PAIN REACTIVITY AND ILLNESS BEHAVIOUR IN KINDERGARTEN-AGED CHILDREN

by

Elizabete Rocha

B.A., The University of British Columbia, 1995

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

in

PSYCHOLOGY

THE UNIVERSITY OF NORTHERN BRITISH COLUMBIA

April, 1998

ABSTRACT

Little is known about the factors that influence pain and somatization in young children. This study tested a proposed model to examine the predictors of pain reactivity and illness behaviour in children. A sample of 157 kindergarten aged children requiring routine inoculation and their mothers participated. To assess the prediction that mothers' sensitivity to variations in facial pain expressions would influence children's pain reactivity, mothers watched and rated 12 video clips of facial pain expressions. Next, children's responses to inoculation were videotaped and coded for pain reactivity using the Facial Action Coding System. Mothers completed questionnaires assessing: their child's previous experience with medical procedures, family history of pain, parental encouragement of illness behaviour (Illness Behavior Encouragement Scale), level of somatic complaints (Children's Somatization Inventory), and temperament (Behavioral Style Questionnaire). A multiple regression examining the predictors of pain reactivity was significant, $F(6,151) = 4.1$, $p < .001$. Children's temperament and experience with previous medical procedures were significant predictors. A multiple regression examining the predictors of illness behavior was significant, $F(3,154) = 2.6$, $p < .05$. Pain reactivity was the only significant predictor. These findings suggest that continued consideration be given to the role of children's previous experiences with medical procedures and temperamental style in response to painful stimuli. Moreover, because pain reactivity was significantly related to illness behaviour, interventions designed to minimize non-adaptive pain response in children who exhibit extreme reactivity may lead to decreased somatization. Results are discussed in terms of future research directions and clinical implications.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENT

I extend my sincere appreciation to my thesis supervisors, Ken Prkachin and Sherry Beaumont, for their invaluable advice and support. Cindy Hardy is thanked for her excellent suggestions on the manuscript. I thank the following people for their help in data collection: Lynn Lee-Ran, Karen Schierer, Christine Gertzen, Caron Hurt, Elizabeth Hughes and Greg Pope. In addition, I thank Reiko Graham for conducting some of the reliability coding.

The study could not have been successful without the enthusiastic assistance of the staff and volunteers of the Prince George Northern Interior Health Unit. The University of Northern B.C. Nursing Department is thanked for the loan of audiovisual equipment used in the data collection. I extend my gratitude to the many mothers and children whose participation made this study possible.

And finally, I am grateful for the continued support and encouragement of my family and friends.

This thesis is dedicated to the memory of my brother George, whose youthful spirit and zest for life encourages me to achieve my goals.

CHAPTER I

Pain Reactivity and Illness Behaviour in Kindergarten-Aged Children

Illness behaviour, as defined by Mechanic (1962, 1978, 1984), describes the manner in which persons monitor their bodies, define and interpret their symptoms, take remedial actions, and utilize various sources of help. Pain behaviour can be defined as overt or observable actions in response to an unpleasant sensory and emotional experience associated with actual or potential tissue damage (Fordyce, Roberts, & Sternbach, 1985). The potential public health impact of both illness behaviour and pain is enormous. Pain is among the leading symptomatic reasons for visits to physicians (Osterweis, Kleinman & Mechanic, 1987) and accounts for a large proportion of medical care costs. For example, the Quebec Task Force (Spitzer & Task Force, 1986) reviewed the records of 3,000 workers in Quebec who reported an incident of occupational back problems. Although only 7.4 percent of the patients were disabled for more than six months, this small group of chronic pain patients accounted for 70 percent of lost work days and for 73 percent of medical care costs that year.

One of the most troubling clinical paradoxes about pain is that there are often observed discrepancies between the clinical manifestation of pain and the behaviours of people with pain. The concept of illness behaviour, being couched in the psychological, social and cultural domains, provides a framework for understanding these discrepancies. For example, consider a typical chronic pain patient. He or she may have lost gainful employment, rely on disability payments or

a spouse's earnings, and thus experience considerable financial strains. Pain and disability may lead to mood alterations in the patient that can adversely affect the family which has to deal with altered roles and responsibilities. The way the family copes with these added strains, in turn, may affect the course of illness. This example helps to illustrate the rationale for viewing the concepts of pain and illness behaviour within a broader context of psychosocial issues.

The patterns for exhibiting illness behaviours develop in childhood and carry on into adulthood (Mechanic, 1980). Pain complaints are frequent in childhood and comprise a significant part of pediatric medical care (McGrath & Feldman, 1986). For example, Apley (1975) estimated the prevalence of recurrent abdominal pain at 10 to 15% of school-aged children. Identification of factors that may play a role in the etiology of recurrent illness behaviour is an important issue in the potential prevention and management of maladaptive pain and somatization. The purpose of this study is to examine the determinants of pain reactivity and illness behaviour in young children.

A myriad of factors may influence a child's response to pain and other somatic complaints. A particularly relevant factor in the ontogeny of pain expression is social learning. Because parents are primary socializers of children, they play a significant role in determining how children communicate their pain (Craig, 1983). Although research in this area is growing, to date no studies have examined the role of parents' ability to decode facial expressions of pain in their child's pain behaviour. Because children are not as adept at verbally communicating their pain as adults, parents often must rely on alternative methods to infer pain in their child. Facial

expression represents a rich source of information about reactions to pain and is one common form of communicating information about pain to others. One purpose of the present study was to discover whether parents' sensitivity to facial expressions of pain is related to pain reactivity and illness behaviour in their children. It was predicted that parents who are less accurate at decoding pain expressions would have children who displayed increased pain reactivity to inoculation. It was also predicted that accuracy at decoding pain expressions would be associated inversely with parents' reports of somatic complaints in their children. This prediction was based on the idea that children who display increased pain expression may do so in attempts to elicit attention and sympathy from parents who are seemingly not sensitive to their illness states. Parents who are extremely sensitive at decoding pain expression were also predicted to have children who display heightened pain reactivity and illness behaviour. In this case, increased reactivity and illness behaviour would be due to parents' over-responsiveness to painful incidents, resulting in operant reinforcement of the child's illness behaviour.

Background Literature

Pain Reactivity in Children

As they mature, children naturally sustain a diversity of routine injuries, varying from superficial bumps, cuts, burns and scrapes that cause minimal tissue damage to deeper wounds that cause moderate to severe tissue damage. Children also experience pains from medical and dental treatments, such as immunization injections, blood-sampling or local anesthetic infiltrations. The same type of injury will often not produce equivalent levels of pain in all children. Even young children

clearly note distinct levels of pain and affect for similar noxious stimuli (McGrath, 1990). Children undergoing medical procedures that damage tissue may feel pain. Although the range of children's pain reports for different medical procedures is generally proportional to the level of tissue damage, the pain for each procedure may be minimized or enhanced by emotional, situational and other factors. For example, Ellerton, Ritchie and Caty (1994) examined the pain and coping behaviours of preschool children during venipuncture. Results showed that the child's report of procedural pain was correlated with the number of coping behaviours used by the child and with helpful nursing interventions. In addition, two studies examining pain response to bone marrow aspirations in children with cancer have found that the number of previous medical experiences is negatively correlated with distress response and that mothers' anxiety is positively correlated with distress response (Jacobsen et al., 1990; Jay, Ozolins & Elliott, 1983).

The intensity of the child's response, or reactivity, to painful stimuli can be inferred by several behavioural means. For example, vocalizations or cry patterns, facial expressions, and torso or limb movements are behaviours typically associated with pain. These distress responses are invaluable for inferring pain in children who may not be able to describe or rate their pain accurately. However, pain behaviour is often assessed conjointly with anxiety, usually resulting in a measure comprising an integrated index of the child's fear, anxiety, distress and pain. For example, the Procedure Behaviour Rating Scale (PBRS), a frequently used tool designed to assess behavioural distress during painful medical procedures (Katz, Kellerman & Siegel, 1980), uses a variety of distress-related behaviours to determine child

response. A revised version of this scale called the Observational Scale of Behavioural Distress (OSBD) created by Jay et al. (1983) consists of 11 operationally defined behaviours indicative of anxiety and/or pain in children. The authors noted the difficulty in distinguishing anxiety and pain in acute clinical situations and chose to devise a measure that encompassed both constructs. Still, researchers have recommended that one should try to assess the anxiety and sensory components of pain separately (Winer, 1982). Thus, there exists the challenge of distinguishing behaviour due to other forms of distress from behaviour due to pain.

In the present study, pain responses to an acute medical stressor in children were assessed using facial expression as the key measure. Facial expressions of pain have been shown to be a common form of pain behaviour which tap a specific dimension of pain experience that is relatively independent from the expression of psychological distress. For example, LeResche and Dworkin (1988) examined facial expressions of pain and other emotions in patients with temporomandibular disorder pain (TMD). Patients were observed during a standard clinical dental examination involving measurement of voluntary and forced mandibular opening. The sessions were videotaped and later coded for facial expressions of pain, fear, anger, sadness, disgust or contempt. Results indicated that whereas self-report measures of anxiety and depression were correlated with some global self-report measures of pain (e.g. visual analogue scale measures), this relationship was not evidenced between self-report measures of anxiety and depression and facial expressions of pain. The finding that verbal measures of anxiety and depression

were more likely to be associated with verbal pain report than with non-verbal facial expressions of pain suggests that facial expression measures make use of a specific element of pain experience. Thus, facial expressions are indeed measuring pain, not specific affective disturbance. Furthermore, Prkachin (1992) found that a combination of facial expressions are consistent across pain induced by several modalities (electric shock, cold, pressure, and ischemia). Four facial actions provided evidence of a consistent association with pain: brow lowering, tightening and closing of the eyelids, and nose wrinkling/upper lip raising. A factor analysis demonstrated that these facial actions reflected a general factor with a consistent pattern across modalities, suggesting that the four actions were able to identify most of the facial information conveyed about pain. Therefore, facial expressions of pain are a consistent and reliable means of assessing pain.

Although there is no direct evidence of cross-cultural consistency of facial pain expressions, studies of other expressions of emotion have demonstrated the universality of facial expressions. For example, a study examined cultural variation in facial expressions of happiness, anger, sadness, fear, surprise and disgust. Results demonstrated that people in various cultures can easily read the emotions of another culture, agree on how to convey a given emotion, and on what combinations of two emotions an expression conveys (Ekman et al., 1987). Therefore, although not empirically examined in this study, because facial pain expressions are basic expressions in human interaction, it is likely that they are cross-culturally consistent. Taken together, the evidence of the consistency of facial expressions of pain across pain modalities, and the likelihood that they are also

consistent across cultures, supports the use of facial expressions to examine children's pain responses to noxious medical procedures independently of other distress behaviours.

Illness Behaviour in Children

Illness behaviour refers to the variability in reactions to somatic symptoms and illness, and can be affected by various sociocultural, environmental and psychological factors (Mechanic, 1995). A crucial premise in the study of illness behaviour is that illness, as well as illness experience, is shaped by these factors irrespective of their genetic, physiological, and other biological bases (Mechanic, 1985). Illness is often used to achieve a variety of social and personal objectives having little to do with biological symptoms or the pathogenesis of disease. For example, Mechanic (1985) describes the many anomalous findings when the medical definition of a case is examined and not the processes that may lead to its social definition. For example, why are rates of depression, neurotic disturbance, and the use of prescription and over the counter medication relatively high among women, and alcoholism, hard drug use and violence particularly high among men? Are these independent observations or is there an underlying process leading to alternate pathways of expression? Why, among populations such as the Chinese, are affective expressions of depression uncommon, but the somatic complaints relatively frequent? Understanding these questions requires inquiries into culture, social situations and personal predispositions.

The concept of illness behaviour shares various features with that of somatization; in fact, the two constructs seem to overlap. Somatization has been

defined as the tendency to experience or express psychological states as somatic symptoms (Lipowski, 1985, cited in Kirmayer, 1985). The difference between the definitions of illness behaviour and somatization seems to be that illness behaviour can be a type of response to a veritable underlying physiological concern, whereas somatization occurs in the absence of a true bodily complaint. These boundaries become blurred when we consider that many times physicians will be unable to find a physiological cause for a person's complaints, not necessarily because one does not exist, but rather because of the limits of modern medicine. For example, although ten to 15% of school children complain of recurrent abdominal pain, data indicate that 20 to 80% of those complaints result in positive organic findings (Barr, 1983). Thus, distinguishing between "real" physical complaints and those that are psychogenic in nature seems futile. Consequently, this study will use the terms "illness behaviour" and "somatization" interchangeably as referring to the way in which a person responds to bodily indications and the conditions under which they come to view them as abnormal.

Although much of the literature focuses on illness behaviour in adults, somatic complaints occur frequently in children. To the author's knowledge, there are currently four measures used to assess somatization in children: the Children's Somatization Inventory (CSI; Garber, Walker, & Zeman, 1991); the Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker, 1982); the somatic complaints scale of the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983); and the Symptom Inventory Rating Scale (SIRS; Leikin, Firestone, McGrath, & Bernard, 1987). Somatic complaints assessed in children include colds, gastrointestinal

symptoms and various bodily pains. In a recent study using the CSI, 15 percent of children in grades 2 through 12 reported four or more symptoms in the previous two weeks, the cutoff for significant somatization suggested by the authors (Garber et al., 1991). The most commonly reported symptoms were headaches, low energy, sore muscles, nausea or upset stomach, back pain, stomach pain, blurred vision, weakness, and food intolerance. Acknowledging that such illness behaviours are common in young children, and measures are available for assessing its expression, researchers must also examine antecedents of its expression.

Previous research on somatization in children has described some of the variables affecting its presentation. Campbell (1978) interviewed parents and their children aged 6 to 12 years at a pediatric hospital. Children responded to 14 questions concerning their own actions in a variety of situations related to illness or injury. A factor analysis of these self-reports provided measures for three aspects of sick-role functioning: level of emotionality in illness and injury, rejection of the sick-role, and communication of the sick-role identification. Results showed boys, older children, and children of parents with higher socioeconomic status tended to minimize somatic complaints. Consistent with some of these findings, a more recent study (Garber et al., 1991) also revealed that girls exhibit increased somatization relative to boys. However, this difference was found only for senior high school students; there were no significant gender differences in junior high school or elementary school-aged children. It also was found that high school boys had significantly lower somatization scores than did elementary school boys; no significant age difference was found for girls. Although this research seems to

suggest that girls exhibit more somatic complaints than boys, reports of gender and age differences in illness behaviour have been mixed. For example, Grunau, Whitfield, Petrie and Fryer (1994) found no significant gender differences in somatization at four years. Somatization was measured by mother-report on a 30-item somatization scale tapping the occurrence of stomach aches, headaches, leg pains, and other somatic symptoms and concerns which was developed for this study. Apart from revealing nonsignificant gender differences, this study also revealed that level of family conflict, as measured the Family Relations Subscale of the Personality Inventory for Children (Wirt, Lachar, Klinedinst, & Seat, 1977, cited in Grunau et al., 1994), was positively related to somatization levels. Another study examining physical symptom reporting in children aged five to 14 years demonstrated that older children reported more clinical symptoms than younger children using the SIRS (Leiken et al, 1988). That study also found that, independent of age and gender, Type A children under reported a wide variety of symptoms. Type A assessments included teacher reports of aggressiveness, competitive-achievement striving, and impatience. It is evident that comparisons across these investigations are difficult, due to the differences in tools used to assess illness behaviour and the range of age groups examined. Nevertheless, these studies, unfortunately, fail to provide a consistent depiction of illness behaviour in children. Age and gender differences are inconsistent across studies and personality and family conflict variables are beginning to emerge as important correlates of illness behaviour.

