress (i.e., nightmare, hurt knee, illness, peer rejection, and separation) vignettes acted out with dolls and props. Following an induction phase, the child completes the story and is then given a series of probes aimed at clarifying the mental attributions of the dolls (e.g., Can you tell me how the child doll is feeling now?). The content of the narrative is then coded across four broad groups (e.g., Attachment-related behaviours) and then assigned a categorical Secure, Avoidant, Ambivalent, or Disorganized designation. Results showed that the MCAST had good inter-rater reliability and content validity and that the patterns of attachment representation showed stability over a five-month period.

While pain has been included as an elicitor of attachment in these studies, there are three limitations that need to be addressed before any conclusions can be made with respect to the relations between children's differential response to pain and attachment behaviour. First, the protagonist in these studies is portrayed as having hurt him/herself and exhibiting a pain response (e.g., crying). Thus, it is not clear whether a participant's response reflects the internal working model in response to the pain itself or a more general working model of emotional distress or, alternatively, empathy. Second, in these studies there is inclusion of only one example of a painful event that children may be familiar with. Thus, the children's responses may be specific to an isolated pain event

rather than to pain experiences in general. Finally, the intensity of the pain event itself is only moderate (Belter, McIntosh, Finch, & Saylor, 1988). As preschoolers have difficulty distinguishing low pain intensity from moderate pain intensity (Belter et al., 1988), it is therefore not clear whether the pain event was perceived as sufficiently anxiety-provoking to activate attachment behaviour.

With respect to the multi-context behavioural measure, Stovall and Dozier (2000) developed a diary designed to capture the attachment behaviour of foster infants displayed when in distress. In this approach, parents complete a checklist of items following incidents in which the infant has been physically hurt, scared, or separated from the parent. The checklist includes items pertaining to (1) the child's initial reaction to being hurt or frightened (e.g., cried, did not indicate he/she wanted or needed the parent); (2) the parents immediate reaction to the child's behaviour (e.g., picked child up, ignored child); and, (3) the child's reaction to the parental response (e.g., was soon calmed, remained upset, was difficult to soothe). The child's reaction to the incident and to the parent's response is then coded in terms of secure (e.g., proximity-seeking/contact maintenance), avoidant (e.g., ignoring the parent), and resistant (e.g., inability to be soothed) behaviours. To calculate total scores for each dimension, the number of secure, avoidant, and resistant behaviours are summed across the three incidents (hurt, scared, separated).

In their initial validation study, Dozier, Stovall, Prettyman, and Spears (1999; as cited in Stovall & Dozier, 2000) had 42 biological and foster parent-infant dyads complete the diary on seven consecutive days. Parent-infant dyads subsequently participated in the Strange Situation procedure. Infants classified as secure in the Strange

Situation obtained significantly higher security scores on the diaries than the avoidant babies; babies classified as avoidant had significantly higher diary avoidance scores than the secure and resistant babies; and babies classified as resistant had significantly higher resistance scores than the secure and avoidant babies.

Similar results were found by Stovall and Dozier (2000). In this study, single subject analyses of newly developing attachment relationships in 10 foster infant-parent dyads were conducted. Their results showed that for the infants classified as secure in the Strange Situation, there were significantly more security behaviours, as compared to both resistant and avoidant behaviours, reported on the diaries. For the infants classified as resistant in the Strange Situation, there were significantly more resistant behaviours relative to both secure and avoidant behaviours, reported on the diaries. For the infant classified as avoidant in the Strange Situation, there were significantly more avoidant behaviours relative to both secure and resistant behaviours, reported on the diaries. Finally, the infants classified as disorganized in the Strange Situation, displayed either more avoidant behaviours or a mixture of avoidant and secure behaviours on the diaries.

These studies provide evidence that the diary data were related to Strange Situation classifications. However, the summation of behaviour across the attachment-related contexts precludes examination of the interrelations of responses between contexts. Thus, the summation limits the conclusions that can be drawn about the potential links between attachment and pain behaviour specifically.

Only one study to date has systematically examined how imagined pain can elicit attachment behaviour in children (Walsh, 2000). In this study, the continuity of preschoolers' internal working models of attachment relationships displayed during

separation experience were compared to those displayed during pain experience. The quality of attachment representations was assessed with the *Separation Anxiety Test* (SAT; Slough & Greenberg, 1990) and pain representations were assessed by examining responses to pictures of children about to experience pain in the presence of their parents. Unlike others (Bretherton et al., 1990; Green et al., 2000), the pain stimuli in this study were more ambiguous, did not dictate the child's response, and came from a range of pain experiences and intensities. SAT responses provided scores of attachment, self-reliance, and avoidance, and pain representations were scored in a similar fashion. Representations of separation and pain experience were systematically related and the associations were not accounted for by the child's ability to differentiate emotional states, language ability, or regulate emotions. For example, children who expressed vulnerability about the severe separations also tended to express vulnerability or need about the severe pain situations.

In addition, SAT responses were cluster analyzed to classify children into secure, anxious-ambivalent, and avoidant groups. Children's responses to painful pictures differed systematically according to their SAT security classification. For example, the secure children were better able to express vulnerability or need about the severe pain incidents and self-confidence about handling the milder pain situations more or less independently, and had a lower degree of avoidance in discussing the pain situations than both the anxious-ambivalent and the avoidant children. There was also some concurrent support for the differential patterns in the parent reports of child pain behaviour. Specifically, in response to a moderately painful incident, 45% of the anxious-ambivalent children's parents described them as "seeks help but seems clingy" as compared to 30%

of the secure children's parents and 21.4% of the avoidant children's parents. In addition, 80% of the anxious-ambivalent children's parents described them as being more reactive to a mild pain incident as compared to 60% of the secure children's parents and 64.3% of the avoidant children's parents. In this study, however, pain behaviour was based primarily on the children's self-report for hypothetical pain scenarios. No studies to date have examined observed rather than imaginary pain. Internal working models of pain remain to be tested as predictors of actual pain behaviour.

Pain and Internal Working Models

Pain is an unpleasant, subjective, sensory and emotional experience associated with actual or potential tissue damage (International Association for the Study of Pain, 1994). As such, it is a salient threat that can precipitate a sequence of attachment behaviours (Bowlby, 1969/1982). It serves as a signal that some harm is occurring to the body, and is essential to the body's defence against immediate, as well as future, tissue damage (Mikail et al., 1994). Ultimately, and potentially, the threat may be to the survival of the individual. The suffering associated with pain arouses the motivating mechanisms to ensure that eliminating the source of the pain gets the highest priority (Mikail et al., 1994). Thus, the manner in which children appraise and respond to pain should be consistent with their attachment histories and, more specifically, with the features of their internal working model. For instance, if pain activates the attachment system, then secure base behaviour should result in children who use parents for comfort and distress resolution. The following section will provide an overview of the role the attachment system may play in differential pain appraisal and response.

In the context of pain, a securely attached child should be able to express his or her needs fluently, confidently, and calmly. Moreover, given that the experience of security distress is associated with expectations of amelioration (Kobak & Sceery, 1988), the experience of pain may become less threatening, and over time, the child may develop the ability to temporarily tolerate or cope with mild pain situations. At the same time, as a child with a secure attachment has an internal working model in which the attachment figure is seen as a source of comfort and reassurance (Ainsworth et al., 1978), the child should have little hesitation in seeking comfort or assistance from the attachment figure in more painful situations. That is, a caregiver should be able to serve as a secure base in these cases and, thus, someone to turn to, for assistance with pain coping and distress resolution.

A child with an avoidant attachment has an internal working model in which the attachment figure is seen as cold or rejecting (Ainsworth et al., 1978). Thus, in the context of pain, an avoidantly attached child should not be likely to seek out comfort or assistance from the attachment figure, and would actively avoid the caregiver (i.e., claim self-reliance in pain situations) or cope on his or her own. It is unlikely that this child would turn to the caregiver for distress resolution. Moreover, due to the child's previous experience with repeated rejected security-seeking behaviours, the avoidantly attached child is also likely to dismiss the physical symptoms associated with pain and may actually minimize the meaning and expression of his or her pain (Cassidy, 1994).

Children with an anxious-ambivalent attachment have an internal working model in which the attachment figure is seen as inconsistent or insensitive (Ainsworth et al., 1978). They are characteristically hypersensitive to negative affect, and show heightened

expressions of distress and anger (Cassidy, 1994). Thus, in the context of pain, a child with an ambivalent/anxious attachment is likely to exhibit excessive expressions of distress (e.g., crying, wailing, screaming) to get a response from the caregiver. Once a response is achieved, the child is likely to oscillate between seeking proximity and contact with the caregiver (e.g., clinging) and resisting contact and interaction with the caregiver. Moreover, as the child has not developed a sense of autonomy and self-confidence (Kobak & Sceery, 1988), the experience of pain may be viewed as more threatening to the child. Thus, the child is likely to seek assistance from the caregiver in response to painful situations but his or her distress should not be resolved as effectively as that of securely attached children.

A child with a disorganized or controlling attachment has an internal working model in which the attachment figure is seen as frightening (Main & Solomon, 1986). As a result, a child with a disorganized or controlling attachment style is likely to appraise pain situations to be more threatening than they really are. However, as approach to the attachment figure is also seen as threatening (Main & Solomon, 1986), the child is likely to delay or avoid seeking comfort and may display disorganized behaviour and thought in response to painful situations. What marks this category is an inconsistency of behavioural strategy across situations. Finally, his or her distress should not be resolved as effectively as that of securely attached children.

Pain and Emotion Regulation

Attachment theorists contend that internal working models are substantially involved in the regulation of emotion (Bowlby, 1980; de Rosnay & Harris, 2002; Main et al., 1985; Cassidy, 1994). Emotion regulation is a complex, multidimensional process by

which emotions influence other psychological processes and by which emotional experience and expression is modulated in relation to situational demands and perceived social standards (Cole, Zahn-Waxler, Fox, Usher & Welsh, 1996; Campos, Mumme, Kermoian & Campos, 1994; Frijda, 1986; Shipman, Zeman, Nesin, & Fitzgerald, 2003; Shipman, Zeman, & Stegall, 2001; Thompson, 1994; Zeman & Garber, 1996; Zeman, Penza, Shipman, & Young, 1997; Zeman & Shipman, 1998; Zeman & Shipman, 1996). Emotion regulation develops in infancy and becomes increasingly complex and integrated during the preschool and grade-school years (Fox, 1994; Saarni, 1999; Saarni, 1990). Securely attached children are emotionally responsive and able to modulate their expressive responses, whereas, both the overregulation of expressive behaviour displayed by avoidantly attached children and the underregulation of expressive behaviour displayed by both children with ambivalent or disorganized/controlling attachment, reflect problems in emotion regulation (Block & Block, 1980; Cole, Michel & O'Donnell-Teti, 1994; Eisenberg & Fabes, 1992; Fox, 1989; Green & Goldwyn, 2002). Empirical evidence has supported the proposed associations between quality of attachment and emotion regulation in infancy (Braungart & Stifter, 1991; Carter, Little, Briggs-Gowan, & Kogan, 1999; Diener, 2002), childhood (Arend, Gove, & Sroufe, 1979; Nachmias, Gunnar, Mangelsdorf, Parritz, & Buss, 1996; Sroufe, 1983), and adolescence (Kobak & Sceery, 1988; Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993; Berlin, 1995; Kogan, 1997; Spangler & Zimmermann, 1999; Zimmermann, 1999). In these studies, secure strategies have typically been related to greater emotion regulation skills in terms of ego resiliency, coping behaviours on tasks designed to elicit frustration and distress, and psychobiological techniques (e.g., cortisol levels).

Recently, there has been a heightened interest in the relations between emotion regulation and pain (e.g., Keefe, Lumley, Anderson, Lynch, & Carson, 2001). The experience of pain is a multidimensional construct, composed of a sensory aspect, an affective aspect, and an evaluative aspect (Melzack & Wall, 1982). The sensory aspect reflects the sensory quality of the pain in terms of temporal, spatial, pressure, and other properties. The affective aspect can be defined as the emotional portion of the pain in terms of tension and fear. The evaluative aspect reflects the subjective, overall intensity of the pain, and is based in part on the sensory and affective components, as well as other factors such as prior experience and the meaning of the situation to the individual. Thus, emotion regulation may influence the expression of pain, and more specifically, the associated distress, as emotions play an integral role in the pain experience.

In the adult literature, research into the link between emotion regulation processes and the experience of pain has progressed along two lines. These are: (1) the individual's ability to be aware of, identify, and understand one's emotions; and (2) whether emotions are expressed or inhibited. A number of studies have demonstrated that many adult chronic pain patients show a deficit in the ability to use cognitive mechanisms to understand and subsequently regulate emotions (i.e., Alexithymia; Lumley, Asselin, & Norman, 1997). For example, Porcelli, Zaka, Leoci, and Centonze (1995) found that 35.7% of the patients with inflammatory bowel disease were alexithymic as compared to only 4.5% of the control patients. Similarly, Fernandez, Sriram, Rajkumar, and Chandrasekar (1989) found significantly greater alexithymia in rheumatoid arthritis patients than controls. Based on these findings it has been suggested that the inability to label emotional states may contribute to chronic pain in that the patients are unable to

differentiate emotional arousal from physical sensations associated with injury (Keefe et al., 2001). Alternatively, given the correlational nature of these studies, it may be that having chronic pain contributes to difficulty in emotional expression such as a suppression of affect.

In terms of the relations between inhibition of emotions and chronic pain, researchers have speculated that emotional inhibition leads to depression, physical symptoms, interference with adaptive behaviour, and increased physiological arousal, which may lead to immune dysfunction and possibly disease (Pennebaker, 1993; Pennebaker & O'Heeron, 1984). In partial support of this proposition, investigators have found that emotional inhibition is an important distinguishing characteristic among chronic back pain patients (Coen & Sarno, 1989) and patients with intractable pain who have not responded to conventional treatment (Pilowsky & Spence, 1977). Overall, these studies suggest that problems in regulating and expressing emotions are linked to increased pain and distress in adults (Keefe et al., 2001).

Support for the role of emotion regulation in the expression of children's pain has also been found. For instance, Sweet et al. (1999) found that 44% of the variability in six-month olds' immunization pain behaviour was predicted by maternal vocalizations and infant difficultness. Conversely, 35% of the variability in 18-month olds' immunization pain behaviour was predicted by a general caregiving approach of maternal sensitivity and infant physiological reactivity as reflected by vagal tone. While emotion regulation was not examined directly in this study, the investigators speculated that children's emotion regulation strategies might have accounted for their observed age-related changes in pain predictors. Specifically, as infants have not yet developed the skills to

independently regulate their own emotions and restrain their behaviour, they may have been relying on their mothers as external regulators of emotion. The older infants, however, due to gross motor and cognitive changes in the second year of life, may be better able to monitor and regulate their behaviour. Thus, while immediate maternal behaviour may remain important in helping children to regulate the distress associated with the painful event, its importance may be somewhat decreased. The relations between attachment, emotion regulation, and pain expression in children remain to be examined.

Interpersonal Pain Research

A child's attachment and internal working model to a caregiver do not develop nor function in isolation. Rather they are contingent on actual or predicted reciprocal exchanges between child and parent, and as such, it is an interpersonal process. The importance of interpersonal processes involved in the expression and management of medically-related pain in children has been explored in numerous studies. For instance, immediate parental behaviour (e.g., Blount et al., 1991; Dahlquist, Power, & Carlson, 1995; Dahlquist, Power, Cox, & Fernbach, 1994; Frank et al., 1995; Gonzalez et al., 1993; Manne et al., 1992) has been examined in order to account for the observed differences in children's responses to pain. The following sections will review the existing literature on the relations between parenting variables and children's pain behaviour. In addition, a discussion of the potential relations between both immediate and more general parental behaviour and child pain behaviour as they relate to attachment security will be offered.

Immediate Parental Behaviour

Many observational and experimental studies have demonstrated the influence of parental behaviour during incidents of medically-related pain (for a review, see Blount, Davis, Powers, & Roberts, 1991). At the broadest level, parental influence has been examined by manipulating its presence or absence during painful medical procedures such as injections (Broome & Endsley, 1989a; Gonzalez, Routh, Saab, Armstrong, Shifman, Guerra, & Fawcett, 1989; Gross, Stern, Levin, Dale, & Wojnilower, 1983; O'Laughlin & Ridley-Johnson, 1995; Shaw & Routh, 1982) or dental treatment (Frankl, Shiere, & Fogels, 1962). These studies have produced equivocal findings, with some reporting decreases in child distress when the parent is not present (Gonzalez et al., 1989; O'Laughlin & Ridley-Johnson, 1995), and some reporting increases in child distress when the parent is absent (Frankl et al., 1962). Similarly, some studies report increases in child distress when the parent is present (Gross et al., 1983; Shaw & Routh, 1982) and some report decreases in child distress when the parent is present but not interacting with the child during the procedure (Broome & Endsley, 1989b; O'Laughlin & Ridley-Johnson, 1995).

Observational studies have examined the spontaneous behavioural and vocal interactions of children and their mothers in relation to increases and decreases in child pain behaviour or distress. By contrast, experimental approaches have investigated the impact of parental behaviour on children's pain experiences by manipulating parental behaviours, such as distraction, reassurance, or information giving. While a few studies have shown no relation between parental behaviour at the time of child pain and child distress (e.g., Broome & Endsley, 1989b; Schechter, Bernstein, Beck, Hart, & Scherzer,

1991), the vast majority of studies find relations between spontaneous or coached immediate parental behaviour and child distress.

In terms of decreasing child distress, several studies document the positive effect of parental humour (Blount, et al., 1991; Frank et al., 1995) and distraction (Blount, Corbin, Sturges, Wolfe, Prater, & James, 1989; Blount et al., 1991; Bush, Melamed, Sheras, & Greenbaum, 1986; Cohen, Blount, & Panopoulos, 1997; Frank et al., 1995; Gonzalez et al., 1993; Manimala, Blount, & Cohen, 2000; Manne et al., 1992; Powers, Blount, Bachanas, Cotter, & Swan, 1993; Sweet, 1999; Sweet et al., 1999) during painful procedures. By contrast, parental reassurance (Blount et al., 1989; Blount et al., 1991; Blount, Sturges, & Powers, 1990; Broome & Endsley, 1989b; Dahlquist et al., 1995; Dahlquist et al., 1994; Frank et al., 1995; Gonzalez et al., 1993; Mamimala et al., 2000), apologizing, giving control to the child, making empathetic statements, praise, and admonishing or criticizing (Blount et al., 1989; Blount et al., 1991; Blount et al., 1990; Bush et al., 1986; Dahlquist et al., 1994; Frank et al., 1995; Manne et al., 1992) have been shown to be related to increased child distress. Despite the high correlation with child distress, reassurance has been found to be the most commonly occurring adult vocalization directed towards the child (e.g., Blount et al., 1989; Broome & Endsley, 1989b; Dahlquist et al., 1995).

A less directly observable but influential parental variable that has been shown to be related to increased child distress during painful medical procedures is parental anxiety. For instance, parental anxiety has been found to be negatively related to the use of cognitive coping strategies in children with cancer undergoing minor surgery (Bennett-Branson & Craig, 1993). Similarly, several studies have documented positive relations

between parental anxiety and increased distress in children undergoing bone marrow aspiration (Dahlquist et al., 1984; Jay, Ozolins, Elliot, & Caldwell, 1983) or venipuncture procedures (Jacobsen, Manne, Gorfinkle, Schorr, Rapkin, & Redd, 1990). However, studies examining the relations between parental anxiety and child distress during immunizations (Broome & Endsley, 1989b; Frank et al., 1995; Sweet, 1999) have not shown significant relations. As suggested by Sweet (1999), it may be that parental anxiety plays a larger role in medical procedures that are relatively uncommon, longer lasting, and related to higher levels of child distress than in routine immunizations.

There may also be potential relations between attachment security and parental behaviour at the time of child pain. Specifically, as the development of attachment is attendant on the parent's ability to meet the child's security needs (Cassidy, 1994), there may be differences in the relative use of coping promoting strategies (e.g., distraction, non-procedural talk, humour) and distress promoting strategies (e.g., reassurance, apologies, giving control to child) between parents of securely versus insecurely attached children. Specifically, securely attached children may have parents who use relatively more coping promoting and less distress promoting strategies than parents of insecurely attached children. Conversely, parents of children with anxious-ambivalent attachment, whose security develops when their needs are inconsistently or ineptly met, would likely use either equal amounts of distress and coping promoting strategies, or relatively more distress promoting and relatively less coping promoting strategies than parents of secure children. Previous researchers have found that mothers of children with an anxious-ambivalent attachment report more separation anxiety (Scher & Mayseless, 2000) and more anxiety in general (Stevenson-Hinde & Shouldice, 1995) than other mothers. Thus,

the parents of children with anxious-ambivalent attachment may also be more anxious about the painful procedure than parents of either securely or avoidantly attached children. Parents of avoidantly attached children, whose security needs are met with rejection, may also use more ineffective strategies, such as criticizing. However, as these children are also thought to minimize their expression of distress over time, it is possible that these parents may not use either coping or distress promoting strategies and rather may use more neutral strategies (e.g., non-procedural talk to other adults). Finally, parents of children with a disorganized/controlling attachment, whose security needs are met with hostility and intrusiveness (Lyons-Ruth et al., 1999), may also use more ineffective strategies, such as criticizing. Given the reciprocal, dyadic nature of the parent-child attachment relationship, it is also possible that the behaviour of insecurely attached children may prompt specific behaviours in parents.

Maternal Sensitivity

Researchers have also proposed that children's pain behaviour may be related to general patterns of parent-child interactions that are not limited to pain (e.g., Maternal sensitivity; Sweet, 1999; Sweet et al., 1999). Maternal sensitivity is a global term that encompasses a variety of parental behaviours, such as style of child care and interaction, attentiveness, and communication skills (Moran, Pederson, Pettit, & Krupka, 1992). Generally, higher sensitivity is characterized by attentiveness, awareness, and appropriate responses to child signals (Ainsworth, Bell, & Stayton, 1971, 1972, 1974), as well as a harmonious, emotionally close mother-child relationship (Symons, 2001).

Sweet (1999) argues that most infants have more experience with their parents' responses to cues associated with daily basic needs (e.g., hunger) than they do with those

associated with pain. Thus, through these repeated experiences they may come to learn about their parents' general responsivity to their cues, as well as their own ability to elicit responses from caregivers. Specifically, children who believe that their signals will be responded to will be more open and active in their expression of distress than those who do not believe their signals will be responded to (Cassidy, 1994). According to Sweet (1999), these mother-child interactions might then be generalized to painful situations.

Two studies to date have examined the relations between sensitivity and child pain behaviour. In the first study, Dahlquist et al. (1994) examined the associations between children's distress during invasive cancer procedures and parent disciplinary attitudes. Their results showed that the younger children (ages 2-7 versus 8-17 years) with parents who reported less responsive and less nurturant disciplinary styles undergoing bone marrow aspiration or lumbar puncture showed more behavioural distress than the other children prior to but not during the procedure.

In the second study, Sweet et al. (1999) examined the relative importance of maternal sensitivity in the prediction of infant immunization pain behaviour. At 18 months of age, but not six months, maternal sensitivity accounted for 23% of the variability in pain behaviour. More specifically, infants of less sensitive mothers did not react as strongly to immunization pain as did infants of relatively more sensitive mothers. Sweet et al. contend that these results support the role of socialization in child pain behaviour.

Attachment theorists have strongly implicated the role of maternal sensitivity in the development of a secure infant-mother attachment relationship (Bowlby, 1969). Specifically, the manner in which the primary caregiver responds to the child's reaction

over time plays a critical role in determining the type of internal working model constructed (Ainsworth et al., 1978). In support of this argument, several studies have documented relations between contemporaneous measures of maternal sensitivity and attachment security (e.g., Ainsworth, 1979; Ainsworth, 1982; Ainsworth et al., 1978; Smith & Pederson, 1988; Symons, 2001). The research in this area suggests that sensitive mothers have infants who are more secure and less avoidant than those mothers who are relatively less sensitive. Given the overlap observed between maternal sensitivity and attachment security, it is possible that the Dahlquist et al. (1994) and Sweet (1999) studies may have also been tapping into individual differences in attachment.

Everyday versus Medical Pain

Minor everyday bumps and scrapes, which rarely result in any observable physical injury or lasting pain, are the most common causes of pain in children (Fearon et al., 1995; von Bayer et al., 1998). Children themselves cite everyday type incidents as more likely causes of pain than both medical procedures and illnesses (Gaffney & Dunne, 1987; Harbeck & Peterson, 1992; Ross & Ross, 1984; Savedra, Gibbons, Tesler, Ward, & Wegner, 1982). However, while there exists a wealth of knowledge about children's response to medical pain, little research has focused on children's response to everyday pain. Two main reasons seem to account for the lack of research in this area. First, difficulties arise when attempting to measure pain response predictors in their natural environment. The situational possibilities are limitless, and it becomes impractical to examine each individual possibility (Fearon et al., 1996). Second, it is costly and intrusive to wait for a pain incident in a child's natural home setting, while examining

everyday pain in a laboratory setting would be ethically complicated (Fearon et al., 1996).

Only two studies to date have examined the prevalence and nature of everyday pain in children (Fearon et al., 1996; von Baeyer et al., 1998). In these studies, children between the ages of two and seven years were observed in their normal day care settings and an observational checklist was used to record information relevant to incidents of everyday pain. The information recorded included the age and sex of the child, time and location of the incident, the physical and behavioural context of the incident, and both the child's and adult's response to the incident. Care was also taken to insure that data collection did not interfere with the situational context.

Their results showed that in a day care setting everyday pain incidents occurred on average once every three hours per child and the majority of observed incidents were perceived to cause only momentary, minor discomfort. Rubbing the affected area, crying and making verbal statements were the most common responses to the incidents. Adult response was strongly associated with children's facial expression of distress with physical comfort and first aid offered more frequently to children who displayed the greatest distress. The majority of incidents received no adult response. Fearon et al. (1996) found that girls received physical comfort more often than boys (23% vs. 11%), however this finding seemed to be due to the fact that they exhibited a more vocal response style thereby alerting the caregiver. Based on these results, the authors concluded that: (1) as everyday pain constitutes children's major experience with pain and that (2) even minor incidents resulted in observable distress, everyday pain incidents

likely have considerable influence on the development of children's concept of and response to pain (Fearon et al., 1995; von Baeyer et al., 1998).

While the Fearon et al. (1996) and von Baeyer et al. (1998) studies provide much needed, but preliminary, information about the nature of everyday pain incidents in children, several research questions remain. For instance, in these studies pain was observed within a day care setting and with day care providers, but the nature of everyday pain incidents within a child's home or with parental caregivers is important. Further, while these incidents formulate a basis of pain experience, it remains unclear whether children respond to both everyday and medical pain in a similar or dissimilar fashion. The possibility of finding relations among medical and everyday pain situations would allow the findings from medical pain situations to be generalized to more common pain experience in children.

Additionally, given the social context in which these painful incidents frequently occur, it is plausible to assume that these repeated experiences would be incorporated into the child's internal working model of relationships. The relations between attachment processes and everyday pain remain to be examined. Moreover, elucidation of the potential differences between attachment security and everyday pain versus medical pain would be useful. For instance, while everyday pain incidents are reported by children to be the most commonly occurring type of pain (e.g., Savedra et al., 1982), children identify "shots" and venipuncture as among the most painful procedures to be experienced (Eland, 1981; Fernald & Corry, 1981; Lutz, 1986; Menke, 1981). In addition, everyday pain incidents typically occur within the child's normal social environment, whereas medical pain normally occurs outside of the child's normal social

environment (i.e., it is a strange situation). On the one hand, the novel situation of a medical environment may add additional stress to the child and serve to exacerbate his or her pain response, but on the other hand, the clinical context may act to restrict or alter the range of the child's behavioural responses. It would be interesting to see whether attachment dimensions better predict children's pain in everyday versus medical pain situations. Alternatively, if there were consistency in children's responses across contexts, it would also be interesting to determine whether there are differential relations between children's attachment security and the consistency of children's responses. For example, it may be that secure children, as compared to insecure children, are able to rely more on their parents as a source of comfort regardless of the painful situation and thus respond to both types of pain in a similar fashion. Similarly, the parents themselves may use consistent or inconsistent strategies across the situational contexts, which may be differentially related to their child's attachment security.

The Present Study and Hypotheses

The primary purpose of the present study is to examine the relations between attachment dimensions and child pain behaviour following both an everyday pain incident (e.g., bumps and scrapes) and acute pain incident (i.e., immunization) in a sample of five-year-old children and their mothers. The secondary goals of this study are to examine the potential relations between attachment dimensions and maternal behaviour during pain incidents and the potential similarities or dissimilarities between child and maternal behaviour displayed during the immunization and an everyday pain incident.

To investigate the relations between attachment, child pain behaviour, and parental behaviour, a correlational study was conducted. Attachment dimensions (i.e., security, avoidance, ambivalence, and disorganization/control) were assessed using aggregates of (1) lab-based, child-mother Separation-Reunion behaviour (Main & Cassidy, 1988; Marcus, 1988); (2) performance on representational measures of attachment (i.e., Separation Anxiety Test, Slough & Greenberg, 1990; and Pain and Relationship Task, Walsh, Symons, & McGrath, in press); and (3) a measure of emotion regulation (Shields & Cicchetti, 1995).

Within the attachment literature, the majority of research has typically assessed attachment using the well-established attachment categories. Several researchers have begun to assess attachment using a dimensional approach (e.g., Bartholomew & Horowitz, 1991; Brennan, Clark, & Shaver, 1998; Fraley & Waller, 1998). In the current thesis, the attachment constructs were assessed using continuous dimensions as opposed to categorical classifications for several reasons. First, as some researchers have suggested (Bartholomew & Horowitz, 1991; Brennan et al., 1998; Fraley & Waller, 1998), continuous ratings, when available, have several advantages over categorical ratings. Specifically, continuous ratings may be more powerful and precise in terms of assessing individual differences. For instance, it is possible for children in the same classification group to differ in intensity in their ratings, and this difference may be clinically significant. Further, correlational as opposed to group difference analyses may be more appropriate when samples are not sufficiently large or when there are naturally occurring differences in the distribution of group members. For instance, there is a disproportionate number of secure versus insecure individuals. However, despite the

potential benefits of using continuous ratings, it is hard to dispute the value of using the traditional attachment classifications. Thus, several of the analyses were also conducted using a categorical approach and showed similar findings. These analyses are contained in Appendix A.

Child pain behaviour and maternal behaviour were assessed using both objective and subjective measures. Specifically, children's faces were videotaped during inoculations at age five. Pain reaction was coded using the Children's Facial Coding Scale (Chambers, Cassidy, McGrath, Gilbert, & Craig, 1996) and parent-child interactions were assessed with the Child Adult Medical Procedure Interaction Scale - Revised (Blount, Cohen, Frank, Bachanas, Smith, Manimala, & Pate, 1997). Following the needle, both mothers and children provided ratings of subjective pain intensity and pain behaviour using a Medical Pain Incident Form (Strobele, 1998). In addition, mothers completed diaries following four everyday pain incidents (i.e., Everyday Pain incident Report Form; Fearon et al., 1996, Strobele, 1998) that their child experienced. Included in the diary was information concerning the child's reaction and subsequent parental response to the pain incidents.

Primary Hypotheses

It is hypothesized that attachment dimensions would be unrelated to children's baseline levels of pain and coping verbalizations and amount of pain experienced during the incidents but would be differentially related to the children's response to and behaviour following the painful incidents.

Hypothesis (a): Regardless of the attachment dimensions, the children would be equivalent in terms of baseline levels of pain and coping verbalizations and self-report of pain experienced during the incidents.

Hypothesis (b): Children with greater attachment security should express negative affect, make relatively more coping promoting versus distress promoting verbalizations, seek comfort or assistance from the mother, and be able to be soothed by the mother during the pain incidents.

Hypothesis (c): Children with greater avoidant attachment should minimize expressions of negative affect and pain-related facial activity, make relatively more coping promoting versus distress promoting verbalizations, should not seek comfort or assistance from the mother, and should not be able to be soothed by the mother should she initiate assistance during the pain incidents.

Hypothesis (d): Children with greater ambivalent attachment should express more negative affect and have greater pain-related facial action during the pain incidents, make relatively less coping promoting versus distress promoting verbalizations, seek comfort or assistance from the mother but also exhibit resistant and angry behaviour, and be less able to be soothed by the mother.

Hypothesis (e): Children with greater disorganized/controlling attachment should express more negative affect and have greater pain-related facial action during the pain incidents, make relatively less coping promoting versus distress promoting verbalizations, either seek comfort or assistance from the mother or alternatively avoid the mother, and be less able to be soothed by the mother.

Secondary Hypotheses

Several secondary relations were examined in order to provide a more comprehensive picture of the potential relations between attachment dimensions and pain behaviour. First, as the development of attachment is attendant on the parent's ability to meet the child's security needs (Cassidy, 1994), the hypothesis that there may be differences in the relative use of coping promoting strategies (e.g., distraction, non-procedural talk, humour) and distress promoting strategies (e.g., reassurance, apologies, giving control to child) between parents of secure versus insecure children was examined. Second, as attachment dimensions, and internal working models, are thought to be consistent across situations and experiences that evoke negative emotions (Cooper et al., 1998), the hypothesis that child and maternal behaviour would be consistent during the immunization and an everyday pain incident was examined. Given the paucity of research in these areas, these analyses are considered exploratory.

Hypothesis (f): Mothers of children with greater attachment security would use more coping promoting and less distress promoting strategies during the pain incidents.

Hypothesis (g): Mothers of children with greater avoidant, ambivalent, or disorganized/controlling attachment, would use more distress promoting and less coping promoting strategies during the pain incidents.

Hypothesis (h): Mothers of children with greater ambivalent attachment would be more anxious about the painful procedure than the other mothers.

Hypothesis (i): Both child and maternal behaviour, as assessed by the Everyday Pain Incident Form and the Medical Pain Incident Form, would be consistent across pain contexts.

Hypothesis (j): If child and maternal behaviour were not consistent across contexts, then differences in the child attachment dimensions would account for this discrepancy.

CHAPTER 2. METHOD

Participants

Ethical approval was provided by the Health Sciences Research Ethics Board at Dalhousie University. The participating medical clinics also reviewed this study and gave consent for their clients to be approached for participation. Participant recruitment was carried out using two methods. First, mothers and their children who had been involved in a previous immunization study conducted at 6 and 18 months (Sweet et al., 1999) and who had agreed to consider participation in future studies were contacted and invited to participate with their children in this study. A copy of the initial phone script is contained in Appendix B. Second, mothers of four- to six-year-old children were contacted by the participating medical clinic staff to obtain permission for them to be contacted further by a researcher in order to learn more about the study. In addition, posters advertising the study were placed in the waiting room at the clinics, and interested mothers were invited to call the Dalhousie Pain Research Laboratory for more information. Mothers who were contacted by phone, or who contacted the department on their own, were informed about the study using a standard script concerning the purpose of the study and what participation would entail (see Appendix C).

To be eligible to participate, children had to be between the ages of four and six years, receiving their immunization at one of the participating medical clinics, and in good health at the time of the study. Mothers and children who met the inclusion criteria and who wished to participate were scheduled to visit the Pain Research Laboratory as close as possible to the anticipated date their children were to receive their immunization.