As alluded to, the family environment provides an important arena for the

development of a child's characteristic pattern of symptom reporting. The theoretical framework of social learning theory has guided research which suggests that modeling and reinforcement of illness behaviour by other family members contributes to the development and maintenance of patterns of illness behaviour (Craig, 1983). For example, one investigation demonstrated that children with recurrent unexplained pain and their parents were more likely to report positive consequences for the pain and to identify models of pain or illness behaviour in their environment (Osborne, Hatcher, & Richtsmeier, 1989). Rickard (1988) found that children of chronic lower back pain patients exhibited a higher frequency of behaviours hypothesized to be learned through observation of, and interaction with, a chronic lower back pain parent than did children of diabetic or healthy parents. Results of these studies provide support for a social learning perspective on the development and maintenance of excessive illness behaviour in children.

The Role of Communication of Facial Expressions

Although pain is subjective, it is the outward expression , or the observable illness behaviours, that defines the occurrence and the severity of the problem for others. Facial expression is a principal cue for caregivers' perceptions of children's distress, which, in turn, influence the level of concern expressed (Le Resche & Dworkin, 1984). Facial expressions are especially important in young children as self-report is not always useful due to changing cognitive-developmental levels. Therefore, parents must use other cues (e.g. facial expressions) to quantify the pain experienced by their children. Inevitably parents will vary in their ability to use these cues effectively. For instance, some individuals have great difficulty

identifying the feelings communicated to them through the facial expressions of other people (Buck, 1984; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979). Other research has shown that observers are not particularly sensitive to facial cues of a sufferer's pain and appear to make insufficient use of the expression, often demonstrating an underestimation bias (Prkachin, Berzins, & Mercer, 1994; Prkachin, Soloman, Hwang, & Mercer, 1995). To date, no studies have examined the possible effects of variation of parents' sensitivity to facial pain expressions on the pain and illness behaviour in others. Nevertheless, it seems conceivable that parents who are either insensitive or hypersensitive decoders of facial expressions of pain may have children who display increased pain reactivity and somatic complaints. With parents who are less sensitive at decoding, increased display of pain among their children might occur due to the child's need to amplify their display of illness to overcome the apparent lack of sensitivity from the parent. On the other hand, among parents who are highly sensitive decoders, increased display of pain among their children might occur due to the child's eagerness to attain the extra parental attention offered during times of illness.

Parental ability to decode facial expressions of pain may be particularly relevant to children's illness behaviour for two reasons. First, in infancy and early childhood, children spend much of their time with parents. When experiencing pain or illness, parents are usually the first persons to whom children will turn for assistance. Thus, the parent-child interaction is of primary importance to the child. Second, because young children are not great communicators, they often depend on parents to ascertain what ails them.

Although young children may not be verbally or cognitively aware of the social display rules for pain they have internalized, they may nonetheless engage in social rule governed behaviour. For example, Cole (1986) demonstrated that children as young as four years can exercise control over the display of negative emotion. Other observers have noted that young children display more negative expressions in the presence of an adult than when playing with other children (Blurton-Jones, 1972; Zeman & Garber, 1996). These facial display rules are learned largely through indirect feedback and observational learning (Gnepp & Hess, 1986). Thus, children may learn the extent and manner in which their behaviour and verbal expressions of suffering are most likely to draw parents' attention.

Prkachin and Craig (1995) have introduced a model which describes the processes involved in the encoding and decoding of pain expression. They note that there are three distinct phases of reaction to pain by observers : (a) detecting and discriminating the available information; (b) attaching meaning to that which has been perceived; and (c) reacting behaviourally. Therefore, before responding to pain, parents must first be able to detect and discriminate pain expressions. Parents who are less accurate at detecting facial cues may be less likely to make a behavioural response to the pain expression. Thus, children may need to amplify their display of pain (an effect on display rules) and illness behaviour in order to ensure that their suffering is detected. Altematively, parents may be overly likely to make a behavioural response to the pain expression. If that response itself is reinforcing, for example by communicating warmth or soothing, children may amplify their display of pain due to the process of operant conditioning. The primary

purpose of the present study was to empirically examine these possibilities.

Given that pain expression and illness behaviour are multi-dimensional constructs, the importance of other predictors will also be assessed. Three factors believed to be predictive of illness behaviour will be examined: pain reactivity, parental illness behaviour encouragement, and number of family members who have experienced, or are currently experiencing a chronic illness. The latter two factors are based on operant conditioning and social learning theories, respectively. Both theories have played a prominent role in the explanation of pain and illness behaviour and are therefore relevant to the development of illness behaviour.

The Role of Operant Learning

Operant conditioning models emphasize the important role of contingent reinforcement in the development of pain and illness behaviour. The family may play a primary role as an agent of positive and negative reinforcement. Indeed, clinical lore suggests that disability and handicap run in families. If a parent is unable to work because of pain, there may be an increased risk that the child will miss school because of pain. Despite the lack of epidemiologic data in this area, some studies suggest this may be true. A study using videotaped parent-child interaction showed that, in comparison to adolescents who coped well with chronic pain, adolescents who did not cope well had mothers who were significantly more likely to display behaviour that discouraged the adolescent's efforts at coping with an exercise task (Dunn-Geier, McGrath, Rourke, Latter, & D'Astous, 1986). Another investigation demonstrated that children with recurrent unexplained pain and their parents were more likely to report positive consequences of the pain and to identify

models of pain or illness behaviour in their environment than were children with explained pain (Osborne, Hatcher, & Richtsmeier, 1989). A direct relationship also has been found between illness behaviour encouragement in parents and children's illness behaviour (Walker & Zeman, 1992). That study described the development of the Illness Behaviour Encouragement Scale (IBES) and its relation to various child somatic complaints. Results demonstrated that child-report IBES total scores were significantly correlated with child-report illness behaviour scores (measured using the PILL). Together, these findings support the prediction that children whose parents report reinforcing illness behaviour will exhibit increased somatic complaints.

The Role of Social Modeling

According to social learning theory (Bandura, 1977) children and adults learn a wide range of behaviours by observing and then imitating the observed behaviour. Whether or not the observed behaviour is imitated depends largely upon the salience of the model. Because parents are the primary socializers of young children, it is likely that they play an essential role in modeling pain behaviours for children. Therefore, children may learn to respond to pain or illness behaviour from observing parents' pain responses. For example, fathers who reported being more afraid of needles than other people, were found to have children with significantly stronger responses to a needle than other children (Schechter, Berstein, Beck, Hart, & Scherzer, 1991). The family modeling perspective (Craig, 1986) also is supported by studies that have reported a higher incidence of abdominal disorders in family members of recurrent abdominal pain patients than in family members of healthy children (Apley, 1975) and a significant positive correlation between the number of

pain models in an individual's familial environment and the frequency of his/her current pain reports (Edwards, Zeichner, Kuczmierczyk, & Boczkowski, 1985). I hypothesize that children who have more pain models in the home will exhibit increased somatic complaints.

The Role of Previous Pain Experience

Research has suggested that previous pain experiences may influence later pain behaviour. The results in this area are mixed, however. For example, a recent investigation of the effects of neonatal circumcision and its association with pain response to routine vaccination at four or six months found that circumcised infants had higher behavioural pain scores and cried longer than non-circumcised infants (Taddio, Katz, Hersich, & Koren, 1997). Three behavioural pain measures were used to assess pain: infant facial actions (using the Neonatal Facial Coding System (NFCS); Grunau & Craig, 1987), cry duration, and visual analogue scale scores rated by a pediatrician and an observer.

Consistent with these findings, Grunau, Whitfield and Petrie (1994) found that children who, as infants, underwent multiple painful procedures in a Neonatal Intensive Care Unit had higher levels of pain sensitivity at 18 months of age. However, the child's pain sensitivity was measured only by one parent-report item: "Child is very sensitive to pain of bumps or cuts or other common hurts," rated on a scale of one to five, ranging from "not characteristic" to "very characteristic" of their child. As a result, the validity of the sensitivity measure is questionable. Nevertheless, another study examined the relation between past medical experience and children's response to preparation for throat culture examinations in

pediatric outpatients aged three to 12 years (Dahlquist et al., 1986). Children's experience with medical procedures was described by mothers who rated their children's reactions to four types of medical procedures on a 7-point Likert scale (1 = negative, 4 = no reaction, 7 = positive). Results indicated that children with previous negative medical experiences demonstrated more behavioural distress (assessed using the Observation Scale of Behavior Distress; OSBD) during the examination than did children with previous positive or neutral medical experiences.

Together, these studies suggest that previous pain experience increases pain reactivity. However, some research has suggested that children habituate to painful medical procedures. Jacobsen et al. (1990) examined children's distress during a venipuncture required for pediatric cancer treatment. Children (aged three to ten years) who had fewer venipunctures exhibited greater distress than children who had more experience with venipunctures. However, after the effects of child age were statistically controlled, the result became nonsignificant. Jay et al. (1983) examined behavioural distress in pediatric cancer patients aged two to 20 years undergoing bone marrow aspiration. Using the OSBD to measure distress behaviours, results revealed that the number of previous medical procedures experienced by the child was positively related to distress behaviour; the effect remained after age was controlled.

It is notable that the two studies described which suggested habituation, occurred in medical procedures related to cancer. It may be that there exists a specific aspect of cancer treatments or something particular about children with cancer that would cause habituation to be more likely. There are, however, results

of studies examining pain in children with cancer that do not find an habituation effect. For example, Katz, Kellerman and Siegel (1980) examined responses to bone marrow aspiration in children with cancer aged one to 17 years. Distress responses were measured using the Procedure Behavior Rating Scale (PBRS) and no stable pattern of habituation to the procedure was found. Similarly, another study revealed no effect of prior pain experiences (Wong & Baker, 1988). That study examined self reports of pain caused by various hospital procedures in hospitalized children aged three to 18 years. Pain was assessed using six different pain scales and findings suggested that children do not become accustomed to pain. Children who had numerous painful procedures were just as likely to report that venipunctures or injections hurt as children who had not experienced traumatic tests such as bone marrow aspirations. Taken together, the various studies examining the effects of previous pain experience on pain behaviour are inconsistent. That is, some studies have demonstrated a habituation effect, and others a sensitization effect. In the present study, it was predicted that children who had previous negative experiences with medical procedures would exhibit increased pain reactivity to a noxious stimuli.

Role of Temperament

Children bring to the pain experience their own individual responses which may determine how well they cope with the pain and their reactivity to it. One method of conceptualizing these varying responses is to label them as temperament. Temperament can be defined as a behavioural style of reacting to the environment (Thomas & Chess, 1977). Although researchers do not always

define or measure temperament in precisely the same way, most would agree that such attributes as *activity level* (the typical pace or vigor of behaviour), *irritability* or *emotionality* (how easily and intensely upset the child becomes over negative events), *soothability* (how easy the child is to calm after being upset), *fearfulness*, and *sociability* (receptiveness to social stimulation) are important components of temperament (Buss and Plomin's study, and Rothbart's study; as cited in Shaffer, 1993). Accordingly, measures designed to assess temperament should incorporate these dimensions into their scales. There have been many measures developed to obtain temperament ratings in children ranging from infanthood to middle childhood. In early school aged children (three to seven years), there are two frequently used measures: the Temperament Assessment Battery Scale (TABS; Martin, 1983) and the Behavioral Style Questionnaire (BSQ; McDevitt & Carey, 1978).

The role of temperamental characteristics in various aspects of children's health functioning has been described. Research has demonstrated that children with a difficult temperament have a greater frequency of colic (Carey, 1968) and tend to sustain more accidents requiring sutures (Carey, 1972) than children with other temperaments. One might suspect that a child with a difficult temperament also may cope less well with pain or receive inappropriate attention for such behaviours. In fact, temperament has been found to be significantly correlated with pain response. A study examining the responses of five-year-old children to immunization found some temperament ratings to be related to distress response (Schechter, Berstein, Beck, Hart, & Scherzer, 1991). Distress response was measured using a revised version of the PBRS. Using the BSQ, researchers

showed that the child's "adaptability" (the ease or difficulty with which reactions to stimuli can be modified) scores were significantly correlated with level of distress. Mothers', but not fathers', ratings of "rhythmicity" (the regularity of physiologic functions such as hunger, sleep and elimination) also were significantly correlated with distress.

Grunau et al. (1994) examined the role of temperament on pain sensitivity in toddlers. Temperament was assessed using a 20-item 5-point rating scale from which measures of child Emotionality, Activity, Sociability and Shyness are derived (Bus and Plomin's study, as cited in Grunau et al., 1994). A composite temperament score was correlated with child pain sensitivity. The results showed that temperament was related to pain sensitivity. However, as mentioned earlier, pain sensitivity was measured using one parent report item. For the present study, it was hypothesized that children with more difficult temperaments would display increased pain reactivity.

Overview of the Present Study

This study capitalized on the convenience and methodological advantages of routine public health inoculations. All children entering kindergarten are recruited to undergo a Diphtheria-Pertussis-Tetanus-Polio (DPTP) booster shot. From a methodological standpoint, inoculations of this sort are advantageous because they have a clearly defined stimulus and a specific time of onset. Inoculations of this type are generally considered to be particularly painful and thus a range of distress behaviours may be expected.

Because a major focus of the study was on the child's pain reactivity and

illness behaviour, it was important to measure the child's pain reaction to the inoculation as objectively and sensitively as possible. One way of doing this is by application of a fine-grained method for measurement of facial behaviour, the Facial Action Coding System (FACS) (Ekman & Friesen, 1978). The technique provides an objective, quantitative description of any visible facial reaction to the inoculation in terms of its underlying muscular basis. The validity of the measure has been demonstrated in adults and infants experiencing pain (Prkachin & Mercer, 1989; Grunau, Johnston, & Craig, 1990).

Rationale and Goals of the Present Study

The foregoing review provides a rationale for the research questions considered in this study. Based on the available literature and models, a series of hypotheses and predictions were made.

Four variables were expected to predict pain reactivity in children: (a) parental decoding ability; (b) the child's experience with medical procedures; (c) the child's temperament; and (d) the number of pain models in the home. Because prior research has demonstrated that people may vary in their ability to identify facial expressions of emotions in others (Buck, 1984; Prkachin, Berzins, & Mercer, 1994), the present study sought to examine whether the variation in parents' ability to decode facial expressions of pain was related to their child's pain reactivity. There is currently no literature in this area, thus, hypotheses were based on the logic that people who are good decoders are, by definition, highly sensitive to variations in children's distress. Consequently, these parents are expected to show an adaptive

response to children's distress, resulting in more normative pain behaviour in their children. Less accurate decoders may be less sensitive to variations in distress, such that children need to display more behaviour to elicit the appropriate response from parents. This may result in more pathological illness behaviour. Accordingly, it was predicted that parents who were less sensitive at decoding facial expressions of pain would have children who reacted more negatively to a noxious stimuli. On the other hand, parents who were extremely sensitive at decoding facial pain expressions also were predicted to have children who displayed a heightened response to pain.

Research has suggested that previous pain experience may influence later pain behaviour (e.g. Dahlquist et al., 1986; Grunau et al., 1994; Taddio et al., 1997). Accordingly, children who had previous negative experiences with medical procedures were expected to display increased pain response to routine vaccination.

Several studies indicate that a child's temperament may be important in predicting pain reactivity (e.g. Schechter, Bernstein, Beck, Hart & Scherzer, 1991; Wallace, 1989; Young & Fu, 1988). In the present study, children with more difficult temperaments were predicted to display increased pain reactivity. In addition, prior research indicates that the number of pain models in one's home is positively related to the frequency of one's pain reports (e.g. Edwards et al., 1985). In the present study, it was expected that the number of pain models in the home, as reported by mothers, would be positively related to the child's pain reactivity.

Three variables were expected to predict children's somatization scores: (a) number of pain models in the home; (b) the child's pain reactivity; and (c) parents' illness behaviour encouragement.

The social learning framework has guided research with adults and children which suggests that modeling and reinforcement of illness behaviour by family members contribute to the development and perpetuation of patients' illness behaviour (e.g. Dunn-Geier, McGrath, Rourke, Latter, & D'Astous, 1986; Turkat, 1982). Accordingly, it is hypothesized that both the number of pain models in the home and parents' reports of encouraging illness behaviour will be positively related to children's illness somatization.

Given that pain expression is the cardinal somatic sign, it may be true that factors that contribute to pain reactivity (e.g. parental ability to decode facial expression) also may markedly influence illness behaviour. In many ways the reactivity that children demonstrate is an example of illness behavior, as much of their expression is designed to communicate to others the extent of their pain. Thus, children's pain reactivity was expected to be positively related to children's illness behaviour.

Figure 1 presents a model which summarizes the foregoing and was used to guide the methods, data collection and analyses in the present study. The purpose of the proposed research was to examine the predictors of pain reactivity and illness behaviour presented in the presented model. In particular, the predictive power of the role of parental ability to decode facial expressions of pain was examined as to

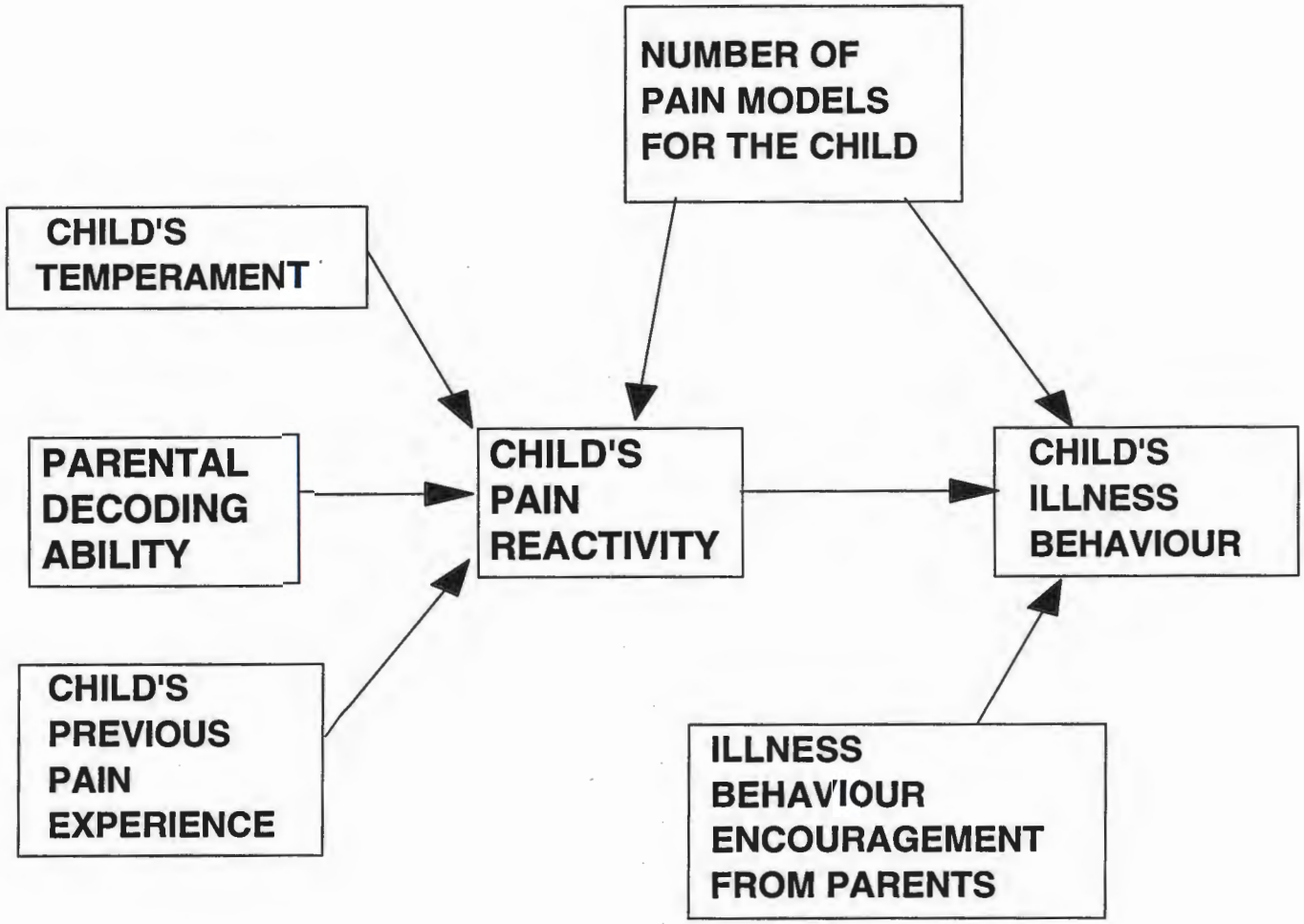

Figure 1

Proposed Model to Examine the Predictors of Pain Reactivity and Illness Behaviour

date, it has not been investigated. The role of pain reactivity as a mediating variable of illness behaviour was also assessed.

The present study will contribute to the existing literature in many ways. For example, to date, no studies have examined the aforementioned issues in early-school-aged children in a comprehensive manner. Also, it is notable that this study is one of the first to elucidate the possible links between temperament, parental decoding ability, previous medical experiences and an objective measure of pain reactivity. Because other studies in school-aged children have predominantly focused on global conceptualizations of distress, no relationships specific to pain reactivity could be demonstrated. In addition, the examination of the possible contribution of pain reactivity to illness behaviour in children has been absent from the literature, yet may have important implications for the possible prevention of dysfunctional pain and somatization.

CHAPTER II

Method

Participants and Setting

The participants included 157 mothers and their children. The mean age of children was 5.2 years, and 53% of the children were boys and 47% were girls. Other demographic characteristics of the participants are shown in Tables 1 and 2. Information on family health status was collected and is presented in Figure 2.

The study was conducted at the Northern Interior Health Unit (NIHU) in Prince George, B.C. during the month of September, 1997. The clinic serves the northern interior regional district of B.C., an area that has a varied ethnic composition and socioeconomic status. Seven community health nurses administered the injections

Families were recruited in two ways. First, notices sent out by the Northern NIHU in Prince George, B.C. provided information on the study and interested families were asked to call the principal investigator at a university research lab. When they did so, a time to meet parents at the NIHU was arranged. Second, on the days of the inoculations, a research assistant approached parents and asked if they would be interested in participating. Three hundred and fifty-nine parents were approached and 289 were recruited to participate in the study. Seventy (19%) of the parents approached declined to participate. Although the reasons for declining were not formally assessed, several parents stated that they did not have the extra time and others "just wanted to get it over with." The first 26 subjects recruited to participate were used as a pilot sample. Of these 26, one father and 25 mothers

Table 1

Participant Age and Demographic Characteristics

Variable	Range	M	SD
Age			
Mother (years)	21-45	32.26	4.78
Father (years)	24-54	35.07	4.99
Child (months)	56-68	61.81	3.50
SES	22-101	44.76	13.27

Note. Socioeconomic status was calculated according the Blishen et al., index (1987). The mean of 44.39 represents middle class.

Table 2

Other Sample Characteristics

Variable	Frequency	Percent
Child Gender		
Male	83	52.87
Female	74	47.13
Child's Birth Order		
1	69.00	44.80
2	55.00	35.71
3	21.00	13.64
4	7.00	4.55
5	2.00	1.30
Ethnic Status		
Caucasian	149	94.90
Aboriginal[a]	1	.64
Mixed Aboriginal /Caucasian	6	3.82
Punjabi	1	.64
Marital Status		
Married	116	73.89
Divorced/ Separated	14	8.90

(table continues)

Table 2 (cont'd)

Remarried	3	1.90
Widowed	1	0.60
Never Married	10	6.30
Common Law	13	8.30

[a] Aboriginal status was determined by self-definition.

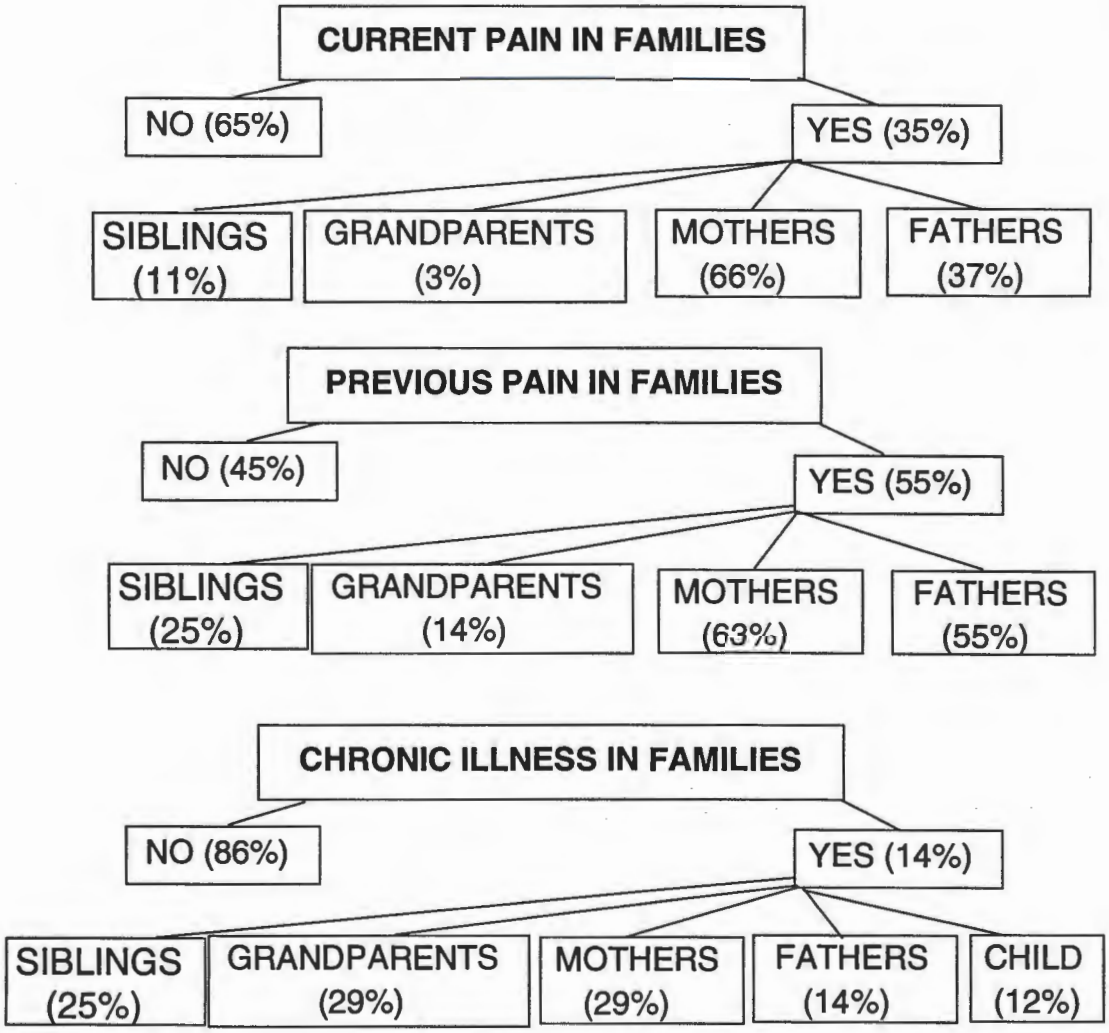

Figure 2.

Current pain in families = the number of mothers who reported having someone in the home suffering from a pain condition. Break-downs of family members who are experiencing pain problems are provided.

Previous pain in families = the number of mothers who reported previously having someone in the home suffering from a pain condition. Break-downs of which family members experienced pain problems are provided.

Chronic health/illness condition in families = the number of mothers who reported having someone in the home with a chronic health condition. Break-downs of which family members are experiencing chronic health conditions are provided.

Note. Percentage figures represent percentages within the sub-sample and may sum to over 100% because of multiple representation of family members in each category.

participated. Consequently, it was decided to recruit only mothers for the study due to the potential problem of low participation rates among fathers.

Of the 263 participants (excluding pilot sample), 186 (71%) returned questionnaires. Families who did not return questionnaires were given two reminder telephone calls. Four children were not videotaped because they had very strong emotional reactions prior to the needle and, as a result, were taken to another room. These mothers did not return their questionnaires. One mother declined to participate mid-way through the procedure and no video was obtained.

Procedures

Phase I. For families recruited before the day of inoculation, a time to meet parents at the NIHU was arranged. For families recruited on the day of the inoculation, details of the study were provided at that time. Mothers were told that a study looking at parents' thoughts about children's reactions to medical procedures was being conducted. Also, mothers were told that participation would involve taking home questionnaires that would take about 40 minutes to complete, watching a 2-minute videotape of patients with shoulder pain and making ratings, and having their child's reaction to the needle videotaped. Informed consent was obtained from all mothers prior to the inoculation (see Appendix A for the consent form).

Phase II. Parents completed the first portion of the study in a private room of the health unit. After obtaining informed consent, one of four undergraduate research assistants first asked parents to rate on a 10-cm visual analogue scale (VAS; Cella & Perry, 1986) how much anxiety they were presently feeling regarding their child's upcoming inoculation. Anchors for the scale were "not at all

upset/distressed" and "very upset/distressed." Next, the mother's ability to decode pain behaviour was assessed by showing her twelve video clips of adult patients with shoulder pain undergoing shoulder manipulation by a physiotherapist. Each of the twelve stimulus videotaped clips showed the patient's head and shoulders and were approximately 2-s long. Clips were separated by 5-s intervals. Equal numbers of male and female patients were represented and patients' pain responses varied in intensity from no pain to severe pain. The stimulus videotape clips were sampled from a previous study on pain in patients with shoulder pain pathology (Prkachin & Mercer, 1989). Immediately after viewing the clip, mothers rated how much pain they thought each person in the video expressed using a 10-cm VAS with anchor points of "no pain" and "severe pain". After viewing the video clips, parents were given the questionnaire package in a self-addressed and stamped envelope. They were asked to complete the questionnaires at home and were told that if the questionnaires were returned within a month's time, their name would be placed in a $100 draw. Questionnaires were expected to require approximately 40 minutes to complete.

Phase III. All children were administered a DPTP inoculation in the upper arm. The immunizations were carried out in a room with three cubicles. The third cubicle contained the video-camera and was designated for study participants. Children were seated on their parent's lap, while the nurse swabbed the skin with alcohol to cleanse it, and then administered the injection. Children were video-taped just prior to the onset of the injection and for approximately 10-s afterwards. Prior to, and during the inoculation, a research assistant completed a checklist of parental

coping behaviours (Appendix B). It was expected that the primary caregiver would be present during the inoculation as variation of this factor would likely cause confounding effects (Gross, Stern, Levin, Dale & Wojnilower, 1983), and this was the case for all participants.