In total, 102 mothers were informed about the study over the 19-month period from July 2001, to February 2003. Of those, 93 were eligible to participate, and 17 (18.3%) declined. Finally, of the total number of participants who completed the study, 10 mother-child dyads had to be excluded due to technical problems in data collection. The specific reasons for non-participation are presented in Appendix D.

The participants included in the data analyses were 66 mother-child dyads. The children ranged in age from 4.20 years to 6.25 years (M = 5.07 yrs, SD = 0.35). All children spoke English as a first language, 30 (45.5%) of the children were female, 63 (95.4%) came from two-parent households, and 12 (18.2%) had no siblings. Thirty-four (51.5%) of these children were first born, 25 (37.9%) were second born, six (9.1%) were third born, and one (1.5%) was a fourth born. The ethnic backgrounds of these children included 60 (90.9%) English Canadians, two (3.0%) African Canadians, one (1.5%) French Canadian, one (1.5%) Chinese Canadian, one (1.5%) bi-racial Canadian, and one (1.5%) Lebanese Canadian.

All mothers in this study were the biological parents of their children. Mothers' ages ranged from 25.20 to 45.42 years (M = 36.64 yrs, SD = 4.42). The ethnic backgrounds of mothers included 60 (90.9%) English Canadians, two (3.0%) African Canadians, one (1.5%) French Canadian, one (1.5%) Chinese Canadian, one (1.5%) Italian Canadian, and one (1.5%) Lebanese Canadian. Sixty (90.9%) mothers were married, three (4.5%) were living common law, two (3.0%) were separated, and one (1.5%) was single. Forty-five (68.2%) mothers were working outside of the home. Twelve (18.2%) mothers had one child, 32 (48.5%) had two children, 15 (22.7%) had three children, six (9.1%) had four children, and one (1.5%) had five children. The

educational level among the mothers was graduate or professional training (level 1) for 17 (25.8%) mothers, undergraduate university training (level 2) for 31 (47.0%) mothers; partial university or college level training (level 3) for 15 (22.7%) mothers, and high school graduation (level 4) for three (4.5%) mothers.

Socioeconomic status (SES) was calculated using the Hollingshead Two-Factor Index of Social Position (Miller, 1977). The highest level of SES was calculated for each household. The values obtained were level one for 21 (31.8%) households, level two for 29 (43.9%) households, level three for 13 (19.7%) households, level four for 2 (3.0%) households, and unspecified for 1 (1.5%) household. Lower scores indicate higher SES (i.e., level one is the highest SES).

Measures

Mothers completed a demographic questionnaire (see Appendix E) concerning family background variables including: parent education, employment, marital status of the mother, parent and child ethnicity, mother's age, child's age, number of adult and child family members presently living with the child, and age of any children currently residing or not residing with the mother and child.

Two coders scored measures where appropriate. Scores used in data analyses were based on the primary coder's ratings. The secondary coder's ratings were used solely to determine the inter-rater reliability of the respective measures.

Measures of Attachment Relevant Constructs

Consistent with the suggestion of Main and Cassidy (1988), children's attachment was assessed using both representational and behavioural measures. In addition, given the proposed link between attachment and the regulation of emotion (Bowlby, 1980; de

Rosnay & Harris, 2002; Main et al., 1985; Cassidy, 1994), a measure of emotion regulation was also included.

Representational Measures

Separation Anxiety Test.

Measurement. The Separation Anxiety Test (SAT; Klagsburn & Bowlby, 1976; Slough & Greenberg, 1990) is a semi-projective test designed to assess children's responses to representations of separations from parents. The SAT was originally developed by Klagsburn and Bowlby (1976) for children aged four to seven years and was later modified by Slough and Greenberg (1990). The stimuli for this task include 12, six with boys and six with girls, black and white 5" x 7" photographs depicting the following separation situations: (1) parents go out for the evening, leaving child at home; (2) parents go away for the weekend, leaving child with aunt and uncle; (3) child's first day of school, moment of parting from mother; (4) parents are going away for two weeks and prior to their departure they give child a gift; (5) while in a park, child is asked to play alone for awhile because the parents want some time alone to talk; and (6) mother tucks child in bed and leaves the room. The classification of the separation photographs as severe or mild followed Slough, Goyette, and Greenberg (1988), with photographs 1, 2 and 4 representing severe separation, and 3, 5 and 6 representing milder separations.

Following Slough et al. (1988), the SAT was introduced as follows: "Sometimes parents have to go away for a little while and leave their little girl (boy). I would like to know how children feel when their parents have to leave. Some children feel happy, some feel angry, some feel scared, and some feel OK. I would like you to help me know how little girls (boys) feel. I am going to show you some pictures and ask you some

questions." The child was then shown each picture, followed by a brief description of the situation.

After each photograph was described, the child was asked, "How do you think the little girl (boy) in the picture might feel?" Once the child gave a response, the examiner asked the child "Why do you think she (he) feels _____ ?" After the child completed the justification for the feeling the child was asked, "What is the little girl (boy) going to do?" If the child was reluctant to respond, the examiner encouraged the child with probes such as, "How do you think the child *might* feel?" or "Go ahead and just guess." These questions were then repeated in reference to the child's own feelings. A copy of the SAT script is shown in Appendix F.

The child's responses to each question were transcribed verbatim from the videotape of each session. The transcripts were then scored according to the scoring system based on that used by Slough et al. (1988). Responses to all three parts of the answer were considered (i.e., the valence of the feeling, the focus of justification for feeling, and the content of coping). The total response was then allocated to one of 21 subcategories which differentiate particular aspects of the answer (e.g., recognition of stress). For a description of the subcategories see Slough et al. (1988). The subcategories were then given a score derived from the following system. Responses to the three severe separation pictures were rated on a four-point attachment security dimension (1 = low to 4 = high) giving a summary score range of 3 to 12. The attachment security dimension reflects the child's ability to express vulnerability or need about the separation. Responses to the three mild separation pictures were rated on a four-point self-reliance dimension (1 = low to 4 = high) giving a summary score range of 3 to 12. The self-

reliance dimension reflects the child's ability to express self-confidence about handling the separations more or less independently. All six pictures were rated on a three-point avoidance dimension (1 = low to 3 = high) giving a summary score range of 6 to 18. The avoidance dimension reflects the child's degree of avoidance in discussing the separations. The ratings were given twice, once for the hypothetical child reference and once for the child's self-reference.

Both self and other references were used as researchers examining child representations of self versus other have found systematic differences in how children describe themselves as compared to a hypothetical peer when discussing attachment related material (Slough & Greenberg, 1990; Walsh et al., in press; Wright, Binney, & Smith, 1995). For instance, Slough and Greenberg (1990) found that overall there were higher correlations between the ratings of attachment based on a separation-reunion task and the scores for self (*r*'s .27 to .46) on the SAT than between the ratings of attachment and the scores for the other child (*r*'s .22 to .38). Based on this finding, Slough and Greenberg concluded that for some children, the ways in which they discuss or avoid discussing themselves in the context of separation is more closely related to their attachment status than is their discussion of hypothetical peers. In addition, children who obtained the same self-reliance scores when referring to self and to the hypothetical child also had the highest security ratings as obtained using the separation-reunion sequence. Children whose scores for self were higher than their scores for other (i.e., they tended to make themselves appear somewhat more self-sufficient than the children in the pictures) were rated as less secure. Children whose scores for the hypothetical child were higher than their scores for self (i.e., the children in the pictures were presented as more self-

reliant than themselves) were rated as least secure. Finally, children who had the same avoidance SAT scores when referring to self and other were rated as more secure and less avoidant than children whose scores for self and other differed. Slough and Greenberg (1990) concluded that children with the most secure attachments are less likely to make a distinction between self and peer, which would suggest that they can process and disclose their emotions concerning attachment-related material without regard to the referent. Insecure children, however, are less able to consciously process (i.e., defensively exclude) attachment-related material about the self than when discussing the hypothetical child. Thus, a more accurate representation of their internal working models may be revealed in reference to themselves.

The SAT is gaining recognition as an assessment of internal working models of relationships that is related to social skills (Bohlin, Hagekull, & Rydell, 2000), preschool adjustment, and later cognitive abilities (Jacobsen, Edelstein, & Holfmann, 1994; Main et al., 1985; Shouldice & Stevenson-Hinde, 1992). For instance, Shouldice and Stevenson-Hinde (1992) have provided data to support the concurrent validity of the SAT as an attachment instrument. In their study, Shouldice and Stevenson-Hinde (1992) used Klagsburn and Bowlby's (1976) SAT to examine if the same organization of attachment seen on reunions (e.g., secure, avoidant, ambivalent, or controlling/disorganized) of four and a half-year-olds' and their mothers would be revealed in the child's responses to the separation pictures. The responses to the SAT pictures were coded for emotional openness (e.g., appropriate expression, avoidance, denial, overreaction, anxiety), interruption, somatic responses, passive solutions, and incoherence. Their results showed that secure children gave the highest percentage of appropriate negative responses and a

lower percentage of inappropriate responses and exhibited fewer persistent denials, over-positive feelings, interruptions, passive solutions, and incoherent responses. For the insecure children, more avoidant children gave an avoidant response more often than any other type of response, ambivalent children displayed the most anger and the controlling/disorganized children showed more incoherence than the other groups combined. Previous research has also shown moderate correlations (*r*'s ranging from .22 to .46) between SAT scores and attachment ratings obtained from separation-reunion situations, both measured concurrently (Shouldice & Stevenson-Hinde, 1992; Slough & Greenberg, 1990) and longitudinally (Main et al., 1985).

Operationalization. Representations of separation were operationalized as the children's raw scores on each of the attachment and self-reliance rating scales and the logarithmic transformed scores on the avoidance rating scale for both the self-reference and other-reference responses. Logarithmic transformations were conducted on the avoidance scales as preliminary analyses showed that the distributions were positively skewed for the self-reference ($S = 1.18$, $s_S = .299$, $z = 3.95$) and other-reference ($S = 1.17$, $s_S = .299$, $z = 3.91$) data. Elevated scores on the attachment rating scale and self-reliance rating scale represent security, whereas elevated scores on the avoidance rating scale represent insecurity. The attachment security rating scale raw scores had a range of 3 to 12 ($M = 7.89$, $SD = 2.87$), and 3 to 12 ($M = 8.59$, $SD = 2.58$), for the self- and other-reference respectively, with higher scores indicating greater expression of vulnerability or need about the separation. The self-reliance rating scale raw scores had a range of 3 to 12 ($M = 7.84$, $SD = 2.69$), and 3 to 12 ($M = 7.22$, $SD = 2.00$), for the self- and other-reference respectively, with higher scores reflecting greater expression of self-confidence

about handling the separations more or less independently. The avoidance rating scale raw scores had a range of 6 to 18 (M = 8.50, SD = 3.23), and 6 to 15 (M = 7.98, SD = 2.26), for the self- and other-reference respectively, with higher scores indicating a greater degree of avoidance in discussing the separations.

Bivariate correlations between the three SAT subscales for both the self- and other-reference data showed no relation between attachment and self-reliance (r's ranged from -.01 to .15), indicating that the two scales are measuring independent aspects of responses. Correlations between attachment and avoidance (r's ranged from -.65 to -.71, p's < .001) and between self-reliance and avoidance (r's ranged from -.28 to -.55, p's < .05), suggest that avoidance is only partially independent of the other two scales. These findings are consistent with Slough and Greenberg's (1990) account of the scale psychometrics.

Reliability. Two coders were trained on the SAT. Prior to data coding, coders established inter-rater reliability on a series of 16 practice tapes and transcripts. On these tapes, the primary and secondary coders achieved an inter-rater reliability of .89 (Attachment Security), .97 (Self-Reliance), and .84 (Avoidance) for the self-reference data, and .92 (Attachment Security), .87 (Self-Reliance), and .93 (Avoidance) for the other reference data, using Pearson correlations between like-variables. Further, to ensure that individual coding judgments were reliable, Cohen's Kappa (Cohen, 1968) was calculated on the allocation of individual responses to the 21 subcategories across participants and yielded kappas of .77 for the self-reference data and .72 for the other-reference data.

Twenty percent (13) of test tapes were randomly selected and coded for inter-rater reliability. Using Pearson correlations between like-variables, coders achieved an inter-rater reliability of .98 (Attachment Security), .90 (Self-Reliance), and .98 (Avoidance) for the self-reference data, and .97 (Attachment Security), .93 (Self-Reliance), and .90 (Avoidance) for the other-reference data. The overall inter-rater reliability kappas for these cases were .81 for the self-reference data and .86 for the other-reference data.

Pain and Relationship Task (PART)

Measurement. The Pain and Relationship Task (PART; Walsh et al., in press) is a semi-projective task designed to assess children's responses to representations of pain situations. The stimuli for this task include six black and white, ink drawn Charleston Pediatric Pain Pictures (CPPP; Belter et al., 1988) depicting the following pain situations: (1) child burning hand on stove at home; (2) child being stung by a bee outside; (3) barefoot child stepping on a nail outside; (4) child scraping knee on sidewalk; (5) child hitting head on table corner at home; and (6) child having a book fall on foot at home. The classification of the pain pictures as severe or mild followed Belter et al. (1988), with pictures 1, 2 and 3 representing severe pain situations, and 4, 5 and 6 representing mild pain situations. The parent pictures from the Family Relations Test – Children's Version (Bene & Anthony, 1985) were modified to include neutral facial expressions and accompanied the presentation of the pain pictures. Before administering the PART, the child was asked, "Who are the people who live with you at home?" and "Who are the people in your family?" The child was then shown the parent pictures and asked to pick ones that best represent her/his parents [i.e., "child's parent(s)"]. The parent pictures are available to be integrated or not into the child's response at the participant's discretion.

Next pictures, of a similar composition, were selected by the examiner to represent the "other's parent(s)".

The PART was introduced as follows: "Sometimes children hurt themselves by mistake. I would like to know how children feel when they are hurt. Some children feel happy, some feel angry, some feel scared and some feel OK. I would like you to help me know how little girls (boys) feel. I am going to show you some cartoon pictures of a little girl (boy) and ask you some questions." The child was then shown the pain pictures, with either the pictures of the "other's parents" or the "child's parent(s)", followed by a brief description of the situation.

After each picture was described, the child was asked, "How do you think the little girl (boy) in the picture might feel?" Once the child gave a response, the examiner asked the child "Why do you think she (he) feels _____ ?" After the child completed the justification for the feeling the child was asked, "What is the little girl (boy) going to do?" If the child was reluctant to respond, the examiner encouraged the child with probes such as, "How do you think the child *might* feel?" or "Go ahead and just guess." Also, if the child responded that the child will go to the parent but does not say what the parent will do, then an additional prompt was given in which the child was asked, "What is the mommy and/or daddy going to do?" Next, the "other's parent(s)" pictures were replaced by the "child's parent(s)" pictures and these questions were then repeated in reference to the child's own feelings. A copy of the PART script is shown in Appendix G.

The child's responses to each question were transcribed verbatim from the videotape of each session. Transcripts were used for scoring the PART. As similar internal working models are hypothesized to direct children's responses to both

separation and pain situations, the scoring system paralleled that used by Slough et al. (1988) for the SAT with the following modifications made to the subcategory descriptions. First, two of the subcategories (Attachment/Self-Reliant/Image of Parents and Hi Attachment/Self-Reliant) were dropped as they were inconsistent with a pain scenario. For example, a coping response that involves looking at a picture of your parents, which is relevant in separation, was not thought to be plausible in pain situations. Second, three of the SAT subcategories deal with the child physically trying to stay with the parents (Attachment/Increase Access to Parents, Anxious/Increase Access to Parents, and Attachment/Self-Reliant/Increase Access to Parents) and are scored as less secure. For the PART, however, seeking assistance from the parents was considered to be a secure coping response. Thus, to remain consistent with Slough et al.'s (1988) scoring system these three categories were modified to describe a less secure coping response (i.e., Decreasing Access to Parents). Finally, the subcategory descriptions were reworded to reflect children's thoughts about pain incidents, as opposed to separation situations. A copy of the PART scoring protocol is contained in Appendix H.

The overall scoring procedure was identical to Slough et al. (1988). Responses to all three parts of the answer were considered (i.e., the valence of the feeling, the focus of justification for feeling and the content of coping). The total response was then allocated to one of 19 subcategories that differentiate particular aspects of the answer (e.g., recognition of stress). The subcategories were then given a score derived from the following system. Responses to the three high pain pictures were rated on a four-point attachment security dimension (1 = low to 4 = high) giving a summary score range of 3 to 12. The attachment security dimension reflects the child's ability to express vulnerability

or need about the pain situation. Responses to the three low pain pictures were rated on a four-point self-reliance dimension (1 = low to 4 = high) giving a summary score range of 3 to 12. The self-reliance dimension reflects the child's ability to express self-confidence about handling the pain situations more or less independently. All six pictures were rated on a three-point avoidance dimension (1 = low to 3 = high) giving a summary score range of 6 to 18. The avoidance dimension reflects the child's degree of avoidance in discussing the pain situations. The ratings were given twice, once for the hypothetical child reference and once for the child's self-reference.

The construct validity of the PART has been demonstrated. Specifically, for both the self- and other-references, Walsh et al. (in press) found significant correlations between the SAT attachment rating scale, self-reliance rating scale, and avoidance rating scale, and the respective PART subscales (*r*'s range from .33 to .57).

Operationalization. Representations of pain were operationalized as the children's raw scores on each of the attachment and self-reliance rating scales and the logarithmic transformed scores on the avoidance rating scale for both the self-reference and other-reference responses. Transformations were conducted on the avoidance scales as preliminary analyses showed that the distributions were positively skewed for the self-reference ($S = 1.01$, $s_S = .299$, $z = 3.38$) and other-reference ($S = 1.27$, $s_S = .299$, $z = 4.25$) data. Elevated scores on the attachment rating scale and self-reliance rating scale represent security, whereas elevated scores on the avoidance rating scale represent insecurity. The attachment security rating scale raw scores had a range of 3 to 12 ($M = 8.63$, $SD = 2.74$), and 4 to 12 ($M = 9.33$, $SD = 1.78$), for the self- and other-reference respectively, with higher scores indicating greater expression of vulnerability or need

about the pain situation. The self-reliance rating scale raw scores had a range of 3 to 12 (M = 7.56, SD = 2.53), and 4 to 12 (M = 8.34, SD = 2.46), for the self- and other-reference respectively, with higher scores reflecting greater expression of self-confidence about handling the pain situations more or less independently. The avoidance rating scale raw scores had a range of 6 to 18 (M = 8.75, SD = 3.24), and 6 to 14 (M = 7.66, SD = 2.37), for the self- and other-reference respectively, with higher scores indicating a greater degree of avoidance in discussing the pain situations.

Bivariate correlations between the three PART subscales showed no relation between attachment and self-reliance ($r(62)$ = -.02, p = .91) for the other-reference data only, indicating that the two scales are measuring relatively independent aspects of responses. Significant correlations were found between attachment and self-reliance for the self-reference data ($r(62)$ = .32, $p < .05$). For both the self- and other-reference data, significant correlations were found between attachment and avoidance (r's ranged from -.70 to -.80, p's < .001) and between self-reliance and avoidance (r's ranged from -.37 to -.54, p's < .01), suggesting that avoidance is only partially independent of the other two scales, which is consistent with the subscale construction.

Reliability. Two coders were trained on the PART. Prior to data coding, coders established inter-rater reliability on a series of 16 practice tapes and transcripts. On these tapes, the primary and secondary coders achieved an inter-rater reliability of .91 (Attachment Security), .86 (Self-Reliance), and .93 (Avoidance) for the self-reference data, and .86 (Attachment Security), .83 (Self-Reliance), and .93 (Avoidance) for the other-reference data, using Pearson correlations between like-variables. Further, to ensure that individual coding judgments were reliable, Cohen's Kappa (Cohen, 1968) was

calculated on the allocation of individual responses to the 19 subcategories across participants and yielded kappas of .75 for the self-reference data and .81 for the other-reference data.

Twenty percent (13) of test tapes were randomly selected and coded for inter-rater reliability. Using Pearson correlations between like-variables, coders achieved an inter-rater reliability of .95 (Attachment Security), .96 (Self-Reliance), and .93 (Avoidance) for the self-reference data, and .95 (Attachment Security), .95 (Self-Reliance), and .91 (Avoidance) for the other-reference data. The overall inter-rater reliability kappas for these cases were .84 for the self-reference data and .84 for the other-reference data.

Behavioural Measure of Attachment

Separation-Reunion Procedure.

Measurement. A separation-reunion procedure was used to provide a behavioural measure of attachment along four dimensions: secure behaviour, avoidant behaviour, ambivalent behaviour, and controlling behaviour. The procedure was similar to the separation-reunion procedure used with six-year-olds in the Main and Cassidy (1988) study. With this procedure, parents and children were separated for approximately one hour during which the individual testing procedures were carried out (e.g., administration of the Separation Anxiety Test). At the end of the separation, the mother was told that the child and examiner were finished with their tasks and that she could return to the room and that the examiner would join them in a couple of minutes. Reunion was not emphasized. The mother and child were allowed to reunite for two minutes.

The reunion was videotaped and later coded using the Parent/Child Reunion Inventory (P/CRI; Marcus, 1988). The Parent/Child Reunion Inventory is based on

research by Main and Cassidy (1988) and the theoretical constructs of Ainsworth et al. (1978). The inventory consists of twenty behavioural items, originally described in Main and Cassidy (1988), which can be rated by either the parent or an observer. The rater is asked to rate the typical occurrence of each behavioural items as 0 = never, 1 = occasionally, and 2 = usually following a separation and reunion. Six of the reunion items pertain to secure behaviours (e.g., Child initiates positive interaction with the parent) and can be summed to provide an overall subscale score of secure behaviour with a possible range of scores from 0 to 12, with higher scores reflecting greater security. The remaining 14 items pertain to insecure behaviours (e.g., Child stays away from the parent) and can be summed provide an overall subscale score of insecure behaviour with a possible range of scores from 0 to 28, with higher scores reflecting greater insecurity. The insecure items can also be subdivided to reflect Main and Cassidy's (1988) avoidant, ambivalent, controlling, and undecided attachment classifications.

The secure and insecure subscales are conceptually and empirically related (*r*'s range from -.38 to -.50; Marcus, 1990; Marcus & Kramer, 2001). The insecure subscale scores also correlate well (part-whole *r*'s range from .66 to .73) with the overall insecure attachment score (Marcus, 1990). Insecure subscale intercorrelations are also good (*r*'s range from .34 to .62), although insecure-avoidant correlates only with insecure-controlling. The internal consistency is also good with Cronbach's alphas of .76 for the secure and .77 for the insecure subscales (Marcus, 1991). The construct validity of the P/CRI has been supported with significant correlations (*r*'s range from .25 to .57) in the predicted directions between both the secure and insecure subscales and measures of pro-social behaviour, social competence, achievement, maladaptive behaviour, internalizing

behaviour problems, and externalizing behaviour problems (Marcus, 1991; Marcus, 1997; Marcus & Kramer, 2001). In addition, comparison of the factor structure of the P/CRI to Main and Cassidy (1988) attachment categories derived from direct observation of 233 five-year-old children showed that 16 of the 20 items loaded on factors corresponding to Main and Cassidy's (1988) category system (Marcus, 1997).

In the current study, coders, blind to the children's other scores, reviewed the videotaped reunions and scored the interactions between the mother and child on the behavioural items. The item scores were then summed in accordance with Marcus (1988, 1990) and averaged to create four rating scales: secure behaviour, avoidant behaviour, ambivalent behaviour, and controlling behaviour. The items included on each scale are contained in Appendix I.

Operationalization. Attachment security behaviour was operationalized as the children's raw mean scores on the secure and avoidant behaviour rating scales and square root transformed mean scores on the ambivalent and controlling behaviour ratings scales. Transformations were conducted on the ambivalent and controlling behaviour scales as preliminary analyses showed that the distributions were markedly, positively skewed (S = 1.58, s_s = .297, z = 5.31; S = 2.04, s_s = .297, z = 6.86, respectively). The secure behaviour rating scale raw mean scores had a range of 0 to 2 (M = 0.98, SD = 0.59), with higher scores indicating greater degree of secure behaviours with the mother. The avoidant behaviour rating scale raw mean scores had a range of 0 to 1.40 (M = 0.56, SD = 0.43), with higher scores indicating a greater degree of avoidant behaviour with the mother. The ambivalent behaviour rating scale raw mean scores had a range of 0 to 2 (M = 0.35, SD = 0.49), with higher scores reflecting greater degree of ambivalent behaviour with the

mother. The controlling behaviour rating scale raw mean scores had a range of 0 to 2 (M = 0.16, SD = 0.32), with higher scores reflecting greater degree of controlling behaviour with the mother.

Consistent with previous research (Marcus, 1990; Marcus & Kramer, 2001), bivariate correlations between the four rating scale mean scores showed that the secure behaviour rating scale was significantly and negatively related to the avoidance ($r(63) = -.79$, $p < .001$), and controlling ($r(63) = -.38$, $p < .01$) behaviour rating scales. The controlling behaviour rating scale was also significantly related to the ambivalent ($r(63) = .51$, $p < .001$) and avoidant ($r(63) = .26$, $p < .05$) behaviour rating scales.

Reliability. Prior to data coding, two coders, trained on the separation-reunion scoring system, established inter-rater reliability on a series of five practice tapes. On these tapes, the primary and secondary coders achieved an inter-rater reliability of .77 on the secure behaviour rating scale, .79 on the avoidant behaviour rating scale, 1.00 on the ambivalent behaviour rating scale, and 1.00 on the controlling behaviour rating scale, using Kendall's tau-b correlations between like-variables. Further, to ensure that individual coding judgments were reliable, Cohen's Kappa (Cohen, 1968) was calculated on the ratings across the 20 individual items and yielded an overall kappa of .83.

The primary coder, blind to all other information about the children including the SAT and PART scores, coded the reunions. Twenty percent (13) of test tapes were randomly selected and coded by a second coder for inter-rater reliability. The Kendall's tau-b correlations for these cases were as follows: .91 on the secure behaviour rating scale, .88 on the avoidant behaviour rating scale, .80 on the ambivalent behaviour rating

scale, and .99 on the controlling behaviour rating scale. The overall kappa for the individual coding judgments was .88.

Emotion Regulation.

Measurement. The Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1995) is a 24-item other-report measure of children's self-regulation and targets processes central to emotion regulation, such as affective lability, intensity, valence, flexibility, and situational appropriateness. With this measure, raters familiar with the child are asked to judge how characteristic each item is for the child on a 4-point Likert scale ranging from 1 (*almost always*) to 4 (*never*). Two subscale scores are then derived from the ratings. The *Lability/Negativity* subscale is composed of items pertaining to mood swings, angry reactivity, emotional intensity, and dysregulated positive emotions. Scores on this subscale have a possible range of 15 to 60 with higher scores reflecting greater dysregulation. The *Emotion Regulation* subscale contains items reflecting processes central to adaptive regulation including equanimity, emotion understanding, and empathy. Scores on this subscale have a possible range of 8 to 32 with higher scores reflecting greater regulation. Mothers completed the ERC in the current study.

The test-retest reliability of the ERC has been demonstrated (Fujiki, Brinton, & Clarke, 2002). Specifically, item-by-item comparisons of teacher ratings obtained twice over a two-week interval showed a percentage of agreement of 87%. The internal consistency is also reported to be high with Cronbach's alphas of .96 for the lability/negativity and .83 for the emotion regulation subscales (Shields & Cicchetti, 1997). The construct validity of the ERC has also been supported (Shields & Cicchetti,

1997). Correlation coefficients between the Emotion Regulation Q-scale and the lability/negativity and emotion regulation subscales were -.79 and .68, respectively.

Operationalization. Emotion regulation was operationalized as the child's ERC lability/negativity and emotion regulation subscales scores as rated by the mothers. The scores ranged from 15 to 50 (M = 26.38, SD = 6.41) for the lability/negativity subscale, with higher scores reflecting greater dysregulation, and from 22 to 32 (M = 28.83, SD = 2.48) for the emotion regulation subscale, with higher scores reflecting greater regulation. The internal consistency of the subscales in the present study were good with Cronbach's alphas of .85 for the lability/negativity and .63 for the emotion regulation subscales.

Aggregation of Attachment Relevant Constructs

Several measures were used to assess the construct of attachment in the current thesis. It has been suggested that the sum of a set of multiple measurements is a more stable and representative estimator of a construct than any single measurement (Carlson & Moses, 2001; Rushton, Brainerd, & Pressely, 1983). By combining numerous exemplars, particularly those using different measurement procedures or domains, the idiosyncratic variance associated with measurement is averaged out (Carlson & Moses, 2001; Rushton et al., 1983). One drawback, however, with aggregation procedures, is that the direct relations between the individual components that comprise the aggregate and the outcome variables are not examined.

In order to increase the psychometric precision of the attachment constructs and to reduce the number of predictor variables to be used in the analyses, an aggregation procedure was employed to create overall dimension scores of security, avoidance, ambivalence, and control. With this procedure, correlations between theoretically-related

attachment constructs were first examined to determine if the separate measures were indeed related. The individual scale scores were then converted to *z*-scores and averaged to create an aggregate dimension score.

Attachment security. Ten measures of attachment security were assessed in the current thesis, including: SAT and PART attachment rating scale and self-reliance rating scale self- and other-reference scores, P/CRI secure behaviour rating scale mean scores, and ERC emotion regulation subscale scores. These measures therefore encompass self-report representational measures of security, observer ratings of secure base behaviour during separation, and parent reports of emotional regulation. The correlation matrix of the attachment security measures is presented in Table 1. First, consistent with previous studies that have shown an association between quality of attachment and emotion regulation (e.g., Arend et al., 1979; Sroufe, 1983; Kobak & Sceery, 1988; Kobak et al., 1993; Berlin, 1995; Kogan, 1997; Spangler & Zimmermann, 1999; Zimmermann, 1999), an examination of the correlation matrix revealed that there were several significant and marginally significant positive correlations between the emotion regulation subscale and the SAT and PART subscales. Specifically, the emotion regulation subscale was significantly correlated with the SAT other-reference and PART self-reference attachment rating scales, and marginally significantly correlated with the SAT self-reference attachment rating scale. Thus, children who were characterized as having relatively greater emotion regulation skills were better able to express vulnerability or need about the severe separations and pain situations.

Second, consistent with the findings of Walsh et al. (in press), for both the self- and other-reference data, significant positive correlations were found between the SAT

Table 1.

Pearson Correlations Between the Emotion Regulation Checklist (ERC) Emotion Regulation Subscale Scores, Separation Anxiety Test (SAT) and Pain and Relationship Task (PART) Attachment Rating Scale and Self-Reliance Rating Scale Self- and Other-Reference Scores, and Parent/Child Reunion Inventory (P/CRI) Secure Behaviour Rating Scale Mean Scores

	1	2	3	4	5	6	7	8	9
ERC									
1. Regulation	--								
SAT - "Self"									
2. Attachment	.23^{+}	--							
3. Self-Reliance	.07	.15	--						
SAT - "Other"									
4. Attachment	.26*	.70***	.12	--					
5. Self-Reliance	.15	.04	.63***	-.01	--				
PART - "Self"									
6. Attachment	.28*	.55**	.33**	.37**	.09	--			
7. Self-Reliance	.05	.27*	.21^{+}	.18	.02	.32*	--		
PART-"Other"									
8. Attachment	.18	.43***	.28*	.37**	.11	.67***	.25*	--	
9. Self-Reliance	-.14	.03	.16	.05	.01	.03	.69***	-.02	--
P/CRI									
10. Secure	.01	.31*	.13	.03	.18	.14	.24^{+}	.11	.16

Note. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$, $^{+}p < .10$.

attachment rating scale and the PART attachment rating scale. The SAT and PART self-reliance rating scales however, which were marginally significant for the self-reference data, were not significantly correlated for the other-reference data. Thus, children who expressed vulnerability about the severe separations also expressed vulnerability or need about the severe pain situations. Children who expressed self-confidence about handling the milder separations more or less independently also tended to express self-confidence about handling the milder pain situations more or less independently.

Finally, consistent with previous research which has shown moderate correlations between representational attachment measures and attachment ratings obtained from separation-reunion situations (Main et al., 1985; Shouldice & Stevenson-Hinde, 1992; Slough & Greenberg, 1990), there were significant positive correlations between the P/CRI secure behaviour rating scale and the SAT self-reference attachment and a marginally significant positive correlation between the secure behaviour rating scale and the PART self-reference self-reliance rating scale. Thus, children who displayed secure behaviours on reunion with the mother were better able to express vulnerability or need about the severe separations and tended to express self-confidence about handling the milder pain situations more or less independently.

The significant intercorrelations obtained between the attachment security measures would suggest that the variables are measuring conceptually-related constructs. Thus, the *z*-scores for the 10 individual subscale scores were combined to produce an aggregate security dimension score. Scores were weighted so that representational, observational, and parent report measures contributed equally to the aggregate. The

Cronbach's alpha for the attachment security dimension aggregate score was .72. Higher scores on the aggregate security dimension reflect greater attachment security.

Avoidance. Five measures of avoidance were assessed including: SAT and PART avoidance rating scale self- and other-reference transformed scores, and P/CRI avoidant behaviour rating scale mean scores. The correlation matrix of the avoidance measures is presented in Table 2. Examination of the correlations between these measures showed that for both the self- and other-reference data, significant positive correlations were found between the SAT avoidance rating scale and the PART avoidance rating scale. In addition, there were significant positive correlations between the P/CRI avoidant behaviour rating scale and the SAT self- and other-reference avoidance rating scales. Thus, children who had a higher degree of avoidance when discussing the separation situations also had a higher degree of avoidance when discussing the pain situations and displayed a relatively greater degree of avoidant behaviours on reunion with the mother.

The significant correlations obtained between the avoidance measures would suggest that the variables are also measuring conceptually-related constructs. Thus, the normalized *z*-scores for the five individual subscales were combined to produce an aggregate avoidance dimension score. A weighted average was used so that representational and observational measures contributed equally to the aggregate. Cronbach's alpha for the avoidance dimension aggregate score was .82. Higher scores on the aggregate avoidance dimension reflect greater avoidant attachment.

Ambivalent and Controlling. The underregulation of expressive behaviour displayed by both ambivalent and controlling children is proposed to reflect atypicality in emotion regulation (Block & Block, 1980; Cole et al., 1994; Eisenberg & Fabes, 1992;

Table 2.

Pearson Correlations Between the Separation Anxiety Test (SAT) and Pain and Relationship Task (PART) Avoidance Rating Scale Self- and Other-Reference Scores, and Parent/Child Reunion Inventory (P/CRI) Avoidant Behaviour Rating Scale Mean Scores

	1	2	3	4
1. SAT - "Self" Avoidance	--			
2. SAT - "Other" Avoidance	.82***	--		
3. PART - "Self" Avoidance	.54***	.60**	--	
4. PART-"Other" Avoidance	.53***	.52***	.70***	--
5. P/CRI Avoidant	.47***	.33**	.14	.13

Note. $^{**}p < .01$, $^{***}p < .001$.