Apparatus

An 18-inch colour television/VCR combination with remote control was used to show parents video clips. A colour video camera mounted on a tripod was used to record the child's facial behaviour. Tapes were later superimposed with a digital time display so that specific time segments could be selected and coded. A 12-inch colour monitor and video-cassette recorder with remote control, stop action, and slow motion feedback were used to code the videotapes of the children.

Measures

Mothers provided information on demographics, their child's previous experience with medical procedures, prevalence of chronic illness in the family, and presence of developmental delays among their children (see Parent Questionnaire, Appendix C). Mothers also rated how much pain they thought each person in the stimulus video expressed using a 10-cm VAS. Previous studies have used the VAS and found it to demonstrate good reliability and validity (Manne, Jacobsen & Redd, 1992; Tarbell, Thomas & Marsh, 1992).

The extent to which mothers encourage their child's illness behaviour was assessed with the parent form of the Illness Behaviour Encouragement Scale (IBES) (Walker & Zeman, 1992). This 10-item measure has been modified to consist of parallel items referring to parent responses to pain symptoms (Appendix

D). Items 3 and 6 of the original scale were removed as they pertained to homework and were not appropriate for this age group. Adequate internal consistency (Cronbach alpha = .83) and test-retest reliability have been demonstrated for the IBES and its construct validity has been supported by the significant correlation of IBES scores with several indices of child illness behaviour (Walker & Zeman, 1992).

The parent version of the Children's Somatization Inventory (P-CSI; Garber, Walker & Zeman, 1991) was used to assess the extent to which children had been bothered in the past two weeks by various somatic complaints (Appendix E). The P-CSI includes symptoms taken from the revised third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R); American Psychiatric Association, 1987) criteria for somatization disorder and from the somatization scale of the Hopkins Symptom Checklist (Derogatis, Lipman, Rickels, Uhlenhuth & Covi, 1974). The P-CSI has demonstrated adequate internal consistency (Cronbach alpha = .86). Mothers rated the extent to which their children had experienced each of 36 symptoms in the last two weeks using a 4-point scale ranging from not at all (0) to a whole lot (3). The total score, obtained by summing the ratings, can range from zero to 140. Scores on the P-CSI were taken as measures of children's illness behaviour. Illness behaviour is the principal outcome measure for the model used in the present study.

Caregivers also completed the Behavioral Styles Questionnaire (BSQ), a temperament measure designed for children aged 3 to 7 years (McDevitt & Carey, 1978). The BSQ is a commonly used 100-item questionnaire that assesses nine

temperament traits: activity (the typical pace or vigor of the child's behaviour), rhythmicity (regularity of physiological patterns such as feeding, sleeping), approach (tendency to greet and engage novel experiences), adaptability (receptiveness to social situations), intensity (the amount of energy in a response, whether positive or negative), mood (general amount of pleasant or unpleasant feelings), persistence (consistency in accomplishing tasks and activities), distractibility (effectiveness of extraneous stimuli in interfering with ongoing behaviour), and threshold (general sensitivity or insensitivity to stimuli). All items are rated on a 6-point scale of frequency ranging from almost never to almost always. From these nine traits, three categories of temperament style can be derived: (1) the difficult child (arrhythmic, low in approach and adaptability, intense and predominately negative in mood), (2) the easy child (rhythmic, approaching, adaptable, mild and positive in mood), and (3) the slow-to-warm-up child (low in activity, approach and adaptability and negative in mood, but variable in rhythmicity and mild in intensity). The scoring system is arranged so that high scores for each category are the less desirable trait direction, i.e., high activity, arhythmicity, slow adaptability, low approach, high intensity, negative mood, high distractibility, low threshold and low persistence. The results of standardization for the instrument have resulted in internal consistency ranges from .47 to .84 for the nine BSQ categories, with test-retest reliability ranges from .67 to .94 (McDevitt & Carey, 1978).

Coding of Parent's Coping Behaviours

In addition to the coding of facial actions, parent's coping behaviours just before and during the child's inoculation were scored. The following 12 categories

of coping behaviours were derived from a reading of the literature (e.g. Jacobsen et al., 1990; Kliewer, 1991; Patterson & Ware, 1988): emotional support, distraction, praise or positive talk, explaining or procedural statements, bargain/reward, yell/threaten, criticize, plead, nothing, pain expression, and anxious questions or comments. Definitions of the twelve categories are provided in Appendix F. The above behaviours were coded as present or absent over an interval stretching from 20 seconds prior to injection to withdrawal of the needle. Thus, the duration of this interval varied from child to child. Five research assistants coded coping behaviours, in vivo, on the Parental Coping Behaviour Checklist (PCBCL; see Appendix B). Twelve percent of the videos were then coded by two research assistants to determine interobserver agreement. Cohen's kappa (Cohen, 1960; Cohen, 1968) was 0.90, which indicates very good interobserver agreement.

Coding of Children's Facial Actions

The children's facial responses during inoculation were taken as a measure of the child's pain reactivity and used as a dependent variable in subsequent analyses. Child facial responses were coded using FACS (Ekman & Friesen, 1978). In this system, coders rate a discrete set of precisely defined facial actions (for example, lowered brows). Coders were able to use slow motion and stop frame feedback. One trained coder carried out all the coding and a secondary coder scored 7% of the segments (n = 12) to determine interrater reliability. Both coders have demonstrated proficiency in the coding procedure according to the FACS test (Ekman & Friesen, 1978). Interobserver agreement was calculated according to the formula given by Ekman and Friesen. For each facial expression coded, two times

the number of action units (AU) agreed upon by the two coders was divided by the total number of AU's scored by the two coders. Interobserver agreement was .87, which compares favorably with other FACS studies.

The following facial actions were coded if they appeared: AU 4-brow lowerer; AU 6-cheek raise; AU 7-lid tightener; AU 9-nose wrinkle; AU 10-upper lip raise; AU 20-lip stretch; AU 27-jaw drop; and AU 43-eyes closed. These facial actions have been identified by a number of researchers as being correlated with pain (e.g. Craig, Hyde & Patrick, 1991; Prkachin, 1992; Prkachin & Mercer, 1989).

In FACS coding, the coder assigns an intensity score ranging from one (barely evident) to five (maximal) to each of the actions present. The following five second segments were coded whenever possible: (a) a baseline period ten seconds prior to the injection, (b) reaction to the injection, and (c) a recovery period ten seconds after the injection. First, the coder determined the start time for each of the three segments (baseline, reaction, recovery). Next, actions were coded as present if the onset occurred during the designated time or if the onset was prior to the designated time, but evidenced an increase of two or more intensity points. Because nurses were told to do the procedure 'as usual,' there were segments in which the child's face was obscured. The entire face was not visible in 4% of segments. An additional three missing segments were due to children who overreacted and were removed from the cubicle and taken to another room where they would not frighten the other children.

Facial Action Data Preparation

Previous studies using FACS with adults have noted the difficulty in

distinguishing between certain action units, in particular AUs 6 and 7 (Ekman, Friesen & Simons, 1985), and AUs 9 and 10 (Prkachin & Mercer, 1989). Oster and Rosenstein (1993) have discussed the difficulty of making the same distinction in infants. Prkachin (1992) has recommended that analyses be conducted on the composite variables of 'orbit tightening' (AU 6/7) and 'levator contraction' (AU 9/10). Consequently, the variables were collapsed according to Prkachin's instructions. A FACS pain index score was calculated by multiplying the intensity (1-5) of each action unit by its duration (Prkachin, Berzins & Mercer, 1994). This pain index score was subsequently referred to as the child's reactivity rating and was used as a dependent variable in the analyses.

Number of Pain Models in the Home

The total number of pain models in the home was calculated by summing the number of people in the home, either presently or in the past, who had suffered from a pain problem, as indicated by the mother.

CHAPTER III

Results

Overview of the Analyses

Analyses were organized around the model used in the study. First, scoring, data reduction and screening of the variables in the model was completed. Next, several tests of the model were performed. Two standard regression analyses were conducted to predict pain reactivity. A third standard regression analysis was conducted to predict illness behaviour. Finally, relationships among pain reactivity, illness behaviour and variables outside the model were examined through a series of correlation analyses.

Preparation of Data

Data Scoring and Reduction

Temperament Data

To simplify the temperament data, BSQ data were subjected to a factor analysis employing a principal components extraction with varimax rotation. Three factors were extracted which accounted for 64% of the shared variance. Loadings of variables on each factor are shown in Table 3. Variables are ordered and grouped by size of loading to facilitate interpretation.

Factor scores based on the three-factor structure were saved as variables and used in the later regression analysis. Items with loadings of .5 or greater on the factors were used to aid in interpretation of the constructs. Activity and Persistence loaded on Factor 1. Examples of items that contribute to these two subscales, respectively, are: "the child runs ahead while walking with the parent" and "the child

Table 3

Factor Loadings and Percent of Variance for Principal Components Analysis and Varimax Rotation on BSQ Temperament Subscales

Subscale	Factor 1	Factor 2	Factor 3
Activity	.886	-.065	.134
Persistence	.782	.096	-.119
Rhythm	.358	.285	-.075
Approach/withdrawal	-.182	.824	.022
Non-adaptability	.404	.753	.130
Mood	.427	.585	.427
Threshold	-.138	.187	.814
Distractibility	-.078	-.341	.742
Intensity	.179	.311	.634
Percent of Variance	30.30	19.20	14.30

Note. Factor 1 = Energy and Consistency; Factor 2 = Adjustment; Factor 3 = Sensitivity.

pays attention from start to finish when the parent tries to explains something to him/her", suggesting an overall construct of *Energy and Consistency.* Approach/Withdrawal, Mood, and Adaptability, loaded on the second factor. Examples of items that contribute to each of the subscales, respectively, are: "the child avoids new guests or visitors", "the child cries and whines when frustrated", and "change in plans bother the child", suggesting an overall construct of *Adjustment.* Intensity, Distractibility and Sensory Threshold loaded on Factor 3. Examples of items that contribute to each of these subscales, respectively, are: "the child shows strong reactions to things, both positive and negative", "the child looks up from playing when the telephone rings", "the child becomes upset or cries over minor falls or bumps", suggesting an overall construct of *Sensitivity.* These findings are consistent with a factor analysis performed on the BSQ in nursery school children by Simonds and Simonds (1982). Those researchers derived three factors from the nine temperament traits, accounting for 62 percent of the shared variance: slow adaptability, negative mood and withdrawal loaded on Factor 1; high intensity, high distractibility and low sensory threshold loaded on Factor 2; and high activity, low persistence and arhythmicity loaded on Factor 3.

Decoding Ability

In order to determine parents' sensitivity at decoding facial expressions of pain, parent VAS scores, for each of the twelve videotape clips of shoulder pain patients, were correlated with FACS scores quantifying the intensity of the patients' pain. These FACS scores were already available from another study (Prkachin, Berzins & Mercer, 1994). The resulting correlation coefficient calculated for each

parent was taken as a measure of their ability to decode pain. The mean correlation was .52 (SD = .15).

In order to address the possibility that mothers' tendencies to rate pain in one direction or the other (response bias) might be related to pain reactivity, the mothers' average VAS ratings for the 12 video clips were calculated and later used in a regression analysis. The mean VAS rating for all 12 videotape clips was 36.4 (SD = 12.5).

Previous Medical Procedures

The child's previous experience with medical procedures was determined by summing the number of medical procedures to which the child had shown a negative response, according to the mothers' report. That is, any medical procedure in which the mother rated the child's reaction as either a 1, 2 or 3 on the 7-point likert scale was taken as an indication of a negative experience. The mean number of previous negative experiences with medical procedures was 1.6 (SD = 1.4).

Data Screening

Prior to analyses, variables were examined for accuracy of data entry, and to determine whether the data met the assumptions underlying the planned multivariate analyses. To reduce extreme positive skewness, scores for children's illness behaviour and pain reactivity were logarithmically transformed. Because continuous variables provide much greater precision than two-value or dichotomous variables (Spector, 1981), previous medical procedures and number of pain models were modified to create continuous variables (as described in the section titled "Number of Pain Models in the Home"). Because a curvilinear relationship was

hypothesized to exist between parental decoding ability and pain reactivity, a scatterplot between the two variables was examined. No evidence of curvilinearity was found, thus, parental ability to decode facial expression was entered in the standard regression analysis. Twenty-one cases were excluded due to missing data. Two cases were identified as multivariate outliers and were deleted as per the recommendations of Tabachnick and Fidell (1996). One hundred and fifty-seven cases remained for analysis.

Evaluating the Model

Overview

The model used to guide the analyses in the present study outlines specific pathways expected to predict children's pain response and children's illness behaviour (see Figure 1). Two standard multiple regressions were performed; the first to examine predictors of pain reactivity, and the second to examine predictors of illness behaviour. In the first regression, log transformed pain reactivity scores were entered as the criterion variable and the predictor variables were the three temperament factor scores (Energy and Consistency, Adjustment, Sensitivity), parental decoding ability, previous negative medical experiences, and number of pain models. In the second regression, log transformed illness behaviour scores were entered as the criterion variable and pain reactivity, number of pain models, and illness behaviour encouragement were entered as predictor variables. All analyses were performed using SPSS standard multiple regression.

Table 4 displays the means and standard deviations for each variable in the model. Table 5 displays the correlations among the variables in the model.

Table 4

Means and Standard Deviations for Variables in the Model Predicting Pain Reactivity and Illness Behaviour

Variable	M	SD
Adjustment	0.12	1.00
Sensitivity	0.05	0.95
Energy/Consistency	-0.01	1.00
Previous Pain	1.64	1.42
Decoding Ability	0.53	0.12
Pain Models	1.10	1.26
IBES	20.88	6.33
Pain Reactivity	23.93	45.95
Illness Behaviour	3.40	3.98

Table 5

Intercorrelations Between Variables in the Model Predicting Pain Reactivity and Illness Behaviour

Variable	1	2	3	4	5	6	7	8	9
1. Adjustment	--	.070	-.005	.248**	-.073	.009	.092	.263***	.192*
2. Sensitivity		--	.025	.081	-.007	.141[t]	1.82*	.112	.119
3. Energy/Consistency			--	-.007	-.116	.064	.058	.121	.077
4. Previous Pain				--	-.049	.141	.178*	.268***	.199*
5. Decoding Ability					--	.008	-.069	-.057	-.116
6. Pain Models						--	.002	.117	.004
7. IBES							--	.082	.069
8. Pain Reactivity								--	.209**
9. Illness Behaviour									--

[t] $p < .01$. * $p < .05$. ** $p < .01$. ***$p < .001$.

Prediction of Pain Reactivity

Using Parental Decoding Ability

The first test of the model was based on predicting pain reactivity from four variables: the number of pain models in the home, children's temperament, parents' ability to decode facial expressions of pain, and children's previous experience with medical procedures. Table 6 displays the unstandardized regression coefficients (B), the standardized regression coefficients, unique variance, R^2 and adjusted R^2 for the regression. The standard regression analysis was significant, $F(6, 151) = 4.1$, $p < .001$. Only two of the predictor variables contributed significantly to the prediction of pain reactivity: the temperament variable Adjustment and the child's previous negative experience with medical procedures. Thus, children with temperaments characterized as predominately negative in mood, non-adaptable and low in approach were more likely to display increased pain response to inoculation. In addition, children who had responded negatively to previous medical procedures also were more likely to display increased pain response to inoculation.

Using Parents' Average VAS Scores

A subsidiary regression analysis was conducted to examine the possibility of response bias on parents' VAS ratings of shoulder pain patients' facial expressions. For example, some parents may tend to consistently underrate pain and others to consistently overrate pain. This type of response bias may affect the validity of the correlation coefficient calculated to measure parent's ability to decoding facial expressions. In order to test this possibility, all twelve VAS ratings were summed and averaged. The mean VAS rating was then saved as a new variable and entered

Table 6

Standard Multiple Regression of Temperament Variables, Parental Decoding Ability, Number of Pain Models and Negative Experience with Medical Procedures on Child Pain Reactivity (N = 157)

Variable	B	SE B	β	sr^2 (unique)
Adjustment	.163**	.061	.208	.040
Sensitivity	.059	.060	.075	.006
Energy/Consistency	.106	.060	.135	.018
Previous pain	.108**	.044	.196	.035
Decoding Ability	-.149	.491	-.023	.001
Pain Models	-.044	.048	.071	.005
				R^2 = .143
				Adjusted R^2 = .108
				R = .378***

*p < .01. ***p < .001

in the place of parental decoding ability in the regression. Thus, log transformed pain reactivity scores were entered as the criterion variable and the following five predictor variables were entered: the three temperament factors (adjustment, sensitivity, energy and consistency), parents' average VAS scores, previous negative medical experiences, and number of pain models.

The introduction of parents average VAS scores did not contribute significant unique variance to the prediction of pain reactivity, $sr^2 = -.004$. Therefore, it appears that mothers' biases towards over-rating or under-rating facial expressions of pain are not related to their children's pain reactivity.

Prediction of Illness Behaviour

The second regression was used to predict illness behaviour from three predictor variables: the number of pain models in the home, children's pain reactivity, and illness behaviour encouragement from parents. Table 7 displays the unstandardized regression coefficients (B), the standardized regression coefficients, unique variance, R^2 and adjusted R^2. The standard regression analysis was significant, $F(3,154) = 2.6$, $p < .05$. The child's pain reactivity was the only predictor variable which contributed significantly to the prediction of illness behaviour.

Partial Correlation Analysis

The contribution of the temperamental factor of Adjustment to the child's illness behaviour independently of pain reactivity was examined. This was deemed necessary because Adjustment was correlated with both illness behaviour and pain reactivity. Thus, it was possible that pain reactivity mediated a relationship between temperament and illness behaviour, rather than providing an independent

Table 7

Standard Multiple Regression of Pain Reactivity, Illness Behaviour Encouragement and Number of Pain Models on Children's Somatization Inventory Scores (N = 157).

Variables	B	SE B	β	sr^2 (unique)		
Pain Reactivity	.100**	.037	.209	.043		
IBES	.003	.005	.051	.003		
Pain Models	.006	.023	-.020	.001		
						$R^2 = .053$
					Adjusted	$R^2 = .034$
						$R = .23$*

*$p < .05$. **$p < .01$

contribution. A partial correlation analysis was employed to explore this possibility. First, the correlation between the Adjustment factor and illness behaviour, controlling for the effect of pain reactivity, was calculated. The result approached statistical significance, r (155) = .14, p = .07. The correlation between illness behaviour and pain reactivity, controlling for the effect of temperament, was statistically significant, r (155) = .17, $p < .05$.

Other Analyses

Parental Coping Behaviours

Data on the percent occurrence of various coping interventions on the part of the mother are given in Table 8. Point biserial correlations were used to examine the relationships between coping behaviours and child pain reactivity and child illness behaviour. Due to the low occurrence of several of the coping categories, only behaviours that were displayed by at least ten percent of mothers were used. This change resulted in the use of four categories of coping behaviour for analysis: emotional support, explaining/procedural statements, praise or positive-talk, and distraction. All four coping behaviours were significantly correlated with the child's pain reactivity, but none were related to the child's somatization level (see Table 9).

Other Relationships with Pain Reactivity and Illness Behaviour

Correlations between child and family variables and pain reactivity and illness behaviour were calculated. A few significant relationships emerged (see Table 10). First, mothers' anxiety about children's immunizations was positively related to their child's illness behaviour. Second, the number of people in the home with an illness was positively related to the child's somatization. No demographic variables were

Table 8

Percentage of Parents Using Coping Behaviours

Coping Behaviours	Percentage
Distraction	61.0
Emotional support	59.3
Praise or positive-talk	30.2
Nothing	19.2
Explaining/procedural statements	11.6
Anxious questions/comments	2.9
Bargain/Reward	2.3
Yell/Threaten	2.3
Other	1.2
Pain expression	0.6
Plead	0.6
Criticize	0

Table 9

Correlations Between Mothers' Coping Behaviours and Child Illness Behaviour and Child Pain Reactivity

Coping Behaviours	Illness behaviour	Pain reactivity
Emotional support	.074	.295***
Explaining/procedural statements	.112	.156*
Praise/positive-talk	-.004	.227*
Distraction	-.046	.197**

*p < .05. **p < .01. ***p < .001.

Table 10

Correlations Between Child and Family Variables and Illness Behaviour and Pain Reactivity

	Illness Behaviour	Pain Reactivity
Birth order	-.001	-.055
Mothers' anxiety [a]	.213*	.023
Mothers' age	.008	.012
Health problems in family [b]	.159*	.101
Child gender [c]	.035	-.135[t]
Socioeconomic status	-.084	.113
Developmental delay[d]	-.103	.006
Child chronic illness[e]	.015	-.046

[a] VAS scale self-reported anxiety regarding child's upcoming inoculation. [b] Number of people in the family with a health problem other than pain. [c] 0 = male and 1 = female . [d]Mothers' reports of the presence of developmental delays in children. [e]Mothers' reports of the presence of chronic illness in children.

[t]$p < .10$. * $p < .05$.

found to be significantly related to children's pain reactivity. However a trend for boys to react more negatively to the inoculation was observed.

Adjusting the Model

The correlation analysis conducted on mothers' coping behaviours and pain reactivity resulted in several significant correlations. Thus, the possibility of incorporating mother's coping behaviours into the present model was assessed. First, the number of coping behaviours for each mother was summed, creating a new continuous variable. Subsequently, correlations between the sum of mothers' coping behaviours pain reactivity were calculated. Next correlations between coping behaviour the two significant predictors of pain reactivity: Adjustment and Previous Pain Experience were calculated. Results revealed that the sum of mothers' coping behaviours was related to pain reactivity r (157) = .323, $p < .001$. In addition, coping behaviour was significantly related to children's previous negative pain experiences, r(157) = .245. As a result, the place of coping behaviour in the model was further examined.

In order to determine whether mothers' coping behaviour moderated the relationship between negative pain experiences, a partial correlation analysis was employed. The correlation between negative pain experiences and pain reactivity was computed, while controlling for the effects of mothers' coping behaviours. The resulting coefficient was significant, r (154) = .206, $p = .01$. Therefore, the effect of previous pain on pain reactivity is not completely moderated by mothers' coping behaviours.

A revised model was proposed based on the findings of the present study.

That is, support was found for the role of temperament and previous pain experiences in predicting pain reactivity. Subsequent analysis also revealed that mother's coping behaviours may be predictive of pain reactivity. Mothers' anxiety and the number of chronic illness models in the home was related to children's illness behaviour. Finally, support for a pathway between pain reactivity and illness behaviour was also found. The revised model is presented in Figure 3.

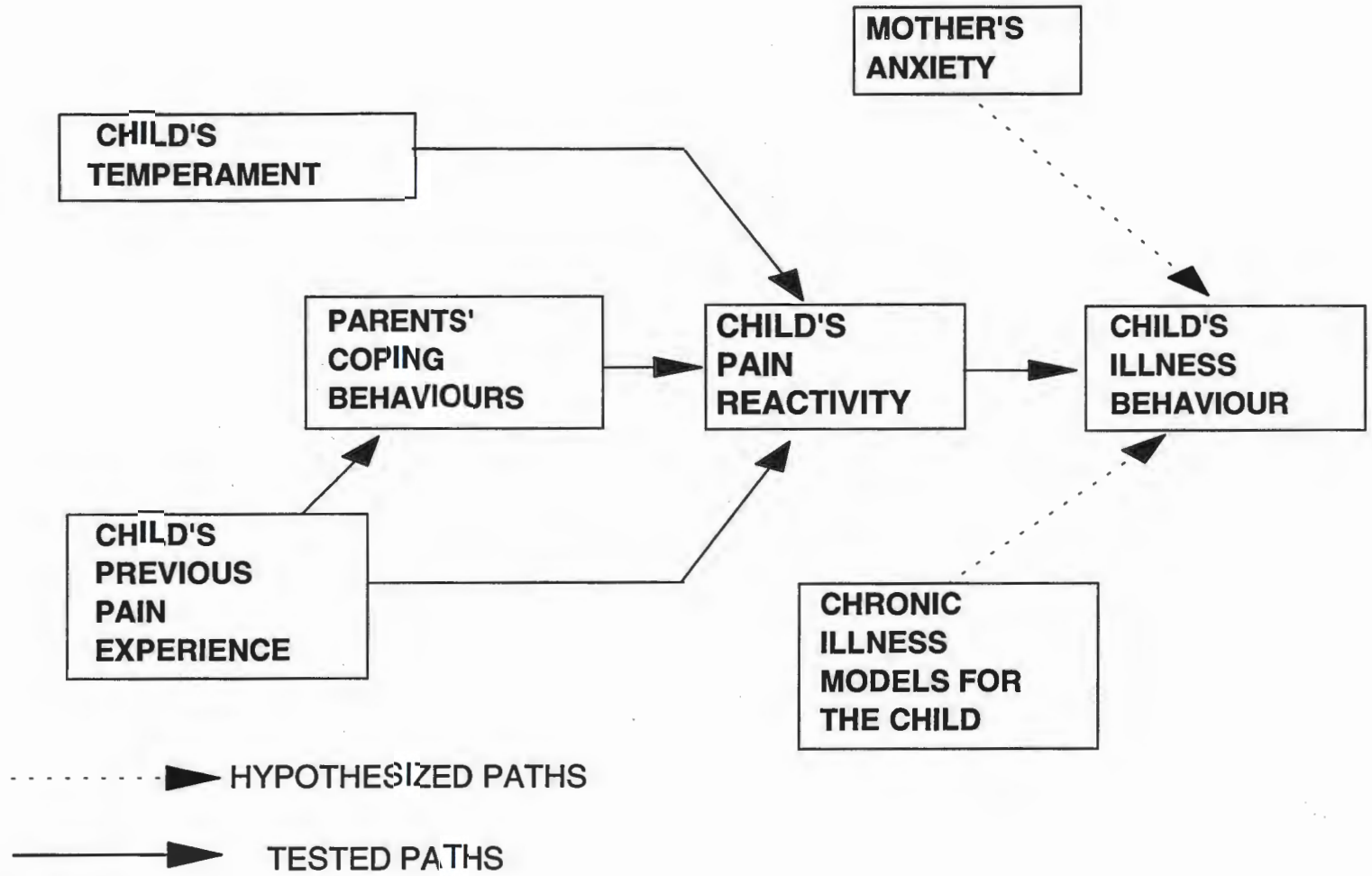

Figure 3

Revised Model to Examine the Predictors of Pain Reactivity and Illness Behaviour in Kindergarten-Aged Children.

CHAPTER IV

Discussion

This study examined the relationship of a number of psychosocial factors with pain reactivity in children's responses to injections and with children's illness behaviour. The overall goal was to evaluate a conceptual model of pain reactivity and illness behaviour, with the hope that such information would allow us a better understanding of pain and somatization in children and, ultimately, ways to ameliorate it.

Kindergarten-aged children who had a temperament characterized as slow in adjustment, and children with more previous negative experiences with medical procedures, were found to exhibit increased pain reactivity to routine inoculation. Also, children who reacted more intensely to the inoculation were more likely to exhibit increased somatization.

Predicting Pain Reactivity

The Role of Temperament

It was predicted that children with more difficult temperaments (i.e., those who are low in approach and adaptability, negative in mood, arhythmic and intense) would be more reactive to immunizations. In fact, several of these dimensions (mood, adaptability, approach), classified as the Adjustment factor according to the factor analysis, were predictive of pain reactivity in the present study. This finding of a relationship between temperament and pain reactivity is consistent with findings from other studies focusing on young children (e.g. Schechter, Bernstein, Beck, Hart & Scherzer, 1991; Wallace, 1989; Young & Fu, 1988).

Schechter et al. (1991) examined temperament and pain response in preschool children and found the child's non-adaptability and rhythmicity scores to be positively related to needle reactivity, as assessed by a revised version of the Procedure Behavior Rating Scale (PBRS; Katz et al., 1980). Wallace (1989) examined the relationship of temperament and postoperative analgesic administration in hospitalized three to seven year-old children. She found that children rated as high on the temperament variable of intensity were more likely to be administered medication than children who were rated as less intense. The authors noted that children who had high intensity levels may have received more medications because their reactions to pain were more overt, whereas children with low intensity may have internalized the discomfort and expressed pain in a less obvious manner. Perhaps nurses were more willing to administer medications to children who showed easily recognizable pain behaviour. Thus, it is unclear whether children with high intensity levels actually experience more pain or whether they simply display pain more overtly,

Young and Fu (1988) also evaluated the influence of temperament on pain response among young children in part of a study examining efficacy of needle play in reducing distress during blood drawing. Results indicated that the temperamental variable of approach correlated with an objective rating of the child's response to pain (measured via bodily/postural movements) immediately after the procedure. Although most of these studies identify somewhat different temperamental variables, and although there were methodological differences among the studies, together with the present study they suggest that there is a

relationship between temperamental aspects of the child's general response style and his/her response to painful situations. It may be that different dimensions of temperament are associated with different aspects of the pain experience. For acute pain, the evidence from this study suggests that the "adjustment" factor of temperament, comprised of negative mood, non-adaptability, and withdrawal, is a key predictor of pain reactivity in young children. These findings suggest the need for continued consideration of individual differences in decisions about the preparation and management of children in medical settings.

With regard to the overall construct of temperament, this study found the temperament dimension of "rhythmicity" to be unrelated to the temperament factors extracted in the BSQ factor analysis. This lack of relationship suggests that information about the regularity of the child's physiological states, such as sleeping, eating and elimination, does not help to understand temperament in this age group. For example, the only notable difference in the present factor analysis of the BSQ compared with that of Simonds et al. (1982) was that rhythmicity did not load on any of the three factors extracted in this study. This difference likely is due to developmental changes. Specifically, as the child gets older, particular temperamental characteristics may change in clinical importance. Rhythmicity, which is a very significant category during infancy, assumes less importance by five years of age (Simonds et al., 1982). On the BSQ, items relating to rhythmicity (e.g., feeding, sleep and elimination) were fairly tightly interrelated in infancy and toddlerhood but this was not the case in early and middle childhood (Carey, 1996). Also, with increasing age, children become more independent and mothers may be

less able to accurately report on behaviours relating to children's physiological processes. Thus, one reason that rhythmicity was not found to be important in the temperament structure may be that the children in the present study were slightly older than those in the Simonds (1982) and Schechter (1991) studies.

The Role of Previous Negative Medical Experiences

In the present study, children who had more prior negative experiences with medical procedures were found to react more intensely to the needle. Previous findings regarding the relationship between the number of previous medical procedures and child distress have been mixed. Some studies have reported that children who have experienced fewer medical procedures react more negatively to venipunctures (Jacobsen et al., 1990; Jay et al., 1983). Still others (Dahlquist et al., 1986) report that children with previous negative medical experiences display more behavioural distress to a medical examination . A survey of children's reactions to blood tests indicated that although some significant negative correlations were obtained between distress scores and previous experience with needle procedures, this was not predictive of the child's self report of pain and did not add significantly to the prediction of observed distress (Fradet, McGrath, Kay, Adams, & Luke 1990).