Fox, 1989; Green & Goldwyn, 2002). Thus, it was predicted that P/CRI ambivalent and controlling behaviour rating scales would be related to the ERC lability/negativity subscale. Contrary to prediction, the ambivalent rating scale was not significantly correlated with the ERC subscale [$r(64) = .16, p = .20$]. Thus, an ambivalence dimension aggregate score could not be calculated and ambivalent behaviour rating scale mean transformed scores were used in the analyses.

However, consistent with prediction, the lability/negativity subscale of the ERC was significantly and positively related to the P/CRI controlling behaviour rating scale [$r(64) = .28, p < .05$]. Specifically, children who displayed a greater degree of controlling behaviour during the reunion with the mother were characterized as having greater emotional dysregulation. Thus, the P/CRI controlling behaviour rating scale transformed mean score and the ERC lability/negativity subscale *z*-scores were averaged to produce a controlling dimension aggregate score (Cronbach's alpha = .71). Higher scores on the aggregate controlling dimension reflect greater controlling attachment.

Measurement of Maternal and Child Behaviour During Immunization

Two measures were used to assess the verbal and physical interactive behaviour of the children and their mothers during the immunization procedure. In addition, as previous studies (e.g., Bennett-Branson & Craig, 1993; Dahlquist et al., 1984; Jacobsen et al., 1990; Jay et al., 1983) have shown that children's pain behaviour is related to parental anxiety, a measure of maternal anxiety about their child's immunization was included.

Maternal and Child Verbalizations.

Measurement. Mothers and children's verbalizations during the immunization were coded using the Child Adult Medical Procedure Interaction Scale, Revised

(CAMPIS-R; Blount et al., 1997). The CAMPIS-R is an observational scale and consists of 35 behaviour codes for mother, child, and medical staff. Nineteen of the codes are for adult verbalizations and the remaining 16 codes are for child verbalizations. Adult verbalizations are combined into three overall code categories including Coping Promoting (non-procedural talk or humour directed to the child, commands to engage in coping strategies), Distress Promoting (reassuring comments, apologies, giving control to the child, criticism, empathetic statements), or Neutral (humour to adults, non-procedural talk to adults, child's condition talk, command for procedural activity, praise, notification of procedure to come, behavioural commands to the child, checking child status). Child verbalizations are also combined into three overall code categories including Coping Promoting (non-procedural talk or humour by the child, making coping statements, audible deep breathing), Distress Promoting (crying, screaming, verbal resistance, seeking emotional support, verbal fear, verbal pain, verbal emotion, information seeking), or Neutral (child's general condition talk, child informs about status, request relief from nonprocedural discomfort, assertive procedural verbalization).

The inter-rater reliability for the CAMPIS-R is high with $r = .80$ for adult codes and $r = .92$ for child codes (Blount et al., 1989). The concurrent validity of the CAMPIS-R child, parent, and staff codes has previously been demonstrated (Blount et al., 1997). Significant correlations between Coping Promoting and Distress Promoting categories and multiple objective and subjective measures of child distress, approach-avoidance behaviour, fear, pain, child cooperation, and parents' perceived ability to help their preschool-aged children during routine immunizations were in the predicted directions. Specifically, coping was positively related to measures of approach, cooperation, and

ease of being helped and inversely related to measures of child distress, fear, and pain. Similarly, distress was positively related to measures of child distress, fear, and pain and inversely related to measures of avoidance, cooperation, and ease of being helped.

In the present study, verbalizations during the immunization were recorded using a Panasonic Camescope S-VHS AG-455P color video camera and S-VHS T120 videotapes. All verbalizations made by individuals who were present during the immunization were recorded and later transcribed. Within each time transcript, verbalizations were time blocked to correspond to the time periods used in CFCS coding (see CFCS section). A JVC S-VHS 4-head HR-S3900U VCR and Panasonic CT-2084 19-inch viewable screen playback color monitor were used during video transcribing and coding. CAMPIS-R coding was performed using both the transcripts and videotapes.

Operationalization. Maternal verbal behaviour during the immunization was operationalized as the ratio of the mother's Coping Promoting to Distress Promoting verbalizations, according to the CAMPIS-R. Child verbal behaviour during the immunization was operationalized as the ratio of the child's Coping Promoting to Distress Promoting verbalizations, according to the CAMPIS-R. Ratios were used in order to examine the relative use of coping promoting versus distress promoting verbalizations as opposed to absolute levels.[1] Both mothers' and children's raw scores (i.e., counts of code occurrences) on the Coping Promoting and Distress Promoting subscales were transformed into continuous variables by calculating the proportion of each type of verbalization within each time period. In this method, the total number of instances that the separate Coping Promoting or Distress Promoting code category were designated as occurring were divided by the total number of coded maternal or child

behaviours, respectively, to create proportions. This method is frequently used by the author of this scale (e.g., Blount et al., 1997). In order to create a final ratio summary score to be used in the analyses, the proportion of Coping Promoting verbalizations within each time period was divided by the proportion of Distress Promoting verbalizations within the same time period. Before division occurred, a constant of one was added to both the proportion of Coping Promoting and the proportion of Distress Promoting verbalizations in order to correct for divisions of zero. Ten (five for mother and five for child) ratio summary scores corresponding to the five time periods coded for child pain were derived. The mean and standard deviation of each variable is contained in Table 3.

Reliability. Two coders were trained on the CAMPIS-R. Prior to data coding, coders established inter-rater reliability on a series of six practice tapes and transcripts. On these tapes, the primary and secondary coders achieved an inter-rater reliability of .84 (Adult Neutral), .83 (Adult Positive), .80 (Adult Negative), .84 (Child Neutral), .96 (Child Positive), and .94 (Child Negative), using Cohen's kappa. In addition, coders achieved an 88.6% agreement on individual adult verbal codes and 96% agreement on individual child verbal codes during training.

Twenty percent (13) of test tapes were randomly selected and coded for inter-rater reliability. The overall inter-rater reliability reliabilities for these cases were as follows: Adult Neutral = .89, Adult Positive = .85, Adult Negative = .84, Child Neutral = .96, Child Positive = .93, and Child Negative= .90.

Table 3.

Descriptive Statistics (Range, Mean, and Standard Deviations) for Child Adult Medical Procedure Interaction Scale, Revised (CAMPIS-R) Coping/Distress Promoting Summary Scores

Summary Score	Range of scores	Mean	SD
Mother Verbalizations			
Baseline	.50-2	1.34	0.49
Injection	.72-2	1.15	0.32
Recovery	.50-2	1.07	0.34
Needle 1	.50-2	1.15	0.40
Needle 2	.50-2	1.14	0.44
Child Verbalizations			
Baseline	.50-2	1.07	0.34
Injection	.50-2	0.91	0.46
Recovery	.50-2	0.98	0.25
Needle 1	.50-2	1.15	0.40
Needle 2	.50-2	0.92	0.42

Note. Higher scores indicate more Coping Promoting relative to Distress Promoting verbalizations.

Measurement of Maternal and Child Immunization Pain-Related Behaviour

Measurement. A Medical Pain Incident Report Form (M-PIRF; Strobele, 1998) was used as an other-report measure of immunization pain-related behaviour (see Appendix J). The M-PIRF is identical to the Everyday Pain Incident Report Form (see Measurement of Child Everyday Pain Behaviour section below) except that the questions are completed in reference to the immunization. The M-PIRF used in the present study was a five-page checklist consisting of 17 questions covering five subscales pertaining to the child's immunization. The subscales include: (1) the *behavioural context* with questions pertaining to the mood of the child (negative, positive, neutral) before the immunization and how typical that mood is for the child; (2) the *situational context* with questions pertaining to the source and location of the pain, and number of people involved in the pain incident; (3) the *child's reaction* to the immunization with questions pertaining to how strongly the child reacted as assessed using a 100-mm visual analogue scale ranging from no response to strongest possible response, how angry the child became as assessed using a 100-mm visual analogue scale ranging from no anger to as angry as can be, where the anger was directed, behavioural reaction of the child during the immunization (e.g., no response, holding/rubbing), length of behavioural reaction (in seconds), amount of time needed for the child to calm down (in seconds), and how typical the pain incident is for the child; and (4) the *parental response* with questions pertaining to the mother's response (e.g., no attention, comfort) in the first few minutes following the immunization, the mother's dominant response in the first few minutes following the immunization, and amount of perceived pain an average child would have in the same situation. The fifth subscale, the *child's response*, was added specifically for

this study and included (1) a checklist of items (cf. Stovall & Dozier, 2000) pertaining to how the child responded (e.g., was soon calmed, remained upset) to the mother's response in the first few minutes following the immunization; and (2) a Faces Pain Scale (see self-reported immunization pain section below) to assess the child's self-report of pain.

The inter-rater reliability of many of the items on the M-PIRF during immunizations has previously been shown to be high (Strobele, 1998). The construct validity of the measure has also been demonstrated. For instance, the severity of the child's reaction was significantly correlated with the behaviours demonstrated by the child, suggesting that they were measuring similar constructs.

Operationalization. Both mothers and an observer completed the M-PIRF immediately following the immunization. Raters were instructed to complete the questions in reference to the immunization procedure as a whole (i.e., encompassing both needle 1 and needle 2, where appropriate, into their responses). The typicality of the child's mood and the pain incident, source and location of the pain, direction of anger, and dominant parental response were all measured using nominal scales. Mood of the child [coded as negative (1), neutral (2), or positive (3)], activity level [coded as quiet (1), medium (2), or active (3)], parental responses (coded as 0 – absent, 1 – present), and number of people involved in incident (0 to 4 or more) were measured using ordinal scales. All participants (100%) indicated that the source of the pain was a needle and was located in the arm. The majority of participants (78.5%) indicated that 0-2 other people were involved in the incident. The frequency and percentage of occurrence of the child variables are contained in Table 4. The frequency and percentage of occurrence of the

Table 4.

Frequency and Percentage of Occurrence of the Medical Pain Incident Report Form (M-PIRF) Child Variables

M-PIRF Scale	Frequency	Percent (%)
Mood		
Negative	8	12.1
Neutral	37	56.1
Positive	21	31.8
Typicality of Mood		
Very Typical	33	50.0
Fairly Typical	21	31.8
Somewhat Typical	9	13.6
Not Very Typical	3	4.5
Activity Level		
Quiet	53	80.3
Medium	13	19.7
Active	0	0
Anger Towards		
No Anger	42	63.6
Nothing Specific	20	30.3
Object	3	4.5
Helper	1	1.5
Typicality of Incident		
Very Typical	10	15.2
Fairly Typical	18	27.3
Somewhat Typical	19	28.8
Not Very Typical	19	28.8

Note. $N = 66$.

parental response variables are contained in Table 5. The behavioural reaction of the child (i.e., question 10) was also measured using an ordinal scale. Each possible response had a weight of either 0 – no response, 1 – minor response, 2 – moderate response, 3 – significant response, or 4 – severe response (see Appendix K for the weight classification of each response). An overall score was calculated by using a rounded average of all the responses indicated. The reactivity level (in mm), anger level (in mm), and amount of pain average child would experience (in mm) were measured using interval scales and calming time (in sec) was measured using a ratio scale. Raw scores for reactivity level and calming time were logarithmic transformed as preliminary analyses showed that the distributions were positively skewed ($S = 1.11$, $s_S = .295$, $z = 3.76$; $S = 2.80$, $s_S = .297$, $z = 9.43$, respectively). Before transformation occurred a constant of 1 was added to each raw score to correct for logarithmic transformations of zero (cf. Tabachnick & Fidell, 1996). For the anger level, raw scores were inversely transformed as preliminary analyses showed that the distribution of the variable was markedly positively skewed ($S = 4.59$, $s_S = .295$, $z = 15.56$). For the anger level transformed scores, lower scores indicate greater anger. The mean and standard deviation of each variable is contained in Table 6. Finally, the child's response to maternal behaviour (scored as 0 – absent, 1 – present) was coded in terms of security, resistance, and avoidance (see Appendix L for the classification of each response). The frequency and percentage of occurrence of the child response to maternal behaviour variables are contained in Table 7. To calculate total scores for each dimension, the number of secure, resistant, and avoidant behaviours were summed. Scores on the secure dimension ranged from 0 to 3 ($M = 0.92$, $SD = 0.69$). Scores on the resistant dimension ranged from 0 to 4 ($M = 0.14$, $SD = 0.58$). Scores on the avoidant

Table 5.

Frequency and Percentage of Occurrence of the Medical Pain Incident Report Form (M-PIRF) Maternal Variables

M-PIRF Scale	Frequency	Percent (%)
Parental Response		
Assess/Treat Injury	6	9.1
No Attention	7	10.6
Praise	49	74.2
Teach	4	6.1
Comfort	45	68.2
Stoic	7	10.6
Distraction	27	40.9
Punishment	1	1.5
Dominant Parental Response		
Assess/Treat Injury	1	1.5
No Attention	6	9.1
Praise	24	36.4
Teach	1	1.5
Comfort	23	34.8
Stoic	2	3
Distraction	9	13.6
Punishment	0	0

Note. $N = 66$.

Table 6.

Descriptive Statistics (Range, Mean, and Standard Deviations) for Medical Pain Incident Report Form (M-PIRF) Behavioural Reaction, Reactivity Level (in mm), Anger Level (in mm), Amount of Pain Average Child Would Experience (in mm), and Calming Time (in sec)

M-PIRF Scale	Range of scores	Mean	SD
Behavioural Reaction	0-4	1.03	0.82
Reactivity Level (mm)	0-100	27.89	27.41
Anger Level (mm)	0-100	8.52	20.89
Average Child Pain (mm)	10-95	45.83	18.03
Calming Time (sec)	0-180	24.05	36.46

Note. N =66. Higher scores indicate greater reaction, reactivity, anger, pain, and calming time.

Table 7.

Frequency and Percentage of Occurrence and Spearman Correlations of the Medical Pain Incident Report Form (M-PIRF) Child Response Variables

M-PIRF Scale	Frequency	Percent (%)	Spearman's Rho
Secure Behaviours			
Was soon calmed or soothed	47	71.2	.49***
Sunk into me or held on to me until calmed down	11	16.7	.48***
Held on to me or went after me if I tried to put him/her down	3	4.5	.39**
Resistant Behaviours			
Pushed me away angrily or in frustration	2	3.0	.81***
Stomped and/or kicked feet	1	1.5	0
Remained upset, was difficult to soothe	3	4.5	.86***
Hit, kicked at me	0	0	0
Turned from me angrily or in frustration	0	0	0
Became quiet and then fussy again	2	3.0	0
Did not easily let me hold him/her but remained upset	0	0	0
Avoidant Behaviours			
Did not indicate that he/she needed my help	26	39.4	.38**
Turned away when picked up or made contact	0	0	0
Acted cool or aloof	8	12.1	$.21^{+}$
Continued to play, did not notice me	6	9.1	-.04
Ignored me	1	1.5	-.03

Note. $N = 66$. $p^{+} = .10$, $p^{**} < .01$, $p^{***} < .001$.

dimension ranged from 0 to 3 ($M = 0.62$, $SD = 0.78$).

Reliability. Inter-rater reliability between mother and observer was measured using Spearman correlations for the ordinal scales, Pearson correlations for the interval or ratio scales, and Cohen's Kappa for the nominal scales. The inter-rater reliabilities for the ordinal scales were as follows: mood of the child [$r(64) = .67$, $p < .001$], activity level [$r(64) = .25$, $p < .05$], number of people involved in incident [$r(64) = .33$, $p < .01$], and the behavioural reaction of the child [$r(64) = .74$, $p < .001$]. For the parental responses the inter-rater reliabilities were as follows: assess/treat [$r(64) = .07$, $p = .59$], no attention [$r(64) = .29$, $p < .05$], praise [$r(64) = .25$, $p < .05$], teach [$r(64) = -.05$, $p = .70$], comfort [$r(64) = .60$, $p < .001$], stoic [$r(64) = .53$, $p < .001$], distraction [$r(64) = .30$, $p < .05$], and punishment [$r(64) = 1.00$, $p < .001$]. For the child responses to maternal behaviour the inter-rater reliabilities ranged from 0 to .81 (Spearman correlations) and are also contained in Table 7. The inter-rater reliability for the interval and ratio scales were as follows: reactivity level [$r(64) = .69$, $p < .001$], anger level [$r(64) = .50$, $p < .001$], and calming time [$r(64) = .75$, $p < .001$]. The inter-rater reliabilities for the nominal scales were as follows: direction of anger [kappa = .37] and dominant parental response [kappa = .30]. There was 100% agreement between raters for the source and location of the pain. As the observer is not familiar with the child outside of the testing procedures, the observer did not assess the typicality of the child's mood or of the pain incident, thus no reliability coefficients are offered for these scales. In addition, no reliability coefficients are offered for the amount of pain an average child would experience question as the number of coders was not consistent (i.e., opinion of 2 researchers vs. opinion of 66 mothers). Mothers' M-PIRF scores were used in the analyses. Given the low reliabilities

found, the assess/treat, teach, direction of anger, and dominant parental response subscales were not included in the analyses.

Maternal Anxiety.

Measurement. Maternal state anxiety prior to the immunization was assessed using a 0 to 10 self-report anxiety rating scale (see Appendix M). The anchors used in this study were "very calm, very relaxed" to "very upset, very distressed". Parental anxiety rating scales have been used in several studies of child needle procedures (e.g., Broome & Endsley, 1989b; Bush et al., 1986; Fradet et al., 1990).

Operationalization. Maternal anxiety was operationalized as the logarithmic transformed mother's self-reported anxiety scores. Transformations were conducted on the anxiety scores as preliminary analyses showed that the distributions were positively skewed ($S = 1.43$, $s_S = .295$, $z = 4.85$). Before transformation occurred a constant of 1 was added to each raw score to correct for logarithmic transformations of zero (cf. Tabachnick & Fidell, 1996). Raw scores ranged from 0 to 9 ($M = 2.14$, $SD = 2.33$), with higher scores reflecting greater anxiety about the needle procedure.

Measurement of Child Immunization Pain

Child immunization pain was assessed using both subjective and objective measures. For the subjective measures, pain was assessed using both self-report and observer-report. For the objective measure, pain assessment was based on child facial action.

Self-Reported Immunization Pain

Measurement. A Faces Pain Scale (FPS; Bieri, Reeve, Champion, & Addicoat, 1990) was included in the M-PIRF in order to assess children's self-report of pain during

the immunization. The FPS is a seven-item scale depicting serially ordered drawn faces of increasing pain intensity. The scale begins with a face depicting a neutral expression and the amount of pain each additional face depicts increases gradually. The FPS approximates a ratio scale, with the first face approximating zero and the intervals between consecutive faces being close to equally spaced (Bieri et al., 1990). Scores on the FPS range from 0 to 6, with higher values reflecting greater pain intensity. Following instructions on how to use the scale, the child was asked by the researcher to circle the face that best described his or her pain during the immunization. An adult observer also rated the child's perceived pain using an FPS immediately following the immunization.

The test-retest reliability of the FPS over a two-week interval has been demonstrated (Bieri et al., 1990; Hunter, McDowell, Hennessy, & Cassey, 2000) with rank correlation coefficients ranging from .55 to .79. The content, concurrent, and discriminative validity of the FPS for preschoolers are reported to be good. For instance, studies have shown good overall agreement on the rank ordering of the face stimuli (Bieri et al., 1990; Hunter et al., 2000). The FPS has been shown to correlate highly with other self-report and behavioural measures of pain intensity (Goodenough, Addicoat, Champion, McInerney, Young, Juniper et al., 1997) and to discriminate between pain and pre-injection anxiety compared with objective and other measures of pain (Champion, Goodenough, von Baeyer, & Thomas, 1998). The FPS has also been shown to be sensitive to both stimulus intensity and category of pain, and to change over time in response to analgesia use (Arts, Abu-Saad, Champion, Crawford, Fisher, Juniper et al., 1994).

Operationalization. Self-reported immunization pain was operationalized as children's raw score on the FPS and reflected the child's perceived pain from the immunization procedure as a whole (i.e., encompassing both needle 1 and needle 2, where appropriate). The scores in the current study ranged from 0 to 6 ($M = 2.21$, $SD = 2.14$).

Reliability. Inter-rater reliability between child and observer was $r(64) = .62$, $p < .001$ using Pearson correlation. In addition, children's raw FPS scores were significantly correlated with: mother rated M-PIRF reactivity level [$r(64) = .31$, $p < .05$]; observer rated M-PIRF reactivity level [$r(64) = .45$, $p < .001$]; CFCS injection [$r(64) = .27$, $p < .05$], and needle 1 [$r(64) = .37$, $p < .01$] summary scores; and VAS needle 1 [$r(64) = .49$, $p < .001$], needle 2 [$r(64) = .36$, $p < .01$], and recovery [$r(64) = .39$, $p < .01$] ratings.

Observer-Reported Immunization Pain

Measurement. A Visual Analogue Scale (VAS) was used to provide a global, unidimensional rating of the intensity of each child's pain during the immunization. Most VAS consist of a 100-mm horizontal line with anchors on each end defining the extreme limits of the pain experience. For the VAS, the rater is instructed to mark the line at a point corresponding to the amount of perceived pain experienced. The mark is then measured and recorded as a continuous variable ranging from 0 to 100, with higher values indicating greater pain.

Several studies have used VAS as proxy measures of pain in younger children (e.g., Blount et al., 1997; Craig, Grunau, & Aquan-Assee, 1988; Manne, Jacobsen, & Redd, 1992; O'Hara, McGrath, D'Astous, & Vair, 1987). In these studies, significant correlations were found between proxy measures of pain and children's self-reports of

pain. For instance, Manne et al. (1992) found correlations of .44 between children's self-report of pain and parental proxy ratings of child-pain using a VAS. Similarly, correlations in O'Hara et al. (1987) were .70 between parent and child ratings of pain. The concurrent validity of proxy VAS measures was also demonstrated by Blount et al. (1997) who showed that parental VAS report of pain to immunization was significantly and positively related to child distress (r = .25) and negatively related to child coping (r = -.23).

In the current investigation, a 100-mm VAS was used to measure child pain during the immunization (see Appendix N). The anchors for the VAS were "no pain" and "worst pain imaginable". VAS ratings were based on the observation of children's behaviour during the immunization. A primary coder made four VAS ratings. The ratings were time blocked to correspond to the baseline, needle 1, needle 2 (if appropriate), and recovery time periods used in CFCS coding (see CFCS section). Ratings were made using the videotaped recordings of the children's immunizations.

Operationalization. Four VAS ratings (baseline, needle 1, needle 2, and recovery) were made as appropriate, with higher values reflecting greater pain. Observer-reported immunization pain was operationalized as the distance (in mm) marked by the primary coder on the 100-mm horizontal VAS in each time period. Raw scores for the needle 1, needle 2, and recovery periods were logarithmic transformed as preliminary analyses showed that the distributions were positively skewed (S = 1.48, s_s = .302, z = 4.90, S = 1.37, s_s = .314, z = 4.36; S = 2.13, s_s = .306, z = 6.96, respectively). Before transformation occurred a constant of 1 was added to each raw score to correct for logarithmic transformations of zero (cf. Tabachnick & Fidell, 1996). For the baseline

period, raw VAS ratings ranged from 0 to 2 ($M = .16$, $SD = 0.41$); for the needle 1 period, the raw ratings ranged from 1 to 99 ($M = 27.89$, $SD = 28.62$); for the needle 2 period, the raw ratings ranged from 1 to 99 ($M = 28.34$, $SD = 26.86$); and for the recovery period, the raw ratings ranged from 1 to 92 ($M = 17.18$, $SD = 21.76$).

To examine the VAS' specificity to pain, a series of paired *t*-tests were conducted to determine if there were significant differences between the time-blocked VAS ratings. Compared to the baseline period, observer reported pain VAS ratings were greater during needle 1 [$t(61) = 22.49$, $p < .001$] and needle 2 [$t(56) = 22.98$, $p < .001$] periods. The rating for needle 1 was equivalent to that displayed during needle 2 [$t(56) = -0.69$, $p = .49$]. Finally, for the recovery period the amount of pain was significantly greater than the baseline period [$t(59) = 17.54$, $p < .001$] but significantly smaller than the needle 1 [$t(59) = -6.11$, $p < .001$] and needle 2 [$t(57) = -8.91$, $p < .001$] periods. The significant differences found provide additional evidence for the specificity of the VAS.

Reliability. Two coders were trained on the use of VAS for rating children's pain during immunization. Prior to data coding, coders established inter-rater reliability on a series of 10 practice immunization tapes. On these tapes, the primary and secondary coders achieved an inter-rater reliability of .89 (Pearson correlation).

The primary coder rated all test tapes. Twenty percent (13) of test tapes were randomly selected and coded by the second rater in order to determine inter-rater reliability. Using Pearson correlations, the inter-rater reliability on the test tapes was .99 for baseline, .94 for needle 1, .95 for needle 2, and .97 for recovery.

Child Pain Behaviour

Measurement. Child pain was also assessed using the Children's Facial Coding Scale (CFCS; Chambers et al., 1996). The CFCS is an observational rating system that was developed for measuring acute pain (e.g., pain from needle procedures) in preschool-aged children. It provides a detailed description of facial activity by assessing the intensity of 13 facial actions during a given time period, based on viewing video recordings of child faces in stop-frame and slow motion to detect movement. These 13 facial actions include: brow lower, eye squeeze, eye squint, blink, nasolabial furrow, nose wrinkler, flared nostril, cheek raiser, open lips, upper lip raiser, lip corner puller, stretch mouth (vertical), and stretch mouth (horizontal). The facial actions correspond to some of those identified in Ekman and Friesen's (1978) Facial Action Coding System. With the exception of blink, flared nostril, and open lips, the intensity of the facial actions are rated as "0" when the facial action is absent, "1" if the facial action is present and slightly obvious to the coder, and "2" if the facial action is present and appears distinctly to maximally and is clearly obvious to the coder. Blink, flared nostril, and open lips receive codes of either "0" if the action is absent or "1" if the action is present. The total facial action is then calculated as the sum of intensity and occurrence ratings of all facial actions within a given time period.

The CFCS has been used in several studies assessing pain-related facial activity in preschool-aged children [e.g., pain from immunization (Cassidy, Reid, McGrath, Finley, Smith, Morley et al., 2002; Breau, McGrath, Craig, Santor, Cassidy, & Reid, 1999); postoperative pain (Gilbert, Lilley, Craig, McGrath, Court, Bennett et al., 1999)] and has demonstrated good inter-rater reliability, with percentage agreements ranging from 75 to

86%. The concurrent validity of the CFCS has also been supported. For instance, regression analyses indicated that both children's self-report and observers' ratings of their pain could be predicted by children's facial action codes (Breau et al., 1999) during immunization. Similarly, preschoolers' facial action summary scores were significantly correlated with a visual analog rating of global pain during the one hour following surgery (Gilbert et al., 1999).

In the current study, only five facial actions (brow lower, eye squeeze, nose wrinkler, cheek raiser, and upper lip raiser) were measured. The decision to include only these five facial actions was based on the research of Prkachin (1992), which suggested that this relatively small subset of actions provided the bulk of information about pain. In addition, the occurrence of these facial actions has been shown to be largely consistent across cold pressor pain, ischemic pain, and pain from electric shock (Prkachin, 1992).

A continuous time period was recorded during the immunization and was broken down into three primary intervals: baseline, injection, and recovery. The "baseline" period included the 10 seconds immediately prior to insertion of the first needle, the "injection" period included the seconds beginning with the insertion of the first needle and continuing to 10 seconds following insertion of the second needle, and the "recovery" period included the 10 seconds immediately following the injection period. For the two children who received only one needle, the injection period was recorded as the 10 seconds immediately following insertion of the needle. For the children receiving two needles, the injection period was further broken down into "needle 1" (10 seconds immediately following insertion of the first needle) and "needle 2" (10 seconds immediately following insertion of the second needle) to control for individual

differences due to variable time periods in which the immunizations occurred. Within each interval, 1-second blocks were coded.

Facial action was recorded using a Panasonic Camescope S-VHS AG-455P color video camera and S-VHS T120 videotapes. A JVC S-VHS 4-head HR-S3900U VCR and Panasonic CT-2084 19-inch viewable screen playback color monitor were used during video coding. CFCS coding was performed using slow motion and stop-frame feedback.

Operationalization. Three primary CFCS summary scores (baseline, injection, and recovery) and two secondary CFCS summary scores (needle 1 and needle 2) were calculated as appropriate. Objective child pain was operationalized as the logarithmic transformed sum intensity of all facial actions in each time period, with higher scores reflecting greater activity and therefore greater pain. Raw scores for the baseline, injection, recovery, needle 1, and needle 2 periods were logarithmic transformed as preliminary analyses showed that the distributions were positively skewed (S = 1.41, s_s = .299, z = 4.72, S = 1.81, s_s = .297, z = 6.10; S = 2.10, s_s = .309, z = 6.80; S = 1.19, s_s = .297, z = 4.01; S = 1.25, s_s = .304, z = 4.11, respectively). Before transformation occurred a constant of 1 was added to each raw score to correct for logarithmic transformations of zero (cf. Tabachnick & Fidell, 1996). For the baseline period, the raw scores ranged from 0 to 67 (M = 15.20, SD = 15.27); for the injection period, scores ranged from 0 to 461 (M = 103.68, SD = 95.53); for the recovery period, scores ranged from 0 to 81 (M = 14.97, SD = 17.60). Needle 1 scores ranged from 0 to 63 (M = 21.69, SD = 22.66) and needle 2 scores ranged from 0 to 94 (M = 23.37, SD = 20.33).

To examine the CFCS' specificity to pain, a series of paired t-tests were conducted to determine if there were significant differences between the time-blocked

periods. The analyses revealed that the amount of facial action displayed during the baseline period was significantly smaller than that displayed during the injection [$t(63) = -13.50$, $p < .001$], needle 1 [$t(63) = -2.01$, $p < .05$], and needle 2 [$t(60) = -3.63$, $p < .01$] periods. The amount of facial action displayed during needle 1 was significantly smaller than that displayed during needle 2 [$t(61) = -2.17$, $p < .05$]. Finally, the amount of facial action displayed during the recovery period was equivalent to that display during baseline [$t(58) = -0.11$, $p = .91$] but was significantly smaller than that displayed during the injection [$t(59) = -13.03$, $p < .001$] and needle 2 [$t(56) = -4.67$, $p < .001$] periods. The significant differences found provide additional support for the specificity of the CFCS.

Reliability. Two coders were trained on the CFCS according to the specifications outlined in the manual (Chambers et al., 1996). Prior to data coding, coders established inter-rater reliability on a series of five practice tapes. Inter-rater reliability was determined using the formula originally outlined in Ekman and Friesen's (1978) original Facial Action Coding System manual [% agreement = (number of actions with coder agreement x 2) / total number of actions coded]. This formula allows a conservative measure of agreement with does not take into account agreement of the absence of a facial action. On these tapes, the primary and secondary coders achieved an inter-rater reliability of 84.4% (brow lower), 75% (eye squeeze), 87.1% (nose wrinkler), 89% (cheek raiser), and 96.6% (upper lip raiser).

The primary coder coded all test tapes. Twenty percent (13) of tapes were randomly selected and coded by a second rater in order to determine inter-rater reliability. The inter-rater reliability on the test tapes was as follows: 86.2% brow lower, 84.2% eye squeeze, 88.2% nose wrinkler, 92.2% cheek raiser, and 78.4% upper lip raiser.

Measurement of Child Everyday Pain Behaviour

Measurement. Everyday pains are the most frequently experienced type of pain for children (Fearon et al., 1996; von Baeyer et al., 1998). Difficulties arise however when attempting to measure pain response predictors in their natural environment. The situational possibilities are limitless, and it becomes impractical to examine each individual possibility. Moreover, it is costly and intrusive and perhaps reactive to wait for a pain incident in a child's natural home setting, while examining everyday pain in a laboratory setting would be ethically complicated. To circumvent these difficulties, the Everyday Pain Incident Report Form (E-PIRF; Strobele, 1998) was used as an other-report measure of everyday pain behaviour (see Appendix O). The E-PIRF is similar to the observational checklist used in the Fearon et al. (1996) and von Baeyer et al. (1998) studies. In the initial validation study, the E-PIRF was found to be a good measure that could be used to capture the full extent of a child's everyday pain incident experience. For instance, the severity of the child's reaction was significantly correlated with the behaviours demonstrated by the child, suggesting that they were measuring similar constructs.

The E-PIRF used in the present study was a five-page checklist consisting of 17 questions covering five subscales pertaining to the child's everyday pain incident. The subscales include: (1) the *behavioural context* with questions pertaining to the mood of the child (negative, positive, neutral) before the everyday pain incident and how typical that mood is for the child; (2) the *situational context* with questions pertaining to the source and location of the pain, and number of people involved in the pain incident; (3) the *child's reaction* to the everyday pain incident with questions pertaining to how

strongly the child's reacted as assessed using a 100-mm visual analogue scale ranging from no response to strongest possible response, how angry the child became as assessed using a 100-mm visual analogue scale ranging from no anger to as angry as can be, where the anger was directed, behavioural reaction of the child during the everyday pain incident (e.g., no response, holding/rubbing), length of behavioural reaction (in seconds), amount of time needed for the child to calm down (in seconds), and how typical the pain incident is for the child; and (4) the *parental response* with questions pertaining to the mother's response (e.g., no attention, comfort) in the first few minutes following the everyday pain incident, the mother's dominant response in the first few minutes following the everyday pain incident, and amount of perceived pain an average child would have in the same situation. The fifth subscale, the *child's response*, was added specifically for this study and included (1) a checklist of items (cf. Stovall & Dozier, 2000) pertaining to how the child responded (e.g., was soon calmed, remained upset) to the mother's response in the first few minutes following the everyday pain incident; and (2) a Faces Pain Scale to assess the child's self-report of pain. Mothers were given four E-PIRF and asked to complete one form as soon as possible after observing an everyday pain incident.

Operationalization. An everyday pain incident was defined as any of: (1) an incident where the child *acts* as if he/she is in pain, but the mother thinks there is no pain. For example, the child gets hit by a sibling and says that he/she is hurt, but the mother thinks there is no pain; (2) an incident where the mother *thinks* that the child feels pain, but he/she did not act as if he/she were in pain. For example, the child falls down and the mother thinks that it would hurt, even though the child seems to be okay; and (3) an

incident where the mother thinks that the child is hurt and the child indicates that he/she is hurt. Mothers were also informed that an everyday pain incident did not include pain caused by sickness, such as headaches, sore throats, or stomach pains.

Mothers were given four everyday pain incident report forms and asked to return the questionnaires upon completion. Of the 66 mothers who participated, 25 (37.9%) returned four completed forms, 15 (22.7%) returned three completed forms, 11 (16.7%) returned two completed forms, 3 (4.5%) returned one completed forms, and 12 (18.2%) did not return any forms. Of the completed forms, a minimum of one of the pain incidents per participant was reported to be somewhat to very typical.[2] Given the variability in the number of pain incident report forms, only one incident per participant was included in the analyses. The incident included was randomly selected from the forms indicated as somewhat or very typical.