Inconsistencies in prior research may be due to methodological differences across studies. First, studies differ in how previous experience with medical procedures is defined. Some studies use the number of previous medical procedures the child has experienced (usually injections or venipunctures) and others use the valence of the child's emotional reaction to the prior medical procedures as measures of previous experiences. The present study used the latter

method as per the procedure outlined by Dahlquist (1986), and thus examined the extent to which the child has had previous *negative* experience with medical procedures. The present findings are consistent with those of Dahlquist (1986) and suggest that rather than examining the number of medical experiences, researchers should instead consider the quality of these previous responses.

A second difficulty in comparing across studies arises because the operational definition of pain can vary. Researchers assessing pain in children often have found it difficult to tap into a unitary construct of pain since it is often mixed with anxiety and fear (Katz, Kellerman & Siegel, 1981). As a result, the majority of studies use techniques that measure an overall construct of "distress". For example, the Procedural Behavioural Rating Scale (Katz, Kellerman & Siegal, 1980) and the Observation Scale of Behaviour Distress (Jay, Ozolins, Elliott & Caldwell, 1983) measure distress using behaviours such as crying, screaming, requests for emotional support, muscular rigidity, verbal pain expression, nervous behaviour and information seeking. These measures are designed to be used to encompass the constructs of pain and anxiety (Jay et al., 1983). Another measure of behavioural distress used is the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS: McGrath, Johnson, Goodman, Schillinger, Dunn & Chapman, 1985). The CHEOPS separates behaviours into six categories: cry, facial expression, verbal complaints, torso movements, touching and legs movement. Therefore, much of the research has used a more global construct of distress as the outcome measure, rather than an objective measure of pain.

The objectivity and sensitivity of FACS coding used in the present study

enabled us to measure a relatively "pure" dimension of pain experience. Children with more previous negative experiences with medical procedures actually exhibited more *pain* behaviour in response to vaccination. Because level of child anxiety was not assessed, it is not possible to determine whether pain reactivity was concomitant with anxiety. Nevertheless, being able to differentiate between pain and anxiety in children is believed to be clinically relevant in medical settings. Although previous researchers have illustrated the difficulties in separating pain and anxiety, LeBaron and Zeltzer (1984) reported that few children had difficulty distinguishing between the concepts of being "scared" and "hurt" and that the problem likely resides in the fact that pain and fear often co-occur. However, evidence of gender differences in anxiety ratings suggests that these two emotional states should be assessed separately. Although the majority of studies examining pain response in children find no significant gender differences (e.g. Dahlquist et al., 1986; Fradet et al., 1990; Jacobsen et al., 1990; LeBaron & Zeltzer, 1984), gender differences have been found in levels of anxiety. It has been shown that girls exhibit more anxiety than boys (van Aken, Lieshout, Katz, & Heezen, 1989) and require more time to calm down (Schechter et al., 1991) following immunizations. Thus, pain and anxiety may need to be differentiated in order to further our understanding of child pain reactivity.

The Role of Parents' Sensitivities in Decoding Facial Expressions of Pain

The possible association of parental ability to decode facial expression of pain with the child's reactivity to the immunization also was explored. It was predicted that parents who were not sensitive at decoding facial expression of pain would have children who exhibit increased pain reactivity. This increase in reactivity

would be due to the children's need to amplify their pain behaviour to compensate for the parental insensitivity. It was also predicted that parents who were extremely sensitive at decoding facial expression would have children with increased reactivity to the needle. This increased response was hypothesized to be due to the operant conditioning of the pain behaviour. Neither of these predictions was confirmed.

Adults engaged in caretaking must decode information available from the child, which requires skill in both observation and interpretation of the pertinent sources of information (Prkachin & Craig, 1995). Interestingly, on average, the parents in the present study were found to be good decoders of pain expression. This knowledge helps to fill a void in the literature regarding the understanding of sensitivities of parents' responses to children's needs (Craig, Lilley & Gilbert, 1996). Those authors describe a communication model for understanding children's pain. The skills adults use in assessing pain are said to be a key factor in learning about the predispositions of adults to acknowledge children's pain. The present study showed that parents are capable of registering signs of pain, however, this capability was not related to how their children reacted to an immunization. Therefore, it may be that, all too often, signs of pain are not attended to or, although perceived, are not interpreted as indicative of pain. The knowledge regarding undertreatment of pain in children and infants provides some support for this notion (Schechter, 1989).

The non-confirmed prediction that parents' ability to decode facial pain expressions would be related to children's pain reactivity suggests that parents may not be using facial expression as a tell-tale signal of pain. If parents are not using the nonverbal cues available to them, they instead, may be relying more heavily on

the child's self-report to assess pain. This interpretation can be supported by a recent study which found that verbal report was the most frequent cue that parents used to assess post-operative pain in their children (Reid, Hebb, McGrath, Finley & Forward, 1995). On average, 44% of parents reported using verbal report cues, as compared with 12% who reported using visible and audible discomfort. However, another study that asked parents to identify behaviours that told them their child was in pain found that for children between the ages of two and six, 59% of parents identified pain using facial expression (Watt-Watson, Evernden, & Lawson, 1990). The use of facial expression as an indicator of pain was second only to crying, which 75% of parents reported using. One of the key differences in these two studies is the age range of children examined. The Reid et al. study examined children aged 2 to 12 years and the Watt-Watson study investigated 2 to 6 year-old children. The older children sampled in the Reid et al. study may have accounted for the increased use of verbal reports by parents. In fact, of the 11 behaviours identified by parents in the Watt-Watson study, 10 were nonverbal behaviours (facial expression, irritability, not sleeping, difficult to console, not eating, body rigid, curls up, quiet, hits out and pale). Crying was the only behaviour that was overtly verbal. Clearly, parents' reports of using nonverbal behaviours to assess pain in their children attests to the importance of identifying nonverbal cues of pain in younger children.

If it is the case, as Reid et al. (1995) report, that parents frequently use their children's verbal statements to estimate pain, this finding is in agreement with repeated assertions that self-report be used as the gold standard of pain

assessment (Beyer, McGrath, & Berde, 1990). However, reliance on self-reported pain can be problematic. Some children may deny their pain if they believe the treatment will be unpleasant (e.g., bitter tasting medicine) and others may exaggerate their pain in attempts to elicit rewards or attention from caregivers. Very young children, and children with developmental or cognitive delays, may have difficulty verbalizing pain; possibly causing some parents to assume the child who does not complain of pain is not experiencing pain. For example, results from a recent study examining everyday pain responses in typical children and children with developmental delays showed that children with developmental delays evidenced a dampened pain response relative to that displayed by typical children (Gilbert, Craig, Rocha, & Matias, 1998). That study also showed that children with developmental delays were less likely than typical children to seek and receive social support from caregivers. This possible underestimation of children's pain is particularly disconcerting, as it may, ultimately, lead to inadequate pain control. Given that parents have the ability to decode facial expressions of pain, teaching parents to pay attention to facial expressions of pain in their children may enable them to provide better pain assessment and management for their children. Increased use of nonverbal behaviour for pain assessment would be especially useful for very young children who cannot provide verbal reports of their pain.

Predicting Illness Behaviour

As hypothesized, pain reactivity was a significant predictor of illness behaviour. To the author's knowledge, no previous research has examined the relationship between child pain reactivity and illness behaviour. Nevertheless,

because pain is the cardinal somatic complaint it seems reasonable to assume that the child's response to an acute pain stimulus may predict how that child responds to physical symptoms. However, because the temperament factor of Adjustment also was significantly related to illness behaviour, it was not clear whether pain reactivity was directly related to illness behaviour, or whether its effect was moderated by temperament. Findings of the partial correlation analysis revealed that there was no relationship between temperament and illness behaviour when the effects of pain reactivity are controlled. Therefore, although some of the shared variance in pain reactivity and illness behaviour may be due to the child's temperamental influences, there are clearly other factors accounting for this association. Moreover, pain reactivity may serve to mediate the relationship between temperament and illness behaviour. Future research should endeavor to identify the mechanisms that may underlie this relationship.

Mothers' Use of Coping Behaviours

Overall, mothers' tendencies to use the coping behaviours of emotional support, distraction, praise or positive self-talk, or explaining and procedural statements were positively related to the level of the child's distress. One explanation for this finding may be that given their knowledge of the child's temperament, daily activities, and previous reactions to pain, parents were able to accurately anticipate the level of distress their child would experience and consequently employed coping mechanisms in efforts to quell their child's distress. In fact, several studies have found parents' predictions of child pain responses to be related to child self-reported pain (e.g., Bennet-Branson, & Craig, 1993; Fradet et

al., 1990), suggesting that parents are able to predict the level of pain their children will exhibit. However, a recent review of agreement between parent and child reports of pain has suggested that previous studies have overestimated the degree of relationship between child and parent reports of pain (Chambers, Reid, McGrath, Finley & Craig, 1997). Those authors suggest that the previous reliance on correlation coefficients to estimate agreement is flawed as it does not consider error variance between parents and children. Using kappa statistics to estimate agreement in postoperative pain reports of mothers and children aged 7 to 12, Chambers et al. reported values representing poor to fair agreement when chance agreement was controlled. Thus, it is not clear whether parents are able to accurately assess their child's pain, or whether they instead draw from information from other sources, such as the child's previous medical experiences and temperament. Regardless, in the present study, mothers of children who exhibited a stronger response to the inoculation were more likely, during the inoculation, to provide the child with emotional support, praise, distraction, and explaining and procedural comments.

Examination of Relationships Outside the Model

Supplementary analyses in this study provided some interesting results. First, a relationship was found between mothers' anxiety ratings for the vaccination and child's illness behaviour. This finding may be a result of the shared method of measuring both variables. That is, both mother's anxiety and child's illness behaviour were mother-reported, and likely share a common antecedent, mainly, general anxiety in the mother. Further support for this view comes from the fact that

mothers' anxiety was not correlated with children's actual pain reactivity. Indeed, studies have shown that persons with high anxiety tend to be hyper-vigilant with regard to their own somatic symptoms (e.g. Linden, Paulhus, & Dobson, 1986; Van-den-Akker & Steptoe, 1985). This vigilance may transfer to reports of child somatization as well. Alternatively, it may be that highly anxious mothers also tend to have children with increased illness behaviour, possibly as a result of modeling excessive attention to somatic complaints. Future research should seek to explain this outcome.

Another correlate of children's somatization was the number of people in the home with a health problem other than pain. This finding is interesting, particularly since the number of people in the home with pain was not found to be related to illness behaviour. This apparent inconsistency may attest to a possible problem of measurement error in the question that asked mothers to report the number of pain models in the home. This possibility is discussed below, in the section titled "Limitations of the Study". Nonetheless, the finding that illness behaviour and number of illness models are related is consistent with the social modeling perspective (Craig, 1983) and previous research examining this relationship (Edwards, Zeichner, Kuczmierczyk & Boczkowski, 1985; Jamison & Walker, 1992).

Evaluation of the Model

The model assessed in the present study specified psychosocial factors expected to predict pain reactivity and illness behaviour in children. The results did not support the utility of the overall model, although support was found for some hypothesized paths. In the first regression analysis, which assessed the predictors

of pain reactivity, the predictor variables accounted for only 14% of the variation in pain reactivity. This value is low compared to similar studies. For example, Jay et al. (1983) were able to account for 86% of the variance in children's distress from bone marrow aspiration (BMA) using three predictor variables (child's age, parental anticipation of the child's pain, and number of previous BMA's). Also, Fradet et al. (1990) accounted for 20% of the variance in children's behavioural distress scores to venipuncture using two predictor variables (age and parental anticipation of the child's pain). However, it is important to note that for both those studies, age was the most important predictor of distress scores and accounted for the largest portion of variance. Because age was held relatively constant in the present study, the task of attempting to account for the remainder of pain behaviour was a difficult one. Nonetheless, the Adjustment dimension of child temperament and negative experiences with previous medical procedures emerged as significant predictors. Overall, the present study explained a limited amount of variance in pain reactivity. As shown in the studies described above (Jay et al., 1983; Fradet et al., 1990) age effects on pain reactivity have been well documented. Therefore, it would behoove researchers to explore other possible determinants of pain reactivity. Moreover, as pain reactivity was found to predict child somatization in the present study, future research directed at explaining children's variations in pain displays will be especially important.

In the second regression analysis, which attempted to predict illness behaviour, the child's pain reactivity was the only significant predictor. The finding of this relationship is new to the existing literature and should be a path included in

future models examining pain and illness behaviours in children. The strength of this relationship is underscored when one considers that the two variables are derived from different sources (i.e., one from mothers and the other from observations of behaviour). As mentioned earlier, it can be concluded that the child's pain reactivity is related to illness behaviour quite independently of the child's temperament. This conclusion was based on the results of the partial correlation analysis which demonstrated that, after controlling for the effects of temperament, pain reactivity was significantly related to illness behaviour. Clearly more work is needed to refine the pathways that may predict somatization in children.

Limitations of the Study

It is important to note some of the limitations in the current study. First, the accuracy of the family health information is questionable. That is, mothers' reports of pain problems within the family may have been inflated due to the unspecific nature of the question which was "Does anyone in your home suffer from pain". Questions were phrased in a simple manner. Thus, the wording may have resulted in the question being confusing for the participant to interpret. For example, one participant called the research lab to inquire as to whether "a pain problem" referred to chronic pain or rather to any type of pain problem. It is possible that other participants may have experienced the same difficulty. This possible measurement error may have masked the relationship between the number of pain models in the home and the child's pain behaviour. The non-significant contribution of pain models found in the present study is puzzling in light of previous research showing that pain behaviour and pain models in the home are positively related (Jamison et

al., 1992; Edwards et al., 1985). This inconsistency with previous research likely reflects measurement error in the family health questions used in the present study.

Another potential difficulty is the loss of data among children with extreme reactions to the needle. Four children were not videotaped because their anticipatory reactions were so strong that they needed to be moved to a secluded room to avoid disturbing the other children. Also, in 4% of the segments the entire face was not visible. The reason for many of these poor video clips was that the child was displaying serious distress behaviours, and consequently the nurse and mother would often have to stand and hover around the child, thus obstructing the camera's view of the face. Therefore, the sample may be slightly skewed towards a less extreme reaction. Nevertheless, there were still several children who did exhibit extreme reactions that were videotaped.

Consideration should also be given to issues of generalizability in the present study. First, the findings are only generalizable to mothers, as fathers were not included in the sample. Future studies should attempt to obtain data from fathers, as they play in important role in the socialization of pain and illness behaviour for their children (Schechter et al., 1991). Second, inoculations were administered at a large clinic which may be significantly different from other settings in which pain is experienced (e.g., at home or school). Nevertheless, the FACS scoring used to code pain behaviour taps a very specific dimension of pain, independent of other psychosocial factors. That is, despite the impact of socialization and voluntary control, at its onset, the facial display of pain is innate, stereotyped, and reflexive (Craig, 1992).

Limitations also arise from the sampling method employed. Although all kindergarten-aged children are required to undergo DPTP inoculations, not all families comply with their scheduled appointments at the local health unit. Therefore, this portion of the general population is not represented in the sample of the present study. In addition, the proportion of aboriginal people in the sample likely under-represents the proportion of aboriginal people in the general Prince George population. Overall, the obtained sample is representative of Caucasian, middle-class families.

Suggestions for Future Research

The results of this study have implications for several avenues of future research. First, the role of temperament and experience with previous medical experiences should be explored further; specifically, the importance of these variables in long-term or chronic pain, or in treatment outcomes should be examined. It may be possible that children with temperaments characterized as high on the Adjustment dimension may respond differently to treatment options than other children. Also, it would be worthwhile to investigate how both temperament and the quality of children's experience with medical procedures affects child coping behaviours during medical procedures. Understanding how children's temperament and previous pain experiences can influence coping during painful medical procedures may help to target children at risk for extreme pain reactivity and ultimately lead to pain interventions that are tailored to children's individual predispositions.

Second, attempts should be made to clarify the relationship between pain

reactivity and somatization. Although not assessed in the present study, the pathway between the two variables may be reversed. That is, perhaps exhibiting increased somatization is predictive of pain reactivity. Nevertheless, if the pathway does run from pain reactivity to illness behaviour, then knowledge about the development and course of this relationship may be valuable in targeting people at risk for maladaptive pain and illness behaviour. For example, an intervention designed to decrease pain reactivity may lead to decreased somatization. The consequences of such interventions may ultimately lead to spin-off benefits such as decreased health care costs.

Third, it will be important to examine the various sensitivities and predispositions of parents to respond to children's pain and illness behaviours. This issue is becoming especially important as parents are often responsible for the assessment and treatment of their children's pain (e.g. following surgery). Left uncontrolled, pain may break down the body's immune functions, impair the body's ability to heal itself, increase the heart rate and elevate blood pressure (Shapiro, 1993). Little is known about how parents determine how much pain their children are feeling. Learning how parents assess their children's pain is the first step in improving their treatment of the pain.

Fourth, future research would benefit from adapting and modifying the revised model provided in the present study (see Figure 3). Mother's coping behaviours were coded during the inoculation primarily for descriptive purposes and thus, were not incorporated into the proposed model. Although not formally tested here, mothers' coping strategies may be important predictors of children's pain

behaviours. Indeed, mother's coping behaviours were significantly related to children's pain reactivity. The partial correlation analysis that examined previous pain experience, coping behaviours and pain reactivity suggested that coping behaviours may directly predict pain reactivity, or may exert their effect as a moderating variable between previous negative medical experiences and pain reactivity. Researchers should consider mothers' coping behaviour as an important variable in future work and endeavor to validate and expand upon the revised model presented. In addition, further studies examining predictors of pain reactivity and illness behaviour should employ path analysis techniques. Because of the exploratory nature of the present study, regression analyses were used to test the hypothesized paths. The use of path analyses will enable researchers to assess parameter estimates and how well the data fit the model.

Summary

The present study identified some of the predictors of pain reactivity and illness behaviour in kindergarten-aged children during routine vaccination. Overall, children with temperamental difficulties in adjustment and children with previous negative experiences with medical procedures were found to display increased reaction to the painful stimulus of inoculation. A new and important contribution to the literature was the finding that children's pain reactivity significantly predicted their illness behaviour. Because the patterns for exhibiting illness behaviour develop in childhood and progress into adulthood, identification of factors which may play a role in the ontogeny of illness behaviour is an important area for future research. The findings of this study can serve as a foundation for prospective models

attempting to account for variation in pain and illness responses in young children.

REFERENCES

Achenbach, T.M. & Edelbrock, C. (1983). Manual for the Child Behavior Checklist and Revised Child Behavior Profile. Burlington: University of Vermont.

Apley, J. (1975). The child with abdominal pains. Blackwell: Oxford.

Bandura, A. (1977). Social learning theory. Englewood Cliffs, NJ: Prentice Hall.

Barr, R. (1983). Recurrent abdominal pain. In M.Levine, W, Carey, A. Crocker & R. Gross (Eds.), Developmental behavioural pediatrics (pp. 521-528). Philadelphia: W.B. Saunders.

Bennet-Branson, S.M. & Craig, K.D. (1993). Postoperative pain in children: Developmental and family influences on spontaneous coping strategies. Canadian Journal of Behavioural Sciences, 25, 355-383.

Beyer, J.E., McGrath, P.J. & Berde, C.B. (1990). Discordance between self-report and behavioural pain measures in children aged 3-7 after surgery. Journal of Pain and Symptom Management, 5 (6), 350-356.

Blishen, B.R., Carroll, W.K. & Moore, C. (1987). The 1981 socioeconomic index for occupations in Canada. Canadian Review of Sociology. & Anthropology, 24 (4), 465-488.

Blurton-Jones, N. (Ed.). (1972). Ethological studies of child behaviour. Cambridge: Cambridge University Press.

Buck, R. (1984). The communication of emotion. New York: Guildford Press

Carey, W.B. (1969). Maternal anxiety and infantile colic. Clinical Pediatrics, 7, 590-595.

Carey, W.B. (1972). Clinical applications of infant temperament measurements. Journal of Pediatrics, 81, 823-828.

Carey, W.B. (1996). The Carey temperament scales test manual. Scotsdale, Arizona: Behavioral-Developmental Initiatives.

Cella, D. & Perry, S. (1986). Reliability and concurrent validity of three visual analogue mood scales. Psychological Report, 59, 827-833.

Chambers, C.T., Reid, G.J., McGrath, P.J., Finley, G.A. & Craig, K.D. (1997). Agreement between child and parent reports of pain. Paper presented at the Annual meeting of the Canadian Psychological Association, Toronto, Ontario.

Cole, P.M. (1986). Children's Spontaneous Control of Facial Expression. Child Development, 57, 1309-1321.

Cohen, J. (1960). A coefficient of agreement for nomianl scales. Educational and Psychological Measurement, 20, 37-46.

Cohen, J. (1968). Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. Psychological Bulletin, 70, 213-220.

Craig, K.D. (1983). Modeling and social learning factors in chronic pain. In J.J. Bonica, U. Lindeblom & A. Iggo (Eds.), Advances in pain research and therapy: Vol. 5, 813-826. Raven Press, New York.

Craig, K.D. (1986). Pain in context: Social modeling influences. In Sternbach, R.A. (Ed.). The psychology of pain. Raven: New York.

Craig, K.D., Hyde, S.A. & Patrick, C.J. (1991). Genuine, suppressed and faked facial behavior during exacerbation of chronic low back pain. Pain, 46, 153-160.

Craig, K.D. (1992). The facial expression of pain: Better than a thousand words? American Pain Society Journal, 1 (3), 153-162.

Craig, K.D., Lilley, C. M. & Gilbert, C.A. (1996). Social barriers to optimal pain management in infants and children. Clinical Journal of Pain, 17, 247-259.

Dahlquist, L.M., Gil, K.M., Armstrong, F.D., DeLawyer, D.D, Greene, P. & Wuori, D. (1986). Preparing children for medical examinations: The importance of previous medical experience. Health Psychology, 5 (3), 249-259.

Derogatis, L.R., Lipman, R.S., Rickels, K., Uhlenhuth, E.H. & Covi, L. (1974). The Hopkins symptom checklist. Behavioral Science, 19, 1-15.

Dunn-Geier, B.J., McGrath, P.J., Rourke, B.P., Latter, L. & D'Astous, J. (1986). Adolescent chronic pain: The ability to cope. Pain, 26, 23-32.

Edwards, P.W., Zeichner, A., Kuczmierczyk, A.R. & Boczkowski, J. (1985). Familial Pain Models: The relationship between family history of pain and current pain experience. Pain, 28, 379-384.

Ekman, P. & Friesen, W. V. (1985). Manual for the Facial Action Coding System. Consulting Psychologists Press, Palo Alto, CA, 1978.

Ekman, P., Friesen, W.V., O'Sullivan, M., Chan, A., Diacoyanni-Tarlatzis, I., Heider, K., Krause, R., LeCompte, W.A., Pitcairn, T., Ricci-Bitti, P.E., Scherer, K., Tomita, M., & Tzavaras, A. (1987). Universal and cultural differences in the judgements of facial expressions of emotion. Journal of Personality and Social Psychology, 53, 712-717.

Ekman, P. & Friesen, W.V., & Simmons, R.C. (1985). Is the startle reaction an emotion? Journal of Personality and Social Psychology, 49, 1416-1426.

Ellerton, M., Ritchie, J.A. & Caty, S. (1994). Factors influencing young children's coping behaviours during stressful health encounters. Maternal Child Nursing Journal, 22 (3), 74-82.

Fordyce, W.E., Roberts, A.H. & Sternbach, R.A. (1985). The behavioral management of chronic pain: A response to critics. Pain, 22, 113-125.

Fradet, C., McGrath, P.J., Kay, J., Adams, S. & Luke, B. (1990). A prospective survey of reactions to blood tests by children and adolescents. Pain, 40, 53-60.

Garber, J., Walker, L.S. & Zeman, J. (1991). Somatization symptoms in a community sample of children and adolescents: Further validation of the Children's Somatization Inventory. Journal of Consulting and Clinical Psychology, 3 (4), 588-595.

Gilbert, C.A., Craig, K.D., Rocha, E.M. & Mathias, M. (1998). Communication of everyday pain response in children with and without developmental delays. Manuscript in preparation.

Gnepp, J. & Hess, D.L.R. (1986). Children's understanding of verbal and facial display rules. Developmental Psychology, 22 (1), 103-108.

Gross, A., Stern, R., Levin, R., Dale, J. & Wojnilower, D. (1983). The effect of mother-child separation on the behaviour of children experiencing a diagnostic medical procedure. Journal of Consulting and Clinical Psychology, 51, 783-785.

Grunau, RVE & Craig, KD. (1987). Pain expression in neonates: facial action and cry. Pain, 28, 395-410.

Grunau, R.V.E., Johnston, C., Craig, K.D. (1990). Neonatal facial and cry responses to invasive and non-invasive procedures. Pain, 42, 295-305.

Grunau, R.V.E., Whitfield, M.F. & Petrie, J.H. (1994). Pain sensitivity and temperament in extremely low-birth-weight premature toddlers and preterm and full-term controls. Pain, 58, 341-346.

Grunau, R.V.E., Whitfield, M.F., Petrie, J.H. & Fryer, E.L. (1994). Early pain experience, child and family factors, as precursors of somatization: a prospective study of extremely premature and fullterm children. Pain, 56, 353-359.

Jacobson, P.B., Manne, S.L., Gorfinkle, K & Schorr, O. (1990). Analysis of child and parent behaviour during painful medical procedures. Health Psychology, 9 (5), 559-576.

Jamison, R.N. & Walker, L.S. (1992). Illness behavior in children of chronic pain patients. International Journal of Psychiatry in Medicine, 22 (4), 329-342.

Jay, S.M., Ozolins, M., Elliott, C.H. & Caldwell, S. (1983). Assessment of children's distress during painful medical procedures. Health Psychology, 2 (2), 133-147.

Katz, E.R., Kellerman, J., & Siegel, S.E. (1980). Behavioral distress in children with cancer undergoing medical procedures: Developmental considerations. Journal of Consulting and Clinical Psychology, 48, 356-365.

Kirmayer, L. (1985). Somatization and the social construction of illness experience. In S. McHugh & M. Vallis (Eds.), Illness behavior: A multidisciplinary model (pp. 111-133). New York and London: Plenum Press.

Kliewer, W. (1991). Coping in middle childhood: Relations to competence, Type A behavior, monitoring, blunting and locus of control. Developmental Psychology, 27 (4), 689-697.

LeBaron, S. & Zeltzer, L. (1984). Assessment of acute pain and anxiety in children and adolescents by self-reports, observer reports and a behavioral checklist. Journal of Consulting and Clinical Psychology, 52 (5), 729-738.

Leiken, L., Firestone, P. & McGrath, P.J. (1988). Physical symptom reporting in Type A and Type B children. Journal of Consulting and Clinical Psychology, 56 (5), 721-726.

Leiken, L., Firestone, P., McGrath, P.J. & Bernard, P. (1987). Validation of the Symptom Inventory Rating Scale (SIRS) in children.

LeResche, L. & Dworkin, S.F. (1988). Facial expressions of pain and emotions in chronic TMD patents. Pain, 35, 71-78.

Linden, W. Paulhus, D.L. & Dobson, K.S. (1986). Effects of response styles of the report of psychological and somatic distress. Journal of Consulting and Clinical Psychology, 54 (3), 309-313.

Manne, S.L., Jacobsen, P.B. & Redd, W.H. (1992). Assessment of acute pediatric pain: do child self-report, parent ratings, and nurse rating measure the same phenomenon? Pain, 48, 45-52.

Martin, R.P. (1983). Temperament: A review of research with implications for the school psychologist. School Psychology Review, 12 (3), 266-273.

McDevitt, S.C. & Carey, W.B. (1975). The measurement of temperament in 3-7 year-old children. Journal of Child Psychology and Psychiatry, 19, 245-253.

McGrath, P.A. (1990). Pain in children. Guildford Press: New York

McGrath, P.J. & Feldman, W. (1986). Clinical approach to recurrent abdominal pain in children. Journal of Development and Behavioural Pediatrics, 7, 56-61.

McGrath, P.J., Johnson, G., Goodman, J.T., Schillinger, J., Dunn, J., & Chapman, J. (1985). CHEOPS: A behavioral scale for rating postoperative pain in chidren. Advances in Pain Research and Therapy, 9, 395-402.

Mechanic, D. (1962). The concept of illness behavior. Journal of Chronic Disease, 15, 189-194.

Mechanic, D. (1978). Medical sociology. (2nd ed.) New York: Free Press

Mechanic, D. (1984). Illness Behaviour. Paper presented at the First International Conference on Illness Behaviour. Adelaide, Australia.

Mechanic, D. (1985). Illness behavior: An overview. In S. McHugh & M. Vallis (Eds.), Illness behavior: A multidisciiplinary model (pp 101-109). London & New York: Plenum Press.

Mechanic, D. (1995). Sociological dimensions of illness behaviour. Social Science and Medicine, 41 (9), 1207-1216.

Osborne, R.B., Hatcher, J.W., & Richtsmeier, A.J. (1989). The role of social modeling in unexplained pediatric pain. Journal of Pediatric Psychology, 14 (1), 43-61.

Oster, H. & Rosenstein, D. (1993). Baby FACS: Analyzing facial movement in infants. Paper presented at the Annual Meeting of the Society for Research in Child Development, New Orleans, LA.

Osterweis, M., Kleinman, A., & Mechanic, D. (Eds.). (1987). Pain and disability. Washington, D.C.: National Academy Press.

Patterson, K.L. & Ware, L.L. (1988). Coping skills for children undergoing painful medical procedures. Issues in Comprehensive Pediatric Nursing, 11, 113-143.

Prkachin, K.M. (1992). The consistency of facial expressions of pain: a comparison across modalities. Pain, 51, 297-306.

Prkachin, K.M., Berzins, S & Mercer, S.R (1994). Encoding and decoding of pain expressions: A judgement study. Pain, 58, 253-259.

Prkachin, K.M. & Craig, K.D. (1995). Expressing pain: The communication and interpretation of facial pain signals. Journal of Nonverbal Behaviour, 19 (4), 191-205.

Prkachin, K.M., Mercer, S.R. (1989). Pain expression in patients with shoulder pathology: Validity, properties and relationship to sickness impact. Pain, 39, 257-265.

Prkachin, K.M., Soloman, P.S., Hwang, T & Mercer, S.R. (1995). Does experience affect judgements of pain behaviour: Evidence from relatives of pain patients and health-care providers. Manuscript submitted for publication.