The typicality of the child's mood and the pain incident, source and location of the pain, direction of anger, and dominant parental response were all measured using nominal scales. Mood of the child [coded as negative (1), neutral (2), or positive (3)], activity level [coded as quiet (1), medium (2), or active (3)], parental responses (coded as 0 – absent, 1 – present), and number of people involved in incident (0 to 4 or more) were measured using ordinal scales. The majority of participants (94.3%) indicated that 0-2 other people were involved in the incident. The frequency and percentage of occurrence of the source and location of the pain incident are contained in Table 8. The frequency and percentage of occurrence of the child variables are contained in Table 9. The frequency and percentage of occurrence of the parental response variables are contained in Table 10. The behavioural reaction of the child (i.e., question 10) was also measured

Table 8.

Frequency and Percentage of Occurrence of the Source and Location of the Everyday Pain Incident

E-PIRF Scale	Frequency	Percent (%)
Source		
Object	22	41.5
Animal	2	3.8
Child	15	28.3
Another Child	11	20.8
Adult	3	5.7
Location		
Head	13	24.5
Arms or Hands	15	28.3
Upper Trunk	2	3.8
Lower Trunk	5	9.5
Legs or Feet	18	33.9

Note. $N = 53$.

Table 9.

Frequency and Percentage of Occurrence of the Everyday Pain Incident Report Form (E-PIRF) Child Variables

E-PIRF Scale	Frequency	Percent (%)
Mood		
Negative	6	11.3
Neutral	16	30.2
Positive	31	58.5
Typicality of Mood		
Very Typical	25	47.2
Fairly Typical	21	39.6
Somewhat Typical	4	7.5
Not Very Typical	3	5.7
Activity Level		
Quiet	3	5.7
Medium	13	24.5
Active	37	69.8
Anger Towards		
No Anger	24	45.3
Nothing Specific	17	32.1
Object	3	5.7
Hurter	9	17.0
Typicality of Incident		
Very Typical	24	45.3
Fairly Typical	18	34.0
Somewhat Typical	11	20.7
Not Very Typical	0	0

Note. $N = 53$.

Table 10.

Frequency and Percentage of Occurrence of the Everyday Pain Incident Report Form (E-PIRF) Maternal Variables

E-PIRF Scale	Frequency	Percent (%)
Parental Response		
Assess/Treat Injury	39	73.6
No Attention	2	3.8
Praise	3	5.7
Teach	21	39.6
Comfort	46	86.8
Stoic	2	3.8
Distraction	18	34.0
Punishment	0	0
Dominant Parental Response		
Assess/Treat Injury	9	17.0
No Attention	2	3.8
Praise	0	0
Teach	7	13.2
Comfort	30	56.6
Stoic	1	1.9
Distraction	4	7.5
Punishment	0	0

Note. $N = 53$.

using an ordinal scale. Each possible response had a weight of either 0 – no response, 1 – minor response, 2 – moderate response, 3 – significant response, or 4 – severe response (see Appendix K for the weight classification of each response). An overall score was calculated by using a rounded average of all the responses indicated. The reactivity level (in mm), anger level (in mm), and amount of pain average child would experience (in mm) were measured using interval scales and calming time (in sec) was measured using a ratio scale. For the anger level, raw scores were square root transformed as preliminary analyses showed that the distribution of the variable was markedly positively skewed (S = 1.86, s_s = .327, z = 5.68). The mean and standard deviation of each variable is contained in Table 11. The child's response to maternal behaviour (scored as 0 – absent, 1 – present) was coded in terms of security, resistance, and avoidance (see Appendix L for the classification of each response). The frequency and percentage of occurrence of the child response to maternal behaviour variables are contained in Table 12. To calculate total scores for each dimension, the number of secure, resistant, and avoidant behaviours were summed. Scores on the secure dimension ranged from 0 to 2 (M = 1.06, SD = 0.66). Scores on the resistant dimension ranged from 0 to 1 (M = 0.11, SD = 0.32). Scores on the avoidant dimension ranged from 0 to 4 (M = 0.51, SD = 0.82). Finally, self-reported everyday pain was operationalized as children's raw score on the FPS and reflected the child's perceived pain from the incident. The scores in the current study ranged from 0 to 6 (M = 2.85, SD = 1.76) and were significantly correlated with mother rated E-PIRF reactivity level [$r(52) = .31, p < .05$].

Table 11.

Descriptive Statistics (Range, Mean, and Standard Deviations) for Everyday Pain Incident Report Form (E-PIRF) Behavioural Reaction, Reactivity Level (in mm), Anger Level (in mm), Amount of Pain Average Child Would Experience (in mm), and Calming Time (in sec)

E-PIRF Scale	Range of scores	Mean	SD
Behavioural Reaction	1-3	1.57	0.54
Reactivity Level (mm)	0-86	45.09	23.68
Anger Level (mm)	0-65	11.08	17.55
Average Child Pain (mm)	4-76	36.42	19.39
Calming Time (sec)	0-150	47.38	35.41

Note. N =53. Higher scores indicate greater reaction, reactivity, anger, pain, and calming time.

Table 12.

Frequency and Percentage of Occurrence of the Everyday Pain Incident Report Form (E-PIRF) Child Response Variables

E-PIRF Scale	Frequency	Percent (%)
Secure Behaviours		
Was soon calmed or soothed	41	77.4
Sunk into me or held on to me until calmed down	15	28.3
Held on to me or went after me if I tried to put him/her down	0	0
Resistant Behaviours		
Pushed me away angrily or in frustration	2	3.8
Stomped and/or kicked feet	0	0
Remained upset, was difficult to soothe	3	5.7
Hit, kicked at me	0	0
Turned from me angrily or in frustration	0	0
Became quiet and then fussy again	1	1.9
Did not easily let me hold him/her but remained upset	0	0
Avoidant Behaviours		
Did not indicate that he/she needed my help	14	26.4
Turned away when picked up or made contact	3	5.7
Acted cool or aloof	0	0
Continued to play, did not notice me	8	15.1
Ignored me	2	3.8

Note. $N = 53$.

Measurement of Covariates

Three potential covariates were also assessed in the present study. First, as the Separation Anxiety Test (SAT) and the Pain and Relationship Task (PART) rely on the child's ability to formulate and produce coherent verbal responses, receptive language ability was considered (as recommended in Dunn, 1999). Second, as performance on both the SAT and the PART rely, in part, on the child's ability to identify and label emotional states, emotional awareness was assessed. Finally, given the interactive nature of the reunion procedure, it is possible that situational variables (e.g., atypicality of the child's mood or behaviour at the time of the study interview) may influence the child's behaviour with the mother. Thus, a rating scale of child situational variables at the time of testing was included.

Receptive Language.

Measurement. Receptive language was assessed using the Peabody Picture Vocabulary Test – third edition, Form IIIA (PPVT-III, Form IIIA; Dunn & Dunn, 1997). The PPVT-III is an individually administered, untimed, norm-referenced, wide-range test of verbal ability. With this test, children are presented with four illustrations and asked to identify the picture that best illustrates the meaning of the stimulus word presented to them orally. An age appropriate standard score, with a possible range of 40 to 160, is then derived, with higher scores reflecting better-developed verbal ability.

The reliability of the PPVT-III with preschoolers has been demonstrated (Dunn & Dunn, 1997). Specifically, the test-retest reliability coefficient for PPVT-III scores obtained twice over a one-month interval was .92. Similarly, the alternate-forms and split-half reliability coefficients were both found to be .95. The internal consistency is

also reported to be high with Cronbach's alphas < .92. The content, construct, internal, and criterion validity of the PPVT-III has also been supported (see Dunn & Dunn, 1997).

Operationalization. Receptive language was operationalized as the child's obtained age appropriate standard score on the PPVT-III. In the current study, the scores ranged from 93 to 140 (M = 115.35, SD = 10.07).

Emotional Awareness.

Measurement. The Emotional Labelling Task (ELT; Denham, 1986; Markham & Adams, 1992; Symons McLaughlin, Moore, & Morine, 1997) was used to assess emotional awareness. The ELT determines the child's ability to differentiate emotional states by having the child identify, verbally and by pointing, various facial expressions. The stimuli for this task include five colour photographs of a four-year-old child modeling facial expressions of happy, anger, surprise, sadness, and fear. The photographs were based on Izard (1977) and later verified by a child action coder (Symons et al., 1997).

With the ELT, the child is shown each picture and asked to identify the five facial expressions in an open-ended format, "Can you tell me how the little girl was feeling in these pictures?". A closed-ended format, "Can you show me a picture of the little girl when she was _____?", is then used to identify any emotions not identified in the open format, and scoring is thus open + newly identified emotions under closed questioning. The total ELT score is the sum of open and closed questions. A copy of the ELT administration script is contained in Appendix P.

Operationalization. Emotional awareness was operationalized as the child's obtained total score on the ELT. In the current study, the raw scores ranged from 1 to 10 ($M = 6.48$, $SD = 1.48$), with higher scores indicating greater emotional awareness.

Child Situational Variables.

Measurement. Child situational variables at the time of testing were assessed using a child rating scale (see Appendix Q). With this measure, mothers were asked to indicate using ordinal scales how well their child slept the previous night, how tired their child was on the day of testing, how good their child's general mood was on the day of testing, and how typical their child's behaviour was on the day of testing.

Operationalization. Child situational variables were operationalized as the mother indicated ordinal scores on the child rating scale items. The vast majority of participants were rated as: (1) having slept fairly well to well the previous night (92.3%), (2) being fairly to very alert and awake on the day of testing (96.9%), (3) being in a good to very good mood on the day of testing (96.9%), and (4) behaving fairly to very typical on the day of testing (96.9%).

Needle Stimulus

The children received two immunizations in the current thesis, including in order of administration: (1) a Diphtheria, Pertussis, Tetanus, and Poliomyelitis vaccine (DaPTP); and (2) a live attenuated measles-mumps-rubella vaccine (MMR). The particular needle for the DaPTP vaccine consisted of the following. The syringe was a B-D® 3cc Syringe by LUER LOK®, manufactured by Becton Dickinson & Co., Franklin Lakes, NJ, 07417-1884, USA (Reorder #309585). The needle was a 25 Gauge ⅝" PrecisionGlide® Needle, manufactured by Becton Dickinson & Co., Franklin Lakes, NJ,

07417-1884, USA (Reorder #305122). The bolus, which was given intramuscularly, consisted of .05 mL of Diphtheria and Tetanus Toxoids Absorbed and Pertussis Vaccine and Inactivated Poliomyelitis vaccine. The vaccine was manufactured by Aventis Pasteur, SA, Lyon, France, and distributed by Aventis Pasteur Limited, Toronto, Ontario, Canada.

For the MMR vaccine, the particular needle consisted of the following. The syringe was a B-D® 1cc Syringe by LUER LOK®, manufactured by Becton Dickinson & Co., Franklin Lakes, NJ, 07417-1884, USA (Reorder #309597). The needle was a 26 Gauge ½" PrecisionGlide® Needle, manufactured by Becton Dickinson & Co., Franklin Lakes, NJ, 07417-1884, USA (Reorder #305111). The bolus, which was given subcutaneously, consisted of .05 mL of reconstituted, live attenuated measles-mumps-rubella vaccine. The vaccine was manufactured and distributed by GlaxoSmithKline Inc., Mississauga, Ontario, Canada.

While no empirical studies have examined differences in the pain intensity of the two immunizations, anecdotal clinical information suggests that, in comparison to the PaPTP vaccination, the MMR vaccination produces more burning and/or stinging at the injection site at the time of the vaccination. In partial support of this anecdotal evidence, in the current thesis, the CFCs summary scores were significantly greater for the Needle 2 period than for the Needle 1 period. Thus, the children displayed more facial action during the MMR vaccination as compared to the PaPTP vaccination. However, as the MMR vaccination was always given second, it is possible that the greater responsiveness was due to an order effect (e.g., greater sensitization; see Woolfe & Salter, 2000).

Procedure

Study procedures were carried out during two visits including both a laboratory visit and a medical clinic visit. The medical clinic visit preceded the laboratory visit for 47% of the participants. No significant differences were found between order of study procedures and the study variables according to analysis of variance (ANOVA) statistics for the interval data and chi-square analyses for the ordinal data.

Laboratory Visit. Children and parents who agreed to participate were asked to come to the Pediatric Pain Research Laboratory in the Psychology Department of Dalhousie University for a 60-minute visit. Upon their arrival, participants were thanked for coming and shown into the test room, which was designed as a "living room" with two sections partially divided by a curtain. The "front" of the room measured 9 ½ feet wide by 12 ½ feet long and contained a chesterfield, two chairs, a coffee table, and two child-sized chairs. The "back" of the room was 9 ½ feet wide and 9 feet long and contained the video camera. The video camera was mounted on a tripod and angled so that the entire "front" portion of the room, including the test room door, could be seen and recorded.

Once in the test room, the purpose of the study and testing procedures were reiterated using a standard script (see Appendix R). Informed consent was obtained and the mother was given a $20 honorarium for her participation to cover any costs associated with participating (e.g., transportation). A copy of the consent form is contained in Appendix S. Mothers were then given the Demographic Questionnaire, Emotion Regulation Checklist, and Child Rating Form. The mother was also given four everyday pain incident report forms with accompanying written instructions on how to complete

the forms. The forms asked the mother to record the first four everyday pain incidents that she observed from beginning to end. The mother was asked to take the forms home to fill out over the next few days and to return the completed forms in a sealed, stamped, self-addressed envelope. After giving the mothers verbal instructions on how to complete each questionnaire the child was asked if it was okay for his or her mother to go next door to fill out some other forms.[3] Mothers were then shown to the adjacent research space were they had partial visual access and no audio access to their children and asked to complete the questionnaires. If fathers or additional children accompanied the mother, they were asked to wait in the adjacent room. Fathers were given the option of completing an Emotion Regulation Checklist for their child or of simply waiting for the study to be completed. Toys and videotaped cartoons were provided for the additional children.

The participating child was seen alone by the researcher in the test room for approximately 45 minutes. After obtaining verbal assent (see Appendix T), the child first completed the ELT, followed by administration of either the SAT or PART. The children then completed the PPVT-III, followed by administration of either the SAT or PART. Each session was videotaped and the order of administration of the SAT and PART was counterbalanced across participants. After the tasks were completed, the child was thanked for his or her participation and given allowed to pick several stickers. The child was then told that the researcher was going to go next door to tell his or her mother that they were finished with their tasks and then asked to wait in the testing room until his or her mother returned.

The researcher then went to the adjacent room to inform the mother that the child's tasks were completed and that she could return to the test room. The mother was also told that the researcher would join her and her child in a couple of minutes to answer any questions that she may have. Reunion was not emphasized. The mother and child were allowed to reunite alone for two minutes. The reunion was videotaped and later coded for attachment variables. After the reunion, the researcher returned to the testing room. The mother was thanked for her participation and allowed to ask questions about the study and study procedure. For the children who had not yet received their immunizations, the time the child was scheduled to receive his or her needle was noted and a time to meet at the clinic was arranged. Mothers were then informed about what would occur during the second visit. The entire visit took approximately one hour.

Medical Clinic Visit. A letter detailing the study was sent to six medical clinics in the Halifax Regional Municipality (See Appendix U). Four medical clinics (Dalhousie Health Services, Woodlawn Medical Clinic, Musquodoboit Harbour Medical Clinic, and Sunnyside Mall Medical Clinic) agreed to participate in this study. The participants recruited from the four medical clinics did not differ on demographic variables according to ANOVA statistics for the child's and mother's age and family SES data and chi-square analyses for the gender, ethnicity, family composition, birth order and sibling data. At Dalhousie Health Services, needles were administered by the clinic's three regular full-time nurses in the nursing office. For the remaining clinics, the child's physician administered the needles in the physician's office. Needles were given throughout the day, depending on the mothers' individual schedules. The time of day the needle occurred ranged from 9 a.m. to 7:30 p.m.

The mother and her participating child were met by the researcher in the waiting room of the medical clinic on the day of the child's medically indicated inoculation shot. While waiting for their appointment, mothers were asked to rate how anxious they felt about their child's needle using a standard script (see Appendix V).[4] The researcher waited in the waiting room during the child's appointment with their physician.

When children were finished with their physician appointment and had received permission to have their needle, the researcher accompanied the mother and child into either the nursing office or physician's office. During the needle, mothers were asked to sit in a standard chair and to hold their children in the manner in which the nurse or physician instructed. The researcher was positioned with the video camera so as to record the best possible view of the child's face. At this time, the mother was reminded of the importance of keeping her child's face as unobstructed as possible during the needle. The child was also instructed to look at the red light on the camera during the needle so that a full frontal view of his or her face could be recorded. Recordings were made from the time before the child's arm was swabbed until approximately 30 seconds after removal of the second needle.[5]

Following the immunization, the researcher left the physician's or nursing office and waited for the mother and child in the waiting room. While waiting, the researcher completed a Medical Pain Incident Report Form. When the mother returned with her child she was asked to complete a Medical Pain Incident Report Form. The child was also asked to complete the faces pain scale on the Medical Pain Incident Report Form. Any questions were answered and the mother and child were thanked for their participation. For those children who had not yet participated in the laboratory visit, a time that was

convenient for the mother and child to meet with the researcher at Dalhousie University was scheduled. Mothers were then informed about what would occur during the laboratory visit.

CHAPTER 3. RESULTS

Overview

Data analyses were performed using SPSS for Windows, version 10.0. Null hypotheses for planned comparisons were rejected using a p value of .05 in accordance with Keppel, Saufley, and Tokunaga (1992). Refer to Appendix W for a summary of the main predictor and criterion variables used in the analyses.

Preliminary Analyses

Examination of Demographic Variables

Prior to the main analyses, correlations were conducted between the demographic variables and the main predictor and criterion variables to determine which demographic variables should be included as covariates in the main analyses. Corrected p values were not used in order to maximize the chance of uncovering potential confounding variables. Spearman correlations were conducted for the ordinal scales and Pearson correlations were conducted for the interval or ratio scales. For the child demographic variables (age, sex, birth order), there were significant correlations between the child's age and mother's self-reported use of M-PIRF stoicism during the needle [$r(65) = .25$, $p < .05$], with mothers of older children reporting relatively greater use of stoic behaviour. The child's birth order was also significantly correlated with M-PIRF calming time [$r(65) = -.28$, $p < .05$], ratio of mother's coping/distress promoting verbalizations during the needle baseline period [$r(63) = -.25$, $p < .05$], and child's ratio of coping/distress promoting verbalizations during the needle recovery period [$r(61) = .25$, $p < .05$]. Thus, later born children took less time to calm down and used relatively more coping promoting relative to distress promoting verbalizations after the needle, and had mothers who used relatively

less coping promoting relative to distress promoting verbalizations before the needle.

Several significant correlations were observed between the maternal demographic variables (age, marital status, employment status, educational level) and main criterion variables. There were significant correlations between mothers' employment status and the number of overall secure [$r(52) = .37$, $p < .01$] and resistant [$r(52) = -.35$, $p < .05$] child behaviours reported on the E-PIRF. Thus, mothers who did not work outside of the home had children who exhibited relatively less secure and more resistant behaviours in response to the mother's behaviour in the first few minutes following a typical everyday pain incident. Finally, maternal educational level was significantly correlated with both the mother and child's ratio of coping/distress promoting verbalizations during the second needle [$r(57) = .29$, $p < .05$; $r(57) = .35$, $p < .01$, respectively] and the number of overall secure [$r(65) = -.32$, $p < .01$] and avoidant [$r(65) = .28$, $p < .05$] child behaviours reported on the M-PIRF. Thus, mothers with a relatively higher education level used relatively less coping promoting relative to distress promoting verbalizations during the second needle and had children who used relatively less coping promoting relative to distress promoting verbalizations during the second needle and who exhibited less secure and more avoidant behaviours in response to the mother's behaviour in the first few minutes following the immunization.

For the family demographic variables (Family SES, number of family members, number of children in the family), the mothers' self-report use of comfort on the E-PIRF was significantly correlated with the number of family members [$r(52) = -.31$, $p < .05$] and number of children in the family [$r(52) = -.32$, $p < .05$]. Thus, mothers with larger

families and more children reported using relatively less comfort following a typical everyday pain incident.

Examination of Covariates

In order to determine if the SAT and PART subscales were related to the child's ability to (1) formulate and produce coherent verbal responses, or (2) identify and label emotional states, Pearson correlations between the subscales and the child's obtained age appropriate standard score on the PPVT-III and total score on the ELT were examined. As shown in Table 13, no significant correlations were found for either the PPVT-III or the ELT total scores.

Next, to examine whether situational variables influenced the child's reunion behaviour with the mother Spearman correlations were calculated between the mean scores on the four Parent/Child Reunion Inventory behaviour rating scales and (1) how well the child slept the previous night, (2) how tired the child was on the day of testing, (3) how good the child's general mood was on the day of testing, and (4) how atypical the child's behaviour was on the day of testing. As shown in Table 14, the situational variables were unrelated to the interactive reunion behaviour rating scales.

Examination of Relations Between SAT and PART "Self" and "Other" Perspectives

To determine if there were significant differences between children's responses when referring to a hypothetical child versus referring to themselves, a series of paired *t*-tests were conducted between the "other" and "self" SAT and PART subscale scores. For the SAT, children had significantly higher attachment [$t(63) = 2.62$, $p < .05$] and lower self-reliance [$t(63) = -2.36$, $p < .05$] rating scale scores when referring to the hypothetical child than when referring to themselves. There was no significant difference for the

Table 13.

Pearson Correlations Between Separation Anxiety Test and Pain and Relationship Task Subscales and Interaction Terms and Peabody Picture Vocabulary Test (PPVT-III) Age Appropriate Standard Score and Emotional Labelling Task (ELT) Total Score

	PPVT-III	ELT
SAT		
Self-Reference		
Attachment	-.05	.11
Self-Reliance	.06	.13
Avoidance	.01	-.03
Other-Reference		
Attachment	.10	-.02
Self-Reliance	-.09	.06
Avoidance	-.004	-.01
PART		
Self-Reference		
Attachment	-.02	.17
Self-Reliance	-.06	.13
Avoidance	-.05	-.07
Other-Reference		
Attachment	.12	.15
Self-Reliance	-.01	.02
Avoidance	.21	-.18

Note. $N = 64$.

Table 14.

Spearman Correlations Between Mean Scores on the Parent Child Reunion Inventory (P/CRI) Rating Scales and Situational Variables

	Sleep	Fatigue	Mood	Behaviour
P/CRI				
Secure	-.18	-.06	-.11	-.21
Avoidant	.12	-.04	.12	.06
Ambivalent	-.09	.12	-.02	.03
Controlling	.03	-.10	.001	.19

Note. $N = 64$. Sleep: Well = 1, Fairly Well = 2, Somewhat Well = 3, Poor = 4, Very Poor = 5; Fatigue: Very Alert and Awake = 1, Fairly Alert and Awake = 2, Somewhat Alert and Awake = 3, Somewhat Tired = 4, Very Tired = 5; Mood: Very Good = 1, Good = 2, Fair = 3, Poor = 4, Very Poor = 5; Behaviour: Very Typical = 1, Fairly Typical = 2, Somewhat Typical = 3, Not Very Typical = 4, Atypical = 5.

avoidance [$t(63) = 1.52, p = .14$] rating scale. Correlations between like-variables scored for both the other child and the self were however fairly high (ranging from $r(62) = .63$ to .82, $p < .001$). Thus, while children tended to produce different responses between references to the hypothetical child and the self when discussing separation from attachment figures, the individual subscale scores were consistent across the two perspectives (e.g., children who had a high attachment rating scale score when referring to the hypothetical child also had a high attachment rating scale score when referring to the self).

For the PART, the children had significantly higher attachment [$t(63) = 2.76, p < .01$] and self-reliance [$t(63) = 3.16, p < .01$], and significantly lower avoidance [$t(63) = -3.71, p < .001$] rating scales for other-reference as compared to self-reference. Correlations between like-variables scored for both the other child and the self were however fairly high (ranging from $r(62) = .67$ to .70, $p < .001$). Thus, while children tended to produce different levels of responses between references to the hypothetical child and the self when discussing separation from attachment figures, the individual subscale scores were consistent across the two perspectives (e.g., children who had a high attachment rating scale score when referring to the hypothetical child also had a high attachment rating scale score when referring to the self).

Examination of Relations Between Predictor Variables

Prior to the main analyses, the relations between the main predictor variables (i.e., Aggregate Security Dimension, Aggregate Avoidance Dimension, Ambivalence Dimension, and Aggregate Controlling Dimension Scores) were examined using Pearson correlations. As shown in Table 15, the Aggregate Security Dimension was significantly

Table 15.

Pearson Correlations Between the Aggregate Security Dimension, Aggregate Avoidance Dimension, Ambivalence Dimension, and Aggregate Controlling Dimension Scores

Dimension	1	2	3
1. Aggregate Security Dimension	--		
2. Aggregate Avoidance Dimension	-.67***	--	
3. Ambivalence Dimension	-.18	.03	--
4. Aggregate Controlling Dimension	-.19	.17	.43***

Note. ***$p < .001$.

and negatively related to the Aggregate Avoidance Dimension. Thus, children who had a greater degree of attachment security had relatively less avoidant attachment. There was also a significant and positive correlation between the Ambivalence Dimension and Aggregate Controlling Dimension. Thus, children who had a greater degree of controlling attachment also exhibited relatively more ambivalent behaviour upon reunion with the mother.

Examination of Relations Between Immunization Pain Criterion Variables

Two measures were included to assess the children's pain reaction to the immunization (i.e., CFCS and observer-reported VAS pain ratings). The CFCS, which rates pain based on multiple defined behaviours, rather than a global impression, was considered the primary measure of pain in this study. The VAS rating, which provides a single metric (i.e., pain intensity) to measure a very complex process, was intended to serve as an adjunct to the CFCS. However, to provide additional evidence for the construct validity of the CFCS, correlations were conducted between the time-blocked CFCS and observer-reported VAS pain intensity ratings. Significant correlations were found for the CFCS and VAS needle 1 [$r(62) = .77, p < .001$], needle 2 [$r(57) = .68, p < .001$], and recovery [$r(61) = .58, p < .001$] periods and a marginally significant correlation was found for the baseline periods [$r(62) = .17, p < .10$]. The CFCS injection period was significantly correlated with the VAS needle 1 [$r(62) = .63, p < .001$] and needle 2 [$r(57) = .74, p < .001$] ratings. The significant correlations suggest that the CFCS and observer-reported VAS pain ratings were measuring conceptually-related constructs. Thus, in order to reduce the number of criterion variables only the CFCS summary scores were used in the primary analyses. The primary analyses were replicated

with children's pain scores based on their raw observer-reported VAS pain and showed similar patterns of significant and non-significant relations.

Primary Analyses

To examine the relations between attachment dimensions and child pain behaviour following both an acute pain incident (i.e., immunization) and everyday pain incident (e.g., bumps and scrapes), bivariate and partial (controlling for demographic variables identified as a covariate in the preliminary analyses, where appropriate) correlations were calculated between the main predictor and criterion variables. Specifically, the relations between the aggregate security dimension, aggregate avoidance dimension, ambivalence dimension, and aggregate controlling dimension scores and children's response to and behaviour (i.e., as assessed by the M-PIRF, E-PIRF, CAMPIS-R, and CFCS) during the painful incidents were examined.

Next, based on the pattern of correlations observed, a series of hierarchical multiple regression analyses were conducted to examine the contribution of the attachment variables in the prediction of the child pain behaviour. Hierarchical regression was chosen as it allows: (1) the examiner to specify the order of variable entry into the equation based on theory; (2) examination of control variables; and (3) examination of interaction terms (Tabachnick & Fidell, 1996). For these analyses, variables identified as a covariate in the preliminary analyses were entered in the initial step, as appropriate, and the attachment dimension scores were entered in the second step. Consistent with recommendations by Cohen and Cohen (1983), *t*-tests for the individual predictors were examined only when the overall *F* test for a set of predictor variables was significant (i.e., the protected *t*-test).

Examination of Relations Between Attachment Dimensions and Pain

The intercorrelations of the attachment dimensions and child pain variables are presented in Table 16. It was hypothesized that the attachment dimensions would be differentially related to the children's response to and behaviour following the painful incidents. The first hypothesis was that the attachment dimensions would be equivalent in terms of baseline levels of pain and coping verbalizations and self-report of pain experienced during the incidents. Consistent with prediction, there were no significant correlations between the attachment dimensions and children's self-report of pain (*r*'s ranged from -.02 to -.26) and facial action (*r*'s ranged from .07 to .15) and verbalizations (*r*'s ranged from .01 to -.22) during the needle baseline period.

The second hypothesis was that children with relatively greater attachment security should express negative affect, make relatively more coping promoting versus distress promoting verbalizations, seek comfort or assistance from the mother, and be able to be soothed by the mother during the pain incidents. Specifically, it was predicted that the secure attachment dimension would be (1) positively related to the child's Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods; (2) positively related to the number of secure behaviours exhibited in response to the mother's behaviour following the pain incidents; and (3) negatively related to reactivity level and calming time during the pain incidents. Contrary to prediction, no significant correlations were observed between the secure attachment dimension and the child pain variables. Notably, a sizeable, but non-significant correlation in the predicted direction was found between the secure dimension

Table 16.

Bivariate and Partial Correlations Between the Attachment Dimension Scores and Child Pain Variables

	Attachment Dimension			
Variable	Security	Avoidance	Ambivalent	Controlling
CFCS Summary Scores				
Baseline	.07	-.11	.15	.08
Injection	.06	-.09	.28*	.40**
Needle 1	-.08	-.04	.26*	.28**
Needle 2	-.02	-.12	.19	.38**
Recovery	.12	-.22	.10	.18
CAMPIS-R Child Verbalizations				
Baseline	-.04	.09	.01	-.22
Injection	-.14	.13	-.11	-.21
Needle 1	-.11	.10	.09	-.10
Needle 2[a]	.06	-.01	-.26	-.35**
Recovery[b]	-.25	.08	.06	-.25
M-PIRF Scales				
Faces Pain Scale	-.02	.05	.20	.19
Reactivity Level (mm)	-.02	-.04	.01	.38**
Anger Level (mm)	.07	-.06	-.10	-.42**
Calming Time (sec)[b]	.11	-.07	-.03	.30*
Secure Behaviours[a]	-.03	-.04	.07	.16
Resistant Behaviours	.08	-.08	.11	.29*
Avoidant Behaviours[a]	.07	.19	.09	-.09
E-PIRF Scales				
Faces Pain Scale	.16	-.26	.08	.04
Reactivity Level (mm)	.04	-.03	.48***	.38***
Anger Level (mm)	.04	-.11	.26	.26
Calming Time (sec)	.11	-.11	.18	.25
Secure Behaviours[c]	.22	-.05	.14	.01
Resistant Behaviours[c]	.15	-.06	-.04	-.14
Avoidant Behaviours	-.15	.15	-.06	-.21

Note. *$p < .05$, **$p < .01$, ***$p < .001$. Partial correlations controlling for [a]child birth order, [b]maternal education level, and [c]maternal employment status.

and E-PIRF number of secure behaviours exhibited in response to the mothers' behaviour following the everyday pain incident (r = .22).

The third hypothesis was that children with relatively greater avoidant attachment should minimize expressions of negative affect and pain-related facial activity, make relatively more coping promoting versus distress promoting verbalizations, should not seek comfort or assistance from the mother, and should not be able to be soothed by the mother should she initiate assistance during the pain incidents. Specifically, it was predicted that the avoidance attachment dimension would be: (1) negatively related to facial action during the injection, needle 1, needle 2, and recovery periods; (2) positively related to the Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods; and (3) negatively related to reactivity level and calming time during the pain incidents; and (4) positively related to the number of avoidant behaviours exhibited in response to the mothers' behaviour following the pain incidents. Contrary to prediction, no significant correlations were observed between the avoidance attachment dimension and the child pain variables (r's ranged from -.01 to -.22). A sizeable, but non-significant negative correlation was observed between the avoidance dimension and CFCS recovery score (r = -.22).

The fourth hypothesis was that children with relatively greater ambivalent attachment should express more negative affect and have greater pain-related facial action during the pain incidents, make relatively less coping promoting versus distress promoting verbalizations, seek comfort or assistance from the mother but also exhibit resistant and angry behaviour, and be less able to be soothed by the mother. Specifically, it was predicted that the ambivalence attachment dimension would be (1) positively

related to facial action during the injection, needle 1, needle 2, and recovery periods, to reactivity level and calming time during the pain incidents, and to anger level during the everyday pain incident and number of resistant behaviours exhibited in response to the mothers' behaviour following the pain incidents; and (2) negatively related to the Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods, and to the reflected anger level during the immunization. Partial support for these predictions was found. Specifically, there were significant positive correlations between the ambivalence dimension and overall injection ($r = .28$, $p < .05$) and needle 1 ($r = .26$, $p < .05$) CFCS summary score and E-PIRF reactivity level ($r = .48$, $p < .001$). Thus, children with more ambivalent attachment displayed greater facial action during the overall injection and first needle period and had a relatively greater reaction to the everyday pain incident than children with less ambivalent attachment. No other significant predicted relations were found (r's ranged from .01 to .26).

The fifth hypothesis was that children with relatively greater disorganized/controlling attachment should express more negative affect and have greater pain-related facial action during the pain incidents, make relatively less coping promoting versus distress promoting verbalizations, either seek comfort or assistance from the mother or alternatively avoid the mother, and be less able to be soothed by the mother. Specifically, it was predicted that the controlling attachment dimension would be (1) positively related to facial action during the injection, needle 1, needle 2, and recovery periods, and to reactivity level and calming time during the pain incidents; and (2) negatively related to the Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods. As predicted, several

significant correlations were observed between the controlling dimension and child pain variables. First, the controlling dimension was significantly and positively correlated with overall injection ($r = .40, p < .01$), needle 1 ($r = .28, p < .01$), and needle 2 ($r = .38, p < .01$) CFCS summary scores. Thus, children with more controlling attachment displayed greater facial action during the injection, needle 1, and needle 2 periods than children with less controlling attachment. Second, there was a significant negative correlation between the controlling dimension and the ratio of child's coping/distress promoting CAMPIS-R verbalizations during the second needle period ($r = -.35, p < .01$). Thus, children with more controlling attachment made relatively less Coping Promoting relative to Distress Promoting verbalizations during the second immunization. Third, the controlling dimension was significantly and positively correlated with M-PIRF reactivity level ($r = .38, p < .01$), calming time ($r = .30, p < .05$), and number of resistant behaviours exhibited in response to the mothers' behaviour ($r = .29, p < .05$) following the immunization. There was also a significant negative correlation between the controlling dimension and M-PIRF reflected anger level ($r = -.42, p < .01$). Thus, children with more controlling attachment had a relatively greater reaction to the immunization procedure, displayed greater anger, took more time to calm down, and displayed more resistant behaviour in response to the mothers' behaviour. Finally, the controlling dimension was significantly and positively correlated with E-PIRF reactivity level ($r = .38, p < .001$), indicating that children with more controlling attachment had a relatively greater reaction to the everyday pain incident.

Predicting Child Pain Behaviour from the Attachment Variables

Immunization. To examine the contribution of the attachment variables in the prediction of the child pain behaviour during the needle procedure, a series of hierarchical regression analyses were conducted. The main predictor variables for these analyses were the ambivalent and controlling attachment dimension scores. As the correlational analyses showed that only the ambivalent and controlling attachment dimension scores were significantly related to the child immunization pain variables, the secure and avoidance attachment dimensions were not included in these analyses. The criterion variables included: the CFCS summary scores and the ratio of child's coping/distress promoting CAMPIS-R verbalizations during the five needle periods, M-PIRF faces pain scale scores, mother reported reactivity and reflected anger levels (in mm), calming time (in sec), and number of secure, resistant, and avoidant child response behaviours. Tables 17 to 19 contain summary data of the regression analyses.

For the CFCS data (see Table 17), facial action was not significantly predicted by the ambivalent and controlling attachment dimension scores entered at step one for the baseline and recovery periods. The predictive equations for the overall injection, needle 1, and Needle 2 periods were significant when the ambivalent and controlling attachment dimension scores were entered at step one and accounted for 18%, 10%, and 15% of the variance in child facial action, respectively. With respect to the individual predictors, for both the overall injection and needle 2 periods the standardized betas were significant for the controlling dimension scores ($\beta = .34$, $t = 2.64$, $p < .01$; $\beta = .37$, $t = 2.74$, $p < .01$, respectively).

Table 17.

Hierarchical Regressions of the Ambivalent and Controlling Dimension Scores on the Child Facial Coding System (CFCS) Summary Scores

	Results at each step in the regression analysis			
Variable	Total R^2	*df*	*F*	*p*
Baseline Period				
Attachment Dimensions	.02	2, 60	0.67	.52
Injection Period				
Attachment Dimensions	.18	2, 61	6.48	.003
Needle 1 Period				
Attachment Dimensions	.10	2, 61	3.43	.04
Needle 2 Period				
Attachment Dimensions	.15	2, 58	5.05	.01
Recovery Period				
Attachment Dimensions	.03	2, 56	0.92	.41

For the CAMPIS-R data (see Table 18), child verbalization was predicted by the maternal education level at step one, and accounted for 21% of the variance for the needle 2 period. When the ambivalent and controlling dimension scores were entered at the second step, the predictive equation remained significant and accounted for an additional 17% of the variance. With respect to the individual predictors, the standardized betas were significant for maternal education level (β = .37, t = 3.21, p < .01) and controlling dimension (β = -.40, t = -3.01, p < .01). No significant regression equations were found for the overall injection, needle 1, or recovery period child verbalizations.

For the M-PIRF data (see Table 19), consistent with prediction, neither the ambivalent nor controlling attachment dimensions accounted for a significant amount of the variance in the self-reported pain subscale. Also consistent, reactivity level was predicted by the ambivalent or controlling attachment dimensions at step one and accounted for 17% of the variance. With respect to the individual predictors, the standardized beta was significant for the controlling dimension (β = .46, t = 3.62, p < .01). Anger level (reflected) was also predicted by the ambivalent and controlling attachment dimensions at step one and accounted for 19% of the variance. With respect to the individual predictors, the standardized beta was significant for the controlling dimension (β = -.46, t = -3.65, p < .01).

Next, as child birth order was significantly correlated with calming time, it was entered as a covariate in the initial step, but it did not account significantly in prediction. When the ambivalent and controlling attachment dimensions were entered at the second step the predictive equation became significant and accounted for 14% of the variance.

Table 18.

Hierarchical Regressions of the Ambivalent and Controlling Dimension Scores, and Covariates on the Child Adult Medical Procedure Interaction Scale, Revised (CAMPIS-R) Child Coping/Distress Promoting Summary Scores

		Results at each step in the regression analysis				
Step	Variable	Total R^2	*df*	*F*	*p*	R^2 Change
Baseline Period						
1.	Attachment Dimensions	.07	2, 60	2.16	.12	
Injection Period						
1.	Attachment Dimensions	.05	2, 61	1.48	.24	
Needle 1 Period						
1.	Attachment Dimensions	.02	2, 61	0.50	.61	
Needle 2 Period						
1.	Maternal Education Level	.12	1, 55	7.36	.009	
2.	Attachment Dimensions	.29	3, 53	7.22	.000	.17**
Recovery Period						
1.	Child Birth Order	.02	1, 59	1.27	.27	
2.	Attachment Dimensions	.08	3, 57	1.66	.19	.06

Note. $^{**}p < .01$. Child Birth Order: 1 = first born, 2 = second born, 3 = third born, 4 = fourth born; Maternal Education Level: 1 = graduate or professional training, 2 = undergraduate university training, 3 = partial university or college level training, 4 = high school graduation.

Table 19.

Hierarchical Regressions of the Ambivalent and Controlling Dimension Scores, and Covariates on the Medical Pain Incident Report Form (M-PIRF) Child Reaction and Response Scales

		Results at each step in the regression analysis				
Step	Variable	Total R^2	*df*	*F*	*p*	R^2 Change
Faces Pain Scale						
1.	Attachment Dimensions	.05	2, 62	1.77	.18	
Reactivity Level (mm)						
1.	Attachment Dimensions	.17	2, 62	6.55	.003	
Anger Level (mm)						
1.	Attachment Dimensions	.19	2, 62	7.06	.002	
Calming Time (sec)						
1.	Child Birth Order	.05	1, 62	3.36	.07	
2.	Attachment Dimensions	.14	3, 60	3.28	.03	.09*
Secure Behaviours						
1.	Maternal Education Level	.06	1, 63	3.77	.06	
2.	Attachment Dimensions	.10	3, 61	2.45	.09	.04
Resistant Behaviours						
1.	Attachment Dimensions	.08	2, 62	2.77	.07	
Avoidant Behaviours						
1.	Maternal Education Level	.05	1, 63	3.49	.07	
2.	Attachment Dimensions	.11	3, 61	2.47	.07	.06

Note. *$p < .05$. Child Birth Order: 1 = first born, 2 = second born, 3 = third born, 4 = fourth born; Maternal Education Level: 1 = graduate or professional training, 2 = undergraduate university training, 3 = partial university or college level training, 4 = high school graduation.

With respect to the individual predictors, the standardized beta was significant for the controlling dimension ($\beta = .34, t = 2.50, p < .05$).

For the child response data, the number of secure behaviours exhibited in response to the mothers' behaviour following the pain incident was not significant when maternal educational level was entered at the first step. Further, the predictive equation remained non-significant when the ambivalent and controlling attachment dimensions were entered at the second step. Similarly, for the avoidant behaviour child response data, neither the mothers' educational level nor ambivalent and controlling attachment dimensions accounted for a significant amount of variance in the number of avoidant behaviours displayed. Finally, the number of resistant behaviours was not significantly predicted by the ambivalent and controlling attachment dimensions at step one.

Everyday Pain. To examine the contribution of the attachment variables in the prediction of the child pain behaviour during a typical everyday pain incident, a series of hierarchical regression analyses were conducted. The main predictor variables for these analyses were the ambivalent and controlling attachment dimension scores. The secure and avoidance attachment dimensions were not included in these analyses as the correlational analyses showed that only the ambivalent and controlling attachment dimension scores were significantly related to the child everyday pain variables. The criterion variables included: the E-PIRF faces pain scale, mother reported reactivity and anger levels (in mm), calming time (in sec), and child response secure, resistant, and avoidant child response behaviours. As maternal employment status was significantly correlated with the number of secure and resistant child behaviours exhibited in response

to the mothers' behaviours, these variables were entered as a covariate in the initial step, where applicable. Table 20 contains summary data of the regression analyses.

Consistent with prediction, the attachment dimensions did not account for a significant amount of variance in the self-reported pain subscale. Also consistent, reactivity level was predicted by the ambivalent and controlling attachment dimensions at step one and accounted for 26% of the variance. With respect to the individual predictors, the standardized beta was significant for the ambivalence dimension ($\beta = .39$, $t = 2.74$, $p < .01$). Contrary to prediction, the attachment dimensions did not account for a significant amount of variance in the anger level or calming time subscales.

For the child response data, the number of secure behaviours exhibited in response to the mothers' behaviour following the pain incident was significantly predicted by maternal employment status at step one and accounted for 14% of the variance. When the attachment dimensions were entered at the second step, the predictive equation remained significant and accounted for an additional 4% of the variance. With respect to the individual predictors, the standardized beta was significant for maternal employment status ($\beta = .32$, $t = 2.39$, $p < .05$) only. Similarly, for the resistant behaviour data, the predictive equation was significant when maternal employment status was entered at the first step and accounted for 12% of the variance, but became non-significant when the attachment dimensions were entered at the second step. Finally, for the avoidant behaviour child response data, the attachment dimensions did not account for a significant amount of variance in the number of avoidant behaviours displayed.

Table 20.

Hierarchical Regressions of the Ambivalent and Controlling Dimension Scores, and Covariates on the Everyday Pain Incident Report Form (E-PIRF) Child Reaction and Response Scales

		Results at each step in the regression analysis				
Step	Variable	Total R^2	*df*	*F*	*p*	R^2 Change
Faces Pain Scale						
1.	Attachment Dimensions	.01	2, 49	0.16	.85	
Reactivity Level (mm)						
1.	Attachment Dimensions	.26	2, 49	8.51	.001	
Anger Level (mm)						
1.	Attachment Dimensions	.09	2, 49	2.34	.11	
Calming Time (sec)						
1.	Attachment Dimensions	.06	2, 49	1.68	.20	
Secure Behaviours						
1.	Maternal Employment Status	.14	1, 50	7.81	.007	
2.	Attachment Dimensions	.18	3, 48	3.49	.02	.04
Resistant Behaviours						
1.	Maternal Employment Status	.12	1, 50	7.02	.01	
2.	Attachment Dimensions	.14	3, 48	2.53	.07	.02
Avoidant Behaviours						
1.	Attachment Dimensions	.05	2, 49	1.22	.31	

Note. Maternal Employment Status: 0 = not working outside of home, 1 = working outside of home.

Predicting Child Pain Behaviour from the Individual Controlling Dimension Aggregate Components

The use of aggregation procedures limits the conclusions that can be made about the relative contribution of the controlling aggregate component variables in the prediction of the child pain behaviour during the needle procedure. Thus, an additional series of hierarchical regression analyses were conducted using the individual controlling dimension aggregate components to examine their relative contribution in prediction. The main predictor variables for these analyses were the P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores. The criterion variables included: the CFCS overall injection and needle 2 summary scores, the ratio of child's coping/distress promoting CAMPIS-R verbalizations during the second needle period, and M-PIRF mother reported reactivity, reflected anger levels (in mm), and calming time (in sec). Only these variables were examined as the initial regression analyses showed that the standardized betas for these variables were significant for the controlling dimension. Table 21 contains summary data of the regression analyses.

For the CFCS data, the predictive equations for the overall injection and Needle 2 periods were significant when the P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores were entered at step one and accounted for 16%, and 15% of the variance in child facial action, respectively. With respect to the individual predictors, for the overall injection period the standardized beta was significant for the P/CRI controlling behaviour rating scale ($\beta = .30$, $t = 2.44$, $p < .05$). For the needle 2 period, the standardized beta was significant for the ERC lability/negativity subscale ($\beta = .30$, $t = 2.40$, $p < .05$).

Table 21.

Hierarchical Regressions of the P/CRI Controlling Behaviour Rating Scale and ERC Lability/Negativity Subscale Z-Scores, and Covariates on the Child Facial Coding System (CFCS), Child Adult Medical Procedure Interaction Scale, Revised (CAMPIS-R), and Medical Pain Incident Report Form (M-PIRF) Child Reaction Scales

	Results at each step in the regression analysis				
Step Variable	Total R^2	*df*	*F*	*p*	R^2 Change
CFCS					
Overall Injection Period					
1. Controlling Components	.16	2, 63	5.98	.004	
Needle 2 Period					
1. Controlling Components	.15	2, 58	5.26	.008	
CAMPIS-R					
Needle 2 Period					
1. Maternal Education	.12	1, 55	7.36	.009	
2. Controlling Components	.29	3, 53	7.20	.000	.17**
M-PIRF					
Reactivity Level (mm)					
1. Controlling Components	.15	2, 62	5.55	.006	
Anger Level (mm)					
1. Controlling Components	.18	2, 62	6.77	.002	
Calming Time (sec)					
1. Child Birth Order	.05	1, 62	3.36	.07	
2. Controlling Components	.13	3, 60	2.89	.04	.09

Note. $^{**}p < .01$. Child Birth Order: 1 = first born, 2 = second born, 3 = third born, 4 = fourth born; Maternal Education Level: 1 = graduate or professional training, 2 = undergraduate university training, 3 = partial university or college level training, 4 = high school graduation.

For the CAMPIS-R data, child verbalization was predicted by the maternal education level at step one, and accounted for 12% of the variance for the needle 2 period. When the P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores were entered at the second step, the predictive equation remained significant and accounted for an additional 17% of the variance. With respect to the individual predictors, the standardized beta was significant for the maternal education level ($\beta = .37, t = 3.21, p < .01$) and P/CRI controlling behaviour rating scale ($\beta = -.27, t = -2.23, p < .05$).

Finally, for the M-PIRF data, reactivity level was predicted by the P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores at step one and accounted for 15% of the variance. With respect to the individual predictors, the standardized beta was significant for the ERC lability/negativity subscale ($\beta = .31, t = 2.52, p < .01$). Anger level (reflected) was also predicted by the P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores at step one and accounted for 18% of the variance. With respect to the individual predictors, the standardized beta was significant for the P/CRI controlling behaviour rating scale ($\beta = -29, t = -2.43, p < .05$).

Next, as child birth order was significantly correlated with calming time, it was entered as a covariate in the initial step, but it did not account significantly in prediction. When the P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores were entered at the second step the predictive equation became significant and accounted for 13% of the variance. With respect to the individual predictors, none of the standardized betas was significant.

Secondary Analyses

In order to provide a more comprehensive picture of the complex interaction of variables involved in the pain experience, several secondary analyses were conducted. First, as the development of attachment is attendant on the parent's ability to meet the child's security needs (Cassidy, 1994), it was predicted that there might be differences in the parental behaviour at the time of child pain between parents of secure versus insecure children. To examine this hypothesis, bivariate and partial (controlling for demographic variables identified as a covariate in the preliminary analyses, where appropriate) correlations were calculated between the aggregate security dimension, aggregate avoidance dimension, ambivalence dimension, and aggregate controlling dimension scores and the CAMPIS-R maternal verbalizations, M-PIRF and E-PIRF maternal response subscales, and self-reported maternal anxiety. Given the relatively low frequency of occurrence of several of the parental response types (see Table 5) during the immunization, only use of praise, comfort, and distraction were examined in these analyses. Similarly, given the relatively low frequency of occurrence of several of the parental response types (see Table 10) during the everyday pain incident, only use of assess/treat, teach, comfort, and distraction were examined. Second, as attachment dimensions, and internal working models, are thought to be consistent across situations and experiences that evoke negative emotions (Cooper et al., 1998), it was predicted that child and maternal behaviour would be consistent during the immunization and an everyday pain incident. Further, it was predicted that if child and maternal behaviours were not found to be consistent, then differences in attachment security might account for the discrepancy. To examine these hypotheses, a series of paired *t*-tests and correlations

were conducted between the respective *child's reaction*, *parental response*, and *child response* subscales of the Medical and Everyday Pain Incident Forms.

Examination of Relations Between Attachment Dimensions and Parental Behaviour During Pain Incidents

The intercorrelations of the attachment dimensions and parental behaviour variables are presented in Table 22. It was hypothesized that the parental behaviour at the time of child pain might differ between parents of secure versus insecure children. First, it was predicted that the secure attachment dimension would be: (1) positively related to the mothers' Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods; (2) positively related to the mothers' reported use of assess/treat, teach, comfort, and distraction during the pain incidents; and (3) negatively related to the mothers' reported use of praise. Second, it was predicted that the avoidance, ambivalence, and controlling attachment dimensions would be: (1) negatively related to the mothers' Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods; (2) negatively related to the mothers' reported use of assess/treat, teach, comfort, and distraction during the pain incidents; and (3) positively related to the mothers' reported use of praise. It was also predicted that maternal anxiety would be positively related to the ambivalence dimension.

Contrary to prediction, no significant correlations were found between the attachment dimensions and maternal verbalization or behaviour during the immunization. In addition, no significant correlations were found between the attachment dimensions and mothers' reported use of assess/treat, teach, or distraction during the everyday pain

Table 22.

Bivariate and Partial Correlations Between the Attachment Dimension Scores and the CAMPIS-R Maternal Verbalizations, M-PIRF and E-PIRF Maternal Response Subscales, and Self-Reported Maternal Anxiety

	Attachment Dimension			
Variable	Security	Avoidance	Ambivalent	Controlling
CAMPIS-R Maternal Verbalizations				
Baseline	-.15	.15	.04	-.03
Injection	-.09	.05	.17	-.02
Needle 1	-.11	.10	.04	-.10
Needle 2[a]	-.06	.01	-.003	-.12
Recovery	-.19	.07	-.01	-.04
M-PIRF Scales				
Praise	-.21	-.20	-.01	-.06
Comfort	.03	-.08	-.18	.14
Distraction	-.02	.09	.14	.02
E-PIRF Scales				
Assess/Treat	.07	-.24	-.07	-.19
Teach	.24	-.22	.08	.27
Comfort[b]	.28	-.32*	.05	.21
Distraction	.04	.08	.12	.13
Maternal Anxiety	-.08	-.03	.10	.32**

Note. $*p < .05$, $**p < .01$. Partial correlations controlling for [a]child birth order, [b]number of family members and number of children in family.

incident. Maternal anxiety was also significantly and positively related to the controlling attachment dimension. Thus, contrary to prediction, mothers of children with more controlling attachment reported feeling more anxious about the proceeding immunization procedure. However, consistent with prediction, the avoidance dimension was significantly and negatively correlated with maternal use of comfort during the everyday pain incident. Thus, mothers of children with more avoidant attachment used relatively less comfort during the everyday pain incident.

Examination of Relations Between Medical and Everyday Pain

To examine whether child and maternal behaviour was consistent during the immunization and an everyday pain incident, a series of tests were conducted between the respective *child's reaction*, *parental response*, and *child response* subscales of the Medical and Everyday Pain Incident Forms. First, paired samples *t*-tests were conducted to determine if there were overall differences between the two types of pain incidents. Next, zero-order and partial (controlling for significantly related demographic variables as identified in the preliminary analyses) correlations were conducted to determine whether the individual subscale scores were consistent across the two incidents (e.g., do children who have a relatively stronger reaction to the needle pain also have a relatively stronger reaction to the everyday pain incident?). Table 23 contains the summary data for these analyses.

For the child reaction data, there were significant differences in the child's behavioural reaction, mother-reported reactivity level, and calming time between the immunization procedure and everyday pain incident. There were no significant differences between the incidents in terms of the anger level or self-reported pain. Thus,

Table 23.

Summary Data for Paired Samples t-Tests and Correlations Between the Child's Reaction, Parental Response, and Child Response Subscales of the Medical (M-PIRF) and Everyday Pain Incident Forms (E-PIRF)

PIRF Subscales	Mean Difference	Standard Error	*t*	*r*
Child Reaction				
Behavioural Reaction	-0.58	0.12	-4.69***	.12
Reactivity Level (mm)	-17.81	4.79	-3.72***	.09
Anger Level (mm)	-4.23	3.30	-1.28	.12
Calming Time (sec)[a]	-22.62	7.65	-2.96**	-.10
Faces Pain Scale	-0.49	0.36	-1.37	.16
Parental Response				
Average Child Pain (mm)	8.72	3.40	2.57*	.09
Assess/Treat Injury	-0.64	0.07	-8.94***	.05
No Attention	0.09	0.06	1.70^{+}	-.08
Praise	0.66	0.07	9.30***	-.03
Teach	-0.32	0.08	-4.27***	.06
Comfort[b]	-0.17	0.08	-2.02*	-.16
Stoic	0.08	0.05	1.43	-.07
Distraction	0.02	0.08	0.23	.21
Punishment	0.02	0.02	1.00	.00
Child Response				
Secure Behaviours[c]	-0.13	0.15	-0.90	-.34*
Resistant Behaviours	0.04	0.10	0.39	.01
Avoidant Behaviours[c]	0.08	0.15	0.51	.06

Note. N =53. $^{+}p < .10$, $*p < .05$, $**p < .01$, $*** p < .001$. Partial correlations controlling for [a]child birth order, [b]number of family members and number of children, and [c]maternal employment status and education level.

as a whole, while the two incidents were rated as equally painful, the children exhibited more severe pain behaviours, reacted stronger, and took more time to calm down following a typical everyday pain than following the immunization. No significant correlations were found between the child reaction variables across incidents, suggesting that the reaction of some of the individual children was not consistent across the immunization and everyday pain incidents.

For the parental response data, there were significant differences in the mothers' reported use of assess/treat injury, praise, teach, and comfort following the immunization procedure and everyday pain incidents. Thus, as a whole, relatively more mothers used praise following the immunization than following the everyday pain incident. Whereas, relatively more mothers assessed or treated the injury, noted teaching the child about the incident, or comforted the child following the everyday pain incident than following the immunization. There was also a significant difference in the mothers' perception of the pain incidents, with the immunization procedure being rated as more painful on the whole than the everyday pain incidents. The parental responses endorsed were not significantly correlated across the pain incidents. The contingency coefficient between the mothers' reported dominant response during the immunization and everyday pain incident was also nonsignificant ($c = .61, p = .42$). The lack of observed relations would suggest that some of the mothers did not respond to their child's immunization and typical everyday pains in a consistent manner.

Finally, for the child response data, there were no significant differences between the two types of pain incidents in terms of the number of secure, resistant, and avoidant child behaviours in response to maternal behaviour variables. Thus, as a whole, the

number of secure, resistant, and avoidant behaviours exhibited was equivalent across the immunization and everyday pain incidents. No significant correlations were found between the resistant and avoidant variables across incidents, suggesting that for some of the individual children exhibition of these behaviours was not consistent across the immunization and everyday pain incidents. However, a significant negative correlation was found for the number of secure behaviours exhibited between the pain incidents. This relation would suggest that children who displayed relatively more secure behaviours in response to the mothers' behaviour following the immunization displayed relatively less secure behaviours in response to the mothers' behaviour following an everyday pain incident.

The observed lack of significant, positive correlations between the respective child's reaction, parental response, and child response subscales of the Medical and Everyday Pain Incident Forms suggests that the child and maternal behaviours were not consistent across the two types of pain incidents. It is possible that differences in the children's attachment dimensions may account for the inconsistency. To examine this hypothesis, median splits were first conducted on the aggregate security dimension, aggregate avoidance dimension, ambivalence dimension, and aggregate controlling dimension scores. The correlations between the respective subscales were then recalculated separately for each of the groups (see Table 24).

For the child reaction data, there was a significant negative correlation between the M-PIRF and E-PIRF calming time subscales for the less secure and more avoidant subgroups. Thus, children who were less secure or more avoidant were less consistent in terms of the amount of time required to calm down after the incidents. A significant

Table 24.

Correlations Between the Child's Reaction, Parental Response, and Child Response Subscales of the Medical (M-PIRF) and Everyday Pain Incident Forms (E-PIRF) for the Attachment Dimensions Median Split Groups

PIRF Subscales	Attachment Dimension							
	Security		Avoidance		Ambivalence		Controlling	
	Less (25)	More (25)	Less (25)	More (25)	Less (28)	More (24)	Less (27)	More (25)
Child Reaction								
Behavioural Reaction	.07	.17	.27	-.06	.07	.06	-.15	.29
Reactivity Level (mm)	-.14	-.12	-.06	-.21	-.06	-.20	-.44**	-.10
Anger Level (mm)	-.18	-.07	-.06	-.16	.08	-.19	.26	-.13
Calming Time (sec)[a]	-.47*	.05	.04	-.41*	-.09	-.15	-.48**	.04
Faces Pain Scale	.14	.07	.39*	-.06	.10	.11	.17	.08
Parental Response								
Average Child Pain	.29	-.07	.06	.17	.15	.07	.12	-.01
Assess/Treat Injury	-.18	.21	.13	-.01	0	.13	.03	N/A
No Attention	-.10	-.06	N/A	-.13	-.08	-.08	-.09	-.06
Praise	N/A	-.27	.09	-.27	-.16	N/A	-.13	N/A
Teach	-.18	.28	-.01	.14	.06	.05	.10	.01
Comfort[b]	-.33	.26	-.14	-.16	-.07	-.29	-.14	-.25
Stoic[c]	-.18	N/A	N/A	-.16	N/A	-.08	-.17	-.05
Distraction	.34	.26	.31	.31	.13	.32	.45*	.02
Punishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Child Response								
Secure Behaviours[d]	-.70***	-.11	-.10	-.79***	-.35	-.33	-.45*	-.24
Resistant Behaviours	0	.01	.09	-.06	.41*	-.07	N/A	.01
Avoidant Behaviours[d]	.01	-.02	.01	.04	.01	.12	-.08	-.07

Note. $*p < .05$, $**p < .01$. Partial correlations controlling for [a]child birth order, [b]number of family members and number of children, [c]child's age, and [d]maternal employment status and education level.

positive correlation was also found for the faces pain scale for the less avoidant subgroup. Thus, children who were less avoidant rated their level of pain in response to the two types of incidents in a similar manner. In addition, for the less controlling subgroup, there were significant negative correlations for the reactivity level and calming times subscales. Thus, children who were less controlling were less consistent across incidents in terms of their reaction to the pain and the amount of time required to calm down after the incidents.

For the parental response data, a significant positive correlation was found for the less controlling subgroup and the mothers' use of distraction. Thus, mothers of children with less controlling attachment were consistent in their use of distraction across pain incidents.

Finally, several significant correlations were found between the two types of pain incidents in terms of the number of secure, resistant, and avoidant child behaviours exhibited in response to the maternal behaviour variables. A significant negative correlation was found for the number of secure behaviours for the less secure, more avoidant, and less controlling subgroups. Thus, children who were less secure, more avoidant, or less controlling were less consistent in their display of secure behaviours in response to the mothers' behaviour following the pain incidents. A significant positive correlation was found for the number of resistant behaviours for the less ambivalent subgroup. Thus, children with less ambivalent attachment were more consistent in the amount of resistant behaviour they displayed in response to the mothers' actions during both the immunization and everyday pain incidents.

CHAPTER 4. DISCUSSION

Overview

The findings of this study lend partial support to the proposed hypotheses. Each of the proposed hypotheses will be examined, the findings that support or refute the hypotheses will be reviewed, and possible explanations for the pattern of findings will be discussed.

Review of Preliminary Analyses and Discussion of Findings

Examination of Demographic Variables

Based on past literature, it was expected that there might be relations between the demographic variables and the main predictor and criterion variables. For the child demographic variables (age, sex, birth order), there were significant relations between the child's age and mother's self-reported use of stoicism during the needle, with mothers of older children reporting relatively greater use of stoic behaviour. It is possible that this finding reflects a developmental progression in parental involvement in children's pain coping. For instance, research has shown that during routine inoculations, mothers of children less than one year of age primarily used physical comforting tactics, whereas mothers of infants in the second year of life used both comforting behaviours and verbal distraction (Craig, McMahon, Morison, & Zaskow, 1984). No studies to date have directly examined parental reaction to young school-age children's pain, however, given the advances in their cognitive capabilities and increasing ability to self-regulate arousal, it may be that these mothers would use less active coping strategies (i.e., distraction) and would promote more independent coping in this age group. Similarly, it may be that the

older children are better able to self-comfort or self-regulate distress and thus do not elicit overt maternal coping responses to manage their pain.

The child's birth order was also significantly related to needle calming time, ratio of mother's coping/distress promoting verbalizations during the needle baseline period, and child's ratio of coping/distress promoting verbalizations during the needle recovery period. Thus, later born children took less time to calm down and used relatively more coping promoting relative to distress promoting verbalizations after the needle, and had mothers who used relatively less coping promoting relative to distress promoting verbalizations before the needle. The research on child birth order and pain reactivity, while not current, has shown that earlier born children were more upset by the threat of injections (Vernon, 1974) and more sensitive to dental pain (DeFee & Himelstein, 1969) than later born children. Modeling may account for the findings in the current study. It is possible that a younger sibling may have had greater opportunity to observe an older sibling's experience with pain. The younger sibling may thus have altered his or her behaviour in accordance with the older sibling who, presumably, would have developed over time the ability to manage his or her pain. Alternatively, it may be that later born children may have had to learn to cope with his or her pain more or less independently given the possible decreased individual parental attention associated with having more siblings or children in the family. This latter explanation may also account for the finding that the mothers with larger families and more children in the current study reported using relatively less comfort following a typical everyday pain incident.

Contrary to previous research which has shown that younger children typically report more pain from needles than do older children (e.g. Fradet et al., 1990; Fowler-

Kerry & Lander, 1991; Johnston, Stevens, & Arbess, 1993; Lander & Fowler-Kerry, 1993; Arts et al., 1994; Goodenough, Kampel, Champion, Nicholas, Laubreaux, Ziegler et al., 1997), no relations were found between child age and pain variables. It is likely that the relatively narrow age group studied precluded detection of age-related pain differences.

In addition, no significant relations were found between sex of the child and the pain variables. Research on sex differences has been equivocal, with some studies showing that girls report more needle pain than boys (e.g., Goodenough et al., 1997) and others reporting no sex differences (e.g., Fernald & Corry, 1981; Goodenough, Thomas, Champion, Perrott, Taplin, von Baeyer et al., 1999; Lander & Fowler-Kerry, 1991). The lack of significant sex differences may be due to the age of the children studied. Previous research has shown a sex by age interaction in children's self-report of needle pain intensity (Goodenough et al., 1999). Specifically, Goodenough et al. found significant sex differences for older children (8–15 years), but not for children younger than seven years of age.

For the maternal demographic variables (age, marital status, employment status, educational level), mothers who did not work outside of the home had children who exhibited relatively less secure and more resistant behaviours in response to the mother's behaviour in the first few minutes following a typical everyday pain incident. This finding is consistent with previous research that has shown that a return to outside employment is associated with higher levels of secure-base behaviour (e.g., Belsky & Eggebeen, 1991; Harrison & Ungerer, 2002).

In addition, while no relations were found between family SES and main predictor and criterion variables, maternal education level was significantly related to several of the study variables. Specifically, mothers with a relatively higher education level used relatively less coping promoting relative to distress promoting verbalizations during the second needle. These mothers also had children who used relatively less coping promoting relative to distress promoting verbalizations during the second needle and who exhibited less secure and more avoidant behaviours in response to the mother's behaviour in the first few minutes following the immunization.

Examination of Covariates

Several potential covariates were also assessed in the present study to examine the validity of the attachment measures. First, the representational measures of attachment (i.e., SAT and PART) rely on the child's ability to formulate and produce coherent verbal responses and to identify and label emotional states. Thus, children's receptive language ability and emotional awareness were considered. The results showed that the SAT and PART scores were unrelated to the PPVT-III and the ELT total scores, suggesting that neither language ability nor emotional awareness accounted for performance on the representational measures.

Next, given the interactive nature of the reunion procedure, it was possible that situational variables (e.g., atypicality of the child's mood or behaviour at the time of the study interview) may have influenced the child's behaviour with the mother. Thus, a rating scale of child situational variables at the time of testing was included. Results showed that the child's reunion behaviour with the mother was not related to: (1) how well the child slept the previous night, (2) how tired the child was on the day of testing,

(3) how good the child's general mood was on the day of testing; or (4) how atypical the child's behaviour was on the day of testing. Thus, child situational variables did not account for the child's behaviour with the mother upon reunion.

Relations Between SAT and PART "Self" and "Other" Perspectives

Researchers examining child representations of self versus other have found systematic differences in how children describe themselves as compared to a hypothetical peer when discussing attachment related material (Slough and Greenberg, 1990; Wright et al., 1995). The current findings are consistent with this previous research. When discussing both separation from attachment figures and painful events, the children were more willing to admit attachment feelings when referring to the hypothetical child than when referring to themselves. In addition, the children were more likely to avoid discussion of the pain events when referring to themselves as opposed to the hypothetical child. The children also saw themselves as less able to cope independently with milder pain situations than the hypothetical child.

These findings are consistent with Bowlby's (1980) theory of defensive exclusion. According to Bowlby, defensive exclusion arises when an insecure individual excludes images or representations from conscious processing that are too anxiety-provoking. Empirical evidence for this process was provided by Slough and Greenberg (1990), who found that children with the most secure attachments were less likely to make a distinction between self and peer, which would suggest that they can process and disclose their emotions concerning attachment-related material without regard to the referent. The insecurely attached children in their study, however, were less able to consciously process (i.e., defensively exclude) attachment-related material about the self

than when discussing the hypothetical child. They argue that the insecurely attached children were able to distance themselves sufficiently from the affective components of the pictures when discussing a hypothetical child. When confronted about the same issues regarding themselves, however, the children were unable to dissociate from the emotional components and averted the anxiety by avoiding discussion of attachment-related issues.

However, it is also possible that the differences in perceptive are due to an order effect. In accordance with Slough and Greenberg (1990), the children were first asked the set of questions about the child in the picture, followed by questions about the child's own feelings. Thus, while the perspective differences in the present study most likely arises from defensive exclusion, no definitive inferences about the observed differences between perspectives can be drawn without the inclusion of a counterbalanced design. What is important, however, is the congruency in the pattern of responses across perspectives (i.e., the high correlations observed between like-variables).

Relations Between Predictor Variables

It was expected that the main attachment predictor variables (i.e., Aggregate Security Dimension, Aggregate Avoidance Dimension, Ambivalence Dimension, and Aggregate Controlling Dimension Scores) would be related. Specifically, based on previous research (e.g., Marcus, 1990; Marcus & Kramer, 2001), it was predicted that the security dimension would be negatively related to the avoidance and controlling attachment dimensions. It was also predicted that the controlling dimension would be positively related to the ambivalent and avoidant attachment dimensions. Partial support for these hypotheses was found. The Aggregate Security Dimension was significantly and negatively related to the Aggregate Avoidance Dimension, suggesting that children who

had a greater degree of attachment security had relatively less avoidant attachment. There was also a significant and positive correlation between the Ambivalence Dimension and Aggregate Controlling Dimension, suggesting that children who had a greater degree of controlling attachment also had relatively more ambivalent attachment.

Contrary to prediction, the controlling attachment dimension was unrelated to the avoidance attachment dimension. The lack of relations between the dimensions may be due to the composite measures used to produce the avoidance aggregate. The avoidance aggregate was comprised of both representational and behavioural measures of avoidance, whereas the controlling aggregate was composed of only behavioural measures. Consistent with previous research (e.g., Marcus, 1990; Marcus & Kramer, 2001), the behavioural measures of both controlling and avoidant attachment were found to be significantly related. The controlling aggregate was not however significantly related to the SAT or PART avoidance rating scales (*r*'s .02 to .16). No studies to date however have examined the relations between controlling attachment and performance on the SAT following Slough et al.'s (1988) protocol. Researchers have developed coding protocols to classify disorganized/controlling attachment using the SAT (e.g., Chazen, 1995; McCarthy, 1998). These coding systems however are based primarily on behavioural indices (e.g., odd behaviour during testing, making strange noises) as opposed to content analysis of verbal responses. Future research on how children with a disorganized/controlling attachment would perform on the SAT using Slough et al.'s coding system would be useful.

Review of Analyses Examining Primary Hypotheses

The primary purpose of this thesis was to examine the relations between attachment dimensions and child pain behaviour following both an acute pain incident (i.e., immunization) and everyday pain incident (e.g., bumps and scrapes) in a sample of five-year-old children and their mothers. Overall, it was predicted that the attachment dimensions would be differentially related to the children's response to and behaviour following the painful incidents. Based on the data analyses, partial support for this prediction was found. The specific hypotheses will be examined, the findings that support or refute the hypotheses will be reviewed, and possible explanations for the pattern of findings will be discussed, in turn.

Relations Between Attachment Dimensions and Pain

Security. First, as previous research has shown that adults with secure attachment appraise themselves as being more able to deal with pain and rely more on problem-focused and less emotion-focused coping strategies (Mikulincer & Florian, 1998), it was predicted that the secure attachment dimension would be positively related to the child's Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods. Contrary to prediction, no significant relations were found between the secure attachment dimension and child verbalizations. The lack of relations might be due to differences in the populations (i.e., child vs. adult) or type of pain (acute vs. chronic) studied or the measures used. At this age group, the children may rely more on their parents to help them cope with pain as opposed to using self-directed coping strategies. It is also possible that the measure used, which focused solely on verbal behaviour, did not fully capture the children's coping strategies (e.g., silent counting).

Second, a child with a secure attachment has an internal working model in which the attachment figure is seen as available and responsive (Ainsworth et al., 1978) and can effectively regulate distressing emotions (Kobak & Sceery, 1988). Thus, it was predicted that the secure attachment dimension would be negatively related to reactivity level and calming time during the pain incidents. Support for this hypothesis was not found. The secure attachment dimension was unrelated to the child's reaction and time to calm down for either of the pain incidents. While attachment theory suggests that the more securely attached children should show less distress than should the more insecurely attached children, this may not be the case. According to Cassidy (1994), while securely attached children overall show less negative affect than insecurely attached children, when need be they should be more open about their distress and more willing to signal caregivers for help than other children. The lack of significant relations between the secure attachment dimension and reactivity and calming time may also be due to unmeasured third variables (e.g., maternal sensitivity). For instance, it may be that securely attached children with more sensitive mothers take less time to be calmed than securely attached children with less sensitive mothers.

Finally, based on the results obtained in Dozier et al. (1999; as cited in Stovall & Dozier, 2000) and Stovall and Dozier's (2000) infant studies, it was predicted that the secure attachment dimension would be positively related to the number of secure behaviours exhibited in response to the mothers' behaviour following the pain incidents. While a sizeable, positive correlation was found between the secure dimension and the number of secure behaviours following the everyday pain incident, the correlation did not reach significance. In addition, for the immunization pain incident, the correlation was

very small and in the opposite direction (-.03). There are several possible explanations that may account for these findings. As the checklist was developed for use with infants in a home setting, it is possible that the behaviours were not applicable to this age group or applicable to medically-related pain. It is also possible that the relatively small sample size for the everyday pain incident may have reduced the power necessary to detect significant relations.

Avoidance. First, as avoidantly attached children are thought to minimize their expression of distress (Cassidy, 1994), it was predicted that the avoidance attachment dimension would be negatively related to facial action during the injection, needle 1, needle 2, and recovery periods and negatively related to reactivity level during the pain incidents. While the relations were in the predicted direction and a sizeable correlation was found between the avoidance dimension and CFCS recovery score, none of the correlations reached significance. The lack of significant relations may be due to the reliance of non-verbal behaviour in coding the CFCS. It is possible that the children who have relatively higher avoidant attachment may be able to minimize their verbal expressions of pain but not their facial reaction to pain. This explanation seems to be less likely as there were no significant relations found for the mother-reported reactivity level, which does encompass verbal behaviour. However, it is possible that the mothers, knowing they were in a research study about pain, may have paid more attention to the pain than normal and thus reported greater pain reactivity.

Second, as avoidantly attached children are thought to be compulsively self-reliant (Bowlby, 1973) and thus may have learned to cope independently with stressful situations, the avoidance attachment dimension was predicted to be positively related to

the Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods. The relations were in the predicted direction, with the exception of the second needle period, but did not reach significance. It is possible that while avoidantly attached children have learned to cope independently, the strategies that they use may be adaptive but may not be optimal. Again, it is also possible that the measure used, which focused solely on verbal behaviour, did not fully capture the children's coping strategies (e.g., silent counting). This explanation may be particularly relevant for avoidantly attached children who do not express their needs (Cassidy, 1994).

Finally, based on the results obtained in Dozier et al. (1999; as cited in Stovall & Dozier, 2000) and Stovall and Dozier's (2000) infant studies, it was predicted that the avoidant attachment dimension would be positively related to the number of avoidant behaviours exhibited in response to the mothers' behaviour following the pain incidents. While the relations were in the predicted direction, they did not reach significance. Again, it is possible that the avoidant behaviours on the checklist were not applicable to this age group or applicable to medically-related pain. It is also possible that the relatively small sample size for the everyday pain incident may have reduced the power necessary to detect significant relations.

Ambivalence and controlling. First, given the underregulation of expressive behaviour displayed by both children with ambivalent or disorganized/controlling attachment (Block & Block, 1980; Cole et al., 1994; Eisenberg & Fabes, 1992; Fox, 1989; Green & Goldwyn, 2002), it was predicted that the ambivalence and controlling attachment dimensions would be positively related to facial action during the injection, needle 1, and needle 2 periods, and to reactivity level during the pain incidents. Support

was found for these hypotheses. Specifically, children with more ambivalent attachment displayed greater facial action during the overall injection and first needle period and had a relatively greater reaction to the everyday pain incident than children with less ambivalent attachment. Similarly, children with more controlling attachment displayed greater facial action during the injection, needle 1, and needle 2 periods, and had a relatively greater reaction to both the immunization procedure and everyday pain incident than children with less controlling attachment.

While a similar pattern of results was found for the ambivalent and controlling attachment dimensions, the underlying mechanisms may be different. Children with an anxious-ambivalent attachment have an internal working model in which the attachment figure is seen as inconsistent or insensitive (Ainsworth et. al., 1978). They are also characteristically hypersensitive to negative affect and show heightened expressions of distress and anger (Cassidy, 1994). Thus, it is likely that the greater pain reaction observed for the children with more ambivalent attachment functions to achieve a response from the caregiver. Conversely, children with a disorganized or controlling attachment have an internal working model in which the attachment figure is seen as frightening (Main & Solomon, 1986). As a result, they are likely to appraise pain situations to be more threatening than they really are. Thus, in response to pain they may exhibit a greater pain or distress reaction.

Second, children with an ambivalent or disorganized/controlling attachment have an internal working model in which the caregiver is not seen as a source of comfort or reassurance (Ainsworth et al., 1978). As a result, their distress should not be resolved as effectively as that of securely attached children. Thus, it was predicted that the

ambivalence and controlling attachment dimensions would be positively related to facial action during the recovery period and to calming time during the pain incidents. Partial support was found for these hypotheses. Specifically, children with more controlling attachment took more time to calm down following the immunization. A sizeable, but non-significant, positive correlation was also observed between the controlling dimension and everyday pain calming time. The discrepancy observed between the two pain incidents may be due to the context in which they occurred. It is possible that the immunization was perceived to be more threatening than the everyday pain incident because it occurred outside of the normal social environment. It is also possible that the relatively small sample size for the everyday pain incident may have reduced the power necessary to detect significant relations.

Despite the significant relations observed for the controlling attachment and needle calming time, the correlation for the recovery period facial action, while in the predicted direction, did not reach significance. Children with a disorganized or controlling attachment often show stilling or freezing behaviour in times of security distress (Main & Solomon, 1986). Thus, it is possible that the CFCS coding, which relies on facial action that is present and appears distinctly to maximally (Chambers et al., 1996), did not fully capture the distress of these children during the recovery period.

Contrary to prediction, no significant relations were observed between the ambivalence attachment dimension and facial action during the recovery period or calming time during the pain incidents. Although children with an ambivalent attachment have an internal working model in which the caregiver is not seen as a source of comfort or reassurance, they do seek proximity to the caregiver (Ainsworth et al., 1978). It is

possible that the proximity-seeking was perceived by the mothers as an indication of distress resolution. It is also possible that having observers present during the immunization served as a distracter for these children and helped to reduce their distress following the immunization. The latter explanation may also account for the larger correlation observed for calming time following the everyday pain incident than for the immunization (.18 vs. -.03, respectively).

Third, children with an ambivalent or controlling attachment have not developed a sense of autonomy and self-confidence (Kobak & Sceery, 1988) and are unlikely to have learned to cope independently or effectively with stressful situations. It was therefore predicted that the ambivalence and controlling attachment dimensions would be negatively related to the Coping Promoting relative to Distress Promoting verbalizations during the injection, needle 1, needle 2, and recovery periods. While the relations between the controlling dimension and verbalizations were in the predicted direction, only the correlation for the second needle reached significance. Thus, children with more controlling attachment made relatively less Coping Promoting relative to Distress Promoting verbalizations during the second immunization. No significant relations however were found between the ambivalence dimension and verbalizations. Behavioural reactions to distress are common to children with ambivalent or controlling attachment. For instance, children with an ambivalent attachment typically react with resistant behaviours (e.g., jerking away, stepping angrily; Ainsworth et al., 1978), whereas children with a disorganized or controlling attachment show odd or disorganized behaviour (Main & Solomon, 1986). It is possible that the measure used, which focused

solely on verbal behaviour, did not fully capture the children's coping, or more importantly distress promoting, strategies.

Finally, as displays of anger during times of distress are common for children with an ambivalent attachment (Ainsworth et al., 1978; Shouldice & Stevenson-Hinde, 1992), it was also predicted that the ambivalence dimension would be positively related to anger level during the everyday pain incident and negatively related to the reflected anger level during the immunization. While the relations were in the predicted direction, they did not reach significance. It may be that anger is a more typical response to separation as opposed to pain. Excessive crying, and other distress signals, may be a more effective strategy for eliciting parental response during pain than anger. However, children with more controlling attachment displayed greater anger during the immunization. While children with a disorganized or controlling attachment are thought to respond to distress primarily with odd or disturbing behaviours, researchers have shown that these children can respond with openly angry behaviour (Main & Solomon, 1986).

In addition, based on the results obtained in Dozier et al. (1999; as cited in Stovall & Dozier, 2000) and Stovall and Dozier's (2000) infant studies, it was predicted that the ambivalence attachment dimension would be positively related to the number of resistant behaviours exhibited in response to the mothers' behaviour following the pain incidents. Contrary to prediction, the children with more ambivalent attachment did not show relatively more resistant behaviours. However, unexpectedly, children with more controlling attachment displayed more resistant behaviour in response to the mothers' behaviour during the immunization. As the resistant checklist is comprised mainly of

angry behaviours (e.g., pushed me away angrily), it is likely that the greater number of resistant behaviours reflects the increased display of anger seen during the immunization for the children with more controlling attachment. Alternatively, it is possible that the resistant behaviours on the checklist were not applicable to this age group or applicable to medically-related pain.

In addition, it was predicted that the attachment dimensions would be unrelated to children's baseline levels of pain and coping verbalizations. It was also predicted that the attachment dimensions would be equivalent in terms of the amount of pain experienced during the incidents. Consistent with prediction, there were no significant relations between the attachment dimensions and children's self-report of pain and facial action and verbalizations during the needle baseline period. The lack of these relations suggests that these variables did not account for the observed findings for the four attachment dimensions. For instance, the greater everyday pain reaction obtained for the ambivalent attachment dimension was not due to the children "feeling" more pain than the other children and thus reacting stronger. Rather, the heightened reaction may be specifically related to having a more ambivalent attachment (e.g., giving stronger distress signals).

Predicting Child Pain Behaviour from the Attachment Variables

This thesis also sought to examine whether children's attachment dimensions would predict their pain behaviour. Based on the findings from the correlational analyses only the ambivalent and controlling attachment dimensions were included as predictors.

Overall, the pattern of results from the regression analyses was consistent with the findings from the correlational analyses. Specifically, consistent with prediction, neither

the ambivalent nor controlling attachment dimensions accounted for a significant amount of the variance in children's self-report of pain during the incidents, or facial action and verbalizations during the needle baseline period. In addition, the controlling dimension, but not the ambivalent dimension, was a significant predictor of: (1) immunization pain reactivity; (2) immunization calming time; (3) immunization anger level; and (4) child distress promoting verbalizations during the second needle. Thus, children with relatively more controlling attachment were more likely to have a greater reaction to the immunization, to take more time to calm down following the immunization, to react to the immunization with more anger, and to make relatively less coping promoting and more distress promoting verbalizations during the second needle. However, while the controlling attachment dimension was related to the number of resistant behaviours exhibited in response to the mothers' behaviour following the immunization, it was not a significant predictor.

In terms of the children's facial action during the immunization, a slightly different pattern of results emerged. Consistent with prediction, the controlling attachment dimension was a significant predictor of facial action for both the overall injection and needle 2 periods. Thus, children with relatively more controlling attachment were more likely to display greater facial action than children with less controlling attachment. However, contrary to prediction, while the ambivalent attachment dimension was related to facial action it was not a significant predictor.

A different pattern of results was also observed for the children's reaction to the everyday pain incident. Consistent with prediction, the ambivalent attachment dimension was a significant predictor with children with relatively more ambivalent attachment

displaying a greater reaction to the pain. Contrary to prediction, the controlling attachment dimension did not significantly predict children's reaction to the everyday pain.

Predicting Child Pain Behaviour from the Individual Controlling Dimension Aggregate Components

Controlling attachment encompasses a number of discrete but related child behaviours including anger, lability, and dysregulated negative affect, and child-parent interaction behaviours including nervousness and rejection and humiliation of the parent. In the current thesis, the controlling dimension aggregate was composed of the P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores. The P/CRI controlling behaviour rating scale captures the child's display of nervousness, parental rejection, parental humiliation, and overprotectiveness upon reunion with the mother. The ERC lability/negativity subscale captures the child's characteristic lack of flexibility, mood lability, anger reactivity, and emotional intensity. To examine more closely which components of the controlling aggregate contributed to the prediction of the child pain behaviour during the needle procedure, an additional series of hierarchical regression analyses were conducted using the individual P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores. For these analyses only those variables in which the controlling aggregate was found to be a significant predictor of were used. Specifically, these variables included the CFCS overall injection and needle 2 summary scores, the ratio of child's coping/distress promoting CAMPIS-R verbalizations during the second needle period, and M-PIRF mother reported reactivity, reflected anger levels (in mm), and calming time (in sec).

The analyses showed that the P/CRI controlling behaviour rating scale was a significant predictor of child facial activity during the overall needle period, child verbalization during the second needle period, and mother-reported angry behaviour following the needle. Thus, children who displayed relatively more controlling behaviour (i.e., nervousness, rejection, humiliation) upon reunion with the mother had greater facial activity during the injection, made relatively greater distress promoting versus coping promoting verbalizations during the second needle, and reacted to the needle with more anger. Whereas, the ERC lability/negativity subscale was a significant predictor of child facial activity during the second needle period and mother-reported reactivity level. Thus, children who were reported to have greater dysregulation of negative emotions displayed relatively greater facial action during the second needle and had a relatively greater reaction to the immunization. Calming time, however, was only predicted when both the P/CRI controlling behaviour rating scale and the ERC lability/negativity subscale *z*-scores were entered and not by the individual components alone.

Summary of Major Findings

Based on the results of this study, it appears that, in terms of attachment dimensions, children's responses to pain are more closely related to the ambivalent and controlling attachment dimensions than to the secure and avoidant attachment dimensions. The lack of relations obtained for the secure and avoidant attachment dimensions may be due to an interplay between the type of pain behaviour measured and the characteristics of the attachment dimensions. Given the more vocal or expressive nature of the ambivalent and controlling attachment styles in times of security distress, it is possible that the specific variables of interest in this study (i.e., anger, reactivity) may

have been more applicable to these two attachment dimensions. Had measures of pain appraisal or the specific coping strategies used by the children during the pain incidents (e.g., the Pain Coping Questionnaire; Reid, Gilbert, & McGrath, 1998) been included in the study, perhaps differential relations would have been observed for the secure and avoidant attachment dimensions.

It also appears that controlling attachment is a better predictor of children's response to immunization pain than ambivalent attachment. The difference in the predictive ability of these attachment dimensions may be related to the organization of the associated internal working models. Children with an ambivalent attachment have an internal working model that is sufficiently organized and which contains dyadic strategies for regulating distress and arousal (Sroufe & Waters, 1977). Although the specific strategies employed are not optimal, they are adaptive to their caregiving environment and can be used for distress resolution. Conversely, children with a controlling attachment have an internal working model that is insufficiently organized and thus they lack a reliable strategy for dealing with distress (Main & Solomon, 1986). This disorganization may prohibit these children from using either internal (e.g., emotional dysregulation) or external (e.g., interactions with parents) regulators for effective distress resolution, and as a result they are predictably reactive to pain. For instance, as evidenced by the individual controlling aggregate components analyses, children who are unable to effectively regulate negative affect or to use their parents as a source of comfort display a greater negative reaction to pain and have a relatively longer and more ineffective distress resolution.

Review of Secondary Analyses and Discussion of Findings

In addition to the primary analyses, several secondary analyses were conducted in order to provide a more comprehensive picture of the potential relations between attachment dimensions and pain behaviour. These analyses focused on the potential differences in the relative use of coping promoting strategies and distress promoting strategies between mothers of securely versus insecurely attached children. In addition, these analyses sought to examine the consistencies in child and maternal behaviour during the immunization and an everyday pain and potential effect of attachment dimensions. Given the paucity of research in these areas, these analyses were considered exploratory. The findings of each of these analyses will be discussed in turn.

Relations Between Attachment Dimensions and Parental Behaviour During Pain Incidents

As the development of attachment is attendant on the parent's ability to meet the child's security needs over time (Cassidy, 1994), it was predicted that there might be differences in the relative use of coping promoting strategies (e.g., distraction, non-procedural talk, humour) and distress promoting strategies (e.g., praise, reassurance, apologies, giving control to child) between parents of securely versus insecurely attached children. Specifically, it was predicted that the secure attachment dimension would be: (1) positively related to the mothers' Coping Promoting relative to Distress Promoting verbalizations during the immunization; (2) positively related to the mothers' reported use of assess/treat, teach, comfort, and distraction during the pain incidents; and (3) negatively related to the mothers' reported use of praise. In addition, it was predicted that the avoidance, ambivalence, and controlling attachment dimensions would be: (1)

negatively related to the mothers' Coping Promoting relative to Distress Promoting verbalizations during the immunization; (2) negatively related to the mothers' reported use of assess/treat, teach, comfort, and distraction during the pain incidents; and (3) positively related to the mothers' reported use of praise.

Consistent with prediction, the avoidance dimension was significantly and negatively correlated with maternal use of comfort during the everyday pain incident. Thus, mothers of children with more avoidant attachment used relatively less comfort during the everyday pain incident. As avoidantly attached children are thought to minimize their expression of distress over time (Cassidy, 1994), it is possible that these children did not elicit comfort from their parents. Moreover, as a child with an avoidant attachment has an internal working model in which the attachment figure is seen as cold or rejecting (Ainsworth et al., 1978), he or she should not be likely to seek out comfort from the attachment figure.

Contrary to prediction, however, no significant relations were found between the attachment dimensions and maternal verbalization or behaviour during the immunization. In addition, the attachment dimensions were not related to the mothers' reported use of assess/treat, teach, or distraction during the everyday pain incident. The lack of significant relations would suggest that parental behaviour during painful incidents is not differentially related to their child's attachment security. However, the development of attachment security, and associated internal working models, are based on the repeated daily experiences with the primary caregiver. Thus, it is possible that there may be developmental differences in the relations between child attachment security and parental behaviour during times of distress. It may be that by age five, children's attachment

behaviour is less related to immediate parental behaviour during an isolated event and more related to general patterns of maternal responsitivity (i.e., maternal sensitivity). Conversely, relations between attachment security and parental behaviour may be more evident during the first two years of life, during which the attachment relationship is being formed.

Alternatively, the lack of observed relations may be due to a social desirability effect. The parents may have believed that showing no attention or use of distraction, although shown to decrease child distress (e.g., Frank et al., 1995), may not be viewed as a socially acceptable response to their child's pain. Conversely, the use praise and reassurance, which has been shown to increase child distress (e.g., Manne et al., 1992), may have been viewed as more socially acceptable. Thus, it is possible that the mothers may have altered their behaviour during the pain incidents so as to respond in a more socially desirable manner.

Finally, as previous researchers have found that mothers of children with anxious-ambivalent attachment report more separation anxiety (Scher & Mayseless, 2000) and more anxiety in general (Stevenson-Hinde & Shouldice, 1995) than other mothers, it was also predicted that maternal anxiety would be positively related to the ambivalence dimension. Contrary to prediction, maternal anxiety was not significantly related to the ambivalence attachment dimension.

The lack of positive relations between maternal anxiety and the ambivalence dimension may be due to the type of medical procedure studied. It may be that the routine immunization may not have been sufficient to elicit high enough levels of anxiety in the mothers of children with more ambivalent attachment. Perhaps medical procedures that

are relatively uncommon, longer lasting, and more distressing for parents (e.g., observing a lumbar puncture) may be more related to maternal anxiety in these mothers than that associated with immunization. Alternatively, the discrepancies may have resulted from differences in the measures used to assess maternal anxiety. Past research has focused on maternal separation anxiety and general anxiety, as opposed to anticipatory anxiety about medical procedures.

Maternal anxiety was, however, significantly related to the controlling attachment dimension. Thus, mothers of children with more controlling attachment reported feeling more anxious about the proceeding immunization procedure. One possible explanation for this observed relation might be George and Solomon's concept of *abdicated caregiving* in mothers of children with disorganized or controlling attachment. According to these authors (George & Solomon, 1996b; Solomon & George, 1996), mothers of children with disorganized or controlling attachment evaluate themselves as helpless to protect their children from threats and danger and describe themselves as lacking effective and appropriate resources to handle caregiving situations. Thus, these mothers may have felt more anxious about the immunization procedure due to their perceived inability to help their children cope with the painful procedure.

Relations Between Medical and Everyday Pain

Given the limited existing research on everyday pain incidents in children, the current thesis also sought to examine the relations between child and maternal behaviour during an everyday and a medical pain incident. To examine these relations, a series of tests were conducted between the respective *child's reaction*, *parental response*, and *child response* subscales of the Medical and Everyday Pain Incident Forms. Specifically,

in the first set of analyses, a series of paired samples *t*-tests were conducted between the subscales to determine if there were overall differences between the two types of pain incidents. In the second set of analyses, correlations were conducted to determine whether the individual subscale scores were consistent across the two incidents (e.g., do children who have a relatively stronger reaction to the needle pain also have a relatively stronger reaction to the everyday pain incident?). In the final set of analyses, median splits were first conducted on the four attachment dimensions. Correlations between the respective subscales were then recalculated separately for each of the subgroups to determine whether the children's attachment dimensions would account for any inconsistencies in the child and maternal behaviour across pain contexts.

First, previous research has shown that while everyday pain incidents are reported by children to be the most commonly occurring type of pain (e.g., Savedra et al., 1982), children identify "shots" and venipuncture as among the most painful procedures to be experienced (Eland, 1981; Fernald & Corry, 1981; Lutz, 1986; Menke, 1981). Thus, it was expected that the children's self-report of pain would be greater for the immunization than for the everyday pain incident. Although the mothers' perceived an immunization procedure to be more painful than an everyday pain incident, contrary to prediction, there were no significant differences between the incidents in terms of self-reported pain.

Second, everyday pain incidents typically occur within the child's normal social environment, whereas medical pain normally occurs outside of the child's normal social environment (i.e., it is a strange situation). Thus, it was possible that the novel situation of a medical environment would add additional stress to the child and serve to exacerbate his or her pain response. Contrary to this line of reasoning, the results showed that while

the two incidents were rated as equally painful, the children exhibited more severe pain behaviours, reacted stronger, and took more time to calm down following a typical everyday pain than following the immunization.

There are several explanations that may account for these findings. First, the differences may be related to the contexts in which the pains occurred. As the immunization procedure occurred outside of the child's normal social environment, it is possible that having strangers present may have acted to restrict or alter the range of the child's behavioural responses (i.e., may have put on a brave face during the immunization). Similarly, as the everyday pain occurred within the child's normal social environment, it is possible that the child was more at ease and displayed a more typical pain response. Finally, unlike with the everyday pain, which occurs "spontaneously", the immunization procedure also involves an anticipatory component. Thus, it is possible that the children may have begun to employ strategies for coping with the needle prior to the pain onset. Moreover, it is possible that the video camera itself may have served as a distracter for the child during the immunization. Distraction has been shown to correlate with decreased child distress during routine immunizations (e.g., Frank et al., 1995). By focusing his or her attention on the camera, the child may have been less aware of the needle procedure and thus had a decreased pain response.

Although overall differences emerged between the child's reactions to the pain incidents, no significant correlations were found between the child reaction variables across incidents. The lack of observed relations would suggest that the reaction of some of the individual children was not consistent across the immunization and everyday pain incidents. It was predicted that child attachment dimensions might account for the

inconsistencies in child behaviour across the pain situations. Partial support for this prediction was found. Specifically, children who were less secure or more avoidant were less consistent in terms of the amount of time required to calm down after the incidents. Securely attached children are thought to have an internal working in which the attachment figure is seen as a source of comfort and reassurance and have come to expect the experience of security distress to be associated with expectations of amelioration (Kobak & Sceery, 1988). Thus, insecurely attached children, as compared to securely attached children, might be less able to rely on their parents as a source of comfort regardless of the painful situation and therefore respond to both types of pain in a dissimilar fashion, and vice versa.

In terms of parental response, as a whole, relatively more mothers used praise following the immunization than following the everyday pain incident. Conversely, relatively more mothers assessed or treated the injury, noted teaching the child about the incident, or comforted the child following the everyday pain incident than following the immunization. The differences in maternal behaviour may be due to the nature of the pain incidents (i.e., anticipatory vs. non-anticipatory) or the context (i.e., normal social environment vs. non-normal social environment) within which the pain incidents occurred. For instance, the mothers' use of praise may have been directed to the child's reaction to the immunization procedure as a whole (e.g., complying with nurse's commands) as opposed to just coping with the pain itself. Alternatively, the mothers' behaviour may also have been dependent on the child's reaction to the pain. As the children reacted less strongly to the immunization procedure than to the everyday pain, it

is possible that the children did not elicit the same behaviours from the mothers across pain incidents.

The parental responses endorsed were not significantly correlated across the pain incidents, suggesting that some of the mothers did not respond to their child's immunization and typical everyday pains in a consistent manner. Differences in children's attachment security did not appear to account for the inconsistency in maternal behaviour, although mothers of children with less controlling attachment were consistent in their use of distraction across pain incidents. The lack of consistency in the mothers' behaviour across contexts suggests that the mothers may be flexible in terms of the strategies they use to help their children cope with pain of various intensities. It is possible that maternal behaviour across different types of pain events may be more related to general patterns of maternal responsitivity (i.e., maternal sensitivity) than to patterns of attachment.

Finally, attachment dimensions, and internal working models, are thought to be consistent across situations and experiences that evoke negative emotions (Cooper et al., 1998). Thus, it was predicted that the number of secure, resistant, and avoidant child behaviours in response to maternal behaviour variables would be consistent during the immunization and an everyday pain incident. Consistent with prediction, the number of secure, resistant, and avoidant behaviours exhibited was equivalent across the immunization and everyday pain incidents. Thus, the children overall did not respond with more secure behaviour, for example, in one pain situation versus the other. However, contrary to prediction, no significant relations were found between the resistant and avoidant variables across incidents, suggesting that for some of the individual

children exhibition of these particular behaviours was not consistent across the immunization and everyday pain incidents. Children with less ambivalent attachment were however more consistent in the amount of resistant behaviour they displayed in response to the mothers' actions during both the immunization and everyday pain incidents.

In addition, contrary to prediction, a significant negative correlation was found for the number of secure behaviours exhibited between the pain incidents. This relation would suggest that children who displayed relatively more secure behaviours in response to the mothers' behaviour following the immunization displayed relatively less secure behaviours in response to the mothers' behaviour following an everyday pain incident. Again, it is possible that this finding was observed because the secure behaviours on the checklist were not applicable to this age group or applicable to medically-related pain. Alternatively, it is possible that some of the children, in particular the more insecurely attached children, modified their behaviour during the immunization as an observer was present. In line with this reasoning, a significant negative correlation was found for the number of secure behaviours for the less secure and more avoidant subgroups. Thus, children who were less secure or more avoidant were less consistent in their display of secure behaviours in response to the mothers' behaviour following the pain incidents.

Limitations of this Study and Suggestions for Future Studies

There are a few limitations in the present thesis that need to be addressed. First, the correlational approach limits firm conclusions that can be made about the directionality of the observed relations. For instance, the avoidant dimension was negatively related to the mothers' use of comfort following the everyday pain incident

Thus, mothers of children with more avoidant attachment used relatively less comfort during the everyday pain incident. However, as avoidantly attached children are thought to minimize their expression of distress over time (Cassidy, 1994), it is possible that these children did not elicit comfort from their parents. The correlational approach also does not allow for a complete examination of potential third variables that may account for the observed relations. For instance, maternal sensitivity, which is related to both child attachment (e.g., Ainsworth, 1979; Ainsworth, 1982; Ainsworth et al., 1978; Smith & Pederson, 1988; Symons, 2001) and child pain behaviour (Sweet et al., 1999) may also account for the findings.

Second, the cross-sectional nature of this study does not allow the developmental or causal relations between attachment dimensions and pain response to be addressed. Longitudinal studies on the relations between attachment and response to pain stimuli would help shed light on the developmental processes related to children's development of relationship constructs and pain behaviour. For example, George and Solomon (1996a) suggest that there may be a developmental progression in how different threats activate the attachment system. Specifically, that attachment events occurring in the real world (i.e., a hurt knee and a parental separation) activate the attachment system most strongly beginning in the transition years. Thus, assessment of attachment security in infancy and again in early childhood in response to both separation from parents and pain stimuli would help elucidate the developmental differences in the activation of the attachment system. It would also be interesting to examine whether repeated experience with the caregiver during pain incidents per se is a *necessary* condition for the development of relations between children's attachment and pain response or whether experience with the

caregiver during stressful events, in general, is *sufficient*. Also important would be to examine whether or not children maintain the patterns of pain behaviour that they develop based on their early formative experiences, or whether their pain behaviour continues to be modified by their ongoing experiences. Examination of the relations at multiple time periods would not only provide increased support for the generalizability of internal working models to a variety of situations, but would provide additional information about the mechanisms that underlie the association between children's attachment history and response to pain.

Third, the reliance on only maternal report of everyday pain is problematic. The relatively good reliability found on most of the immunization pain incident form subscales suggests however that the maternal reports of everyday pain provide an accurate account of the pain incidents. In addition, it is possible that recording the everyday pain incidents in the form of a pain diary itself may have had reactive effects and may have cued the mothers, and in particular the mothers of the insecurely attached children, to pay more attention to the pain and thus to report greater pain reactivity. Similarly, the use of the diary may have prompted the mothers to alter their behaviour in response to the child's pain incident. For instance, observational studies have found that the majority of child everyday incidents received no adult response (Fearon et al., 1996; von Baeyer et al., 1998), whereas only 2 mothers reported giving no attention to the everyday pain incident in the current study. The potential reactivity of pain diary recording warrants further examination. One method to address this limitation in future studies would be to include an observational measure of everyday pain. For example, it

would be interesting to examine the relations between attachment dimensions, parental behaviour, and child pain behaviour at a playground setting.

Fourth, only acute pain incidents were examined. While acute pain incidents comprise the majority of pain experience that children are familiar with, it would also be interesting to examine if individual differences in coping and adjustment to chronic pain in children are related to attachment dimensions. In the adult pain literature, researchers have found a relation between attachment style and the duration of physical pain (Scott, 1989/1990) and coping with and adjustment to chronic back pain (see Mikulincer & Florian, 1998). For example, Scott's (1989/1990) results showed that duration of pain was related to attachment pattern. The acute pain group met the criteria for a mild anxious attachment pattern, the chronic pain group met the criteria for a hostile attachment, and the protracted pain group met the criteria for a strong anxious attachment. Similarly, Mikulincer and Florian (1998) found that attachment style influenced the appraisal of and coping with physical pain. Secure chronic pain sufferers appraised their back pain in less threatening terms, appraised themselves as being more able to deal with the pain and relied more on problem-focused and less emotion-focused coping strategies than both chronic pain sufferers with avoidant and anxious attachments. Replication of these studies in child chronic pain populations would provide additional information about childhood pain and would elaborate on the potential developmental links between relationship processes and pain behaviour.

Finally, while the sample was representative of a rural area in Atlantic Canada, the participants were drawn from a largely White and English-speaking population. Thus, the generalizability of the findings to other populations should be made with caution. In

addition, the inclusion of only mothers precludes generalizability of the findings to father-child pain interactions, which may be different.

Despite these limitations, these data have implications for both pain research and attachment theory. From a theoretical perspective, the results re-emphasize the complexity of pain and the inherent difficulty in making broad statements about children's pain and the factors that predict it. For instance, given the lack of correspondence between children's response to different types of pains it would be incorrect to generalize the wealth of knowledge gathered in medical pain situations to more common pain experience in children. Moreover, while support was found for many, but not all, of the hypotheses, this study underscores that the factors involved in predicting pain and its behavioural expression are equally complex. Continued examination of the individual context in which pain occurs remains important.

The results also suggest that Bowlby's (1969/1982) theory of attachment generalizes to a child's internal working model of pain. Separation from parents has dominated research over the past 30 years, in part, due to the emphasis of the Strange Situation procedure. The current study suggests that secure base phenomena extend to pain situations, which have been given only cursory attention in attachment literature. Just as separation from caregivers can be a threat to survival of the young human child, so too can be the physical damage indicated by perceived pain. Both are emergencies that may elicit secure-base behaviour.

The study also serves as a bridge between attachment theory and current theories of children's concept of and response to pain. Researchers interested in conceptualizing children's differential understanding of and response to pain have typically focused on

various psychosocial factors, such as temperament (Lee & White-Traut, 1996; Young & Fu, 1988), social modeling (Osborne et al., 1989), and maternal sensitivity (Sweet et al., 1999). The present study, however, is the first to propose and provide evidence, albeit limited, that children's differential response to pain may be a function of their attachment security.

From a practical perspective, the potential relation between pain and attachment dimensions may also have implications in terms of managing or limiting the pain associated with immunization procedures and other painful events. For example, for a child with a disorganized or controlling attachment, it may be helpful to try and reduce the experience of unreliability that may serve to exacerbate their expectation of the threat. Thus, it may be that a more proactive, as opposed to reactive, approach to pain management (e.g., information giving about what to expect with the procedure, teaching effective coping strategies a priori) is necessary with this child.

Summary and Conclusions

Overall, the results of this study showed the ambivalence and controlling attachment were differentially related to child pain behaviour. Specifically, children with either more ambivalent or controlling attachment styles had a relatively greater reaction to both the immunization procedure and everyday pain incident. Children with more controlling attachment also took more time to calm down following the immunization, displayed greater anger, and reacted with more resistant behaviour during the immunization. These results are consistent with Bowlby's (1969/1982) account of internal working models. Children with an anxious-ambivalent attachment have an internal working model in which the attachment figure is seen as inconsistent or

insensitive (Ainsworth et. al., 1978) and are characteristically hypersensitive to negative affect and show heightened expressions of distress (Cassidy, 1994). Thus, in the context of pain, a child with an anxious-ambivalent attachment would exhibit excessive expressions of distress (e.g., crying, wailing, screaming) to get a response from the caregiver. Similarly, children with a disorganized or controlling attachment have an internal working model in which the attachment figure is seen as frightening (Main & Solomon, 1986). As a result, a child with a disorganized or controlling attachment style is likely to appraise pain situations to be more threatening than they really are and as a result show a greater negative reaction to pain and have less effective distress resolution.

Security and avoidance, however, were not systematically related to child pain behaviour. However, while these attachments dimensions were not concurrently related to pain behaviour, they may still be longitudinally related. It is also possible that the lack of concurrent effect may be related to the nature of the variables studied (i.e., overt versus covert reactions). The attachment system enables a child to use attachment figures as a secure base across time and distance, from which the child feels safe to explore and master the environment when there is no apparent threat. The caregiver also serves as a safe haven to which the child can turn for reassurance and comfort in situations where the child perceives a threat in the immediate environment (i.e., "security distress"). Thus, the goal of the attachment system is twofold. From the viewpoint of the observer, the goal is to regulate behaviours designed to establish or maintain contact (e.g., crying) with the attachment figure. From the viewpoint of the individual, however, the goal of the attachment system is "felt security" (Ainsworth et al., 1978; Cummings & Davies, 1996).

Felt-security as a goal is defined from an organizational perspective and reflects "the entire pattern of the individual's reaction to events in relation to emotional security as a goal, as opposed to simply those reactions that are conscious or reported as feelings" (Cummings & Davies, 1996, p. 130), as well as behavioural and physiological reactions. Children's security behaviours, however, need not necessarily be congruent with their felt security (Cummings & Davies, 1996, p. 130). Thus, measuring children's reactions to security distress in terms of observable behaviours only may not capture completely the relations between attachment and the experience of pain.

Endnotes

[1]Similar results were obtained when absolute, as opposed to relative, maternal and child Coping Promoting and Distress Promoting verbalizations were used.

[2]For one of the participants, the returned everyday pain forms did not include a somewhat to very typical everyday pain incident. This participant was not included in the analyses.

[3]Three children refused o be separated from their mothers. Study procedures were conducted with the mother in the room, however, the data was excluded from the analyses.

[4]For participants who completed the medical session prior to the laboratory session, informed consent and child verbal assent were obtained prior to participation.

[5]Three of the participants received only the MMR vaccination.

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Appendix A

Results Based on Attachment Categories

Attachment categories were derived from the Separation Anxiety Test (SAT) using McCarthy's (1998) classification system. With this classification system, four attachment categories (secure, insecure-avoidant, insecure-ambivalent, and insecure-disorganized) are derived based on verbal transcripts and non-verbal behaviour during administration of the SAT. Only the child's responses on the severe separation pictures are taken into account.

Children who are classified as being secure are able to talk about attachment-related thoughts and feelings (e.g., sad, lonely) while remaining at ease and without excessive signs of anxiety and disorganization. They also tend to offer constructive ideas about how the child may cope with the separation.

Children who are classified as being insecure-avoidant tend to not elaborate on attachment-related thoughts and feelings and often avert their eye gaze from the picture. They also often reply with one-word answers or say "I don't know" and suggested that the child would feel happy during the separation.

Children who express, verbally or behaviourally, pervasive feelings of anger or conflict are classified as insecure-ambivalent. While able to articulate attachment-related feelings and thoughts, the responses of these children also show contradictory thoughts, feelings, and behaviours about their attachment figures.

Finally, children who express, verbally or behaviourally, signs of fear during the test are classified as insecure-disorganized. These children also tend to show signs of

verbal and behavioural disorganization (e.g., unconnected story phrases or making strange noises).

The classification system was used to classify the children's responses for the three severe separation pictures. Both the self- and other-reference responses were examined to give an overall attachment classification. Coding was performed using both the transcripts and videotapes. To establish the reliability of the coding scheme, a second rater reclassified 20% (13) of the responses. A high inter-rater reliability was found between the two raters with a Cohen's Kappa of .88.

The classification system resulted in 23 (35.9%) secure, 29 (45.3%) insecure-avoidant, 10 (15.6%) insecure-ambivalent, and 2 (3.1%) insecure-disorganized children. As only 2 children received an insecure-disorganized attachment classification, these children were excluded from the analyses. In addition, to control for the unequal sample sizes, 10 secure and 10 avoidantly attached children were randomly selected to be included in the analyses to give a final sample size of 30 children (46.7% female; mean age = 4.99 years, SD = .28).

Preliminary analyses revealed that the three groups did not differ on demographic variables according to ANOVA statistics for the interval data and chi-square analyses for the nominal data. The groups were also equivalent in terms of their PPVT-III age appropriate standard score [$F(2, 27) = 0.92$, $p = .41$] and ELT total score [$F(2, 27) = 1.69$, $p = .20$].

Next, a series of oneway ANOVAs and post hoc Tukey's tests of means were conducted to determine if there were systematic group differences on the aggregate attachment dimensions. For the security dimension, there was a significant main effect of

SAT attachment classification [$F(2,27) = 5.27$, $p = .01$, $\eta^2 = .28$], with the secure group having significantly higher scores ($p < .01$) than the insecure-avoidant group. For the avoidance dimension, there was a significant main effect of SAT attachment classification [$F(2,27) = 8.13$, $p = .002$, $\eta^2 = .38$], with the insecure-avoidant group having significantly higher scores ($p < .01$) than the secure and insecure-ambivalent groups. For the ambivalence dimension, there was a significant main effect of SAT attachment classification [$F(2,27) = 19.58$, $p = .000$, $\eta^2 = .59$], with the insecure-ambivalent group having significantly higher scores ($p < .001$) than the secure and insecure-avoidant groups. For the controlling dimension, there was a significant main effect of SAT attachment classification [$F(2,27) = 5.36$, $p = .01$, $\eta^2 = .28$], with the insecure-ambivalent group having significantly higher scores ($p < .05$) than the secure and insecure-avoidant groups.

Next, a series of ANOVAs were conducted to determine if there were systematic group differences in the children's response to and behaviour during the painful incidents. The independent variable for these analyses was attachment classification group and the dependent variables were the CFCS, CAMPIS-R, M -PIRF, and E-PIRF scores. Table 25 contains the ANOVA statistics for the analyses.

As shown, significant differences were found for the CFCS baseline, overall injection, needle 1, needle 2, and recovery periods summary scores. Post hoc Tukey's tests of means showed that children in the insecure-ambivalent group had significantly greater facial action than children in the insecure-avoidant group for the baseline ($p < .01$), overall injection ($p < .05$), and needle 1 ($p < .05$) periods. Children in the insecure-ambivalent group also had significantly greater facial action for the needle 2 and recovery

Table 25.

ANOVA Statistics for the Child Pain Variables Between Attachment Groups

Variable	F	*df*	*p*	η^2
CFCS Summary Scores				
Baseline	7.92	2, 27	.002	.37
Injection	3.89	2, 27	.03	.22
Needle 1	3.37	2, 27	.04	.20
Needle 2	4.42	2, 24	.02	.27
Recovery	5.83	2, 27	.008	.31
CAMPIS-R Child Verbalizations				
Baseline	0.54	2, 27	.59	.04
Injection	2.24	2, 27	.13	.14
Needle 1	0.63	2, 27	.54	.05
Needle 2	2.73	2, 23	.09	.19
Recovery	0.16	2, 27	.86	.01
M-PIRF Scales				
Faces Pain Scale	0.97	2, 27	.39	.07
Reactivity Level (mm)	1.41	2, 27	.26	.09
Anger Level (mm)	0.21	2, 27	.81	.02
Calming Time (sec)	1.56	2, 27	.23	.10
Secure Behaviours	1.41	2, 27	.26	.10
Resistant Behaviours	1.00	2, 27	.38	.07
Avoidant Behaviours	0.15	2, 27	.86	.01
E-PIRF Scales				
Faces Pain Scale	0.71	2, 27	.50	.05
Reactivity Level (mm)	5.06	2, 27	.01	.27
Anger Level (mm)	2.52	2, 27	.10	.16
Calming Time (sec)	0.47	2, 27	.63	.03
Secure Behaviours	0.66	2, 27	.52	.05
Resistant Behaviours	0	2, 27	N/A	N/A
Avoidant Behaviours	1.55	2, 27	.23	.10

periods than children in the secure ($p < .05$) and insecure-avoidant ($p < .05$) groups. In addition, children in the insecure-ambivalent group had significantly greater reaction to the everyday pain incident than children in the secure group ($p < .01$).

These results suggest that the continuous and categorical measures of attachment representation are measuring similar constructs. These results also show that similar findings were found using both the continuous and categorical measures of attachment.

Appendix B

Script for Initial telephone Contact with Mothers (cohort)

Hello may I please speak to _____.

My name is _____ and I'm calling from the Dalhousie Pain Research Lab. We are doing a follow up to the immunization study that you took part in almost 4 years ago. At the time you had said that you wouldn't mind taking part in other studies so we kept your name and telephone number on file. Would you be interested in participating in a follow up study for your child's 5-year needle? (If no find out why not.) Is now a good time to tell you more about the study?
("Yes" continue, if "No" arrange another time to call.)
And if you have any questions at any time please ask.

As in the previous study we are trying to figure out why some children seem to react to their immunizations so much while others do not seems to mind at all, and to see if and how the child's reaction changes over time. Myself and _____ and _____ have been conducting the study with both 6 and 18 month old infants and their Mothers and now with 5-year-old children as well.

If you agree to help in this study, you will be asked to visit Dalhousie University for approximately sixty minutes. During this time, you will be asked to fill out several questionnaires about your child and your relationship with your child. During this visit, we will also do several fun tasks with your child, which we will be videotaping. These tasks use photographs and cartoon drawings of a young child either displaying different emotional expressions (e.g., Happy), about to be separated from his or her parents (e.g., Parents going out for the evening), or about to have an accident (e.g., Falling on sidewalk). For each picture, your child will be asked a series of questions about how the child in the picture is feeling and/or what the child is going to do. Your child will also be shown cartoon drawings of common objects (e.g., umbrella) and will be asked to identify the objects. The tasks are administered in a game-like fashion and it is our experience that children find participation interesting.

You will also be given four pain incident report forms that we will ask you to fill out at home over the next few days. The forms ask you to record the first four everyday pain incidents that you observed from beginning to end. We will ask you to return the completed forms to us in a sealed, stamped, self-addressed envelope. Finally, we would like to observe and videotape your child receiving his or her medically indicated inoculation shot. Then we would like to have you and you child fill out a quick questionnaire regarding the needle. We will not be involved at all with your visit with the doctor.

I also want to mention that if you choose to participate, all of the information you provide us with will be identified only by number, and all identifying information will remain confidential. If you do agree to take part in this study, you may choose to discontinue at any time.

We are again offering $20 for your participation to cover any costs and if you are interested, we will send you a copy of the results of the study. Do you have any other questions or concerns regarding your participation? Would you like to participate?

NO – Thank you for your interest. This won't affect the care you receive at Dalhousie Health Services in any way.

YES – Thank you …

Do you know when your child is scheduled to have his/her needle at Dalhousie Health Services?
Who is your Doctor there?
When could we schedule your visit to Dalhousie with your child?

Should anything change or if you for any other reason need to give us a call our number is XXX-XXXX. And you can leave a message for either myself or _____.
Bye.

Reminder Call (about 2 days before the interview at Dalhousie)
(Give directions, tell where to park)

Confirm date and time.

Our phone number again is XXX-XXXX. See you on _____ at _____ time.

Appendix C

Script for Initial telephone Contact with Mothers (non-cohort)

Hello may I please speak to _____.

My name is _____ and I'm calling from the Dalhousie Pain Research Lab. We are currently doing an immunization study with five year-old children and their mothers. NAME OF MEDICAL CLINIC WERE RECRUITED has recently contacted you about your interest in hearing more about this study. Is now a good time to tell you more about the study?
("Yes" continue, if "No" arrange another time to call.)
And if you have any questions at any time please ask.

We are trying to figure out why some children seem to react to their immunizations so much while others do not seems to mind at all, and to see if and how the child's reaction changes over time. Myself and _____ and _____ have been conducting the study with both 6 and 18 month old infants and their Mothers and now with 5-year-old children as well.

If you agree to help in this study, you will be asked to visit Dalhousie University for approximately sixty minutes. During this time, you will be asked to fill out several questionnaires about your child and your relationship with your child. During this visit, we will also do several fun tasks with your child, which we will be videotaping. These tasks use photographs and cartoon drawings of a young child either displaying different emotional expressions (e.g., Happy), about to be separated from his or her parents (e.g., Parents going out for the evening), or about to have an accident (e.g., Falling on sidewalk). For each picture, your child will be asked a series of questions about how the child in the picture is feeling and/or what the child is going to do. Your child will also be shown cartoon drawings of common objects (e.g., umbrella) and will be asked to identify the objects. The tasks are administered in a game-like fashion and it is our experience that children find participation interesting.

You will also be given four pain incident report forms that we will ask you to fill out at home over the next few days. The forms ask you to record the first four everyday pain incidents that you observed from beginning to end. We will ask you to return the completed forms to us in a sealed, stamped, self-addressed envelope. Finally, we would like to observe and videotape your child receiving his or her medically indicated inoculation shot. Then we would like to have you and you child fill out a quick questionnaire regarding the needle. We will not be involved at all with your visit with the doctor.

I also want to mention that if you choose to participate, all of the information you provide us with will be identified only by number, and all identifying information will remain confidential. If you do agree to take part in this study, you may choose to discontinue at any time.

We are offering $20 for your participation to cover any costs and if you are interested, we will send you a copy of the results of the study. Do you have any other questions or concerns regarding your participation? Would you like to participate?

NO – Thank you for your interest. This won't affect the care you receive at NAME OF MEDICAL CLINIC WERE RECRUITED in any way.

YES – Thank you …

Do you know when your child is scheduled to have his/her needle at NAME OF MEDICAL CLINIC WERE RECRUITED?
Who is your Doctor there?
When could we schedule your visit to Dalhousie with your child?

Should anything change or if you for any other reason need to give us a call our number is XXX-XXXX. And you can leave a message for either myself or _____.
Bye.

Reminder Call (about 2 days before the interview at Dalhousie)
(Give directions, tell where to park)

Confirm date and time.

Our phone number again is XXX-XXXX. See you on _____ at _____ time.

Appendix D

Recruitment Demographics

Participants:

- 102 mothers were informed about the study
- 93 mother-child dyads were eligible to participate

Reasons mother-child dyads were ineligible:

- they had the needle by the time they were contacted (5)
- child could not understand questionnaires (2)
- moving out of province (2)

Of the eligible mothers, 76 (81.7%) agreed to participate and 17 (18.3%) declined.

Reasons for declining:

- not interested in the study (4)
- not having enough time (5)
- having other young children (2)
- not wanting to travel to Dalhousie (2)
- extreme child shyness (4)

Of the 76 mother-child dyads who participated, 10 (13.2%) were excluded.

Reasons for excluding:

- unable to complete interview portion (2)
- mother did not attend interview portion (2)
- did not complete either needle portion nor everyday pain incident forms (3)
- child refused to be separated from mother during interview portion (3)

Appendix E

Demographic Questionnaire

Parent's Participation Number:_____

Today's Date:_____

Time:_____

PARENT INFORMATION:

Your relationship to the child:

1. mother 2. stepmother 3. other _____

Mother's Date of Birth: Year _____ Month _____ Day _____

Marital Status:

married	_____
single	_____
divorced	_____
separated	_____
remarried	_____
common law	_____
widow	_____
other	_____

Which ethnic group do you feel you belong to?

English Canadian	___
French Canadian	___
African Canadian	___
Asian Canadian	___
First Nations	___
Other (please specify)	___

For participant: How far did you go in school?

Less than grade 7 _____
Junior high: completed _____ partial _____
Senior high: completed _____ partial _____
Community college/trade school: completed _____ partial _____
University: completed _____ partial _____

Professional/graduate training: completed _____ partial _____

Are you presently working outside of the home? ____ yes _____ no

If yes, what is your occupation? _____

If no, what was your previous occupation (if applicable)? How long ago were you working? _____

For your partner (if applicable):

Which ethnic group do you feel he/she belongs to?

English Canadian ___
French Canadian ___
African Canadian ___
Asian Canadian ___
First Nations ___
Other (please specify) ___

For your partner (if applicable): How far did he/she go in school?

Less than grade 7 _____
Junior high: completed _____ partial _____
Senior high: completed _____ partial _____
Community college/trade school: completed _____ partial _____
University: completed _____ partial _____
Professional/graduate training: completed _____ partial _____

Is your partner presently working outside of the home? ____ yes _____ no

If yes, what is his/her occupation? _____

If no, what was his/her previous occupation (if applicable)? How long ago was he/she working? _____

Number of family members: _____ Adults (18+) _____ Children

For each child in your family (other than the child here today), please list their age, sex, and whether or not they currently reside in your home.

Age: _____ Sex (circle one): Male Female Living at home? (circle one): No Yes
Age: _____ Sex (circle one): Male Female Living at home? (circle one): No Yes
Age: _____ Sex (circle one): Male Female Living at home? (circle one): No Yes
Age: _____ Sex (circle one): Male Female Living at home? (circle one): No Yes
Age: _____ Sex (circle one): Male Female Living at home? (circle one): No Yes
Age: _____ Sex (circle one): Male Female Living at home? (circle one): No Yes
Age: _____ Sex (circle one): Male Female Living at home? (circle one): No Yes

CHILD INFORMATION:

Sex of child here today: Female Male

Child's Date of Birth: Year _____ Month _____ Day _____

Which ethnic group do you feel he/she belongs to?

English Canadian	___
French Canadian	___
African Canadian	___
Asian Canadian	___
First Nations	___
Other (please specify)	___

Who presently lives with your child? (list all persons, adults and children):

Appendix F

Script for the Separation Anxiety Test Administration

Sometimes parents have to go away for a little while and leave their little girl (boy). I would like to know how children feel when their parents have to leave. Some children feel happy, some feel angry, some feel scared and some feel OK. I would like you to help me know how little girls (boys) feel. I am going to show you some pictures and ask you some questions.

1 In this picture, the Mommy and Daddy are going out for the evening and leaving the little girl (boy) at home; here they are saying goodbye. (Picture 1)

2 In this picture, the little girl (boy) is going to school – this is her (his) very first day at school – here she (he) is with her (his) hand on the door and her (his) mommy's going to go down the steps. (Picture 3)

3 In this picture, the Mommy and Daddy are going away for the weekend, for two days, and they've brought the little girl (boy) over to stay with her (his) aunt and uncle; here they are saying goodbye. (Picture 2)

4 In this picture, the little girl (boy) has gone to the park with her (his) mommy and daddy, and mommy says "you run off and play by yourself for awhile because daddy and I want to have a talk alone together". (Picture 5)

5 In this picture, Mommy and Daddy are going away for two weeks and leaving the little girl (boy) at home, you can see their suitcases. But before they go, they give the little girl (boy) a present, and here they are saying goodbye. (Picture 4)

6 In this picture, mommy is putting the little girl (boy) to bed and then she is going to go out the door. (Picture 6)

How do you think the little girl (boy) in the picture might feel?

Why do you think she (he) feels _____ ?

What is the little girl (boy) going to do?

If you were the little girl (boy) in the picture how would you feel?

Why would you feel _____?

What would you do?

Prompts: How do you think the child might feel?
Go ahead and just guess.

Appendix G

Script for Pain and Relationship Test Administration

For the next game we are going to play we are going to need some parents.

(a) Who are the people who live with you at home? _____,

(b) Who are the people in your family? _____.

(Place Parent Pictures on table in front of child) See all of these pictures here. We are going to pretend that some of them are the people in your family. [Ask the following questions with respect to the parents identified in (a)]. Which one of these do you think would make the best Mommy? (let child make his or her choice, and take the chosen figure), Which one do you think would make the best Daddy? (let child make his or her choice, and take the chosen figure). Now we have your Mommy and/or Daddy, but we are also going to have somebody else's Mommy and/or Daddy in the game. I am going to pick this one for the Mommy and/or this one for the Daddy (randomly chose pictures matching the same parental composition as the child). Now we have everybody that we need to play the game. Are you ready to play the game with me?

Sometimes children hurt themselves by mistake. I would like to know how children feel when they are hurt. Some children feel happy, some feel angry, some feel scared and some feel OK. I would like you to help me know how little girls (boys) feel. I am going to show you some cartoon pictures of a little girl (boy) and ask you some questions.

1 In this picture, the little girl (boy) is inside with her (his) Mommy and/or Daddy. The little girl (boy) is in the kitchen and touches the hot stove and gets burned on the hand. (Picture 1)

2 In this picture, the little girl (boy) is outside with her (his) Mommy and/or Daddy. The little girl (boy) is running on the sidewalk and falls down and her (his) knees get scraped. (Picture 4)

3 In this picture, the little girl (boy) is outside with her (his) Mommy and/or Daddy. The little girl (boy) is playing by some flowers and a bee gets mad and stings the little girl (boy) on the arm. (Picture 2)

4 In this picture, the little girl (boy) is inside with her (his) Mommy and/or Daddy. The little girl (boy) is walking and bumps her (his) head on the table. (Picture 5)

5 In this picture, the little girl (boy) is outside with her (his) Mommy and/or Daddy. The little girl (boy) is playing in the yard and steps on a board with a nail in it and the nail sticks in her (his) foot. (Picture 3)

6 In this picture, the little girl (boy) is inside with her (his) Mommy and/or Daddy. The little girl (boy) wants to look at a book and the book falls off the table and drops on the little girl's (boy's) foot. (Picture 6)

How do you think the little girl (boy) in the picture might feel?

Why do you think she (he) feels _____ ?

What is the little girl (boy) going to do?

(Prompt) What is the mommy and/or daddy going to do?

If you were the little girl (boy) in the picture how would you feel?

Why would you feel _____?

What would you do?

(Prompt) What is your mommy and/or daddy going to do?

Prompts: How do you think the child might feel?

Go ahead and just guess.

Appendix H

PART Scoring

Attachment

1. Typical Attachment – responses in which the child responds with a negative feeling (sad, mad, hurt, etc.) and justifies this by noting the pain incident and copes by seeking support or comfort from the parents. In addition, the child provides an appropriate response for the parents' actions.

2. Hi Attachment – responses which fulfill the criteria for Typical Attachment category, however, while the child copes by seeking support or comfort from the parents, the child does not provide an appropriate response for the parents' actions.

3. Lo Attachment – responses in which the child responds with a negative valence but the examiner was unable to elicit an adequate response for either the justification or the coping. Lo responses are considered somewhat avoidant and include responses which explain the feeling as due to the pain incident but are missing an adequate way of coping or those which have an adequate coping strategy but lack a justification for the feeling. In some cases the child seemed only able to reiterate the emotions which were felt.

4. Attachment/Retribution – responses in which the child gives a negative feeling attributed to the pain incident but the coping response entails a form of retribution towards the source of the pain. However, the act of retribution was not always directed at the source, but was also aimed at the parents or other people. Throwing tantrums, running away or some mild form of trouble are also coded here.

5. Attachment/Decrease Access to Parents – responses which have a negative feeling valence, in regard to the pain incident, while the coping response describes a way in which the child actively avoids seeking help or comfort from the parents.

6. Atypical Attachment – responses which are unusual because the child gives a feeling with a positive valence but justifies it by refusing to accept the occurrence of the pain.

Self-Reliant

7. Typical Self-Reliant – responses which have a positive feeling valence and focus on the mildness of the pain. Coping with the pain incident involves an appropriate activity, play, or expressing an emotion.

8. Hi Self-Reliant – responses also have a positive valence for the feeling and focus on the mildness of the pain, while coping appropriately, but the child relies on another person to cope with the pain.

9. Lo Self-Reliant – responses which have a positive feeling but, like Lo Attachment responses, the examiner was unable to elicit an adequate response for either the justification or the coping. Children who gave the coping response, "he'd do nothing" were also scored in this category. Responses which justified the positive feeling with "I like to feel that way" or a similar response were also placed here.

10. Atypical Self-Reliant – responses in which the child gives a feeling with a negative valence but attributes it to something other than the pain incident (which would be coded under an Attachment category). The answer is complete (a feeling, logical justification for the feeling and appropriate coping) but the focus is on something other than the pain incident.

Attachment/Self-Reliant

11. Typical Attachment/Self-Reliant – responses in which the child gives a feeling with negative valence and attributes it to the pain incident. However, unlike Attachment categories, the child copes with an appropriate activity (e.g., getting a band-aid), play, or by expressing an emotion. Responses with mixed valences are also coded here (e.g., sad that he is hurt but happy because he'll get a treat).

12. Lo Attachment/Self-Reliant – responses which are incomplete or inadequate. Answers here include those where the child gives a mixed valence feeling but could not justify the feelings but gives an adequate coping response. Also coded here are answers with a negative feeling valence with no justification but with a high coping response that does not include seeking assistance or comfort from the parents.

13. Attachment/Self-Reliance/Decrease Access to Parents – responses which fulfill the criteria for Typical Attachment/Self-Reliant category but the coping response describes a way in which the child actively avoids the parents.

Avoidant

14. Avoidant – responses which are really "non-responses". The examiner can elicit very little or no information about the child's feelings, why the child feels that way or what the child might do. If any two of the three parts of an answer are missing it is categorized here. Avoidant responses also include those that deny that a pain incident might occur.

15. Avoidant-Confused – responses which are also avoidant, but are unlike answers

placed in the Avoidant category where the child is passively silent. Children giving this type of answer seem "confused" because they talk about things unrelated to the picture being shown, focus on irrelevant features in the picture or give an illogical justification for the feeling. These responses are Avoidant as demonstrated by the inability to discuss the pain incident but the child self-distracts by discussing irrelevant issues.

Additional

16. Anxious – responses which reveal anxiety or fear in some component of the answer to the picture. However, the child's response is still complete, with a feeling, a justification for the feeling and an appropriate coping solution (which includes giving an emotion such as "cry" or seeking comfort or help from parents). Answers categorized here are not those of a child who shows an irrational fear or is overwhelmed by the pain incident. These answers are much like those categorized under the Attachment categories, but rather than "sad" the children are generally scared or frightened because of the pain incident.

17. Anxious/Decrease Access to Parents – responses which fulfill the criteria for Anxious but the child copes by not seeking assistance or comfort from the parents or by actively avoiding the parents.

18. Atypical – responses in which the child claims to feel good or happy about the pain incident and specifically attributes it to the incident or to lack of comfort from parents. These answers might be considered as an extreme form of self-reliance. Sometimes the child is unable to give an appropriate coping response but the response is coded here rather than in a Lo category to tag the unusual justification for the feeling.

19. Bizarre – responses which deal with hostility, hatred of mother or father or death.

Scores Assigned to the Subcategories of the P.A.R.T. Indices on the Attachment Component (Severe Pain Incidents)

Subcategories Receiving a Score of 4

1. Typical Attachment
16. Anxious

Subcategories Receiving a Score of 3

2. Hi Attachment
8. Hi Self-Reliant
11. Typical Attachment/Self-Reliant
12. Lo Attachment/Self-Reliant

Subcategories Receiving a Score of 2

3. Lo Attachment
5. Attachment/Decrease Access to Parents
6. Atypical Attachment
7. Typical Self-Reliant
10. Atypical Self-Reliant
13. Attachment/Self-Reliant/Decrease Access to Parents
17. Anxious/Decrease Access to Parents

Subcategories Receiving a Score of 1

4. Attachment/Retribution
9. Lo Self-Reliant
14. Avoidant
15. Avoidant-Confused
18. Atypical
19. Bizarre

Scores Assigned to the Subcategories of the P.A.R.T. Indices on the Self-Reliant Component (Mild Pain Incidents)

Subcategories Receiving a Score of 4

7. Typical Self-Reliant
11. Typical Attachment/Self-Reliant

Subcategories Receiving a Score of 3

8. Hi Self-Reliant
12. Lo Attachment/Self-Reliant

Subcategories Receiving a Score of 2

1. Typical Attachment
2. Hi Attachment
3. Lo Attachment
5. Attachment/Decrease Access to Parents
6. Atypical Attachment
9. Lo Self-Reliant
10. Atypical Self-Reliant
13. Attachment/Self-Reliant/Decrease Access to Parents
16. Anxious
17. Anxious/Decrease Access to Parents

Subcategories Receiving a Score of 1

4. Attachment/Retribution
14. Avoidant
15. Avoidant-Confused
18. Atypical
19. Bizarre

Scores Assigned to the Subcategories of the P.A.R.T. Indices on the Avoidant Component (Severe and Mild Pain Incidents)

Subcategories Receiving a Score of 3

6. Atypical Attachment
10. Atypical Self-Reliant
14. Avoidant
15. Avoidant-Confused

Subcategories Receiving a Score of 2

3. Lo Attachment
9. Lo Self-Reliant
12. Lo Attachment/Self-Reliant

Subcategories Receiving a Score of 1

1. Typical Attachment
2. Hi Attachment
4. Attachment/Retribution
5. Attachment/Decrease Access to Parents
7. Typical Self-Reliant
8. Typical Attachment/Self-Reliant
11. Typical Attachment/Self-Reliant
13. Attachment/Self-Reliant/Decrease Access to Parents
16. Anxious
17. Anxious/Decrease Access to Parents
18. Atypical
19. Bizarre

Appendix I

Parent/Child Reunion Inventory (P/CRI) Subscale Items

P/CRI items included on secure behaviour rating scale:

Seems relaxed

Shows pleasure

Comes nearer

Initiates positive interaction

Affectionate touching

Reacts positively to parent initiations

P/CRI items included on avoidant behaviour rating scale:

Moves away

Stays away

Ignores parent

Gives an excuse for being unable to interact

Continues to be engaged with toys

P/CRI items included on ambivalent behaviour rating scale:

Shows hostility

Acts immaturely

P/CRI items included on controlling behaviour rating scale:

Rejects parent

Humiliates parent

Shows extreme nervousness

Overprotectiveness

Appendix J

Medical Pain Incident Report Form (M-PIRF)

General Information

Date: _____ Time that incident occurred at:_____ (a.m./p.m.)

1) What was the mood of the child just before the needle? Check all of those that apply:

___negative (i.e., tired, frightened, agitated, hungry, upset, sulking, angry, fussy)

___neutral (i.e., content, calm, confused, relaxed)

___positive (i.e., showing off, having fun, lively, excited, happy)

2) How normal was this mood for your child?

___very typical ___fairly typical ___somewhat typical ___not very typical

Situational Context

3) What was the child doing when he or she got the needle? Check all of those that apply:

___quiet (i.e., lying down, being carried, sitting, cuddling)

___medium activity (i.e., standing, playing quietly)

___active (i.e., running, climbing, playing actively, walking)

4) Who or what was the source of the pain? Check all of those that apply:

___object (i.e., rock, stairs, door, toy, etc.) (please specify): _____

___animal/pet (please specify): _____

___the child him/herself (i.e., fell down, tripped, hit themselves)

___another child

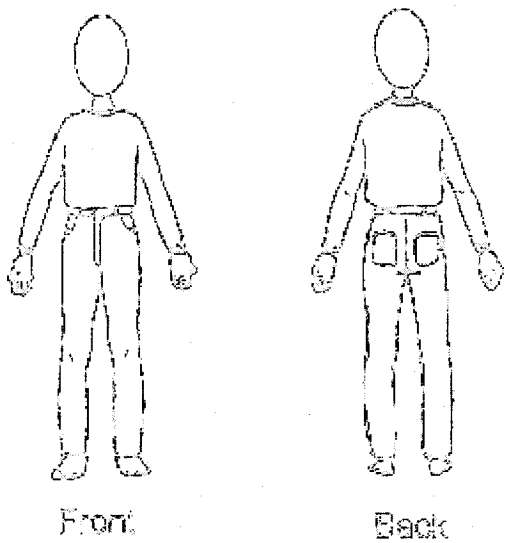
___adult (i.e., mom and child bumped heads)

___other (please specify): __needle_____

5) How many **other** people were involved in the activity with your child?

0 1 2 3 4 or more

6) Where was the pain? Please put "X's" on the bodies where **your child** had pain:



Child's Reaction

7) How strongly did your child react when he or she got hurt? (Please mark with an "X")

_____

no response **strongest response possible**

8) How angry did your child become when he or she got hurt? (Please mark with an "X")

_____

no response **strongest response possible**

9) If the child became angry, who was the anger/aggression directed towards?

___person who hurt the child ___someone helping the child

___no one/thing in particular ___object (please specify): _____

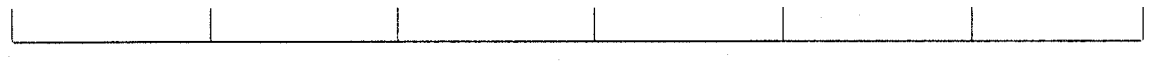
___other person (please specify): _____

10) **a)** How did your child react when he or she was hurt? Check off as many items as apply.

b) Estimate for **how long** the items occurred (**in seconds**) in the space provided.

✓	**Number of seconds**	
___	_____	no response
___	_____	holding/rubbing
___	_____	reduced activity
___	_____	favoring injured area
___	_____	clinging to caregiver
___	_____	asks for "mommy" asks for a kiss, point to booboo to get a kiss, etc
___	_____	asks for a bandaid, asks for help
___	_____	withdrawal
___	_____	surprise/stunned
___	_____	verbal response ("Ouch it hurts")
___	_____	whimper/whine
___	_____	sobbing
___	_____	crying
___	_____	screaming
___	_____	sulking
___	_____	upset facial expression
___	_____	angry facial expression
___	_____	angry behavior (slamming doors/stomping)
___	_____	verbal aggression
___	_____	physical aggression (hitting, kicking)
___	_____	squirming
___	_____	other (please specify): _____

11) How long did it take for your child to calm down? (Please mark with an "X")



If your child took longer than 3 minutes to calm down, how long? In minutes: _____

12) In comparison to your child's other everyday pain incidents (booboo's) how typical would you rate this one?

___very typical ___fairly typical ___somewhat typical ___not very typical

Parental Response

13) What did you do for the first few minutes after your child got hurt?

Please check ALL the categories that apply:

___**assess/treat injury only** [e.g., assessed/looked at the pain/injury; first aid (e.g., Band-Aid for bleeding cut, treat injury only)]

___**no attention** [e.g., ignored child; no attention given whatsoever (verbal or physical); let child play without interupting him/her]

___**praise** [e.g., praised child (e.g., said "There you go! That's my girl!"); gave child a special treat after the incident (e.g., candy, trip to the zoo, etc)]

___**teach** [e.g., questioned the child about the incident (e.g., "What happened?"); explained consequences of child's behaviour; said "I told you……"]

___**comfort** [e.g., *verbal comfort* (reassurance) (e.g., "There, there, it will get better, You'll be okay"; *physical comfort* (e.g., Band-Aid with no cut, kiss/rub "booboo" better, pick up/rock child; *apologized* (e.g., "Ohhh, I'm sorry")]

___**stoic** [e.g., encouraged child to be courageous (e.g., "Be a brave boy/girl."); no attention given, *but* watched/monitored child]

___**distraction** [e.g., *verbal* distraction or *humour* (e.g., "Oh, look Johnny, what's over there?"; *physical* distraction (e.g., give child a new toy, remove child from area/room); commanded child to use coping strategy (e.g., "Think happy thoughts. Breath deeply"); said "You're okay, keep playing."]

___**punishment** [e.g., disciplined child (e.g., take away privileges, or "time-out"); punished child (e.g., send to room)]

14) Please go back to question 13) and **circle** your **most dominant** response.

15) How much **PAIN** do you think the **average** child would have had in the same pain situation? (Use an "X" to mark the intensity of the pain on the scale)

_____

no pain — **the most pain imaginable**

Child Response

16) What did your child do after you responded to his or her hurt?
Please check ALL the categories that apply.

_____ was soon calmed or soothed
_____ pushed me away angrily or in frustration
_____ stomped and/or kicked feet
_____ remained upset, was difficult to soothe
_____ did not indicate that he/she needed my help
_____ turned away when picked up or made contact
_____ sunk into me or held on to me until calmed down
_____ held on to me or went after me if I tried to put him/her down or go away
_____ acted cool or aloof
_____ continued to play, did not notice me
_____ hit, kicked at me
_____ turned from me angrily or in frustration
_____ ignored me
_____ became quiet and then fussy again
_____ did not easily let me hold him/her but remained upset (e.g., arched back, put arm between us)

17) Sometimes children hurt themselves by mistake. Circle the face which best shows how much pain or hurt you had. (The first face depicts "no pain" and the last face depicts "pain as bad as it could be". Use whatever words the child is familiar with: "owie", "booboo" etc...)

Appendix K

Medical/Everyday Pain Incident Form – Behavioural Codes

Responses which receive a score of zero:

no response

Responses which receive a score of one:

holding/rubbing

asks for "mommy" asks for a kiss, point to booboo to get a kiss, etc

asks for a bandaid, asks for help

surprise/stunned

verbal response ("Ouch it hurts")

whimper/whine

upset facial expression

Responses which receive a score of two:

reduced activity

favoring injured area

clinging to caregiver

Withdrawal

Sulking

angry facial expression

Squirming

Responses which receive a score of three:

Sobbing

crying

Responses which receive a score of four:

Screaming

angry behavior (slamming doors/stomping)

verbal aggression

physical aggression (hitting, kicking)

Appendix L

Medical/Everyday Pain Incident Form – Child Response Behavioural Codes

Responses which are coded as secure:

Was soon calmed or soothed

Sunk into me or held on to me until calmed down

Held on to me or went after me if I tried to put him/her down or go away

Responses which are coded as resistant:

Pushed me away angrily or in frustration

Stomped and/or kicked feet

Remained upset, was difficult to soothe

Hit, kicked at me

Turned from me angrily or in frustration

Became quiet and then fussy again

Did not easily let me hold him/her but remained upset

Responses which are coded as avoidant:

Did not indicate that he/she needed my help

Turned away when picked up or made contact

Acted cool or aloof

Continued to play, did not notice me

Ignored me

Appendix M

Parental Anxiety Rating Scale

Please rate on the following scale how anxious you feel about your child's needle:

(Please circle one)

|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|

0 1 2 3 4 5 6 7 8 9 10

very calm, very relaxed

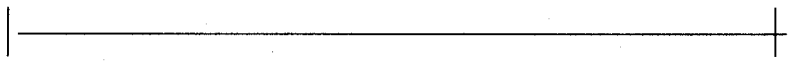
very upset, very distressed

Appendix N

Visual Analogue Scale (VAS)

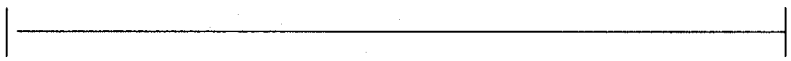
Subject #_____
Coded by _____

Phase: Baseline (0:00:00:0)



No pain Worst pain imaginable

Phase: Needle 1 (0:00:00:0)

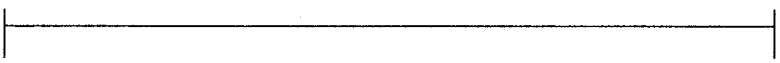


No pain Worst pain imaginable

Phase: Needle 2 (0:00:00:0)

No pain Worst pain imaginable

Phase: Recovery (0:00:00:0)



No pain Worst pain imaginable

Appendix O

Everyday Pain Incident Report Form (E-PIRF)

INSTRUCTIONS

Dear Parent,

Thank you for taking the time to take part in the Children's Pain Responses Study. By filling out the forms that follow you will be helping us to find out what happens when children have everyday pains (booboos).

We would like you to fill out the enclosed forms for **the next 4 pains** (e.g., bumps, falls. Scrapes, etc) that you see your child have after you leave the Dalhousie Pain Research Lab today. Please fill out these forms as soon after the pain as you can, and only for the pains where you have see the **whole** incident happen. This way you will be able to best judge what has happended. Any type of everyday pain can be used, but we are not interested in pain from sickness.

How to fill out the pain forms.

This package contains four forms, one for each pain incident. Please check, or fill in the space where appropriate.

What is an everyday pain incident (booboo)?

For the purpose of this study, an everyday pain incident includes:

(1) An incident where the child *acts* as if he/she is in pain, but the mother thinks there is no pain. For example, the child gets hit by a sibling and says that he/she is hurt, but the mother thinks there is no pain.

(2) An incident where the mother *thinks* that the child feels pain, but he/she did not act as if he/she were in pain. For example, the child falls down and the mother thinks that it would hurt, even though the child seems to be okay.

(3) An incident where the mother thinks that the child is hurt and the child indicates that he/she is hurt.

Do not fill in the forms for pain caused by sickness, such as headaches, sore throats, or stomach pains.

If you have any questions about the pain forms please phone us at XXX-XXXX.Thanks!

General Information

Date: _____ Time that incident occurred at:_____ (a.m./p.m.)

1) What was the mood of the child just before the pain incident? Check all of those that apply:

___negative (i.e., tired, frightened, agitated, hungry, upset, sulking, angry, fussy)

___neutral (i.e., content, calm, confused, relaxed)

___positive (i.e., showing off, having fun, lively, excited, happy)

2) How normal was this mood for your child?

___very typical ___fairly typical ___somewhat typical ___not very typical

Situational Context

3) What was the child doing when he or she got hurt? Check all of those that apply:

___quiet (i.e., sleeping, lying down, being carried, watching T.V., sitting, cuddling, reading/getting read to)

___medium activity (i.e., standing, being bathed, eating, playing quietly, colouring, arts and crafts)

___active (i.e., running, crawling, climbing, playing actively, walking, play fighting,teasing, fighting, dancing)

4) Who or what was the source of the pain? Check all of those that apply:

___object (i.e., rock, stairs, door, toy, etc.) (please specify): _____

___animal/pet (please specify): _____

___the child him/herself (i.e., fell down, tripped, hit themselves)

___another child

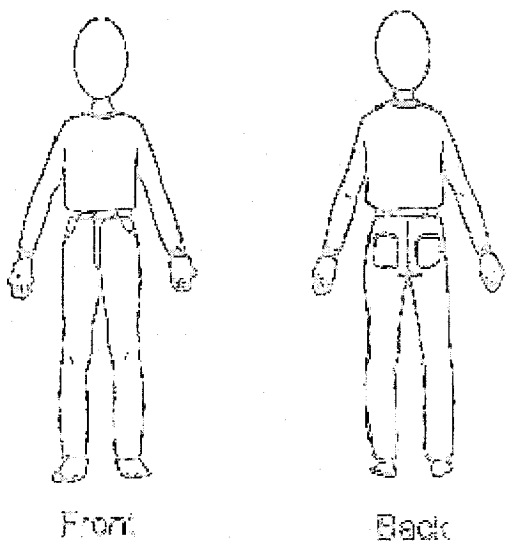
___adult (i.e., mom and child bumped heads)

___other (please specify): _____

5) How many **other** people were involved in the activity with your child?

0 1 2 3 4 or more

6) Where was the pain? Please put "X's" on the bodies where **your child** had pain:



Child's Reaction

7) How strongly did your child react when he or she got hurt? (Please mark with an "X")

no response	**strongest response possible**

8) How angry did your child become when he or she got hurt? (Please mark with an "X")

no response	**strongest response possible**

9) If the child became angry, who was the anger/aggression directed towards?

___person who hurt the child ___someone helping the child

___no one/thing in particular ___object (please specify): _____

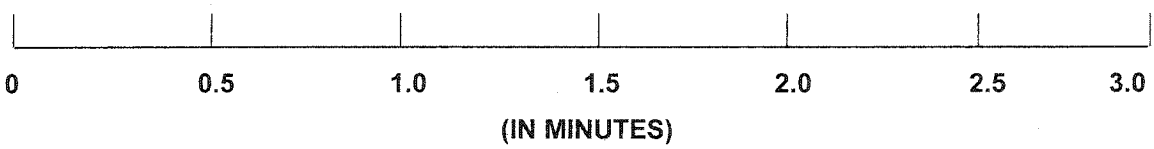
___other person (please specify): _____

10) **a)** How did your child react when he or she was hurt? Check off as many items as apply.

b) Estimate for **how long** the items occurred (**in seconds**) in the space provided.

✓	**Number of seconds**	
___	_____	no response
___	_____	holding/rubbing
___	_____	reduced activity
___	_____	favoring injured area
___	_____	clinging to caregiver
___	_____	asks for "mommy" asks for a kiss, point to booboo to get a kiss, etc
___	_____	asks for a bandaid, asks for help
___	_____	withdrawal
___	_____	surprise/stunned
___	_____	verbal response ("Ouch it hurts")
___	_____	whimper/whine
___	_____	sobbing
___	_____	crying
___	_____	screaming
___	_____	sulking
___	_____	upset facial expression
___	_____	angry facial expression
___	_____	angry behavior (slamming doors/stomping)
___	_____	verbal aggression
___	_____	physical aggression (hitting, kicking)
___	_____	squirming
___	_____	other (please specify): _____

11) How long did it take for your child to calm down? (Please mark with an "X")



If your child took longer than 3 minutes to calm down, how long? In minutes: _____

12) In comparison to your child's other everyday pain incidents (booboo's) how typical would you rate this one?

___very typical ___fairly typical ___somewhat typical ___not very typical

Parental Response

13) What did you do for the first few minutes after your child got hurt?

Please check ALL the categories that apply:

___**assess/treat injury only** [e.g., assessed/looked at the pain/injury; first aid (e.g., Band-Aid for bleeding cut, treat injury only)]

___**no attention** [e.g., ignored child; no attention given whatsoever (verbal or physical); let child play without interupting him/her]

___**praise** [e.g., praised child (e.g., said "There you go! That's my girl!"); gave child a special treat after the incident (e.g., candy, trip to the zoo, etc)]

___**teach** [e.g., questioned the child about the incident (e.g., "What happened?"); explained consequences of child's behaviour; said "I told you……"]

___**comfort** [e.g., *verbal comfort* (reassurance) (e.g., "There, there, it will get better, You'll be okay"; *physical comfort* (e.g., Band-Aid with no cut, kiss/rub "booboo" better, pick up/rock child; *apologized* (e.g., "Ohhh, I'm sorry")]

___**stoic** [e.g., encouraged child to be courageous (e.g., "Be a brave boy/girl."); no attention given, *but* watched/monitored child]

___**distraction** [e.g., *verbal* distraction or *humour* (e.g., "Oh, look Johnny, what's over there?"; *physical* distraction (e.g., give child a new toy, remove child from area/room); commanded child to use coping strategy (e.g., "Think happy thoughts. Breath deeply"); said "You're okay, keep playing."]

___**punishment** [e.g., disciplined child (e.g., take away privileges, or "time-out"); punished child (e.g., send to room)]

14) Please go back to question 13) and **circle** your **most dominant** response.

15) How much **PAIN** do you think the **average** child would have had in the same pain situation? (Use an "X" to mark the intensity of the pain on the scale)

no pain	**the most pain imaginable**

Child Response

16) What did your child do after you responded to his or her hurt?
Please check ALL the categories that apply.

_____ was soon calmed or soothed
_____ pushed me away angrily or in frustration
_____ stomped and/or kicked feet
_____ remained upset, was difficult to soothe
_____ did not indicate that he/she needed my help
_____ turned away when picked up or made contact
_____ sunk into me or held on to me until calmed down
_____ held on to me or went after me if I tried to put him/her down or go away
_____ acted cool or aloof
_____ continued to play, did not notice me
_____ hit, kicked at me
_____ turned from me angrily or in frustration
_____ ignored me
_____ became quiet and then fussy again
_____ did not easily let me hold him/her but remained upset (e.g., arched back, put arm between us)

17) Sometimes children hurt themselves by mistake. Circle the face which best shows how much pain or hurt you had. (The first face depicts "no pain" and the last face depicts "pain as bad as it could be". Use whatever words the child is familiar with: "owie", "booboo" etc...)

Appendix P

Script for Emotional Labelling Task

I have some pictures here of a little girl. For each one, the little girl was feeling different when her picture was taken. In this picture the little girl wasn't feeling anything (show neutral face).

Open-Ended Format:

Can you tell me how the little girl was feeling in these pictures?

1. Happy _____ Correct _____ Incorrect _____ Other
2. Sad _____ Correct _____ Incorrect _____ Other
3. Angry _____ Correct _____ Incorrect _____ Other
4. Surprised _____ Correct _____ Incorrect _____ Other
5. Scared _____ Correct _____ Incorrect _____ Other

Open-Ended Score: _____

Closed-Ended Format: ***teach if necessary

Can you show me a picture of the little girl when she was:

1. Happy? Correct Incorrect No Response
2. Sad? Correct Incorrect No Response
3. Angry? Correct Incorrect No Response
4. Surprised? Correct Incorrect No Response
5. Scared? Correct Incorrect No Response

Total Score: _____

Appendix Q

Child Rating Scale

1) How did your child sleep last night?

_____ well
_____ fairly well
_____ somewhat well
_____ poorly
_____ very poorly

2) How tired is your child today?

_____ very alert and awake
_____ fairly alert and awake
_____ somewhat alert and awake
_____ somewhat tired
_____ very tired

3) How would you rate your child's general mood today?

_____ very good
_____ good
_____ fair
_____ poor
_____ very poor

4) How typical is your child's behaviour here today of what he or she is usually like?

_____ very typical
_____ fairly typical
_____ somewhat typical
_____ not very typical
_____ atypical

Appendix R

Script for First Visit in Study at Dalhousie University

Hello Ms. _____ and __Child's name___. Thank-you so much for coming today. Before we start, I'll quickly review the purpose of the study with you. We are trying to understand more about why some children seem to mind their immunization so much while other children do not seem to react to them at all. We are looking at two groups of things that these differences might be related to. The first is differences in the children themselves, so I'll be asking you questions about your child's emotional reactivity. The second is differences in more environmental things, such as how you typically respond to your child and how you tend to react when *he/she* experiences pain or other emotional events like being separated from you. Today, as I mentioned over the phone, I will have you fill out some questionnaires. While you are doing that I will be doing several fun tasks with your child next door, which we will be videotaping. You will be able to see everything that we are doing through the two-way mirror. These tasks use photographs and cartoon drawings of a young child either displaying different emotional expressions (e.g., Happy), about to be separated from his or her parents (e.g., Parents going out for the evening), or about to have an accident (e.g., Falling on sidewalk). For each picture, your child will be asked a series of questions about how the child in the picture is feeling and/or what the child is going to do. Your child will also be shown cartoon drawings of common objects (e.g., umbrella) and will be asked to identify the objects. The tasks are administered in a game-like fashion and it is our experience that children find participation interesting. Before we start, please read this consent form that says that you agree for you and your child to participate, and to sign it if you are comfortable with everything in the study. If you have any questions about the form or the study, please don't hesitate to ask.

(Give Mother the $20.00 and have her complete a receipt)

Instructions for Completing the Questionnaires

I would like you to fill out some questionnaires about your child and yourself. Please don't put your name on any of them. They'll be coded by number. While you are filling them out, remember, you do not have to answer any questions you are uncomfortable with. You will notice here again that some of the questions are not suited to children of all ages.

1) Demographic Questionnaire.

The first questionnaire asks you some background information about you and your child. During this section, you may notice that some of the questions are not really suited to your child. This is because the same questions are being asked to mothers with children of various ages. If a question does not really apply you, please answer as best you can.

2) Emotion Regulation Checklist.

This questionnaire asks you to report about your child's emotional reactivity. There are a number of statements that describe typical behaviour and you have to circle the response that best characterizes your child.

3) Child Rating Scale

The last thing to fill out is this rating scale. This is to give me an idea if your child's behaviour here today is typical of what he or she is usually like, or if he or she was unusually hungry, tired, or something like that.

4) Explain the Pain Incident Report Form

That§s it for the questionnaires that we have for you today here in the lab. There is, however, one more form that we'd like you to fill out at home. It's an incident report form which is quickly filled out by simply checking off the appropriate answers and filling in the spaces where needed. Please record the **first four** typical everyday pain incidents that your child, the one here with you today, has over the next few days. All we ask is that you observe the incident from beginning to end and that it is an everyday type of pain that your child is experiencing. Please fill out the forms as soon as possible after the pain incident and send the completed package back to us in the stamped, self-addressed envelope.

(Go through all types of everyday pains that can be used (listed on white sheet) and then go through the form with them and give an example and show child how to complete Pain Faces Scale)

Now, I'll ask you to go next door to complete the questionnaires while I do the tasks with your child here in this room. As I said before you will be able to see everything through the one-way mirror over here. **(ask child if it is okay for mom to go next door, show child room if necessary).**

Child interview

Complete Child Verbal Assent Form

Complete the Emotional Labelling Task

I have some pictures here of a little girl. For each one, the little girl was feeling different when her picture was taken. In this picture the little girl wasn't feeling anything (show neutral face). Show remaining pictures and follow ELT Script.

Complete either the SAT or PART

Sometimes parents have to go away for a little while and leave their little girl (boy). I would like to know how children feel when their parents have to leave. Some children feel

happy, some feel angry, some feel scared and some feel OK. I would like you to help me know how little girls (boys) feel. I am going to show you some pictures and ask you some questions. Show pictures and follow SAT script.

Complete Peabody Picture Vocabulary Test

Now I want to find out if you know the names of some things. I'm going to show you some pictures and then I'm going to say a word and I want you to put your finger on the picture of what I've just said. Administer PPVT according to standardized administration procedure.

Complete either the PART or SAT

For the next game we are going to play we are going to need some parents.
(a) Who are the people who live with you at home? _____,
(b) Who are the people in your family? _____.
(Place Parent Pictures on table in front of child) See all of these pictures here. We are going to pretend that some of them are the people in your family. [Ask the following questions with respect to the parents identified in (a)]. Which one of these do you think would make the best Mommy? (let child make his or her choice, and take the chosen figure), Which one do you think would make the best Daddy? (let child make his or her choice, and take the chosen figure). Now we have your Mommy and/or Daddy, but we are also going to have somebody else's Mommy and/or Daddy in the game. I am going to pick this one for the Mommy and/or this one for the Daddy (randomly chose pictures matching the same parental composition as the child). Now we have everybody that we need to play the game. Are you ready to play the game with me?

Sometimes children hurt themselves by mistake. I would like to know how children feel when they are hurt. Some children feel happy, some feel angry, some feel scared and some feel OK. I would like you to help me know how little girls (boys) feel. I am going to show you some cartoon pictures of a little girl (boy) and ask you some questions. Show pictures and follow PART script.

Well that's all we have to do. Thank you very much for playing these games with me. *(let child pick 5 stickers)* I'm going to go next door now and get your mom. Can you wait here for her?

When Mother has finished Questionnaires

We're finished next door. You can go over now. I will join you and your child in a couple of minutes and will answer any questions that you may have.

At end of Interview

We're finished for today. Thank you for helping us with the study. Did you have any questions about the study or the questionnaires? Just tell me again when you are

scheduled for your needle appointment at NAME OF MEDICAL CLINIC WERE RECRUITED. Great. I'll meet you there in the waiting room. I'll ask you to be there about 5 minutes early and I'll get you to fill out two rating scales. Then I'll wait for you until the nurse calls me in for the needle. I won't be involved at all in your visit with the doctor. I'll just come in to the nursing office and video-tape the needle. After that§s done, I'll ask you to quickly fill out one more incident report form regarding the needle which will take about 5 minutes to complete and that will be the end of the study. Do you have any questions? Okay, I will see you on _____. Here is a card with my name and number and the time that I have recorded for the appointment. In case you need to change it, it will remind you to let me know.

Appendix S

Consent Form

Title: Children's Development of Pain Responses to Immunizations

Principal Investigator
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Co-Investigators
Catherine Stewart: undergraduate psychology honours student

For any questions or concerns please contact:

Trudi Walsh, or Catherine Stewart
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Dalhousie University
Halifax, NS
B3H 4J1
(XXX) XXX-XXXX

Introduction

We invite you to take part in a research study at Dalhousie University. Taking part in this study is voluntary and you may withdraw from the study at any time. The quality of your medical care will not be affected by whether you participate or not. Your participation in the previous studies in no way obligates you to participate in the current study. The study is described below. This description tells you about what you will be asked to do, and any risks, inconvenience or discomfort which you might experience. Participating in this study will not benefit you. You should discuss any questions you have about this study with the people who explain it to you.

Purpose of the Study

Different children can have very different responses to the same types of pain. The purpose of this study is to learn more about the factors which may be important in influencing these different responses to pain and how the factors and responses change with age. For instance, we have previously found that children showed lower distress behaviours when their parents used distraction techniques during their child's immunization. The factors we would like to look at include the characteristics of your child, such as his or her age, sex, and typical levels of activity and reactivity as well as how you typically respond to your child, and how you tend to react when he or she experiences pain. We also want to look at how these variables change over time, as your child develops. By uncovering some of the factors that contribute to children's response to pain, we may help to limit or reduce the pain experienced during immunization procedures and other painful events.

Study Design

The study is a within-subjects design. This means that we will compare the factors under investigation (i.e., your child's age, sex, and typical levels of activity and reactivity as well as how you typically respond to your child, and how you tend to react when he or she experiences pain) to your child's response to pain. The study is also a longitudinal design, following some of the same children at 6 months, 18 months and 5-year immunizations. A longitudinal design means that the same children are studied at various ages to see if there are any changes in their behaviour or response to pain as they get older. Specifically, we will be comparing the information about your child's response to pain, your typical response to your child, and your reaction when he or she experiences pain that we collected when he or she was 6 months and 18 months of age to his or her response to pain, your typical response to your child, and your reaction when he or she experiences pain at 5 years of age.

Who can Participate in the Study

This study is aimed at mothers and their children. You may participate in this study if your child: (1) was involved in the previous immunization study conducted by Dr. Pat McGrath at 6 and 18 months and is approaching or has recently turned (between October 1996 and December 1997) 5 years of age; is receiving his/her immunizations at Dalhousie Health Services; and is in good health at the moment. Or (2) is approaching or has recently turned (October 1996 and December 1997) 5 years of age; is receiving his/her immunizations at NAME OF MEDICAL CENTRE FROM WHICH CHILD WAS RECRUITED; and is in good health at the moment.

Who will be conducting the research?

The research will be conducted by Trudi Walsh (M.Sc.) and Catherine Stewart under the supervision of Dr. Patrick McGrath (Ph.D.) and Dr. Doug Symons (Ph.D).

What you will be asked to do

If you agree to help in this study, you and your child will be:

1. Asked to visit Dalhousie University for approximately sixty minutes. During this time, you will be asked to fill out several questionnaires about your child and your relationship with your child in an adjacent research space. You will have partial visual access and no audio access to your child in the adjacent research space.
2. During this visit, we will do several fun tasks with your child, which we will be videotaping. These tasks are used to assess his or her emotional awareness, language ability, and how he or she thinks about and reacts to emotional events (e.g., being in pain).
3. The tasks use photographs and cartoon drawings of a young child either displaying different emotional expressions (e.g., Happy), about to be separated from his or her parents (e.g., Parents going out for the evening), or about to have an accident (e.g., Falling on sidewalk). For each picture, your child will be asked questions about how the child in the picture is feeling and/or what the child is going to do.
4. Your child will also be shown cartoon drawings of common objects (e.g., umbrella) and will be asked to identify the objects. The tasks are administered in a game-like fashion and it is our experience that children find participation interesting.
5. Before conducting any of these tasks we will be asking for permission from your child. He/she will be told that there are no right or wrong answers and that he/she does not have to answer any question that he/she does not want to answer. He/she will also be told that I will not tell anyone his/her answers and that he/she can stop at any time.
6. You will also be given four pain incident report forms which we will ask you to fill out at home over the next few days. The forms ask you to record the first four

everyday pain incidents (e.g., bumps and scrapes) that you observed from beginning to end. We will ask you to return the completed forms to us in a sealed, stamped, self-addressed envelope.

7. Finally, we would like to observe and videotape your child receiving his or her medically indicated inoculation shot, after which we will ask you and your child to complete a questionnaire about the immunization.

Possible Risks and Discomforts

The risks in this study are minimal. The only foreseeable risk in this study is that you or your child may become distressed about being separated during the interview portion. If you agree to help with this study, you may change your mind at any time during the study. In addition, you may also refrain from answering any questions you are uncomfortable with. You or your child are also free to withdraw from the study at any time, for any reason without loss of compensation. Your decision about participating or not participating will in no way influence the care you and your child will receive at Dalhousie Health Services or NAME OF MEDICAL CENTRE FROM WHICH CHILD WAS RECRUITED.

Possible Benefits

This study provides no direct benefits to you, the participant. However, the information collected in this study will contribute to our understanding of how children react to immunizations.

Compensation

We offer $20.00 compensation to cover any costs (e.g., parking) associated with participating in this study.

Confidentiality

If you participate, any information collected will be strictly confidential. All personal information will remain private and only the persons involved in this study will have access to it. It will be coded only by number and your name will not be recorded on any of the information you give us. Videotapes of the testing and needle procedures will be stored in locked cabinets in the psychology department of Dalhousie, and they too will be identified only by code number. Only those persons involved in this study will have access to it. The tapes will be kept for five years. This is the standard amount of time that data is kept and is necessary in the event that questions are raised about the integrity of the research or in case re-analysis of the data is required. After five years the tapes will be destroyed. The only limit to confidentiality is that the researchers are required to report the names of children in need of protection to Family and Children's Services.

If you have any questions or concerns about this study, please feel free to contact Trudi Walsh, Catherine Stewart, or Dr. Pat McGrath (XXX-XXXX).

In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics/ Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: XXX-XXXX.

Having read and understood the explanation of the study, I hereby consent to the participation of my child (child's name) _____ and myself in this study:

_____ _____

(Parent's Name) (Parent's Signature)

_____ _____

(Date) (Signature of Researcher)

Appendix T

Child Oral Assent/Dissent Script

This will be read to the child at the beginning of the session. If the child does not agree to participate then the researcher will bring the mother back to the room and thank them for participating.

Would you like to play do some activities with me, like looking at some pictures, and playing some games for about 40 minutes? Would you mind answering some questions for me? Is it o.k. if we play some games and talk about some things together?

[child's response here]

Okay, some of the questions are about you and some of the questions are about you and your family. There are no right or wrong answers for any of the questions, you don't have to answer any question that you don't want to answer, and I won't tell anybody what you tell me. The only time I will anybody what you told me is if you tell me that someone is hurting you. Do you understand what I just said?

[child's response here]

Is that o.k.?

[child's response here]

Do you have any questions you want to ask me about what we will be doing together today before we start? You can ask me any questions you have at anytime when we are doing the activities together or even after we stop.

Appendix U

Letter to Medical Clinic(s)

Children's Development of Pain Responses

DATE

Dear Dr. XXXX,

I am a clinical psychology graduate student working in the Dalhousie Pain Research Lab. I have been involved in a study of children's pain responses under the supervision of Dr. Patrick McGrath. I am interested in further pursuing this area of research for my dissertation. An honours student, Cathy Stewart, will be assisting me.

Children have very different responses to the same type of pain. We are interested in investigating certain factors that are believed to influence these different responses to pain. The factors we would like to look at include the child's age, sex, temperament, typical levels of activity and reactivity. We would also like to observe the child/mother relationship through their interactions during the immunization procedure.

We are asking for your help in allowing us to videotape the immunizations of approximately 20-40, four- to five-year-old children. We will be taping only the child's face for approximately 2 minutes during the immunization procedure and recording all that is said during this time. Every attempt will be made to stay out of the nurse's and/or doctor's way. The tapes will then be taken to the Dalhousie Pain research Lab where they will be analyzed. We hope to be finished will all of the videotaping by the end of this year.

Lastly we would truly appreciate it if the staff of XXXX would help us by contacting ~40 mothers, with children born between the months of April 1997 and October 1997. Recruiting these children would involve calling the mothers of patients who visit the clinic, and who are in the required age range, and asking if they would mind being contacted by those involved in this study. We ask if the staff of XXXX would provide us with a list of the mothers' names, phone number's and their child's date of birth of those participants agreeing to be contacted. Agreeing to be contacted does not mean that the mothers are agreeing to participate in the study. We will only be using those families interested in the study. All further contact with the families would be our responsibility. A summary of what contact information is needed and a copy of the initial phone contact script are attached.

If you have any questions or concerns regarding the study or the role we are asking you to take, please contact either Trudi Walsh or Cathy Stewart (XXX-XXXX). Our plan is to contact you by telephone in a week or two to see if your setting is willing to participate.

Thank you for your consideration.

Trudi Walsh, MSc

Appendix V

Script for Second Visit in Study at Medical Clinic

Hello Ms. _____ and __Child's name___. Before you go in to the doctor, I'd like you to complete several rating scales about how you think your child is going to react to his/her needle today and your anxiety surrounding the needle. *Administer Parental Anxiety Rating Scale*

(When mother goes in to the doctor) I'll wait here until you return for the needle.

(When mother returns for needle) It's important for me to have a clear view of your child's face during the needle, because I will use changes in facial expression to code his/her response. Because of this, I'll ask you to try not to block your child's face during and after the needle. I will tape for about 20 seconds before the first needle and about 30 seconds after the second needle. *Child's name* do you see the red light on the camera? Can you look at the red light while the nurse/doctor gives you your needle?

(After needle video-taping complete) I have one more form for you to fill out. It is similar to the forms I gave you to fill out at home but is specifically about your child's response to his/her needle. *Administer the Medical Pain Incident Form*

Thank you both for helping me with this study. I appreciate your time and effort. I will be sending all interested participants a summary of the results, when one becomes available. Thank you again for your participation. Do you have any questions before you go?

Appendix W

Summary of Main Predictor and Criterion Variables

Predictor Variables:

Attachment Behaviour

- raw mean scores on the secure, avoidant, ambivalent, and controlling P/CRI behaviour rating scales
- higher scores indicate greater degree of occurrence of the behaviour upon reunion with the mother

Attachment Representations

- raw scores on the SAT attachment security, self-reliance, and inverse avoidance rating scales
- higher attachment scores indicated greater expression of vulnerability or need about the separation; higher self-reliance scores reflect greater expression of self-confidence about handling the separations more or less independently; higher inverse avoidance scores indicate a lower degree of avoidance in discussing the separations
- raw scores on the PART attachment security, self-reliance, and inverse avoidance rating scales
- higher attachment scores indicated greater expression of vulnerability or need about the pain incident; higher self-reliance scores reflect greater expression of self-confidence about handling the pain incidents more or less independently; higher inverse avoidance scores indicate a lower degree of avoidance in discussing the pain incidents

Emotion Regulation

- lability/negativity subscale of the ERC, with higher scores reflecting greater dysregulation
- emotion regulation subscale of the ERC, with higher scores reflecting greater regulation

Attachment Dimensions

- raw scores on the attachment security dimension aggregate (comprised of weighted average of *z*-scores for the SAT and PART Attachment Rating Scale and Self-Reliance Rating Scale self- and other-reference scores, P/CRI secure behaviour rating scale mean scores, and ERC emotion regulation subscale scores) with higher scores reflecting greater attachment security

- raw scores on the attachment avoidance dimension aggregate (comprised of weighted average of *z*-scores for the SAT and PART Avoidance Rating Scale self- and other-reference transformed scores, and P/CRI avoidant behaviour rating scale mean scores) with higher scores reflecting greater attachment avoidance
- raw scores on the attachment ambivalence dimension (comprised of ambivalent behaviour rating scale mean transformed scores) with higher scores reflecting greater ambivalent attachment
- raw scores on the attachment controlling dimension aggregate (comprised of average of *z*-scores for the P/CRI controlling behaviour rating scale mean scores and lability/negativity subscale of the ERC) with higher scores reflecting greater controlling attachment

Criterion Variables:

Maternal Behaviour During Immunization

- five maternal CAMPIS-R Coping Promoting to Distress Promoting verbalizations ratio summary scores, with higher scores reflecting greater coping promoting verbalizations
- M-PIRF parental response subscale scores (coded as 0 – absent, 1 – present)
- mother's self-reported raw score on the 0- to 10-point anxiety rating scale, with higher scores reflecting greater anxiety about the needle procedure

Child Behaviour During Immunization

- five child CAMPIS-R Coping Promoting to Distress Promoting verbalizations ratio summary scores, with higher scores reflecting greater coping promoting verbalizations
- M-PIRF child's reaction subscale scores including: overall behavioural reaction, reactivity level (in mm), anger level (in mm), amount of pain average child would experience (in mm), and calming time (in sec), with higher scores reflecting greater reaction, reactivity, anger, pain, and calming time
- M-PIRF child's response to maternal behaviour subscale scores including: number of secure, resistant, and avoidant behaviours, with higher scores reflecting greater occurrence of the behaviour

Measurement of Child Immunization Pain

- raw scores on the FPS, with higher scores reflecting greater perceived self-reported pain
- four observer-reported VAS pain intensity ratings (baseline, needle 1, needle 2, and recovery), with higher values reflecting greater pain

- three primary CFCS summary scores (baseline, injection, and recovery) and 2 secondary CFCS summary scores (needle 1 and needle 2), with higher scores reflecting greater activity and therefore greater pain.

Measurement of Child and Maternal Everyday Pain Behaviour

- E-PIRF parental response subscale scores (coded as 0 – absent, 1 – present)
- E-PIRF child's reaction subscale scores including: overall behavioural reaction, reactivity level (in mm), anger level (in mm), amount of pain average child would experience (in mm), and calming time (in sec), with higher scores reflecting greater reaction, reactivity, anger, pain, and calming time
- E-PIRF child's response to maternal behaviour subscale scores including: number of secure, resistant, and avoidant behaviours, with higher scores reflecting greater occurrence of the behaviour
- raw scores on the FPS, with higher scores reflecting greater perceived self-reported pain