Reid, G.J., Hebb, J.P.O., McGrath, P.J., Finley, G.A. & Forward, S.P. (1995). Cues parents use to assess postoperative pain in their children. Clinical Journal of Pain, 11, 229-235.

Rickard, K. (1988). The occurrence of maladaptive health-related behaviors and teacher-rated conduct problems in children of chronic low back pain patients. Journal of Behavioral Medicine, 11, 107-116.

Rosenthal, R., Hall, J.A., DiMatteo, M.R., Rogers, P.L., & Archer, D. (1979). Sensitivity to nonverbal communication: The PONS Test. Baltimore: Johns Hopkins University Press.

Schechter, N.L. (1989). The undertreatment of pain in children: An overview. Pediatric Clinics of North America, 36, 781-795.

Schechter, N.L., Berstein, B.A., Beck, A., Hart, L., & Scherzer, L. (1991). Individual differences in children's response to pain: Role of temperament and parental characteristics. Pediatrics, 87 (2), 171-177.

Shaffer, D.R. (1993). Developmental psychology: Childhood and adolescence (3rd ed.). Pacific Grove: Books/Cole Publishing Company.

Shapiro, B. (1993). Treating cancer pain in kids gets new attention. Journal of the National Cancer Institute, 85 (16), 1278-1279.

Simonds, J.F. & Simonds, M.P. (1982). Factor analysis of temperament category scores in a sample of nursery school children. Journal of Clinical Psychology, 38 (2), 359-366.

Spector, P.E. (1981). Research designs. Sage University Paper series on Quantitative Applications in the Social Sciences, 07-001. Beverly Hills and London: Sage Publications.

Spitzer, W.O., and Task Force. (1986). Rapport du Groupe de Travail Quebecois sur les Aspects Cliniques des Affections Vertebrales Chez les Travailleurs. L'Institut de Recherche en Sante et en Securite du Travail due Quebec.

Tabachnick, B.G. & Fidell, L.S. (1996). Using multivariate statistics (3rd ed.). New York: Harper Collins.

Taddio, A., Katz, J., Hersich, A.L. & Koren, G (1997). Effect of neonatal circumcision on pain responses during subsequent routine vaccination. The Lancet, 349, 599-603.

Tarbell, S.E., Cohen, T.I. & Marsh, J.L. (1992). The Toddler-Preschooler Postoperative Pain Scale: An observational scale for measuring postoperative pain in children aged 1-5. Preliminary report. Pain, 50, 273-280.

Thomas, A. & Chess, S. (1977). Temperament and development. New York: Brunner/Mazel.

Turkat, I.D. (1982). An investigation of parental modeling in the etiology of diabetic illness behaviour. Behaviour Research and Therapy, 20, 547-552.

van Aken, M.A.G., van Lieshout, C. F.M., Katz, E.R., & Heezen, T.J.M. (1989). Development of behavioral distress in reaction to acute pain in two cultures. Journal of Pediatric Psychology, 14 (3), 421-432.

Van-den-Akker, O. & Steptoe, A. (1985). The pattern and prevalence of symptoms during the menstrual cycle. British Journal of Psychiatry, 147, 164-169.

Walker, L.S. & Zeman, J.L. (1992). Parental response to child illness behavior. Journal of Pediatric Psychology, 17, 49-71.

Wallace, M.R. (1989). Temperament: a variable in children's pain management. Pediatric Nursing, 15, 118-121.

Watt-Watson, J.H., Evernden, C., & Lawson, C. (1990). Parents' perceptions of their child's acute pain experience. Journal of Pediatric Nursing, 5 (5), 344-349.

Winer, G.A. (1982). A review and analysis of children's fearful behavior in dental settings. Child Development, 53, 111-1113.

Wong, D.L. & Baker, C.M. (1988). Pain in children: Comparisons of assessment scales. Pediatric Nursing, 14, 9-17.

Young, M.R., & Fu, V.R. (1988). Influence of play and temperament on the young child's response to pain. Child Health Care, 18, 209-217.

Zeman, J. & Garber, J. (1996). Display rules for anger, sadness, and pain: It depends on who is watching. Child Development, 67 (3), 957-973.

Appendix A
Parent Consent Form

Department of Psychology
3333 University Way
Prince George, B.C. Canada V2N 4Z9
Tel: (604) 960-5820

Parents' Perceptions of Children's Distress During Medical Procedures

We are conducting a study to look at how children respond to booster shots and parents' thoughts about children's pain during needles. Through this research we hope to understand the factors which influence children's reactions to painful medical procedures.

As a parent, your participation will involve:

- Filling out four brief questionnaires, which you can mail back to us. The questionnaires take about 45 minutes to do, and will ask about you and your family, your child's past medical experience and your child's general health.
- Watching a two minute videotape of patients who have had an injury to the shoulder and are being examined by the therapist. You will be asked to rate how much pain you feel each person expressed.
- We will also be videotaping your child's reaction to the needle.

Your participation in this project is strictly voluntary and you are free to withdraw at any time.

All information gathered in this study will be treated with strict confidence. All parent responses will be labeled with code numbers rather than names and information will be stored in locked files. Information will be available only to personnel involved in the research project.

If you wish further information now or later, you can contact Liz Rocha, research co-ordinator at 960-6062, or Dr. Ken Prkachin, Department of Psychology at 960-6633.

Name of Child_____ Name of Parent_____

Telephone Number_____

_____ I agree to participate in the research. I have received a copy of this consent form for my personal records.

_____ _____

Signature of parent Signature of witness

Appendix B
Parent Coping Behaviour Checklist

Date:_____ Coder:_____
ID#:_____

EMOTIONAL SUPPORT _____ BARGAIN/REWARD_____
PAIN EXPRESSION _____ PLEAD_____
*DISTRACTION*_____ CRITICIZING_____
NOTHING _____ YELL/THREATEN_____
EXPLAINING/PROCEDURAL STATEMENTS_____ PRAISE OR POSITIVE TALK _____
ANXIOUS QUESTIONS/COMMENTS_____ OTHER (PLEASE DESCRIBE)
_____

Date:_____ Coder:_____
ID#:_____

EMOTIONAL SUPPORT _____ BARGAIN/REWARD_____
PAIN EXPRESSION _____ PLEAD_____
*DISTRACTION*_____ CRITICIZING_____
NOTHING _____ YELL/THREATEN_____
EXPLAINING/PROCEDURAL STATEMENTS_____ PRAISE OR POSITIVE TALK _____
ANXIOUS QUESTIONS/COMMENTS_____ OTHER (PLEASE DESCRIBE)
_____

Date:_____ Coder:_____
ID#:_____

EMOTIONAL SUPPORT _____ BARGAIN/REWARD_____
PAIN EXPRESSION _____ PLEAD_____
*DISTRACTION*_____ CRITICIZING_____
NOTHING _____ YELL/THREATEN_____
EXPLAINING/PROCEDURAL STATEMENTS_____ PRAISE OR POSITIVE TALK _____
ANXIOUS QUESTIONS/COMMENTS_____ OTHER (PLEASE DESCRIBE)
_____
_____

Appendix C
Parent Demographic and Family Health Questionnaire

These questionnaires take about 45 minutes to complete. When you have finished them, please mail them in the stamped and addressed envelope included. In order for participants to be eligible for the $100 prize draw, questionnaires must be received by October 20, 1997. If you would like us to send you a letter at the end of the study to tell you what we have found, please write your address on the last page of this questionnaire packet. If you have any questions or concerns, please call Liz Rocha, research co-ordinator, at 960-6062.

Parent Information Sheet

1. Your relationship to the Child (circle one number)

   1. Mother 2. Father 3. Stepmother 4. Stepfather 5. Other _____

2. Would you define yourself as the primary caregiver (circle one): Yes No

3. Your current age: _____(years)

4. Your ethnic origin: _____

5. Your current marital status (circle one number):

   1. Married
   2. Divorced/Separated
   3. Remarried
   4. Widowed
   5. Never married
   6. Other _____

6. Your occupation (please describe):

_____
_____
_____

7. Your Spouse's/Partner's Current Age: _____(years)

8. Your Spouse's ethnic origin: _____

9. Your Spouse's/Partner's Occupation (please describe):

_____
_____
_____

Child Information Sheet

Please complete these questions in reference to your child.

1. Child's age: _____ (years)

2. Child's Date of Birth _____(month) _____ (day) _____ (year)

3. Child's Ethnic origin _____

4. Does your child have any chronic illnesses (e.g. asthma) (circle one): No Yes

If yes, please list the illness(es):

_____

5. Does your child have any developmental delays (e.g. Down's syndrome, speech impairment) (circle one): No Yes

If yes, please describe the delay(s):

_____

Health Status

1) a. Does anyone in your home suffer from pain (circle one): No Yes

b. If yes, is it (circle those that apply):
Mother Father Brother/Sister Grandparent Aunt/Uncle Other_____

c. If yes, how many people in your home suffer from pain (please write the number)_____

2) a. In the past, has there been anyone in your home that suffered from pain (circle one): No Yes

b. If yes, was it (circle those that apply):
Mother Father Brother/Sister Grandparent Aunt/Uncle Other_____

c. If yes, how many people (please write the number): _____

3) a. Does anyone in your home suffer from a major health problem other than pain (circle one): No Yes

b. If yes, is it (circle those that apply):
Mother Father Brother/Sister Grandparent Aunt/Uncle Other_____

c. If yes, how many (please write the number): _____

Past Medical Experiences

Please indicate how many times your child has experienced each of the following medical procedures:

0 = never
1 = one or two times
2 = three or four times
3 = more than four times

Throat Cultures.....	0	1	2	3
Medical Appointments.....	0	1	2	3
Dental Appointments.....	0	1	2	3
Blood work (i.e., finger poke and/or venipuncture)...	0	1	2	3
Hospitalizations.....	0	1	2	3
Surgery.....	0	1	2	3

If your child is a BOY, was he circumcised as an infant (circle one): No Yes

Please rate your child's reactions to each of these medical experiences (circle one number):

Throat cultures

1 2 3 4 5 6 7 N/A
negative (distressed) no reaction positive (pleased)

Medical Appointments

1 2 3 4 5 6 7 N/A
negative (distressed) no reaction positive (pleased)

Dental Appointments

1 2 3 4 5 6 7 N/A
negative (distressed) no reaction positive (pleased)

Blood work (i.e., finger poke and/or venipuncture)

1 2 3 4 5 6 7 N/A
negative (distressed) no reaction positive (pleased)

Hospitalizations

1	2	3	4	5	6	7	N/A
negative (distressed)			no reaction			positive (pleased)	

Surgery

1	2	3	4	5	6	7	N/A
negative (distressed)			no reaction			positive (pleased)	

Appendix D
Illness Behaviour Encouragement Scale

These questions are about what you do when your child is hurt or in pain. For each question, choose one of the answers.

NEVER	means that you NEVER do this
HARDLY EVER	means that you only do this ONCE IN A WHILE
SOMETIMES	means that you do this SOME OF THE TIME
OFTEN	means that you USUALLY DO THIS
ALWAYS	means that you ALWAYS DO THIS

	Never	Hardly Ever	Sometimes	Often	Always
1. How often do you let your child stay home from daycare/preschool when he/she is hurt or in pain?	0	1	2	3	4
2. How often do you say your child does not have to do regular chores such as picking up toys when he/she is hurt or in pain?	0	1	2	3	4
3. How often do you bring your child special treats, or little gifts when he/she is hurt or in pain?	0	1	2	3	4
4. How often do you insist that your child go to daycare when he/she is hurt or in pain?	0	1	2	3	4
5. How often do you take your child to the doctor when he/she is hurt or in pain?	0	1	2	3	4
6. How often do you spend more time than ususal with your child when he/she is hurt or in pain?	0	1	2	3	4

	Never	Hardly Ever	Sometimes	Often	Always
7. How often do you give your child special privileges or let him/her do things he/she isn't usually allowed to do when he/she is hurt or in pain?	0	1	2	3	4
8. How often do you stay home from work or come home early (if you don't work, how often do you stay home instead of going out or running errands, etc.,) when he/she is hurt or in pain?	0	1	2	3	4
9. How often do you pamper or spoil your child when he/she is hurt or in pain?	0	1	2	3	4
10. How often do you tell other people in the family not to bother your child or to be especially nice to your child when he/she is hurt or in pain?	0	1	2	3	4

Appendix E
Children's Somatization Inventory - Parent Version

The following are bodily symptoms often experienced by children. Please rate how much your child has been bothered by them in the past 2 WEEKS.

0 means that your child has NOT been bothered by this
1 means that your child has been bothered A LITTLE by this
2 means that your child has been bothered by this A LOT
3 means that your child has been bothered by this A WHOLE LOT

Seizures	0	1	2	3
Difficulty urinating	0	1	2	3
Blindness	0	1	2	3
Pain urinating	0	1	2	3
Fainting	0	1	2	3
Vomiting spells	0	1	2	3
Memory loss	0	1	2	3
Pain in genitals	0	1	2	3
Difficulty swallowing	0	1	2	3
Blurred vision	0	1	2	3
Loss of voice	0	1	2	3
Deafness	0	1	2	3
Dizziness	0	1	2	3
Double vision	0	1	2	3
Trouble catching breath	0	1	2	3
Heart beating too fast	0	1	2	3
Pain in chest	0	1	2	3
Numbness/tingling	0	1	2	3
Low energy	0	1	2	3
Lump in throat	0	1	2	3
Stomach pain	0	1	2	3
Nausea/upset stomach	0	1	2	3
Food intolerance	0	1	2	3
Diarrhea	0	1	2	3
Constipation	0	1	2	3
Bloating	0	1	2	3
Hot/cold spells	0	1	2	3
Headaches	0	1	2	3

Pain in arms/legs	0	1	2	3
Pain in joints	0	1	2	3
Sore muscles	0	1	2	3
Muscle weakness	0	1	2	3
Heaviness in arms/legs	0	1	2	3
Weakness in body parts	0	1	2	3
Trouble walking	0	1	2	3
Back pain	0	1	2	3

Appendix F
Parental Coping Behaviour Checklist-Category Descriptions

Anxious Questions/Comments
Says "Are you afraid?" "Did that hurt?" "You look upset" and so forth

Bargain/Reward
Promises or offers future reward in return for co-operation ("If yo stop crying, I'll get you a toy" "If you behave, we'll go for ice-cream after"

Explaining/Procedural Statements
Says "the nurse is going to give you a needle" "it will be quick" "sit here so the nurse can give you the needle" and so forth

Plead
Says "please be a good girl/boy," "please don't cry, " please stay still" and etc.

Yell/Threaten
Abrupt commands directed to child or threats of future retribution ("Get over here!" "If you don't stop crying you won't go home" or so forth

Criticizing
Statements negatively evaluating or disapproving of child's actions

Praise or Positive Talk
Statement positively evaluating or approving of prior, ongoing or future actions of the child. (E.g. "good sitting" "You did a good job during the needle") or a coping statement the child can repeat ("only a few more secs" "you can do it")

Emotional Support
Hugs, hand holding, hair stroking, or other forms of physical or verbal comfort/soothing provided by the parent

Distraction
Statements trying to distract child from medical procedure (e.g. talking about school, home, telling jokes or stories, counting singing, imagery)

Pain expression (vocal or physical)
Any expression of pain or discomfort in face or bodily action. Verbal pain expression such as gasping or sighing.

Nothing: Mom watches

Other: none of the above, please describe: