INVESTIGATING THE RELATIONSHIP BETWEEN CHILDREN'S SELF-REPORTED COPING STRATEGIES AND REPEATED NEEDLE PAIN

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Abstract

While the majority of school-aged children associate immunizations with low levels of anxiety, fear, and pain, there is a small subset for whom needles are highly distressing (Humphrey, et al., 1992). Poorly managed, these individuals may come to avoid medical treatment (Ollendick, King, & Muris, 2002). Using Lazarus and Folkman's (1984) transactional theory of coping and Reid and colleagues' (1998) development and validation of the *Pain Coping Questionnaire* as frameworks, the present program of research elaborated on existing knowledge about how children cope with needles. As part of Studies 1 (N = 176) and 2 (N = 302), a *Coping with Needles Questionnaire* (CNQ) was developed and validated; both two- and three-subscale versions of the questionnaire were examined. The resulting CNQ was composed of and scored as two separate subscales: problem-focused and emotion-focused coping. Construct validity testing demonstrated that emotion-focused coping was robustly associated with more negative experience with needles (i.e., higher anxiety, fear, pain, and lower self-efficacy). There was no main effect of problem-focused coping but it tended to moderate the negative effect of emotion-focused coping when the two interacted. Study 3 (N = 78) was designed to investigate (1) the percentage of participants who are high on only one type of coping (i.e., dominant copers) and (2) how coping responses change over time in response to repeated presentations of the same stressor. Presently there are gaps in the existing literature regarding these two targeted areas of investigation. Results of this investigation indicated that most children engage in high amounts of both problem- and emotion-focused coping when initially queried about their experience with an immunization, with approximately 30% showing a pattern of coping dominance. When participants were followed and queried about a second experience with immunization, it was found that most of them engaged in low amounts of both types of coping. This pattern of change in the distribution of coping over time was not consistent with learning effects. In other words, participants did not seem to improve their coping with experience. However, lack of a clearly positive type of coping and a six-month time-lag may have inhibited the potential for learning to occur. The utility of the CNQ for screening purposes and implications of these findings for interventions are discussed.

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SECTION A: GENERAL INTRODUCTION

1. Background

The present program of research sought to elaborate on existing knowledge about how children cope with needles by using Lazarus and Folkman's (1984) transactional theory of coping and Reid and colleagues' (1998) development and validation of the *Pain Coping Questionnaire* as coping frameworks. At the commencement of this program of research, little was reported in the literature about what percentage of individuals have a dominant type of coping responses (i.e., high on only one type of coping). Similarly, little was known about how coping responses change over time in response to repeated presentations of the same stressor. A series of three studies was run to help elucidate these areas of the literature. The hepatitis B immunization series was chosen as the target stressor because, as a multi-dose immunization[1], it provided for a naturalistic repeated-measures design. The theoretical and literature background supporting this program of research is presented in the following section.

1.1 Immunization compliance and coverage

Immunizations are an important part of preventative health care and many of them are scheduled throughout childhood. Regular vaccination can help prevent diseases and ailments such as polio, mumps, measles, rubella, hepatitis A and B, and influenza. Yet, as important as it is to be protected from disease, many North American children are not up-to-date on their immunization schedules (Canadian Immunization Registry Network, 2005; Faustini et al., 2001; McWha et al., 2004; National Vaccine Advisory Committee, 1999). Children describe the process of getting a needle as painful and unpleasant (Goodenough, Thomas, Champion, Perrott, Taplin, von Baeyer et al., 1999), and a significant portion of children fear them (Humphrey, Boon, van-Linden-van-den-Heuvell, & van-de-Wiel, 1992; Lapouse & Monk, 1959). Some parents have reported delaying or altogether avoiding their young children's scheduled immunizations for fear of putting them through an experience that could make them afraid or cause them to cry (Jacobson et al., 2001; Pruitt, Kline, & Kovaz, 1995; Tarrant & Gregory, 2003). At some stages in development, immunizations are required repeatedly for the vaccine to

[1] Note that the literature review focuses on acute procedural pain including immunizations of various types, blood draws, and intra-venous starts.

be fully effective. Yet it tends to be these repeat or "booster" visits that parents and their children fail to attend (McWha et al., 2004).

In Canada, babies receive a battery of vaccines by their first birthdays that require boosters at 18 months and at school entry. In 2002, the Canadian government commissioned a survey that assessed the immunization coverage rates (i.e., how many children received their full vaccine series) of vaccine boosters for 2- and 7-year-olds. Results indicated that coverage for single dose vaccine among 2-year-olds was quite high ranging between 93.5 and 94.5% for measles, mumps and rubella (MMR, McWha et al., 2004). However, coverage for multi-dose vaccines was less high. Among 4-dose vaccines, coverage ranged from as low as 64% for *Haemophilus influenzae* type B (flu) vaccine to as high as 76.8% for diphtheria. Coverage for polio was 87.7%, which is a 3-dose vaccine. Coverage in the 7-year-old cohort was less extensive than it was among the toddler group. Single-dose vaccination coverage ranged between 73.8 and 75.8% for MMR. Multi-dose vaccine coverage ranged from 65.3 to 70.5% for diphtheria, pertussis, and tetanus and 65.6% for polio. *Haemophilus influenzae* type B vaccine did not have a booster group but 65.2% of 7-year-olds had received all four doses of this vaccine.

While the Canadian immunization survey thoroughly assessed coverage in infants, toddlers, and early school-age children, no such information was collected for older school-aged or adolescent children. The multi-dose vaccine that is scheduled for school-aged children is hepatitis B[2] (hepB). It is administered three times within a six month period (Mast, Williams, Alter, & Margolis, 1998). In Saskatchewan, hepB was administered as a three doses series until the 2006-2007 school year. In October 2006, a two-dose series, separated by approximately 6 months, was introduced in Saskatoon, SK.

Some data are available on hepB vaccine coverage in the literature. Linton and colleagues (2003) reported that in 1999, 67.2% of 38,875 San Diego, CA students had received required hepatitis B vaccine doses. Of 315 participating schools, coverage was less than 40% in 60 schools and exceeded 80% in 111 schools. Factors associated with high coverage included private schools, early and frequent notice to parents, and, for public schools, higher overall socioeconomic status of students. In the United States, insurance coverage and state policies are also pertinent issues affecting immunization uptake (Olson, Mahon, Wang, & Woods, 2007).

[2] Hepatitis B is a viral liver disease that may be acute or chronic, and can be life-threatening (Ropero, Danovaro-Holliday, & Andrus, 2005).

British Columbia introduced a universal hepB immunization program in 1992 for grade six students (Bell, 1995; Patrick et al., 2003). Immunization coverage ranged between 90% and 93% for each year between 1993 and 2001. The overall rate of reported acute hepB declined from 7 per 100,000 to just more than 2 per 100,000, whereas that in 12- to 21-year-olds declined from 1.7 to 0 per 100,000 over this one-decade period. The rate of acute hepB infection was significantly associated with year (more infections early in the program history), urban region (more infection among lower SES groups), and lower vaccine uptake. In British Columbia, hepB has been eliminated in the immunized adolescent cohort, which speaks to the importance of universal immunization coverage.

1.2 Factor Predicting Immunization Coverage

Linton and colleagues (2003) and Bell and colleagues (1995) were able to identify several school characteristics that are predictive of good hepB immunization coverage. However, little is known about individual difference variables that might contribute to immunization compliance or non-compliance when the vaccine is optional (as is the case for hepB vaccine in Saskatchewan). Even less is known about individual difference variables that predict good immunization coverage among preadolescent and adolescent children, who might have some say in consenting, or not consenting, to hepB vaccination.

While parents take the legal role of consenting for immunizations in school-aged children, researchers and ethicists suggest that preadolescent children are developmentally capable of contributing to decisions regarding their health (Baylis, Downie, & Kenny, 1999; David, Edwards, & Alldred, 2001; Fundudis, 2003; Hallstrom, 2004; Kuther, 2003; McCabe, 1996; Thurston & Church, 2001). It is possible that some portion of parents ask their grade six children whether or not they want to be immunized against hepB. Among other reasons, researchers have documented that parents will avoid getting their young children immunized because it may be a fearful experience (Jacobson et al., 2001; Pruitt et al., 1995; Tarrant & Gregory, 2003), yet little attention has been paid to the role of fear of needles in immunization coverage among school-age or preadolescent children. This omission in the literature seems unwarranted, especially given that preadolescent children are at a developmental level when it is appropriate to weigh their opinions in decisions that concern them, and when fear of needles is still quite prevalent (Humphrey et al., 1992).

In the adult literature, it is well recognized that fear can be a powerful source of avoidance of medical procedures involving needles, such as immunizations and blood sampling (Hamilton, 1995; Kleinknecht & Lenz, 1989; Kleinknecht, Thorndike, & Walls, 1996; Page, 1994; Pate, Blount, Cohen, & Smith, 1996; Wiederhold & Wiederhold, 2005). One might expect fear avoidance involving needles to be present throughout childhood as well, especially given that needle fear tends to be more common among children compared to adults (Agras, Sylvester, & Oliveau, 1969; A. Costello, 1982; C. G. Costello, 1982; Kleinknecht, 1987; Lapouse & Monk, 1959; Marks, 1988; Ost, Lindahl, Sterner, & Jerremalm, 1984). While there is some literature suggesting that adults who were needle phobic as children will avoid medical care in the future (Cohen et al., 2001; Ollendick, King, & Muris, 2002; Page, 1994), there has been little investigation of this relationship during the child and adolescent years.

Refusing immunization is one possible avoidant response that could be implemented to circumvent fear of needles but there are many others that children may also exhibit to manage their distress in this context (e.g., cursing, using imagery, counting, crying etc.). These types of avoidant responses are most likely to emerge in fear or anxiety inducing situations (Norton & Asmundson, 2004; Weinstein, 1990) and they may inhibit the use of other types of coping. The following section reviews the literature on fear of needles among children, first by addressing and defining fear and anxiety, then phobias. Later, the implications of avoidant coping for experience with needles will be reviewed.

2. Fear of Needles among Children

2.1 Defining Terms

According to Marks (1969), ‘Fear is a normal response to active or imagined threat in higher animals, and composes an outer behavioural expression, an inner feeling, and accompanying physiological changes’ (p. 1). Fear may also involve the impulse to escape or avoid the threatening situation (Barrios & Odell, 1998). In contrast, the Oxford English Dictionary defines anxiety as uneasiness or trouble of mind about some uncertain event; a second definition describes anxiety as ‘a sensation of tightness and distress in the precordial region’ (i.e., the region over the heart and stomach). Where fear is seen as limited to a known stressor (i.e., getting a needle), anxiety is considered a more diffuse, state-like or qualitative reaction that may be considered an in vivo measure of general stress or arousal and may result from exposure to a

feared stimulus. Due to the subtle differences between these two states, both fear and anxiety measures were considered in the present program of research.

The term distress will sometimes be used as synonymous with anxiety throughout this document. Stress is also used similarly to anxiety but, more accurately, it refers to discomfort precipitated by situational demands which are perceived as exceeding resources (Lazarus & Folkman, 1984). Therefore, a *stressor* is a necessary condition under which coping will occur (to be discussed in Section 3) and anxiety may occur.

The most recent edition of the Diagnostic and Statistics Manual, or DSM-IV-TR (American Psychiatric Association, 2000), characterizes phobias as a marked and persistent fear that is excessive or unreasonable, cued by the presence or anticipation of a specific object or situation. Exposure to the phobic stimulus almost invariably provokes an immediate anxiety response, which may take the form of a panic attack. The person also recognizes that the fear response is unreasonable. This type of excessive and unreasonable fear of blood, wounds, injuries, needles, etc. is termed "blood-injury-injection phobia" (BII phobia) in DSM-IV-TR (American Psychiatric Association, 2000). Blood-injury-injection type phobia, which subsumes needle phobia, has a relatively high prevalence in the general population. This epidemiology will be discussed in the following section.

Individuals with intense needle fear and phobia are those that are the most likely to avoid medical care (Pate et al., 1996), and as such they have the most need for intervention to help them cope with their anxiety. Though an intervention study is beyond the scope of the present program of dissertation research, it is hoped that improving understanding of successful coping will inform interventions designed to help individuals who are highly fearful or phobic about needles to cope more effectively. It is possible that an associated outcome of successful intervention for highly anxious individuals would be decreased risk of medical avoidance behaviours such as failure to complete a multiple dose immunization series. This is a very interesting area of investigation for future research.

2.2 The Epidemiology of Needle Fear and Phobia

Developmental studies point to a general trend for blood and injury related *fears* to increase through early childhood and subsequently decrease with age starting in early adolescence. Mild fears have been found in 44% of 6- to 8-year-olds but in only 27% of 9- to 12-year-olds (Lapouse & Monk, 1959). In a 1992 study, 51% of children 7 to 12 years old

experienced high anxiety responses, ranging from high levels of observed distress to full-scale panic, during routine venipuncture (Humphrey et al., 1992).

Epidemiological studies report that between 3.1 and 4.5% of the general population have BII *phobia* (Fredrikson, Annas, Fischer, & Wik, 1996; Lapouse & Monk, 1959; Marks, 1988) and it is widely thought that the rate is much higher in children (Agras et al., 1969; A. Costello, 1982; C. G. Costello, 1982; Kleinknecht, 1987; Lapouse & Monk, 1959; Marks, 1988; Ost et al., 1984). Estimates of the developmental prevalence of BII phobia show a similar pattern to that of blood and injury related fear, rising to 13% by age 10 and decreasing progressively until age 60, with a mean age of onset at seven years old (Agras et al., 1969; Ost, Lindahl et al., 1984; Ost, Sterner, & Lindahl, 1984).

2.3 The Consequences of Needle Fear and Phobia

2.3.1 Implications of Needle Fear and Phobia for Memory. Anxiety has implications for individuals' expectations and memories for pain[3]. For example, Merritt, Ornstein and Spicker (1994) found that the more children demonstrated behavioural indications of distress during a painful procedure, the less they recalled, for both immediate and delayed recall.

While it is possible that children who are highly anxious or fearful have less attention available to attend to the details of what is happening around them, Zonneveld and colleagues (1997) found that anxiety does not predict accuracy of recalled pain per se. Rather, anxious individuals tend to remember their negative expectations of a painful procedure more readily than the details of the actual experience (Arntz, van Eck, & Heijmans, 1990; Kent, 1985). Interestingly, pre-procedure anxiety predicts only overestimations of expected pain but does not predict higher experienced pain scores (Arntz et al., 1990; Lander et al., 1992). Similar findings have been reported for expected versus experienced distress (Cohen et al., 2001).

Children with a history of negative medical experiences have been found to show higher levels of anxiety prior to painful procedures and to be more distressed and less cooperative during the procedure than children with previous positive or neutral experiences (Bijttebier & Vertommen, 1998). Although Bijttebier and Vertommen concluded that past negative experiences must sensitize anxious children to future painful events, research by Artz et al. (1990) and Lander et al. (1992) suggests that the anxious children may simply be demonstrating a memory

[3] For the purpose of this program of research, the definition of pain presented by International Association for the Study of Pain (IASP) is used. That is, pain is seen as a unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Pain is also thought to be subjectively experienced (see also Section 8.2.1).

bias for their overestimated expectations of pain. It is possible that some combination of both hypothesized effects contributes to the reported relationship between anxiety and subsequent elevations in pre-procedural anxiety.

The results of these studies indicate that anxious individuals emerge from painful procedures with distorted memories that emphasize their overestimated expectations of pain relative to their less intense, actual experienced pain. Therefore, researchers measuring pain for several painful procedures might expect anxiety during a previous procedure to be more strongly related to subsequent ratings of expected pain and anxiety than to ratings of actual experienced pain and anxiety.

2.3.2 Implications for Medical Avoidance. What is not clear from these statistics is the frequency and consequences of medical avoidance among children with BII phobia. Research on medical avoidance attributable to phobias has largely been limited to adult samples. For example, in a study of university students, among those who reported BII with fainting, 25% avoided consultations with doctors (Kleinknecht & Lenz, 1989).

Ideally, needle procedures are completed quickly and with a minimum of distress, though pediatric nurses recognize that this is not always possible (Bricher, 1999). Unfortunately, the medical procedure protocol for children who are very distressed or agitated is to be forced to comply (with parental consent) because the long-term benefits of completing the procedure are thought to outweigh the short-term negative experience of being forced through it (Bricher, 1999). However, the negative experience associated with forced compliance may not be as short-term as one would hope. Negative experiences with needle procedures in childhood may lead to the development of needle fear by setting up children to expect further negative experiences involving needles in the future (Merckelbach, de Jong, & van den Hout, 1996; Ollendick et al., 2002; Pate et al., 1996; von Baeyer, Marche, Rocha, & Salmon, 2004). For example, in a study of young adults, Pate and colleagues (1996) investigated the impact of childhood medical experience on adults' fear, pain, coping, and avoidance of medical situations. Avoidance of medical care as an adult was significantly predicted by being more fearful in childhood. Adult reports of pain, fear, and coping effectiveness were also predicted by recollections of childhood fear of medical situations.

Fear has also been implicated as an obstacle to the timely completion of medical procedures involving needles, such as intravenous insertion (Holmes, 1991). Given that

approximately 10% of 10-year-olds show a marked fear of needles (Agras et al., 1969; Ost, Lindahl et al., 1984; Ost, Sterner et al., 1984), one would expect to see phobic avoidance of immunization in some portion of the children being immunized for hepatitis B at age 11. Indeed, children's fear of needles has been documented to motivate parents to avoid having their children immunized in early childhood (Pruitt et al., 1995; Tarrant & Gregory, 2003). There has been no documentation in the literature that older children who fear needles might be motivated to refuse consent themselves. However, Slonim and colleagues (2005) reported that 94% of their interviewees cited dislike for needles as one of the several reasons they avoided getting all three doses of hepB vaccine.

Beyond fear, what other factors might lead to or limit negative experience with needle procedures? Some researchers suggest that coping strategies can be implicated in understanding how individuals manage the stressors they are faced with. The investigation of children's reactions to painful medical procedures has broadened from a narrow focus on inducing compliance to an expanded focus on studying how children cope (e.g., see reviews by Peterson, 1989; Siegel & Smith, 1989). This trend reflects increased recognition of the psychological distress associated with both traumatic (Jay, Elliott, Katz, & Siegel, 1987) and more routine medical procedures, as well as the risk of transient and long-term disturbances associated with forced compliance through them (Melamed & Siegel, 1975; Rudolph et al., 1995). Current understanding regarding children's coping with medical procedures is reviewed in the following section.

3. Theory and Conceptualization of Coping

For many years, theoretical conceptualizations of coping existed only for adults, and empirical studies focused primarily on adults (Lazarus & Folkman, 1991). As a result, conceptualizations of coping in children have largely been derived from the adult literature. In the following sections, theoretical conceptualizations of coping will be reviewed followed by a discussion of relevant developmental factors that contribute to a full understanding of coping processes.

3.1 Definitions of Coping

According to the classic definition by Lazarus and Folkman (1984), coping refers to the cognitive and behavioural responses that individuals use to manage or tolerate stress, that is, demands perceived as exceeding resources. Following Lazarus and Folkman (1984), a *coping*

response is defined as an intentional physical or mental action, initiated in response to a perceived stressor, which is directed toward external circumstances or an internal state. Similarly, the term *coping strategies* has been used in the coping literature to refer to effortful responses to stressful circumstances (Fields & Prinz, 1997). In contrast, any response that reflects a spontaneous emotional or behavioural reaction to stress, rather than a deliberate attempt to cope, is referred to as a *stress response* (Rudolph et al., 1995). Both coping responses and coping strategies refer to behaviours and cognitions at the individual level of coping and both refer to coping with a specific stressor or situation (Rudolph et al., 1995). Coping *resources* refer to aspects of both the environment (e.g., availability of social support) and the self (e.g., perceived self-efficacy) that facilitate positive adaptation to stress (Compas, 1987; Compas & Boyer, 2001; Lazarus and Folkman, 1984). The focus of the following investigations will be on the conceptualization and understanding of effortful coping responses situated within the individual and as such the terms coping strategies and coping responses will be used interchangeably throughout the document; relatively little emphasis will be placed on discussion of stress responses and coping resources.

3.2 Trait Versus Process Models of Coping

For several decades dispositional and trait conceptualizations of coping were abundant in the research literature. Among these coping trait theories, coping is typically assumed to be situationally and temporally consistent (Siegel & Smith, 1989). This approach to understanding coping also implies that coping involves automatic or reflexive behaviour (Fields & Prinz, 1997). Trait models allow researchers to assess a personality orientation referred to as coping *style* using self-report measures in order to make predictions about individuals' reactions to stress across various contexts. However, empirical investigation did not support this approach to understanding coping. Researchers have come to recognize that individuals are inconsistent in their use of coping strategies across different stressors and over time (Compas, Forsythe, & Wagner, 1988; Fields & Prinz, 1997). In fact, Tobin and colleagues (1989) note that "characteristics of the stressor have tended to be a stronger determinant of coping than the characteristics of the subjects" (p. 356). As a result, coping style has been only a weak to moderate predictor of actual coping responses (Lazarus & Folkman, 1984).

In place of trait models, researchers such as Folkman and Lazarus and their colleagues support a process or transactional approach to conceptualizing coping, in which the assessment

of coping skills is sensitive to changes across situation and time (Anshel, 1996; Anshel & Wells, 2000; Cosway, Endler, Sadler, & Deary, 2000; Ferguson & Cox, 1997; Folkman, 1984; Folkman, Lazarus, Gruen, & DeLongis, 1986; Folkman, Lazarus, Pimley, & Novacek, 1987; Lazarus & Folkman, 1984, 1987, 1991; Ritchie, Caty, Ellerton, & Arklie, 1990; Rudolph et al., 1995). Individuals engage in coping when they are faced with a stressor that is appraised as taxing or as exceeding their resources and endangering their well-being. Individuals are thought to possess a whole range of coping strategies; however, their presence does not necessarily indicate how or when an individual will make use of them.

The Lazarus and Folkman (1984) description of coping advocates the transactional perspective by defining coping as constantly changing behavioural and cognitive efforts to deal with external and/or internal demands on the individual. The change in coping strategies is thought to occur as a function of ongoing cognitive appraisals of the person-environment relationship, which is also always changing. Changes can result (a) from coping processes directed at altering the situation that is causing distress (i.e., problem-focused coping) and/or regulating distress (i.e., emotion-focused coping); (b) from changes in the person that are a result of feedback about what has happened; and (c) from changes in the environment that are independent of the person. When operating from a transactional model of coping, Lazarus and Folkman (1991) believe that measurement of coping strategies should be situation or stressor specific and, when relevant, researchers should examine change by sampling coping strategies over time.

4. Appraisals and Resources as Part of the Coping Process

Appraisals are cognitive judgements that mediate adjustment to a stressor, the selection of coping strategies, and the nature of the coping outcome (Lazarus & Folkman, 1984). Folkman and Lazarus (1991) speak of two key phases of cognitive appraisal: primary and secondary; these are discussed in the following sections. Cognitive developmental differences have an impact on appraisals; these will be discussed in section 7.1.4.

4.1 Primary Appraisal

In primary appraisal, the individual establishes what he/she has at stake in the stressful encounter (Folkman & Lazarus, 1988). Primary appraisal contributes to the quality and intensity of the emotional reaction that the individual will have in response to a stressful encounter. Folkman (1984) described three types of stressful primary appraisals: harm/loss, threat, and

challenge. Harm/loss refers to some type of injury or damage that has already been done; threat refers to concern about the implications of an event for future harm/loss; and challenge refers to the opportunity for future growth, mastery, or gain resulting from an event.

Rudolph et al. (1995) have used Folkman's conceptualization of three primary appraisals to describe how painful medical procedures may be perceived in varying ways.

> For instance, harm/loss appraisals may be reflected in a child's view of repeated [painful procedures] as a punishment or reminder of an illness. Threat appraisals may be reflected in a child's view of an impending surgery as potentially interfering with the opportunity to participate in activities or favourite sports with peers. Challenge appraisals may be reflected in a child's view of a medical procedure as an opportunity to conquer fears and, perhaps, an illness. For example, if one's physical well-being is at stake, as is the case in painful immunization, worry[4] and fear are likely to be dominant emotional reactions. (p. 19)

Primary appraisals also influence children's selection of coping strategies and their general emotional reactions. Harm/loss or threat appraisals are theoretically associated with more antagonistic, less adaptive, coping responses (e.g., screaming), whereas challenge appraisals are associated with more adaptive coping responses (e.g., positive self-talk; Rudolph et al., 1995). Folkman (1984) suggests that harm/loss or threat appraisals are often linked to negative emotions, such as anger, fear, or resentment, whereas challenge appraisals often are linked to more pleasurable (or at least less aversive) emotions, such as interest, curiosity, or enthusiasm.

4.2 Secondary Appraisal

Secondary appraisal is a multidimensional process that includes beliefs related to general self-efficacy and perceived control. That is, beliefs about the extent to which one can influence the outcome of a stressful event (i.e., self-efficacy), and beliefs about the possibilities for control within a specific stressful encounter (i.e., perceived control, Folkman, 1984; Siegel & Smith, 1989). Weisz and colleagues (e.g., Weisz, 1990; 1994) further refined Folkman's construct of perceived control by emphasizing the joint function of perceived contingency and competence. Where contingency refers to perceptions of the degree to which particular outcomes are dependent on people's behaviour, competence refers to perceptions of one's own ability to

[4] In the context of this direct quote, worry can be interpreted as synonymous with the definition of anxiety presented in section 2.1 above.

manifest the necessary behaviours. For example, in the context of immunizations, a child's (Susie) appraisal of contingency may be that she will have to get the needle no matter what she does, while her appraisal of competence may be that she cannot handle the experience.

Secondary appraisals also involve analysis of options and contingencies regarding possible coping responses, so like primary appraisal, it also influences selection of coping responses. For example, when a stressful situation is appraised as unchangeable, the individual is more likely to adopt emotion-focused forms of coping by attempting to regulate his/her distress (Lazarus & Folkman, 1991). Alternatively, perceptions of control should lead to the use of more adaptive coping strategies, which is consistent with social learning theory (Bandura, 1977). Therefore, in Susie's example, she would be most likely to employ emotion-focused coping because she does not perceive any control over the immunization.

4.3 Coping Resources

While they contend that coping is primarily determined by cognitive appraisals, Lazarus and Folkman (1984) also proposed that coping strategies are influenced by available coping resources. Lazarus and Folkman suggested that resourceful individuals have many resources to draw upon and/or are clever at finding ways of using them to counter demands. There are four main categories of resources: health and energy, positive beliefs (i.e., some benefit of the stressor), problem-solving skills, and social skills. The presence of any, or all, of these four qualities contributes resources to an individual which factor into secondary appraisal of stressors. That is, an individual may appraise a stressor as less threatening if they have social support to rely on, compared to having to cope in isolation. Pearlin and Schooler (1978) found that resources are particularly relevant for individuals facing stress arising out of conditions over which they have little direct control.

5. Coping Frameworks

Lazarus and Folkman (1984) referred to two functions of coping: problem-focused and emotion-focused. A well-replicated finding in the history of their research on coping was that individuals rely on both forms of coping in their responses to stressful encounters. As a result, Folkman and Lazarus (1991) suggested that a full understanding of coping requires consideration of both problem-focused and emotion-focused subtypes. Many other subtypes of coping have also been described by researchers (e.g., Byrne, 1964; Fanurik, Zeltzer, Roberts, & Blount, 1993; Hubert, Jay, Saltoun, & Hayes, 1988; Miller, 1987; Miller, Brody, & Summerton, 1988; Peterson, 1989; Peterson & Toler, 1986; Roth & Cohen, 1986; Suls & Fletcher, 1985). One of the most established of these alternative conceptual frameworks identifies approach and avoidance types of coping (also referred to as active versus passive). The approach-avoidance conceptualization is compatible with transactional theory and also has the advantage of incorporating Folkman and Lazarus' problem-focused and emotion-focused coping subtypes; it will be discussed in detail in the following section.

5.1 Approach-Avoidance Typology of Coping

There has only been moderate agreement in the literature about the number and classification of coping types (e.g., Folkman et al., 1987; Lazarus & Folkman, 1984, 1987; Roth & Cohen, 1986; Suls & Fletcher, 1985). One of the most popular conceptual frameworks organizes coping strategies along a dimension that has alternatively been referred to as approach versus avoidance (Hubert et al., 1988; Roth & Cohen, 1986); as well as information seeking versus information avoiding (Peterson & Toler, 1986); rumination or attention versus distraction (Fanurik et al., 1993); and active versus passive (Peterson, 1989). These constructs also resemble distinctions made between repression and sensitization (Byrne, 1964) and high and low monitoring (Miller et al., 1988).

In essence, approach coping consists of a confrontation of the source of stress and deliberate attempts to reduce it, in contrast to the avoidance coping style, which involves avoiding anxiety-inducing stimuli and their consequences (Anshel, 1996; Bachanas & Blount, 1996; Fields & Prinz, 1997; Finset, Steine, Haugli, Steen, & Laerum, 2002; Hubert et al., 1988; Roth & Cohen, 1986; Rutherford & Endler, 1999; Tobin et al., 1989). Approach and avoidance coping styles are not conceptually independent but are thought to be on opposite sides of a continuum of coping strategies. Factor analyses of coping assessment scales reliably output

factor structures that represent approach and avoidance coping responses as negatively correlated dimensions (e.g., Anshel, 1996; Bachanas & Blount, 1996; Crespo & Cruzado, 1997; Ferguson & Cox, 1997; Finset et al., 2002; Lyne & Roger, 2000; Moos, 1997; Phipps, Fairclough, Tye, & Mulhern, 1998; Roder, Boekaerts, & Kroonenberg, 2002; Tobin et al., 1989).

Various forms of assessment have been used to assess the approach/avoidance typology of coping. Adopting a behavioural approach, Hubert et al. (1988) developed the *Behavior Approach–Avoidance and Distress Scale* to examine overt manifestations of approach and avoidance during preparation in pediatric oncology. High approach behaviour included looking, touching, questioning, or initiating involvement, whereas high avoidance included turning away or trying to escape or change the situation. Burstein and Meichenbaum (1979) used a less-direct behavioural approach with 5- to 9-year-old patients prior to hospitalization for surgery. Children were classified as low defensive if they played actively with medically related toys and high defensive if they avoided playing with medically related toys.

Investigators working from a trait model of coping have also used the approach–avoidance typology. For instance, Peterson and Toler (1986) distinguished between information-seeking and -avoiding dispositions using the *Coping Strategies Interview* and the *Coping Behaviors Scale*. For the *Coping Strategies Interview*, a generalized information-seeking disposition was reflected by child reports of such tendencies as asking questions and observing medical procedures, having a prearranged plan for dealing with medical stressors, and expressing appropriate concerns. For the *Coping Behaviors Scale*, an information-seeking disposition was represented by parent reports of children's tendencies to engage in verbal discussion and questioning about medical procedures. For both measures, an information-avoiding disposition was reflected in an absence of the described behaviours (Peterson & Toler, 1986).

Phipps, Fairclough, Tye and Mulhern (1998) examined the relation between children's trait-dependent coping styles and situation-specific coping responses during bone marrow aspirations (BMAs) and lumbar punctures (LPs) in pediatric oncology. Phipps and colleagues developed a coping scale for use in their research called the *Procedural Coping Questionnaire* (PCQ). The Phipps PCQ contains 20-items to assess coping strategies specific to BMAs and LPs. Children and/or parents were asked to select either “yes” or “no” for each of the 20 items. Factor analysis revealed that the PCQ adhered to the approach/avoidance typology of coping, though the dimensions were not helpful in discriminating their outcome of interest.

5.2 Approach, Problem-focused, and Emotion-focused Types

Some researchers have further divided coping into a three-factor model of approach, problem-focused avoidance, and emotion-focused avoidance. For example, Reid and colleagues (1998) developed a questionnaire called the *Pain Coping Questionnaire* (PCQ) to assess coping responses in children with chronic pain. They conducted a factor analysis of data from 257 healthy participants (ages 8-18 years) and found that their results loaded onto three higher-order scales (approach, problem-focused avoidance, emotion-focused avoidance) and eight hypothesized subscales (information seeking, problem solving, seeking social support, positive self-statements, behavioural distraction, cognitive distraction, externalizing, internalizing/catastrophizing; see Table 1).

Table 1. Higher-order Factor Structure and Corresponding Subscales of the PCQ (Reid et al., 1998)

Higher-order factor structure of the PCQ		
Approach	Problem-focused avoidance	Emotion-focused avoidance
Subscales of the PCQ		
▪ Information seeking ▪ Problem solving ▪ Seeking social support ▪ Positive self-statements	▪ Behavioural distraction ▪ Cognitive distraction	▪ Externalizing ▪ Internalizing/catastrophizing

In naming their three higher order factors, Reid and colleagues (1998) have married the approach-avoidance conceptualization of coping with Lazarus and Folkman's concepts of problem-focused and emotion-focused coping (see Table 2). Specifically, Reid and colleagues incorporated the role of attention as the means to split Lazarus and Folkman's concept of problem-focused coping into two categories, approach and problem-focused avoidance, while keeping the emotion-focused category largely the same. The incorporation of attention into the definitions that Reid and colleagues (1998) use for their three higher order coping factors reflects the approach-avoidance framework presented in the previous section. That is, among approach coping strategies, attention is directed toward the stressor, while among avoidance strategies (i.e., problem- and emotion-focused) attention is directed away from the stressor (Reid et al., 1998;

Roth & Cohen, 1986). Similar conceptualizations have been suggested previously and some adult coping measures have been developed to reflect these distinctions (e.g., Tobin et al., 1989).

Table 2. An Approximation of the Relationship between the Approach-avoidance, Lazarus and Folkman, and Reid et al. Conceptualizations of Coping

Models	**Coping conceptualization**			
Approach-Avoidance	Approach	Avoidance	Approach	Avoidance
Lazarus and Folkman	Problem-focused coping		Emotion-focused coping	
Reid et al.	Approach	Problem-focused avoidance	--	Emotion-focused avoidance

Lazarus and Folkman defined *problem-focused* coping as direct attempts to eliminate or alter a stressful situation. This definition, in essence, corresponds to an umbrella term, which encompasses both Reid and colleagues' concepts of approach and problem-focused avoidance. Specifically, Reid and colleagues define *problem-focused avoidance* as direct attempts to deal with a stressor by *diverting* attention (e.g., distraction), whereas direct attempts to *confront the stressor* are defined as *approach* (e.g., information seeking) – both of which would be considered direct attempts to eliminate or alter a stressor by Lazarus and Folkman. In terms of painful medical stressors, Lazarus and Folkman proposed that a function of problem-focused coping would be to decrease or eliminate such external demands as the painful stimulus itself or to change the environment in which the stimulus is embedded (Siegel & Smith, 1989). In the context of Reid and colleagues' factors this could be achieved by imagining being somewhere else (i.e., problem-focused avoidance) or by asking questions about the pain (i.e., approach).

Finally, *emotion-focused avoidance* as defined by Reid et al. (1998) involves coping strategies in which emotions are freely expressed, reflecting a lack of effort to regulate feelings when in pain. They suggest that emotion-focused coping scales often combine active attempts to regulate emotional reactions and strategies (e.g., "I told myself things that helped me to feel better") in which emotions are unregulated and expressed freely (e.g., "I let my feelings out somehow"). Some coping measures for adults have made a similar distinction (e.g., Tobin et al., 1989). Reid and colleagues' concept of emotion-focused avoidance is a sub-component of

Lazarus and Folkman's emotion-focused coping. Whereas the PCQ does not include emotion-focused subscales that are approach oriented, Lazarus and Folkman's emotion-focused coping construct does (see Table 2).

Lazarus and Folkman (1984) define emotion-focused coping as attempts to deal with emotional reactions to a stressor, but do not deal with the stressor itself. A function of emotion-focused coping would be to deal with internal demands, including the perception of pain and the feelings generated by the painful situation.

It is interesting to note that, as defined by Reid et al. (1998), emotion-focused avoidance does not really compose emotion regulating coping responses, as Lazarus and Folkman (1984) originally posited. Rather, many of the responses are more apt to *amplify* emotional reactions. Consider Reid and colleagues' (1998) externalizing subscale on the PCQ; it consists of behaviours that may cause interpersonal troubles for children beyond the difficulties of the original stressor including: saying mean things to people; yelling to let off steam; getting mad and throwing or hitting something; and cursing out loud. The internalizing subscale consists of cognitions that are catastrophizing in nature (i.e., exaggerated negative attributions), which may actually inflate the initial pessimistic emotional reaction including: worrying that I will always be in pain; keep thinking about how much it hurts; thinking that nothing helps; thinking that the pain will never stop; worrying too much about it.

When emotion-focused coping scales are composed largely of externalizing and internalizing items like those described above, it makes sense that they will be predictive of more pain. It is possible that emotion-focused coping responses that are oriented toward regulating emotions (e.g., relying on a friend for support, praying) rather than amplifying them will be more likely to be associated with successful needle coping outcomes, than the externalizing and internalizing coping responses noted by Reid et al. (1998). Scales that do not incorporate these different types of emotion-focused coping may fail to mark these differences.

5.3 The Utility of a Three-Factor Model

The distinction between problem-focused and emotion-focused coping has been helpful in predicting pain intensity, emotional distress, and functional disability (e.g., Reid et al., 1998; Lynch et al., 2006). In validating the PCQ, Reid and colleagues (1998) found that higher levels of emotion-focused avoidance were related to more emotional distress, less coping effectiveness, and higher levels of pain. In contrast, higher levels of approach coping were related to less

disability. Lynch and colleagues (2006) also found that catastrophizing, as measured by the internalizing subscale (i.e., emotion-focused avoidance) on the PCQ, was a strong predictor of increased functional disability in children with chronic back pain.

Other researchers have found similar support for the construct validity of separating avoidance into problem-focused and emotion-focused but occasionally other labels have been used to describe these concepts. Brophy and Erickson (1990) found that negative self-statements were related to higher levels of anxiety among children undergoing surgery. Bennett-Branson and Craig (1993) found that catastrophizing strategies (sub-component of emotion-focused avoidance) were related to more pain and poorer physical recovery among children undergoing surgery. Furthermore, Gil and colleagues found that coping attempts (i.e. diverting attention, reinterpreting pain, ignoring pain sensations, calming self-statements, increasing behavioural activity), among children with sickle cell disease, were related to less pain intensity and functional disability, while negative thinking (e.g., catastrophizing, fear self-statements, anger self-statements, isolation) was related to more pain intensity and functional disability (Gil, Thompson, Keith, Tota-Faucette, Noll et al., 1993; Gil, Williams, Thompson, & Kinney, 1991). Coping strategies that Gil and colleagues characterized as *coping attempts* can largely be mapped onto the construct of problem-focused avoidance (though calming self-statements might also be considered emotion-focused coping), while negative self-statements can be mapped onto the construct of emotion-focused coping. However, it should be noted that problem-focused and emotion-focused avoidance encompass a larger range of coping strategies than do Gil's concepts of coping attempts and negative self-talk.

In summary, pain research has demonstrated the construct validity of separating avoidant coping into problem-focused and emotion-focused types. In the specific context of coping with acute, or short-duration, pain, problem-focused avoidance tends to be associated with more positive outcomes (e.g., Stevens, 1991-2; Stevens & Terner, 1992-3), while emotion-focused coping is reliably associated with poorer outcomes (Bennett-Branson & Craig, 1993; Brophy & Erickson, 1990). A two-factor model, which does not distinguish between these two types of avoidance, may be too general to be able to discriminate between these opposing outcomes.

7. Developmental Differences in Coping

Although conceptualizations of children's coping were derived from the adult coping work, growing evidence indicates that the coping abilities of children may differ from those of

adults in some very important ways (e.g., Compas, Banez, Malcarne, & Worsham, 1991). Children may be limited in their coping repertoire by environmental, cognitive, affective, or social aspects of development and by lack of experience (Fields & Prinz, 1997). In fact, developmental level has been identified as a variable that moderates the relationship between coping response and outcome (Rudolph et al., 1995), suggesting that the coping responses promoting positive outcomes in children may differ from those promoting positive outcomes in adults. Therefore, it is important to devise developmentally appropriate measures and investigations to study coping. A discussion of important developmental trends in coping follows.

7.1 The Agents of Change in the Development of Coping Responses

7.1.1 Environmental constraints. Children's environments are quite different from adults' environments, particularly because children have less control over circumstances. Children are limited by constraints such as restricted freedom to actively avoid stressors (e.g., being forced to comply with a medical procedure), and a state of personal and financial dependence on parents. On the other hand, restricted freedom also protects children by limiting their exposure to some stressors. Thus, aspects of development and environment may limit the coping responses children are capable of making.

7.1.2 Emotional development. It is important to examine the role of children's emotional development in the study of coping because one of the central tasks of coping involves the regulation of emotion in stressful situations. From preschool to adolescence, there is considerable evolution of emotions. The initial generalized excitement of early infancy changes over the course of the preschool years into a complex composite of emotions including fear, love, and humour (Dill, 1978). Further differentiation of emotions occurs during later childhood and adolescence, with emotional independence from parents becoming a key developmental task.

Biologically, maturation of the nervous system has been posited to influence the process of emotional development, contributing to children's increasing ability to inhibit crying and frustration reactions, and to maintaining behavioural organization (Maccoby, 1983). Emotion regulation also has important communicational and interpersonal consequences. Zeman and Garber (1996) found that children reported controlling their expression of emotion (including pain expression) significantly more in the presence of peers than with either their mother or father or alone. Children's primary reason for controlling their pain expression was the

expectation of a negative interpersonal interaction following disclosure. Therefore, it seems that there is an important link between emotion regulation, social development, and pain expression.

7.1.3 Social development. Social developmental factors influencing children's acquisition of coping abilities include perceived sense of social acceptance, social comparisons, and perspective- taking ability (Hanson, 1992). Events may also be appraised with regard to their impact on other areas, such as one's self-esteem. For example, older children may view medical procedures as a potential threat to their self-esteem if they fear that they will be unable to respond in a mature or socially desirable fashion (e.g., they may scream or cry), whereas younger children may be less likely to fear a loss of self-esteem in the face of similar reactions.

The increased concern for threat to self-esteem during the later primary years is also evident in children's reliance on social support as a coping response. Research suggests that among school-age children there is a trend away from the use of social support; where children in later grades may prefer adult support, children in the lower grades prefer peer support (Altshuler & Ruble, 1989; Kliewer, 1991). This trend is the opposite to that found among preschoolers for preferred source of support, and might be explained by children's increasing awareness of how peers view them. This awareness may cause children to be less willing to reveal weaknesses to peers (Altshuler & Ruble, 1989). Thus, understanding changes in children's interpretations of medical procedures and their implications for self-concept is essential to the study of coping across development.

7.1.4 Cognitive development. Cognitive developmental level appears to be associated with the progressing complexity of children's conceptualization and appraisal of stressors (Rudolph et al., 1995) and is perhaps the largest contributor to developmental change in children's coping responses. Researchers have borrowed from Piaget (1930) to explain how primary appraisals may shift as a function of cognitive–developmental level. Three concepts are relevant: (a) finalism, the belief that natural events occur to serve a purpose; (b) immanent justice, the belief that people get what they deserve; and (c) syncretism, the belief that co-occurring events must be causally related. Younger children's heightened susceptibility to these three types of thinking may result in their assumption that illness or injuries are caused by personal wrong doing and, consequently, that medical procedures are a punishment. Indeed, research indicates that younger children are more likely to view painful procedures as an assault and they are less likely to understand the beneficial aspects of the procedures, whereas older

children are less likely to view procedures as punishment, more likely to recognize the usefulness of treatment and the empathy of the medical staff, and better able to comprehend the long-term benefits of the procedures (Beales, Holt, Keen, & Mellor, 1983; Brewster, 1982; Harbeck & Peterson, 1992; Kister & Patterson, 1980). A child who perceives a painful injection as threatening may be more likely to adopt an antagonistic coping response, whereas a child who appraises an injection in terms of its preventative or curative value may engage in more adaptive coping (Folkman, 1984). Therefore, one might expect older children, specifically those that can identify the benefits of being immunized, to have more adaptive coping responses relative to younger, or more pessimistic, children. Indeed, as will be discussed in section 7.2 this is what researchers find (e.g., Band & Weisz, 1988; Curry & Russ, 1985).

The cognitive developmental gains in understanding and appraisal that older children experience have implications for coping and compliance. For example, Spirito, Stark and Tyc (1994) found that adolescents were more likely to consider the implications of pain, whereas children were more likely to focus on symptoms (i.e., pain). Appreciation for the function of pain may be useful as a cue for positive self-talk coping (e.g., “This will hurt but afterwards I will start to get better”). As children move from magical thinking toward a more accurate understanding of illness and treatment, they may also acquire a greater sense of responsibility for their health and, in turn, engage in self-control strategies that may facilitate treatment (Maddux, Roberts, Sledden, & Wright, 1986).

Memory is an important part of primary and secondary appraisals, and is highly dependent on cognitive developmental level (Peterson & Toler, 1986). Less mature cognitive development may place limitations on children's memory of previous medical stressors, their capacity to define the parameters of procedures (e.g., intensity or duration), and their ability to understand the complex functions of pain and procedures (Peterson, 1989; Peterson, Crowson, Saldana, & Holdridge, 1999). For example, preschool children tend to report that they cannot recall having experienced common physically painful events such as a headache or an injection, even though it is likely that most preschoolers have experienced these events. When children are unable to put a stressor in the context of any kind of prior experience, appraisal becomes exceedingly difficult (Peterson & Toler, 1986) and feelings of self-efficacy are likely to be low.

According to Peterson (1989) the development of control-related beliefs is also potentially important to children’s acquisition of coping abilities. During the early school years,

children grossly overestimate uncontrollable contingencies in situations where no true contingency exists between behaviour and outcome. For example, young children often attribute their development of cancer to some personal transgression (e.g., “I ate a piece of food from the floor even though my mother told me not to”) or to an illogical source (e.g., “the doctor who operated on me didn't wash his hands”; Rudolph et al., 1995). By the end of the primary years, children begin to recognize that non-contingency is typical of the world and they rely less on uncontrollable factors (e.g., luck and powerful others) to understand causality in their lives (Weisz, 1990). This developmental shift in control beliefs has been identified with considerable consistency across studies (see Compas et al., 1991).

Somewhat later in the cognitive developmental process is the emergence of meta-cognitive functioning, which affects coping in several ways. Clearly, the literature on metacognition suggests that younger children have less access to their own thoughts and may have difficulty recognizing that thoughts can be manipulated (W. Mischel, Shoda, & Rodriguez, 1989). The development of metacognitions of self-control (e.g., delay of gratification) is related to problem solving and emotion-regulation coping strategies. Mischel and Mischel (1983) found that with age, there was an increase in the availability of alternative self-control strategies that involved cognitive distraction, cognitive reappraisal of the challenge, or cognitions about enjoyment of the delayed reward.

Although the external stressors faced in medical settings may be relatively similar across youths, it is clear that their appraisals of the meaning or implications of stressors shift quite dramatically with age, affecting coping responses and creating unique challenges at different developmental stages. Therefore, researchers should strive to consider developmental factors in studying coping behaviour. However, Rudolph and colleagues (1995) noted that a full developmental study would be a formidable task given the variable and constantly changing state of coping throughout development. As a result, they suggest that it may be more feasible and parsimonious to approach the study of coping within a narrow age band, initially, and then to follow-up with an application of methodology and findings to wider age bands, once preliminary investigations prove to be informative. The following sections highlight some of the developmental changes in the type and variety of children’s coping responses.

7.2 Developmental Change in Children's Coping Responses

7.2.1 Change in Type of Coping Responses. Within the context of medical stressors, research suggests that there are developmental changes in children's reliance on certain coping responses. In general, researchers have reported that school-age children tend to rely on avoidance strategies more frequently than approach strategies, which are very infrequently used (Altshuler & Ruble, 1989; Band & Weisz, 1988). Avoidance strategies have been presented as the most adaptive set of strategies to adopt in the context of medical stressors. Since individuals often have little control in such settings, adopting approach or behavioural problem-solving types of strategies is likely to be futile and may lead to frustration (Compas, Forsythe et al., 1988; Compas & Boyer, 2001; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Weisz, 1990). Indeed, several studies supported a trend for less use of problem-solving strategies with age (Brodzinsky et al., 1992; Spirito, Stark, Grace, & Stamoulis, 1991). However, reports of children's increasing reliance on avoidance strategies are not undisputed. Hubert, Jay, Saltoun, and Hayes (1988) found no age differences in approach and avoidance behaviour during painful procedures.

Researchers report that behavioural distraction, a component of problem-focused avoidance, is the most frequently endorsed coping strategy among school-aged children and, while cognitive distraction is rare in the early school years, it increases steadily with age along with other cognitive coping strategies (Altshuler & Ruble, 1989; Band & Weisz, 1988, 1990; Brown, O'Keefe, Sanders, & Baker, 1986; Worchel, Copeland, & Barker, 1987). Finally, less use of both cognitive and behavioural avoidance strategies with age was reported in one study (Brodzinsky et al., 1992), while another reported increased use of cognitive avoidance (Brown, O'Keefe, Sanders, Baker, 1986). On the basis of these results, researchers have hypothesized that increased use of cognitive coping may reflect enhanced awareness of the futility of behavioural or primary control strategies within uncontrollable medical situations or may reflect increased access to more self-awareness mechanisms of control (e.g., Weisz, 1990). Inconsistency across studies may reflect variation in children's attainment of cognitive developmental milestones (e.g., theory of mind, abstraction) necessary for such enhanced awareness.

Band and Weisz (1988) found that children recalled greater use of emotion-focused strategies (mostly emotion-focused avoidance) than problem-focused strategies in response to recalled medical stress, and this disparity increased with age. Similarly, Bull and Drotar (1991)

found that emotion-focused coping was more common among adolescents in the context of less controllable illness-related stressors, relative to school-age children. Brown et al. (1986) assessed only cognitive strategies and found that emotion-focused responses during childhood consisted of focus on negative affect and pain, with some use of positive self-talk and cognitive avoidance. In the Brown et al. study, adolescents most often coped with medical stressors by using emotion-focused responses that primarily included positive self-talk and diverting their attention away from the stressor.

Of the approach coping responses, positive-self talk emerges as a coping strategy in late school-age children and increases in frequency throughout the adolescent years (Brown et al., 1986; Stevens, 1989). Increased age has also been found to be related to higher levels of information seeking (Peterson & Toler, 1986), and to lower levels of accessing social support, especially from peers (Altshuler & Ruble, 1989; Kliewer, 1991). One study suggested that older children may engage in higher levels of direct problem solving and lower levels of problem-focused avoidance in relatively controllable medical situations faced by children with diabetes (Band & Weisz, 1988).

7.2.2 Change in the Variety and Adaptability of Coping Responses. Research indicates that during the elementary school years, children's abilities and tendencies to use various coping strategies are in a continuous state of change (Altshuler & Ruble, 1989; Band & Weisz, 1988; Curry & Russ, 1985; Kliewer, 1991; Rossman, 1992; Ryan, 1989; Wertleib, Weigel, & Feldstein, 1987). Overall, it appears that older elementary school children tend to use a greater number and variety of cognitive coping strategies, such as cognitive restructuring and cognitive decision making than do younger elementary school children (Curry & Russ, 1985; Kliewer, 1991; Ryan, 1989; Wertleib et al., 1987). As they move into adolescence, children use a smaller variety of coping strategies overall (Brodzinsky et al., 1992). However, it appears that the variety of cognitive strategies they might draw upon continues to increase with age (Compas, Malcarne, & Fondacaro, 1988). This finding suggests that if a dominant type of coping exists for children - where they engage in mostly one type of coping (e.g., approach) and little of others (e.g., avoidance) - it would likely emerge during adolescence.

Finally, as children mature they learn to apply coping strategies differentially for different stressors. Specifically, researchers have noted a trend for significant changes within the school-age range for selecting specific strategies in application to specific stressors (Fields & Prinz,

1997). For example, 12-year-olds use more direct problem solving to cope with medical and academic stressors but not social stressors; problem-focused aggression increases with age in peer conflict situations, but not medical or academic situations; and problem-focused avoidance decreases with age only with medical stressors (Band & Weisz, 1988). The emergence of formal operational thinking may aid older children and adolescents in choosing effective coping strategies due to improved abilities in abstract thinking, consideration of various points of view; and evaluation of consequences (Rudolph et al., 1995).

8. Defining, Assessing, and Predicting Coping Outcome

8.1 A Coping Pathway Model

Rudolph and colleagues (1995) suggest that the relationship between coping and outcome is best understood as a process. They refer to this process as a *coping episode* which includes the following elements: a coping response, a goal underlying the response, and an outcome. A *coping goal* is defined as the objective or intent of a coping response, which generally entails some form of stress reduction or reduction in some aversive aspect of a stressor (e.g., pain, Rudolph et al., 1995). That the coping process involves a goal-oriented component, distinguishes it from a *stress response*, which involves any spontaneous, or non-deliberate, emotional or behavioural reaction to a stressor.

Rudolph and colleagues (1995) have proposed a pathway model to illustrate the positive and negative consequences of a child's response to a stressor (see Figure 1). Within this model, coping and stress responses each lead to different outcomes following exposure to a stressor. *Stress outcomes* are the immediate consequences resulting from the stress response; these are depicted on the left side of Figure 1. For example, a child may automatically begin to kick and scream at the onset of a painful medical procedure (i.e., stress response), which may in turn lengthen the duration of the procedure (i.e., maladaptive stress outcome, Rudolph et al., 1995). *Coping outcomes*, on the other hand, are the immediate consequences of coping responses; the mediation of coping response between the stressor and outcome is depicted on the right side of Figure 1 (i.e., a coping episode). For example, a child may attempt to relax (i.e., coping goal) by using deep breathing exercises (i.e., coping response). This coping response may allow the child to lie still and relax his arm, which in turn makes the needle hurt less (i.e., adaptive stress outcome, Rudolph et al., 1995). Coping responses are the focus of the proposed investigations

and, as a result, the ensuing discussion will emphasize the right side of the Rudolph et al. pathway model relative to the stress response pathway (see dashed box in Figure 1).

Coping efficacy is analogous to the success or failure of a coping outcome, which is defined by Rudolph and colleagues (1995) in terms of whether the child's goal was attained (see Figure 1). Therefore, coping success or failure is evaluated from the child's perspective. However, the authors differentiate between successful and adaptive coping outcomes because they suggest that what the child views as successful may not always be viewed as successful by other participants (e.g., parents, medical staff). For example, the child may view escaping an immunization as his/her coping goal, whereas parents and medical staff may prioritize a goal such as successful immunization. According to Rudolph et al (1995) *adaptiveness* is determined by integrating multiple participants' viewpoints with objective information (e.g., behavioural observations). Following further down the pathway model, an adaptive coping outcome must also be one that is associated with long-term, general positive adjustment; though Rudolph et al. note that this last link in their model remains in the tentative stage.

The Rudolph et al. (1995) pathway model is helpful in that it clearly distinguishes between stress and coping responses, and it provides an algorithm for understanding different components of a coping outcome (i.e., successful, adaptive, and positive general adjustment) speaking to the need for multiple evaluative components in determining outcome. In the following section, research will be reviewed that has investigated the effectiveness of different types of coping within the context of pain. Both the Lazarus and Folkman (1984) model (i.e., problem- and emotion-focused) and the Reid et al. (1998) model (i.e., approach, problem-focused avoidance, and emotion-focused avoidance) will be considered.

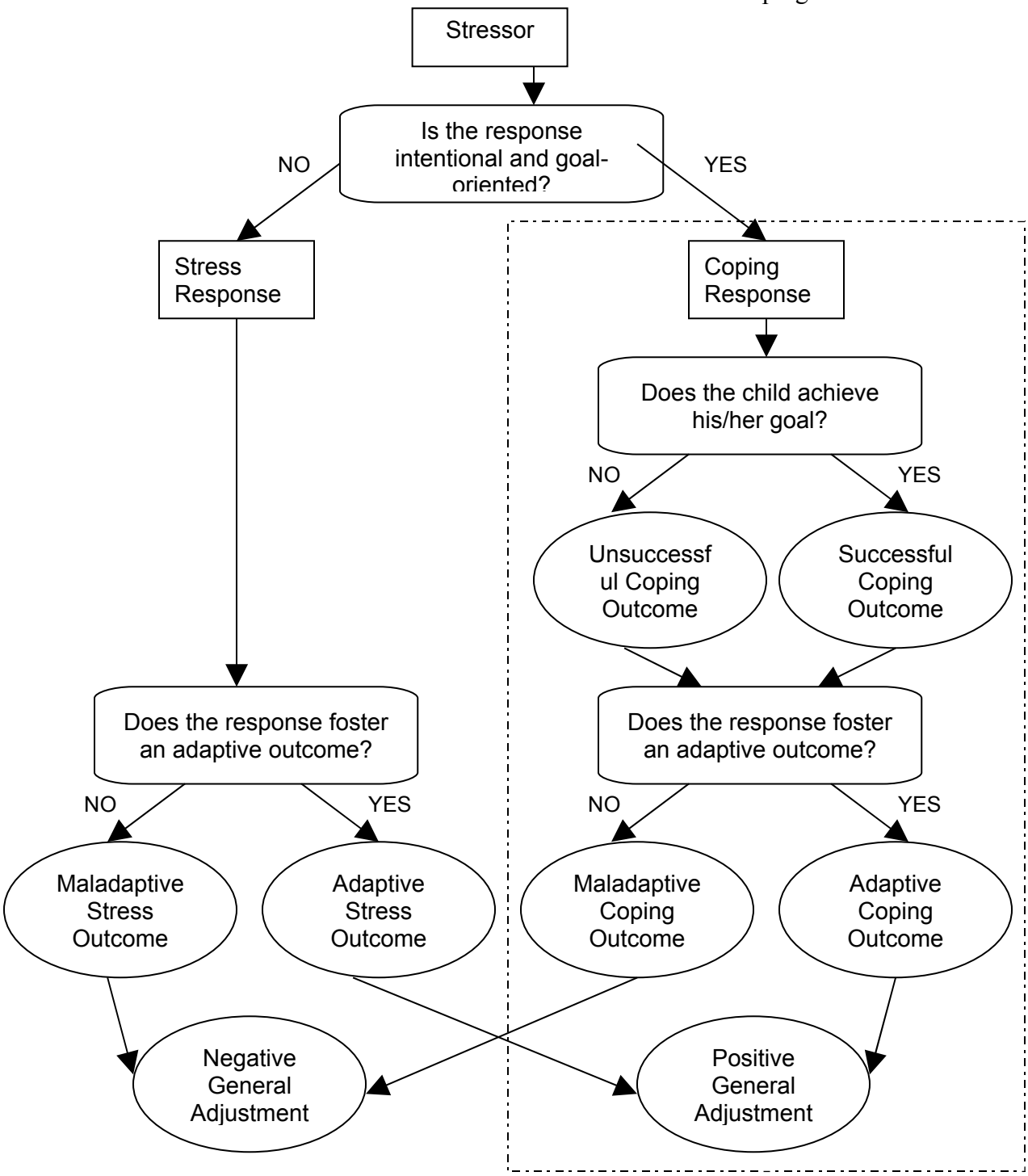

Figure 1. Schematic Diagram of the Steps between the Onset of a Stressor and Adjustment. The Left Side of the Diagram Depicts the Direct Pathway between Stress Responses and Outcomes. The Right Side of the Diagram Depicts a "Coping Episode," including Coping Responses, Coping Goals, and Coping Outcomes. The Pathways Converge at the Level of General Adjustment (Rudolph, Dennig, & Weisz, 1995)

8.2 Predicting Pain Experience as a Function of Coping Responses

8.2.1 Some Definitions of Pain. The International Association for the Study of Pain (Merskey & Bogduk, 1994) defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (p. 210). The duration of pain for acute painful states is usually very short and well characterized and is described in terms of minutes or hours per day or in weeks (Fields & Prinz, 1997; Siegel & Smith, 1989; Spirito et al., 1994). Chronic pain is defined as persisting beyond the time of normal healing, that is, beyond 2 or 3 weeks and may persist indefinitely. Because of their inherent differences, acute and chronic pain are thought to be associated with very different coping responses (Fields & Prinz, 1997; Siegel & Smith, 1989; Spirito et al., 1994). A full discussion of both types of pain is beyond the scope of this dissertation and, as a result, emphasis will be place on discussing acute pain, which includes immunizations, and is the focus of the present program of research.

The coping response that children employ when facing a painful procedure (stressor) is a crucial first step toward adaptive or maladaptive outcomes in the Rudolph and colleagues (1995) pathway model. According to Rudolph et al., researchers know only a little about the efficacy of children's coping responses to painful medical procedures and this paucity of knowledge is worse when considering particular coping strategies. Rudolph and colleagues (1995) identified two important variables in the literature that have been shown to predict outcomes such as increased self-efficacy and/or decreased pain, anxiety, or fear: the *type* of coping responses, and the *variety* of coping responses. These will be reviewed in the following sections.

8.3 Type of Coping Responses as a Predictor of Outcome[5]

8.3.1 Lazarus and Folkman's Problem-focused Versus Emotion-focused Coping. Rudolph et al. (1995) note that there is need for efficacy data using Lazarus and Folkman's transactional model of coping in children undergoing painful medical procedures. The fit between the cognitive appraisals of the controllability of a stressor and children's use of particular coping strategies is viewed by researchers as essential to successful coping (Compas, Forsythe et al., 1988; Compas & Boyer, 2001; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Weisz, 1990); this is sometimes referred to as the goodness of fit hypothesis (e.g., Forsythe & Compas, 1987).

Some research has demonstrated support for the goodness of fit hypothesis. The use of problem-focused coping in an uncontrollable situation (e.g., a needle) is viewed as maladaptive because active attempts to alter the situation would be futile and likely to lead to frustration (Compas, Forsythe et al., 1988; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Weisz, 1990). Similarly, the use of emotion-focused coping in controllable circumstances, which are amenable to change, may interfere with the application of more active techniques to alter characteristics of the situation (Compas, Forsythe et al., 1988; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Weisz, 1990). Thus, goodness of fit (e.g., match between coping goals or responses and stressor controllability) and flexibility in the application of coping responses may prove more useful in predicting outcome than the implementation of particular coping strategies. The efficacy of a particular coping strategy would therefore not be inherent in the response itself but would be a function of its suitability within a given situation (Folkman, 1984).

8.3.2 Approach Versus Avoidance. Roth and Cohen (1986) hypothesized that approach coping is most adaptive when (a) a situation is controllable, (b) the source of stress is known, or (c) outcome measures are long-term (e.g., attending to a source of pain is preferable to risking a more serious injury). Roth and Cohen also maintained that approach coping is more effective than avoidance coping when action is required.

In some instances, the most adaptive coping response may be to ignore or discount the stressor. Roth and Cohen (1986) suggested that an avoidant coping style should be used when (a) emotional resources are limited (e.g., a person has low self-esteem), (b) the source of stress is not

[5] In the context of the present program of research, outcome variables were pain, anxiety, fear, and self-efficacy as measure by self-report ratings. These will be discussed in later sections.

clear, (c) a situation is uncontrollable, or (d) outcome measures are immediate or short-term. Examples of avoidance coping include seeking out others as a distraction or engaging in another task rather than the task at hand (Endler & Parker, 1990). Medical procedures have been conceptualized as stressors over which individuals have little control, and which are typically short-duration (Fields & Prinz, 1997). Therefore, following Roth and Cohen's (1986) logic, avoidant coping might be the strategy of choice for coping with immunizations.

Roth and Cohen (1986) feel that people may alternate rapidly between approach and avoidant coping responses such that these types of coping can be thought of as opposite sides of a continuum. For example, certain aspects of a threatening experience (e.g., an encounter with a threatening individual in a back alley) should be avoided, whereas other aspects of the same experience (e.g., the notification of the police) should be approached. Therefore, while it is possible to identify individual coping responses as approach or avoidant in nature, individuals are likely to demonstrate some of each type of coping for any given stressor.

8.4 Variety of Coping Responses as a Predictor of Outcome

Siegel (1983) observed that successful copers, as measured by behavioural observations of increased procedural cooperativeness, decreased anxiety, and higher thresholds for physical discomfort during medical procedures, reported using a greater variety of strategies than did unsuccessful copers. In contrast, Worchel et al. (1987) found that the presence of fewer, well-used coping strategies may be more effective than a large array of different strategies.

Few other studies have examined children's coping repertoires or their access to a variety of responses (Rudolph et al., 1995). The Siegel and Worchel studies involved different populations and different means of assessing coping outcomes so the disparity between their conclusions may simply reflect different methodologies. Rudolph and colleagues (1995) offer a more complex explanation. On the one hand, the availability and use of multiple coping responses may reflect increased flexibility in reaction to failure ("if this strategy does not work, then I will try that one") or the ability to match coping responses to the demands of the situation ("if this strategy is not appropriate in this situation, then I will try that one"). On the other hand, Worchel et al. (1987) suggested that:

> [The] use of a number of different, sometimes contradictory, actions … may indicate that individuals are unsuccessfully searching to find a workable solution. Therefore, engaging in many different behaviors does not seem to connote

> flexibility in adapting to a situation; rather, it appears to suggest ineffectiveness in coping. (pp. 35–36)

One way it might be possible to tease apart these competing conceptualizations would be to measure coping strategies over time in response to the same stressor. Both Rudolph and colleagues (1995) and Worchel and colleagues (1987) suggest that when initially presented with a stressor, individuals will implement a whole range of coping responses; some of these individuals will be learning the difference between successful and unsuccessful strategies (i.e., those that help or do not help them achieve their goal), while others will simply be floundering. Following the assumptions of both groups of researchers, one would expect that children who are learning from previous experience will *specialize* their coping responses over repeated presentations of the stressor, paring out the coping responses that do not help achieve their goal(s), while persisting with the ones that help them achieve their goal(s). Unsuccessful copers might be differentiated by their inability to move from using a whole range of coping responses to a more specialized approach. Using a repeated measures design would allow researchers to test these assumptions by examining how coping responses change in reaction to the same stressor over time, while simultaneously tracking to see if specialization of coping strategies is associated with improved outcome (i.e., less pain, anxiety, fear, and higher self-efficacy).

Gil, Thompson, Keith, Tota-Faucette, Noil, and Kinney (1993) measured the stability of coping strategies over a 9-month period in a sample of children and adolescents with sickle cell disease. They found that coping strategies were consistent over time for children; however, adolescents decreased their use of negative thinking and passive adherence (similar to emotion-focused coping) over time. Negative thinking and passive adherence were associated with more frequent pain complaints and more health care contact. The results of this study suggest that adolescents do indeed specialize their coping over time. Furthermore, they appeared to pare out the coping strategies that were associated with negative outcomes at baseline, which supports a specialization hypothesis of coping change over time.

9. Summary and the Goal of the Present Program of Research

Though most children handle receiving needles quite well, this routine procedure is a significant source of stress for a subset of them (Lapouse & Monk, 1959). For a significant minority, this stress will translate into needle phobia and avoidance of medical care (Humphrey et al., 1992). While in the past, research emphasized inducing children's compliance with painful

procedures such as needles, more recently researchers have begun to investigate how children cope and how to facilitate their coping through interventions.

One of the primary questions that researchers have been seeking to answer is: "what constitutes successful coping?". Some early theoretical and empirical work suggests that type and variety of coping responses may predict outcome. However, results of these coping efficacy studies have largely been equivocal, leading some researchers to comment on inconsistencies in the literature including: (a) the identification of coping as trait-based or situation-specific; (b) the frameworks used to categorize particular coping responses; (c) the methodology used to assess coping; and (d) the distinction between coping responses and outcomes (Fields & Prinz, 1997; Roth & Cohen, 1986; Rudolph et al., 1995). In order for good quality coping efficacy research to proceed, careful consideration must be given to defining and measuring these important constructs.

The goal of the present program of research was to use the transactional theory of coping (Lazarus & Folkman, 1984), and the coping pathway model (Rudolph et al., 1995) to examine children's coping efficacy in the context of immunizations. Because no measures currently exist to assess children's coping in the context of needles, the first two studies remedied this gap by developing and validating a scale to measure coping in the context of immunizations. The third study implemented this newly developed questionnaire to investigate the relationship between coping strategies and outcome, as indicated by self-reported pain, anxiety, fear, and self-efficacy, over repeated immunization experiences.

SECTION B: OTHER DETERMINANTS OF COPING AND RESEARCH OUTCOMES

This section includes information that is relevant to the discussion of the present program of research; but these constructs were not directly assessed.

1. Memory for Painful Procedures

One of the major goals of the present program of research was to assess whether or not children learn from their previous experience with a stressor. The stressor selected for the present program of research is the hepatitis B immunization series. Recall that this series is administered in two doses, separated by six months. This target stressor is relatively constant across presentations and it is naturally set up for a repeated measures investigation of how children learn from previous coping experiences (see Study 3). However, in order for children to be learning to cope better across presentations of the stressor, they would need to be relying on their memories for their previous experience. Therefore, in reviewing this research design, questions may emerge about how well children would be able to remember their immunization experience over a delay of six months.

Several investigations have indicated that children have quite accurate recall of their painful experiences over a period of months or even years (von Baeyer et al., 2004). For example, Badali et al. (2000) examined 5- to 12-year-old children's memory of reported pain intensity for the cold pressor task, an experimental pain stimulus requiring participants to submerge an arm in cold water for as long as they can (see von Baeyer, Piira, Chambers, Trapanotto, & Zeltzer, 2005, for a review). Children reported their pain immediately after the cold pressor task, and then again after a one year delay. Badali et al. (2000) found that children accurately recalled their pain intensity ratings over time. However, von Baeyer et al. (2004) note that it is difficult to determine whether the children were remembering their actual pain experience from the year before, or rather their specific ratings on the pain scale.

Lander, Hodgins, and Fowler-Kerry (1992) investigated experienced, and recalled sensory (i.e., physical experience) and affective (i.e., emotional) pain among 5- to 17-year-olds receiving venipuncture in a clinical context. Children’s recall of their pain after a two months delay was good overall but was better for affective than for sensory pain. Therefore, children may find it easier to recall their emotional reaction to procedural pain, than the physical sensation of pain itself.

Zonnefeld, McGrath, Reid, and Sorbi (1997) investigated the accuracy of children's recall of their worst and average pain intensity when controlling for the effects of repeated pain measurement. The accuracy of children's recalled pain intensities was studied in hospital inpatients ages 5-16 years by comparing the level of recorded pain intensity with the level of recalled pain intensity following a one-day and a one-week delay. The accuracy of children's recalled pain intensities after one day was high and showed little decrement over one week. Older children had more accurate recall of their worst experienced pain intensity.

Repeated medical events appear to influence what children remember. Some researchers have found that when children experience similar subsequent medical procedures, a reconstruction or blending of memories for the original even can result (Howe, Courage, & Peterson, 1995; Ornstein, Manning, & Pelphrey, 1999; Rocha, 2004). For example, Howe, Courage and Peterson (1995) found that children who had subsequent experiences in the emergency room tended to intertwine those recollections when they were later questioned about the original emergency room visit. Similar effects have been obtained by others in the context of needle pain (Bruck, Ceci, Fancoeur, & Barr, 1995). It should be noted that blending of multiple experiences does not inhibit the recall of the original experience, but it may lead to difficulty discriminating between events if children are not interviewed until after several events have taken place. Therefore, researchers who wish to discriminate between children's experiences for several similar events should strive to enquire about their experiences immediately following each event of interest.

In the context of the present program of research, no intervention was being examined, nor are there any hypotheses that require pure comparison of the first and second measurement points. Therefore, the blending that would result from children having had an additional needle between their first and second hepatitis B immunizations will be of minimal concern. In fact, if children do remember their experience from one needle to the next, it might facilitate their learning to improve coping.

As a precaution against children remembering and re-reporting the number associated with their original pain, anxiety, fear, and self-efficacy ratings, the Visual Analogue Scale (VAS; Gracely, 1979) will be used. The VAS does not make use of numeric anchors. Instead, it requires that the respondent make a mark on a horizontal line, which has a verbal anchor on either end and no anchors through the middle. Because there are no numbers associated with a child's

rating, there should be little risk that the association between their ratings at the two measurement points results from recollection of the previous rating.

Although it may be interesting to examine memory accuracy as an indication that children are accurately referring back as they learn to cope across several doses of the vaccine, a detailed review and investigation of memory accuracy is beyond the scope of the present dissertation. Further, it is likely that children will be unaware of the learning that is taking place across the immunization series due to developmental limitations on their ability to reflect on their own thinking and to think abstractly (see review on cognitive developmental influences on coping in Section 7.1.4). Adolescents may be more capable of making these links. Unfortunately, there are no repeated dose immunization series in adolescents.

2. Cultural and Ethnic Considerations in Retention and Recruitment

The present investigation aims to examine coping within the specific person-environment context of needles. Certainly, a thorough examination of context should consider the broader social context within which children exist. Dumas, Rollock, Prinz, Hops, and Blechman (1999) argue that children's ethnic and cultural backgrounds can have a profound impact on the quality of research if investigators do not give these factors adequate attention. Though no specific hypotheses are made within the proposed research regarding ethnicity and culture, in the interest of comprehensiveness and efforts to be representative in data collection efforts, a brief discussion of ethnic and cultural considerations, and their bearing on the proposed research, follows.

2.1 Defining Terms

Typically, *ethnicity* refers to the shared heritage of a group and the mutual identification of its members with a common culture and upbringing (Yinger, 1985). Where ethnicity refers to group membership, *culture* refers to a group's modal way of life (Dumas, Rollock, Prinz, Hops, & Blechman, 1999), consisting of shared sets of beliefs and values, as well as patterns of communication, affective expression, and skills (Gordon, 1983; Gordon, Miller, & Rollock, 1990). Each culture provides its members with a meaning system and a broad outline for behaviour, which are shaped by the history of the group and by the current common experiences and life circumstances of its members.

2.2 Issues in Recruitment

Researchers have documented several issues that may contribute to difficulties in recruitment of minority populations for research investigations. Shavers-Hornaday, Lynch, Burnmeister and Torner (1997) suggest that minority populations: do not trust in researchers and the institutions they represent; fear that information will not be maintained in a confidential manner; assume that scientific jargon is deliberately confusing and unnecessarily complicated; and assume that they will be harmed or negatively stereotyped and exploited. Misinformation and lack of knowledge about the role of, and controls on, research is also abundant in minority groups. Shavers-Homaday et al. (1997) also note that minority group members are deeply affected by the dynamics of peer and group pressure which stigmatizes research as irrelevant to their well-being and lifestyle.

Within the context of children and parental consent, Spoth and Molgaard (1993) showed that potential participants who refused to take part in a family-focused drug abuse prevention program most often expressed concerns about the time investment and research requirements. In such situations, Dumas and colleagues (1999) suggest that it is helpful to have some data on persons who decline to participate in an intervention, in order to establish the extent to which a final sample is representative of the targeted population.

Aboriginals represent the largest minority group in Saskatoon according to Statistics Canada data for the year of (2001), accounting for 11.5% of city-dwellers. Research indicates that Aboriginal individuals may not respond well to traditional informed consent procedures. Russell and colleagues (2005) conducted a pilot study of informed consent materials developed for Aboriginal parents. Their results showed no differences between the groups in understanding of diseases prevented by a vaccine, the potential risks of participating, or the voluntary nature of participation. Aboriginal participants identified the use of a flipchart, along with a presentation by a doctor and Aboriginal health worker, as preferred delivery modes. They also noted a preference for group presentations rather than one-on-one discussions.

Little is known about participant attrition or withdrawal of consent in both majority and minority groups. Janson et al. (2001) conducted a study to determine the reasons for withdrawal from a large, multi-center, randomized trial; ethnicity was examined along with other factors. They found that participants who withdrew tended to be female and members of ethnic minorities. When compared with subjects who completed the trial, those who withdrew cited

interference with work, lack of time, complicated and cumbersome record-keeping requirements, difficult study medicine regimens, and difficulty rescheduling appointments as a result of study personnel inflexibility.

2.3 Issues in Measurement

The major goal of study methodology is to detect differences attributable to the study variables, rather than to other sources of variance such as cultural and individual differences or idiosyncratic factors. Dumas et al. (1999) identify several reasons why a particular measure may be suitable for one cultural group but not another: the wording of specific items may be interpreted differently depending on one's reference group; members of different cultural groups may perceive the purpose of measurement differently depending on their contextual frame of reference; the length of time and the response burden associated with a measure may differentially affect one group versus another in terms of their tolerance of the tediousness of the procedure; and the psychometric properties of a particular measure (e.g., validity, reliability, factor structure) may not apply to a population for whom the measure was not standardized. Dumas et al. (1999) suggest that these difficulties can all be overcome by taking the time to pilot measures with each cultural group and engaging in a dialogue with participants about their perceptions and understanding of the measures. The researcher can then be prepared to answer questions during data collection and to modify the instructions, if necessary.

SECTION C - STUDY 1 DEVELOPMENT AND VALIDATION OF THE *COPING WITH NEEDLES QUESTIONNAIRE*

1. Phase One Validation of the *Coping with Needles Questionnaire*

Individuals are equipped with coping responses that help them to manage the negative aspects of stressful situations. Although considerable research has been conducted to examine how adults cope with a variety of stressors, less attention has been given to children's coping (Fields & Prinz, 1997), particularly in terms of how they cope with acute pain (Hodgins & Lander, 1997). Although conceptualizations of children's coping were derived from the adult coping work, growing evidence indicates that the coping abilities of children may differ from those of adults in some very important ways (Arnold, 1990; Compas, Banez, Malcarne, & Worsham, 1991; Elias, Gara, & Ubriaco, 1985; Omizo, Omizo, & Suzuki, 1988) suggesting that the coping strategies promoting positive outcomes in children may differ from those promoting positive outcomes in adults. Therefore, it is important to devise developmentally appropriate measures and investigations to study coping in children.

Studying coping in the context of needles is important because needle-related procedures are a relatively common experience that contribute to high levels of anxiety, fear, and pain for a subset of children (Ellis, Sharp, Newhook, Cohen, 2004; Schecter et al., 2007). Understanding how these children cope, and how to help them improve how they cope, is therefore a valuable endeavour.

1.1 Descriptive Accounts of Children's Coping with Needles

Hodgins and Lander (1997) conducted a descriptive study examining children's self-generated strategies for coping with needle pain and distress. Directly following a needle, they asked children to report their coping strategies in an interview format. These interviews were transcribed and coded. Twenty-seven individual coping strategies were identified and subsequently grouped into 11 coping categories: Active Involvement in Procedure, Behaviour-Regulating Cognitions, Cognitive Reappraisal, Direct Efforts to Maintain Control, Diversionary Thinking, Emotion-Regulating Cognitions, Information Seeking, Reality-Oriented Working Through, Reliance on Health-Care Interventions, Support Seeking, and Avoidance and Catastrophizing. Direct Efforts to Maintain Control was the most frequently used category. Hodgins and Lander (1997) suggest that these coping responses and categories should be useful to consider in the development of a coping with pain measure for children.

1.2 Types of Children's Coping

Several formal frameworks have been proposed to categorize children's coping strategies into higher order groups. One of the most commonly referenced frameworks organizes coping strategies along a dimension anchored by approach versus avoidance (Hubert et al., 1988; Roth & Cohen, 1986). For a complete review of approach avoidance coping, see Section 5.1. Approach coping consists of confrontation of the source of stress and deliberate attempts to reduce it, in contrast to the avoidance coping style, which involves avoiding anxiety-inducing stimuli and their consequences (Anshel, 1996; Bachanas & Blount, 1996; Fields & Prinz, 1997; Finset et al., 2002; Hubert et al., 1988; Roth & Cohen, 1986; Rutherford & Endler, 1999; Tobin et al., 1989). Approach and avoidance coping styles are not conceptually independent but are thought to be on opposite sides of a continuum of coping strategies.

Some researchers have further divided coping types into a three-factor model of approach, problem-focused avoidance, and emotion-focused avoidance. Reid and colleagues (1998) have married the approach-avoidance conceptualization of coping with Lazarus and Folkman's concepts of problem-focused and emotion-focused coping (see Table 2). Specifically, Reid and colleagues incorporated the role of attention as the means to split Lazarus and Folkman's problem-focused coping into two categories, approach and problem-focused avoidance, while keeping the emotion-focused category largely the same. That is, among approach coping strategies, attention is directed toward the stressor, while among avoidance strategies (i.e., problem- and emotion-focused) attention is directed away from the stressor (Reid et al., 1998; Roth & Cohen, 1986).

In addition to these two major frameworks, a number of studies have used scales derived from applying factor analysis to a compilation of coping responses generated by children (Phipps et al., 1998; Reid et al., 1998; Spirito, Stark, & Williams, 1988). These empirically derived coping taxonomies have the advantage of being relatively free of the imposition of adult theoretical models so they are helpful in providing information specific to children's coping.

Despite methodological differences and variations in items composing the factors, there is some consistency among these empirical scales and the frameworks described earlier. Most scales have revealed factors representing problem-focused or approach-oriented strategies, such as seeking support, as well as avoidant dimensions or emotion-focused strategies, such as negative self-talk (Ebata & Moos, 1991). All of these frameworks and their associated published

questionnaires will be helpful for the purpose of item generation in the development of a questionnaire to assess coping with needles.

1.3 The Need for a Coping with Needles Questionnaire

Researchers have come to recognize that individuals are inconsistent in their use of coping strategies across different stressors and over time (Compas, Forsythe et al., 1988; Fields & Prinz, 1997). In fact, Tobin and colleagues (1989) note that "characteristics of the stressor have tended to be a stronger determinant of coping than the characteristics of the subjects" (p. 356). As a result, general assessment of coping style has been only a weak to moderate predictor of actual coping responses (Lazarus & Folkman, 1984, see Section A for a complete review of coping).

Lazarus and Folkman's (1984) transactional model of coping acknowledges the temporal and context based nature of coping by defining it as constantly changing cognitive and behavioural efforts to deal with external and/or internal demands on the individual. Behavioural coping efforts are overt physical or verbal activities, while cognitive efforts involve the manipulation of one's thoughts or emotions (Curry, Fuss, Johnsen, & DiSantis, 1988). Coping responses are thought to change as a function of ongoing cognitive appraisals of the person-environment relationship that composes the stressor, which is also always changing. Therefore, proponents of the transactional model suggest that measurement of coping strategies should be situation- or stressor-specific, rather than a general assessment of coping style. Although Lazarus and Folkman's conceptualization of coping describes how adults deal with stressful situations, it is frequently used as the theoretical framework for explaining the coping responses of children (Bennett-Branson & Craig, 1993; Curry & Russ, 1985; Hodgins & Lander, 1997; Ryan-Wenger, 1990).

Although many measures of both general coping style and coping with other identified stressors such as chronic pain (see Reid et al., 1998) and painful oncology procedures (Phipps et al., 1998) already exist, researchers have identified the need for the development of a self-report measure that specifically assesses children's coping with needles (Hodgins & Lander, 1997). There was a coping with medical procedures questionnaire under development in the early 1990s by Routh and Sanfilippo (1991), which they published in a chapter on pain and pain-related distress in cancer. However this tool does not seem to have ever been published. There are notable unique qualities inherent to the process of getting a needle that make coping in this

context relatively unique from other stressors that children may encounter. For example, compared to chronic pain, needles are short in duration; the source of the pain is known; the situation is unchangeable; and there are recognized benefits associated with the procedure, which may give the pain meaning. Further, since children are required to remain still, there are considerable restrictions on their opportunities to rely on behavioural coping responses (e.g., playing with a toy). These restrictions on children's behaviour during needles may limit the utility of behavioural measures of coping. Since contextual variables like these have been found to be more predictive of coping than characteristics of individuals (Tobin et al., 1989), needles are a unique stressor worthy of their own coping questionnaire.

A coping with needles questionnaire may also have the advantage of being sensitive enough to detect subtle effects of coping behaviour. This sensitivity is a desirable element given that researchers have commented on the challenging nature of predicting outcome based on coping (Lazarus & Folkman, 1991). Furthermore, research suggests that individuals are inconsistent in their use of coping strategies across different stressors and over time (Compas, Forsythe et al., 1988; Fields & Prinz, 1997), which emphasizes the possible greater predictive value of a coping measure developed in the context of needles. The goal of the present investigation was to use Lazarus and Folkman's (1984) transactional model of coping to create a self-report questionnaire that can be used to assess coping behaviour among children faced with a needle or immunization.

1.4 Determining Scale Structure

Notably, the coping questionnaires reviewed in the development of this program of research were all designed to assess styles or types of coping behaviour, and they forego tallying full-scale or general coping scores (e.g., Phipps et al., 1998; Reid et al., 1998). The discounting of general coping in these studies may be perplexing to some readers but one can infer reasons why a general coping score tends not to be used. The following discussion reviews the author's conceptualization of rules on which to base decisions about the structure of a coping scale in the present program of research.

Practically, most researchers implement coping assessment tools in an effort to predict outcomes. Historically, research has demonstrated that different types of coping predict outcomes differently. In other words, a full-scale score that combines different types of coping is not

expected to be useful as a predictor of outcomes. Perhaps it is this simple practicality that has led researchers to shy away from a full-scale coping score.

In addition to practicality, decision-making about structuring a coping assessment tool should consider both how the different types of coping uniquely predict outcome (predictive element) and the relationship between the different types of coping (relational element). When there is no difference between the elements, they are referred to as 'equivalent'; whereas 'unique' refers to a difference in predictive or relational elements. The implications and possible permutations of considering these two elements are discussed in detail below and are summarized in Table 3.

Table 3. Scale Structure Decisions based on the Contributions of Unique versus Equivalent Predictive and Relational Subscale Elements

		Predictive Element	
		Unique	Equivalent
Relational Element	Unique	(C) Subscale	(D) Subscale
	Equivalent	(B) Subscale	(A) Full-scale
		(B) Merge the subscales	(A) Discard a subscale or merge them

1.4.1 Assumption of a Positive Relational Element[6]. Theory suggests that when faced with a stressor, individuals will invariably respond either with a stress (involuntary) or coping (goal oriented) response (Rudolph et al., 1995). If all types of coping have a common instigating thread in that they are goal-directed responses to a stressor, one might expect all types of coping to be related in some way. When assuming that different types of coping are positively related (relational element), two alternatives of the predictive element are possible.

[6] Note that this section refers to cells A and B of Table 3.

In the first scenario (A), two positively correlated subscales predict the same outcome in the same direction. In this case of equal relational and predictive elements, the researcher might either discard one subscale or combine the two into a single full-scale score because little information is gained from preserving a subscale structure. Since both subscales contribute to predictive power and since scale reliability tends to increase with more items, in this scenario it may be best to use a full-scale structure or at least merge the two overlapping subscales. One exception might be if the researcher is interested in developing a shorter tool in which case one might pursue the option of discarding the weaker of the overlapping subscales or the weaker loaded items.

In the second scenario (B), two positively correlated subscales predict outcomes differently. For example, one subscale might have no effect on the outcomes of interest, while the second is positively or negatively predictive. When the relational element is equal across subscales but the predictive element differs, there is little utility to a full-scale score because the predictive differences of the two subscales may be lost in compiling them (i.e., they cancel out). Therefore, this scenario favours a subscale structure. However, in the interest of parsimony, the subscale that does not contribute either a unique relational or predictive element could also be excluded from the scale structure. This consideration of parsimony is particularly salient in situations where the researcher is simply interested in developing a tool that can be used to predict outcomes of interest. In a scenario where the researcher endeavours to have a theoretically comprehensive coping assessment tool, the consideration of parsimony as discussed above may be less relevant.

1.4.2 Assumptions of a Negative Relational Element[7]. Although theory would indicate that different types of coping are positively related (Rudolph et al., 1995), research has not always supported this position (e.g., Reid et al., 1998). In general, types of coping associated with positive outcomes have been shown to be positively associated, while types of coping associated with negative outcomes emerge as negative correlates.

In the validation of the *Pain Coping Questionnaire* with school children, which is analogous to the sample used in the present program of research, the approach scale was positively correlated with the problem-focused avoidance scale ($r = 0.38$, $p < 0.001$) and negatively correlated with the emotion-focused avoidance scale ($r = -0.15$, $p < 0.01$). The

[7] Note that this section refers to cells C and D of Table 3.

problem- and emotion-focused avoidance scales were negatively correlated with each other ($r = -0.21$, $p < 0.001$). These results suggest that approach and problem-focused avoidance coping are conceptually similar constructs, while emotion-focused coping is distinct. Fittingly, Reid and colleagues (1998) found that emotion-focused coping was negatively related to pain controllability and coping and positively related to pain intensity and distress. Approach and problem-focused coping showed the opposite pattern, with the exceptions that approach coping was not significantly related to pain intensity or distress. In such a case (C), when subscales have unique relational and predictive elements, it would be important to preserve the subscale structure, which Reid and colleagues did.

The results reported by Reid et al. (1998) suggest that emotion-focused coping, in particular, may be unique in both relational and predictive elements. Therefore, in the development of the *Coping with Needles Questionnaire*, if emotion-focused coping emerges as a factor, it is hypothesized that it will be negatively correlated with the other extracted types of coping, as well as be predictive of greater fear of needles. This hypothesis would situate the CNQ at the top- of Table 3 (C or D) suggesting that a subscale structure would be the best organization of the tool.

1.5 Establishing Construct Validity

In addition to measuring coping responses, fear of needles and pessimism were also measured in order to assess the construct validity of the developed coping questionnaire. Norton and Asmundson (2004) suggest that avoidant coping should be associated with fearfulness. Therefore, fear ratings should be highest among individuals identified by the developed questionnaire as emotion-focused or problem-focused avoidant.

Pessimistic individuals are characterized by negative expectations and approaches to stressful situations or health threats (Scheier & Carver, 1992, 1993, 2003). Trait pessimism emerges as a strong predictor of, or as analogous to, catastrophizing, a sub-component of emotion-focused coping (Caryk & Walker, 1986; Davey & Levy, 1999; Sinclair, 2001; Wickramasekera, 1986). Past research suggests that individuals identified as dominant in emotion-focused coping should have a more difficult time identifying positive aspects of a stressful situation (i.e., immunization) compared to individuals characterized by either problem-focused, or approach, oriented coping (Sinclair, 2001). For instance, coping techniques such as cognitive restructuring or selective attention to positive aspects of an experience may positively

change the subjective meaning of a stressor (Folkman & Lazarus, 1988). In order to assess pessimism, participants were asked to identify one good thing about being immunized.

1.6 Summary of Hypotheses

1.6.1 Relationship between Coping Factors. An emotion-focused coping factor, if extracted, was expected to be negatively correlated with other extracted coping factors.

1.6.2 Coping Type. Children high on emotion-focused coping were hypothesized to have higher fear ratings compared to children with low emotion-focused coping. Conversely, it was expected that children high on problem-focused coping would have lower fear ratings compared to participants low on problem-focused coping.

1.6.3 Pessimism. It was expected that participants coded as "pessimistic" would have higher mean emotion-focused coping compared to positive individuals. There was no hypothesized effect for problem-focused coping.

2. Method

2.1 Participants

Participants were 189 grade 6 students (ages 11 and 12), who had recently received their third of three hepatitis B immunizations. Although the participants were asked to identify their gender, 24% of the questionnaires were missing this data, probably because it was printed at the top of the first page, separate from the main body of the questionnaire. Of those who responded to the gender item, 58% were male and 42% were female. Since data collection was not directly tied to the date that children were immunized, participants were also asked to indicate whether or not they had been immunized for hepatitis B[8]. All of the children in the present sample indicated that they had indeed recently been immunized. By teacher report, at most, the lag between immunization and questionnaire completion was three weeks; at minimum, the questionnaires were completed the same day as the immunization.

2.2 Measures

2.2.1 Coping with Needles Questionnaire-Preliminary. The CNQ-P is a preliminary self-report scale that asks children to rate how much (1 = very unlike me to 5 = very like me) each of 42 statements reflects how they coped with a needle (see Appendix A). The 5-point Likert scale was chosen as it is commonly used among similar coping assessment tools (e.g., Reid et al.,

[8] This last question was included as a check to make sure all participants had been immunized because, while the immunization clinics at individual schools all occurred within three weeks of the questionnaire administrations, it was possible that students missed school the day that the immunization clinic occurred at their school.

1998). It was designed to assess coping strategies that children might use during the span before, during, and after being immunized. Discussion of item development follows in the procedure section (2.3). One of the items was reversed and included as a means of screening children's responses for consistency: "I watch the needle go in", and "I look away when the needle goes in".

2.2.2 Fear of Needles. Participants were asked to rate their fear of needles on a Visual Analogue Scale (VAS, Gracely, 1979) by making a mark across a horizontal line that is 100 mm long. The distance between the participant's mark and the left side of the line is measured and assigned a corresponding score that can range from 0 – 100 mm, where 0 corresponds to 'Not at all scared' and 10 to 'Extremely Scared'.

2.2.3 Pessimism. In an open-ended written question, participants were asked if they could think of one good thing about getting immunized. Their written responses were then coded by two independent raters as either (a) positively or (b) negatively/neutrally valenced.

2.2.4 Additional items. In an open-ended written question, participants were asked if there was anything else they did or thought about when they got their needle that was not already part of the questionnaire. The item was included to help derive further items should a second phase of validation be required.

2.3 Procedure

2.3.1 Item generation. A team of one PhD graduate student and four undergraduate volunteers wrote test items in a 2-hour item writing session. A brief orientation, including definitions of coping constructs reported in the literature, was conducted to familiarize raters with the coping literature. Following this orientation,, a pool of 83 potential items was created using the deductive approach of classical test theory (see Burisch, 1984; Nunnally, 1978). Specifically, each team member was given an article or two to review and use to guide their writing of potential test items. Lazarus and Folkman's theoretical construction and structure of coping was used to write some of the new items reflecting cognitive and behavioural responses to immunization. Some new items were written for each of the 11 coping categories that Hodgins and Lander (1997) used to summarize the 27 individual coping strategies reported by children in their study. Finally, some of the items were modelled on items from the Procedure Coping Questionnaire (Phipps et al., 1998) and the *Pain Coping Questionnaire* (Reid et al., 1995). To ensure that cognitive and behavioural coping responses were equally represented among both the

approach and avoidant coping items, each rater was asked to draft 50% in a way they felt reflected the construct of approach coping and 50% representing avoidant coping.

2.3.2 Content validity. The same team of one PhD graduate student and four undergraduate volunteers acted as raters. Using a minimum criterion of 60% agreement[9], that was decided upon by consensus of the raters, all of the 83 test items were were rated as reflecting either theoretical constructions of approach coping or avoidant coping. Efforts were also made to rate the avoidant coping items as either problem-focused avoidant or emotion-focused avoidant but more than half of the items achieved less than 50% agreement. Therefore, this second level of categorization was abandoned in favour of examining the number of factors resulting from formal factor analysis during the analysis phase.

The final 40 pilot items were selected by a consensus vote (see Appendix A). A research team of two PhD psychologists, two PhD graduate students, and five undergraduate volunteers contributed to this consensus through an open discussion. Items were discarded if they were duplicates or if they achieved less than 60% agreement regarding their reflection of approach or avoidant coping. The only two exceptions to the latter rule was when items were not clearly approach or avoidant but they uniquely captured a dimension of coping reported among the participants in the Hodgins and Lander (1997) study or if the consensus vote was that it was an important/common coping behaviour among individuals being immunized (e.g., "I think nothing will help").

One of the 40 items was reverse worded to be included in the questionnaire as a test of response consistency; this item was not included in item analysis. Another item was slightly altered in wording but had the same underlying approach coping theme (i.e., "I watch the needle go in" versus "I watch the needle"); these items were both included in item analysis because the research team raised concern that children may respond to these items quite differently depending on the emphasis of watching the skin break.

2.3.3 Recruitment and Data Collection. The present study was approved by the University of Saskatchewan Behavioural Research Ethics Board (Beh 04-179). Participants were recruited from 13 elementary schools in Saskatoon and surrounding area. Principals were contacted by telephone or email for permission to distribute consent forms (see Appendix B) to

[9] This criterion of 60% was chosen because the goal behind development of a pool of test items was to have an approximately even number of approach and avoidant items represented. It was not necessary to have 100% agreement as to the type of coping represented in each item because the planned test of item type was factor analysis.

grade six students. Consent forms were mailed to or dropped off at participating schools. Once consent forms were returned, a classroom visit was arranged for researchers to come in and administer the questionnaire. Typically, questionnaires were group administered in the participants' classrooms. Only the students with consent completed the questionnaires. The classmates who did not have consent were typically encouraged by their teachers to continue their schoolwork. Occasionally, the questionnaires were group administered in a separate room, where only the students with consent were gathered. These arrangements were made at the convenience of participating schools.

Participants were asked not to write their names on the questionnaires. Gender and school were the only pieces of identifying information that were collected. All children who completed the questionnaire were 11 or 12 years old, as this is the age for administration of hepatitis B vaccine in Saskatchewan schools. In addition to completing the CNQ-P, children were asked to list any things they thought about or did during their immunization that were not represented by one of the questionnaire statements. Participants were also asked to indicate whether or not they had received a needle during their present school year and they rated their fear of needles from 1 (not at all scared) to 10 (extremely scared). Finally, children were asked to identify one "good thing" about being immunized. The entire questionnaire took approximately 10 minutes for grade six children to complete.

3. Results

3.1 Data Cleaning

3.1.1 Response Consistency. Participants who failed either the (a) parallel item or the (b) item-reversal check were excluded from the analysis. The first check required that participants rate two items with the same underlying theme within one Likert point of each other. All of the participants passed this check. The second check required that participants rate the target item and its reversed item within one Likert point of each other, factoring in reversed scoring. For example, if a child circled a '5' to the item, "I watch the needle go in", then they needed to have responded either a '1' or a '2' on the reversed scored item, "I look away when the needle goes in" to pass screening. Five of 189 participants were excluded for failing this screening process. Of these excluded participants, two were male, one was female and two did not identify their gender.

3.1.2 Response Variability. There were two questionnaires where all of the CNQ-P items had '1's circled as responses. Both of these questionnaires belonged to males who were already excluded from data analysis for also failing the response consistency check.

3.1.3 Missing Data. Typically, when there are only a few missing data points and when they are randomly distributed among the variables in the study, the best strategy is to leave them as missing (Tabachnick & Fidell, 2001). If the data are confined to one or two variables then they are not judged to be very important, simply leaving out these variables from the analysis is a good strategy to choose. If there are a few missing data points scattered throughout the items in a multi-item scale, it is possible to create the overall scale score for most participants by averaging over the items which the respondent does answer.

If missing data are scattered throughout the data set and many respondents are missing some data points, as in this study, then omitting those with missing data will result in a larger than acceptable reduction in sample size. This is a particularly salient concern for this study since the number of participants, while acceptable, is toward the low end of what is considered necessary for running a factor analysis. Several methods of estimating values for missing data are available. A conservative approach is to replace the missing values with the mean of all the respondents for that variable. This procedure ensures that the mean for the sample does not change, but tends to reduce the variance in the sample since most scores are not right at the mean. This is the procedure that is recommended by Tabachnick and Fidell (2001).

In the present study, participants who were missing more than 10% of their data were excluded from the analyses[10]. Eleven of 189 participants were excluded based on this criterion. Three of these 11 participants also met the response consistency exclusion criterion. Therefore, 176 participants remained in the dataset after data cleaning.

Typically the convention for what constitutes an acceptable amount of missing data is less than 5% of the total number of administered items (P. Grant, personal communication, 2004). Considering the present questionnaire, that would mean that any participants missing more than two item responses would need to be addressed by either exclusion from the analyses or by recoding the missing data. In the present study, there were 24 individuals (12.6%) missing more than two items of data and 11 individuals (5.8%) missing more than four items. Mean substitutions were used to cope with the remaining missing values.

[10] The exception to this procedure for missing data was the gender data which was preserved and included in all analyses as a covariate.

One trend in participant response errors is worth noting, which may have contributed to a large number of missing data values. The most common pattern of missing data in the present study was for blank items (i.e., missing data) to be paired with a preceding item that had two response options selected (e.g., item 13 had both 1 and 5 circled, while item 14 was missing a circled value). Likely, what this pattern represents is a tracking error where participants inadvertently circled a number on the line above while tracking across the page from the question on the left side, to the response options on the right side. So rather than representing a lack of a response per se, many of the missing data values seemed to represent a systematic pattern of errors in responding.

For data entry, the way that these pairs of doubled and missing data were handled was to take the mean of the doubled item (i.e., if both 3 and 5 were circled, the response was entered as 4), and to enter the blank item as missing. This approach was conservative since, likely, one of the doubled responses was meant to be filled in for the blank item.

3.2 Preliminary Analysis

A one-way analysis of variance (ANOVA) was run to test for any differences in fear of needles ratings between males, females, and participants who failed to respond to the gender item on the questionnaire. Results suggested that the males had the lowest fear of needles rating ($M = 2.811$), while females had the highest ($M = 5.190$), $F(2, 167) = 14.437$, $p < 0.001$. This gender effect is well-documented in pain research (e.g., Goodenough, et al., 1999; Goodenough, Kampel, Champion, Laubreaux, Nicholas, Ziegler, & McInerney, 1997). There was a significant difference between females' fear of needles ratings and the participants with missing gender information ($M = 3.364$), but no difference between missing and males. Gender was entered as a covariate in subsequent analyses.

It was not possible[11] to collect information about which individual nurses administered immunizations to which participants. However, typically only one or two nurses were in attendance for immunization clinics. Therefore, school effects were examined as a proxy indication of possible nurse effects using one-way analysis of variance (ANOVA). There were no differences fear ratings across schools.

[11] Administrative approval for this type of data collection was not provided by Public Health.

3.3 Reliability and Item Analysis[12]

One of the 42 items on the CNQ-P was not included in item analysis because its function was simply to check against another item for response sets (see Section 3.1). Therefore, 41 CNQ-P test items were included in this analysis.

3.3.1 Response Distributions. Response distributions were used to identify ceiling and basement effects in individual items. Examining item distributions is important because many statistical analyses depend on normality within observations (i.e., items). Specifically, variable frequencies were examined to identify items that had 80% or more of participants endorsing either the extreme top (i.e., '5' – "very much like me") or extreme bottom (i.e., '1' – "very unlike me") of the Likert scale. Two items were removed for being highly skewed at this check. Thirty-nine items remained at this stage of item analysis.

3.3.2 Item Discrimination. Item discrimination measures an item's effectiveness in discriminating between high and low overall scorers (Burisch, 1984; Crocker & Algina, 1986). To assess item discrimination for a subscale test, Pearson correlations can be used to find the correlation between an individual item and the overall subscale score if that item were deleted. For the present analysis, the first step was to examine item-total correlations[13] between the items and the overall scale. Three items that correlated negatively with the overall CNQ-P were excluded at this step. Thirty-six items remained in item analysis at this stage.

The next step was to form theoretical subscales (i.e., established by consensus vote), which would be used to further examine item-total correlations. For this item analysis, three preliminary subscales were derived based on the items' perceived representations of theoretical coping constructs (approach, problem-focused avoidance, and emotion-focused avoidance)[14]. Some of the items were initially included on more than one scale (usually approach and problem-focused avoidance) because of ambiguity about which subscale they belonged to. At this stage, items were over-included across subscales to ensure that all potentially contributing items to a subscale would be included in factor analysis. Items that had low or negative item-total

[12] Other types of reliability and validity not covered in the present program of research are briefly reviewed in the General Discussion (see section 4.3)

[13] In all cases, "item-total correlations" refer to the correlation between an individual item and the overall scale or subscale mean, assuming that the item of interest is deleted.

[14] Recall that these items were all rated for their fit to theoretical conceptualizations of coping in the literature. These ratings, which were completed by teams of trained raters (see Section 2.3.2), were used for this part of the analysis.

correlations or those that decreased the subscale reliability (i.e., Cronbach's alpha) were excluded.

For the approach subscale, 19 items were examined. All 19 had item-total correlations that exceeded 0.25 so none were deleted from analysis at this stage.

For the problem-focused avoidance subscale, 18 items were examined. Of these, one had an item-total correlation of 0.11, which decreased the overall subscale reliability statistic. This item was deleted from the problem-focused avoidance subscale but was also tested as part of the emotion-focused subscale item analysis. This left 17 items theoretically associated with the problem-focused subscale.

For the emotion-focused avoidance subscale, 11 items were examined. Two items had negative item-total correlations, these were deleted and the item analysis was rerun. After the second run, one item had an item-total correlation of 0.189 that decreased the subscale reliability statistic. This item was deleted from the emotion-focused avoidance subscale, leaving eight items theoretically associated with this subscale.

The final step in item discrimination was to re-examine the full-scale item-total correlations with the remaining 33 items. Three of these items had item-total correlations less than 0.081 that decreased the overall subscale reliability statistic; these were deleted. There were two other items that had item-total correlations between 0.17 and 0.19 and that decreased the overall scale reliability after re-running the full-scale item-total correlations. However, these items were maintained because they were well associated with their subscales and there was one further step in item analysis and factor analysis, which could serve as a check for their suitability to the final scale.

3.3.3 Internal Consistency. Cronbach's alpha was used to assess internal consistency, which is defined as the extent to which item responses obtained at the same time correlate highly with each other (Nunnally, 1978). It is equivalent to the mean of all possible split-half coefficients (Nunnally, 1978). The higher the alpha, the more the scale or subscale is reliable.

The internal consistency statistics (Cronbach's alpha) for each of the three theoretical subscales (i.e., established by consensus vote) and the full-scale CNQ-P at this stage of the analysis are presented in Table 4.

Table 4. Internal Consistency Statistics for the CNQ-P Subscales as they were Established by Consensus Vote

Full-Scale CNQ-P	Approach	Problem-focused avoidance	Emotion-focused avoidance
$\alpha = 0.894$	$\alpha = 0.871$	$\alpha = 0.874$	$\alpha = 0.779$

When Cronbach's alpha is very high, it may reflect redundancy and less variance in the scale and may not discriminate well between participants (Nunnally, 1978). If subscale alphas were higher than 0.8, bivariate correlations were examined to identify subscale items that were very highly correlated (i.e., $r \geq 0.7$). Nunnally (1978) suggests that these highly correlated items should be considered for deletion.

Two items had a bivariate correlation that exceeded 0.7 and had very similar content: "I tell myself it's not so bad" and "I tell myself I can handle it". These items appeared only on the theoretically derived approach subscale. Of the two, the item that had the lower item-total correlation on the approach subscale was "I tell myself I can handle it". This item was also perceived to have higher reading level demands (i.e., "handle" versus "not so bad") so it was deleted. Following this deletion, the full-scale CNQ-P internal consistency statistic decreased to 0.893 and the approach subscale internal consistency statistic decreased to 0.859. There were 29 items remaining after item analysis.

3.4 Factor Analysis

3.4.1 Factor Analytic Method. Data from administered CNQ-Ps were analysed using maximum likelihood (ML) factoring with an oblique rotation. This method of factor analysis is a favourite among statisticians because of its desirable asymptotic properties (i.e., gradually approaching constant), which aids in the estimation of communalities (Bickel & Doksum, 1977). Because of its hypothesis testing capabilities, ML is often used in confirmatory factor analysis (Pett, Lackey, & Sullivan, 2003). Therefore, ML is well-suited to the present questionnaire development because there are a priori predictions about the derived factors based on extensive pre-existing literature. It was expected that the items would load on either two (approach, avoidance) or three (approach, problem-focused avoidance, emotion-focused avoidance) factors as has previously been reported in the literature (e.g., Phipps et al., 1998; Reid et al., 1998).

3.4.2 Rotation. Oblique rotation of the extracted factors is used when a relationship is hypothesized to exist between the factors. In this case, problem-focused and emotion-focused coping are thought to be related in that they are lower-order concepts that compose an overall

concept of general coping. Therefore, an oblique rotation, direct oblimin, was used. This rotation has the advantage of simplifying the interpretation of factors by minimizing the extent to which variables cross-load across factors (Tabachnick & Fidell, 2001).

3.5 Item Analysis as Part of Factor Analysis

3.5.1 Salient Factor Loadings. Salience has been used to describe high factor loadings (Gorsuch, 1983). As a general rule of thumb, some statisticians suggest choosing loadings of 0.3 or greater as salient (Comrey, 1992; Gorsuch, 1983; Tabachnick & Fidell, 2001). In the context of sample size, Gorsuch (1983) has suggested that factor loadings as low as 0.3 can be interpreted for samples of at least 175 participants, whereas higher loadings are more desirable with smaller sample sizes.

For the present study, a slightly more conservative cut-off of 0.35 was chosen. There are two reasons for using a cut-off greater than 0.3: (1) Relying on low loadings to justify factor structure is unlikely to contribute to a solid, reliable factor solution (Comrey, 1992); and (2) Some authors suggest that only the highly loaded items should be relied on to name factors, while interpreting moderate and low loadings should be done cautiously (Comrey, 1992; Gorsuch, 1983).

3.5.2 Communalities. Communalities represent the extent of overlap between variables and factors (Gorsuch, 1983; Humphreys, Ilgen, McGrath, & Montanelli, 1969). The higher the communality, the better the extracted combination of factors account for variance in the variable's scores. Communalities at zero represent variables that do not share anything in common with any of the factors. When many low communalities exist, the associated model is unlikely to replicate well. In other words, communalities are an indication of how well the data fit the model. For the present study, items that had communalities less than .25 were deleted from the scale.

3.5.3 Variables per Factor. The decision points to exclude items in factor analysis that have low loadings and low communalities were aimed at increasing the reliability and variance accounted for by the extracted factor solution, as is advised in the literature (Child, 2006; Gorsuch, 1983; Humphreys et al., 1969). However, stable solutions also require an adequate ratio of variables to factors. Gorsuch (1983) reported that it is generally difficult to replicate factors with fewer than five or six salient variables per factor. If fewer than five or six items compose a

factor, two strategies could be adopted: (1) use a higher-order solution; or (2) adopt less stringent criteria for item exclusion.

3.6 Assumptions of Factor Analysis

3.6.1 *Number of Individuals.* The ratio of individuals needed for factor analysis is thought to be at least five per variable entered into the analysis but not less than 100 (Gorsuch, 1983). A more general rule is that sample sizes of 100 are considered poor, 200 as fair, 300 as good, 500 as very good, and 1000 as excellent (Comrey, 1992). The required sample size also depends on magnitude of correlations and number of factors: if there are strong, reliable correlations and a few, distinct factors, a smaller sample size is adequate.

There were 29 items remaining after item analysis. Therefore, at least 145 participants were needed to run a factor analysis. In fact 179 participants had data entered into the factor analysis, which represents a ratio of slightly better than six participants per variable entered into the analysis.

3.6.2 Normality. Distributions of the 29 variables were examined. Transformations of these variables were examined but were largely inadequate in correcting for the skewness problems (see Table 5). Transformations to correct skewness were as follows: (1) square root, which is the less severe transformation of the original data; (2) log10, which is a moderate transformation of the data; and (3) inverse, which is an extreme transformation typically reserved for J-shaped distributions (Tabachnick & Fidell, 2001). Only the mildly skewed items were corrected using a square root transformation, while both the mildly and moderately skewed items were corrected using a log10 transformation. For all but one of the attempted transformations, the items remained kurtotic following transformation. In fact, in many cases, they became more kurtotic following transformation.

Table 5. Transformation for Normality for Sample Low, Medium, and Highly Skewed CNQ Items using a Cut-off of 0.402 for Skewness and 0.800 for Kurtosis

Item	Skewness (*SE* = .201)	Kurtosis (*SE* = .400)
Untransformed		
Item 26	.490	-1.194
Item 7	.790	-.564
Item 34	2.292	4.251
Square root		
Item 26	0.268*	-1.462
Item 7	0.474	-1.037
Item 34	2.050	2.920
Log10		
Item 26	0.072*	-1.632
Item 7	0.181*	-1.370
Item 34	1.859	1.960
Inverse		
Item 26	0.490	-1.194
Item 7	0.790	-0.564[a]

Item 34	2.292	4.251

* Indicates that the transformation was successful in correcting skewness
[a] Indicates that the transformation was successful in correcting kurtosis

From examination of the item distributions it is clear that several of the variables are highly skewed; some in the positive direction and some in the negative. However, this is expected in a questionnaire that is meant to discriminate between a majority of children, who should be coping well with needles, and a small group of children who are expected to have difficulty with needles. It is also expected that the questionnaire resulting from these analyses will have some clinical utility for identifying children who are likely to need an intervention to help them cope better with getting needles. It is unlikely that a questionnaire, which requires algebraic corrections of children's responses will be useful in busy hospital or medical clinic contexts. For these reasons, and because transformations were largely unhelpful in achieving normality, skewness and kurtosis were not corrected for in the present study.

Skewed variables in the context of factor analysis contribute to lowered correlations in the factor matrix. The factor analysis will still run, but significance tests may be inappropriate and variance accounted for will likely be diminished (Tabachnick & Fidell, 2001).

3.6.3 Linearity. The existence of skewness for many variables raises the possibility of curvilinearity for some pairs of variables. However, transformations are unfavourable in the context of the present study for reasons outlined in the above section.

3.6.4 Determinant of a Matrix. The determinant in essence determines whether or not a given square matrix will have an inverse (Pett et al., 2003). It is also a test of singularity or multicollinearity, or the extent to which variables are too highly correlated within the correlation matrix (Tabachnick & Fidell, 2001). There can be problems in calculation of the inversion of the correlation matrix when the determinant is close to, or at, zero.

For both the two- and three-factor solutions, the determinant is zero, but the inversion matrices could still be calculated by SPSS. There are four checks that must be completed when the determinant is zero: (1) Check for inter-item correlations that exceed 0.80; (2) Check the dataset for duplicate respondent; (3) Spot-check the dataset for response sets; (4) Check to be sure that there are enough participants per item. There was only one inter-item correlation that exceeded 0.80 during item analysis and one item from the pair was excluded at that stage (see Section 3.3).

The dataset was checked and within it there was no duplication of participants. In terms of response sets, all sets where participants had zero variability in their responses were removed during data cleaning. There may be some sets reflecting coping style such as endorsing all the emotion-focused items, but none of the problem-focused items. These types of questionnaire patterns are actually desirable within the context of the present research and thus were not removed. Finally, while the sample size for this study is acceptable, it is toward the low end of what is necessary to run factor analysis. Pett et al. (2003) suggest that when a problem with the determinant exists, a sample size of at least 10 participants per variable is needed. Therefore, the most likely contributor to the determinant being zero is sample size.

3.6.5 Bartlett's Test of Sphericity. Bartlett's test of sphericity is a chi-square test that tests the null hypothesis that there is no relationship among the items (Bartlett, 1950). Larger values of Bartlett's test indicate greater likelihood that the null will be rejected.

For the two-factor solution, the null is rejected, $\chi 2\ (190) = 1067.903$, $p < 0.001$. For the three-factor solution, the null is also rejected, $\chi 2\ (171) = 1120.170$, $p < 0.001$. Meeting this assumption is a positive sign because it indicates that there are significant relationships between the items despite the presence of skewness in the variables.

3.6.6 Kaiser-Meyer-Olkin Measure of Sampling Adequacy. KMO is a measure of sampling adequacy that tests whether the partial correlations[15] among variables are small (Pett et al., 2003). If the items share common factors, then it is expected that the partial correlation coefficients between the pairs of items would be small when the linear effects of other items have been removed. KMO can range between 0 and 1, with smaller values being more problematic. Pett et al. (2003) offer the following guidelines: above 0.9 is "marvellous"; in the .80s is "meritorious"; in the .70s is just "middling"; in the .60s is "mediocre,"; less than .60 is "miserable," or "unacceptable" (Pett et al., 2003). For the two- and three-factor solutions, the KMO values are 0.837 and 0.854, respectively, which represent "meritorious".

[15] These partial correlations are calculated after adjusting for the variance in the other variables.

In the following sections, both the two- and the three-factor solutions of the *Coping with Needles Questionnaire* will be examined both in terms of psychometrics as determined by factor analysis and in terms of construct validity testing. The two-factor solution will be discussed first, followed by the three-factor solution.

3.7 Results of the Two-factor Solution

For the two-factor solution, a total of ten items were removed over three executions[16] of the factor analysis. The remaining 19 items, and their factor loadings, are presented in Table 6. Only loadings greater than the cut-off of 0.350 are shown. This solution accounts for a cumulative percentage of 45.232% of the variance. This is somewhat low by the standards in the literature. Researchers suggest that between 50-60% of the variance should be accounted for by factor solutions in the behavioural sciences (Child, 2006; Comrey, 1992; Gorsuch, 1983; Pett et al., 2003).

[16] Each time items were removed from the factor analysis, the factor loadings changed somewhat so further factor analyses were run until a final solution was obtained. It was never the case that variables moved from one factor to another following the deletion of some items. Rather, it tended to be the case that the strength of the factor loadings would change modestly.

Table 6. Factor Loadings Greater than 0.350 for Study 1 Draft Items Assuming a Two-factor Solution

Item	Factor 1	Factor 2
I try to think of different ways to make the needle go better	.738	
I tell myself it's not so bad	.698	
I remind myself why I have to get immunized	.677	
I tell myself it will be okay	.632	
I try and think about the positive things about getting immunized	.630	
I imagine doing something else	.616	
I think about what needs to be done to make the needle go better	.588	
I imagine the nurse or needle is something different	.552	
I try to be brave	.533	
I ask the nurse what might help me get through it	.529	
I imagine being somewhere else	.513	
I take deep breaths	.470	.401
I count in my head	.422	
I trust the nurse knows what she is doing	.420	
I cry		.745
I worry too much about the needle		.701
I keep thinking the needle will hurt a lot		.680
I look for comfort from someone or something around me		.539
I pray		.402

3.8 Results of the Three-factor Solution

For the three-factor solution, a total of nine items were removed over three executions of the factor analysis. The remaining 20 items, and their factor loadings, are presented in Table 7. Only loadings greater than the cut-off of 0.350 are included. This solution accounts for a cumulative percentage of 52.105% of the variance.

Table 7. Factor Loadings Greater than 0.350 for Study 1 Draft Items Assuming a Three-factor Solution

Item	Factor 1	Factor 2	Factor 3
I imagine doing something else	.879		
I imagine being somewhere else	.826		
I try to think of different ways to make the needle go better	.576		
I imagine the nurse or needle is something different	.575		
I tell myself the next one will go better	.476		
I ask the nurse what might help me get through it	.381		
I try to make my mind go blank	.373		
I cry		.738	
I worry too much about the needle		.736	
I keep thinking the needle will hurt a lot		.640	
I look for comfort from someone or something around me		.552	
I take deep breaths		.521	.516
I pray		.418	
I talk to a friend about how I feel		.368	
I tell myself it's not so bad			.699
I remind myself why I have to get immunized			.653
I try and think about the positive things about getting immunized			.644
I try to be brave			.591
I tell myself it will be okay			.551
I trust the nurse knows what she is doing		-.364	.400

3.9 Factor Naming

Factors were named based on their high loading items with cautious attention paid to moderate and low loadings (see Table 8). Based on the way that their items overlap on Factor 1 for the two-factor solution, Factors 1 and 3 are considered to be subscales of a higher-order, "problem-focused coping" Factor. Factor 1 is named "cognitive distraction", while Factor 3 is named "positive self-statements". Factor 2 was mostly consistent across both the two- and three-factor solutions; it represents "emotion-focused coping". A very similar three-factor structure of coping responses was reported by Brown and colleagues (1986) and Hermann, Hohmeiste, Zohsel, Ebinger, and Florin (2007).

Table 8. Factor Names for both the Two- and the Three-factor Solutions and the Relationship between Them

Two-factor Solution		
Factor 1		Factor 2
Problem-focused		Emotion-focused
Three-factor Solution		
Factor 1	Factor 3	Factor 2
Cognitive Distraction	Positive Self-statements	Emotion-focused

It should also be noted that in Factor Analysis once factors have been extracted, in order to calculate subscale scores, the researcher has the option of equally weighting each item (i.e., ignoring the magnitude of the factor loadings), or weighting each item by its factor loading. Since one of the future hopes for disseminating this questionnaire is that it might prove useful in busy hospital settings, the more practical and less time consuming option of equally weighting the items will be implemented in the present program of research.

3.10 Construct Validity

Once factors are named in factor analysis, the next step is to verify the factor structure by establishing the construct validity of the factors. In the present study, construct validity was assessed by the extent to which the two- and three-factor structures predict relationships established in existing literature. Specifically, participants were asked to rate their fear of needles and to identify "one good thing about getting a needle" because it was expected that high

emotion-focused coping would be associated with high fear scores and difficulty identifying a positive aspect of needles. Conversely, high problem-focused coping and its derivatives, cognitive distraction and positive self-statements, were expected to be associated with lower fear scores and identification of a positive aspect of needles. The literature suggests that cognitive distraction may even be more advantageous than positive self-statements.

Two separate sets of construct validity analyses were run: one using the two-factor solution and one using the three-factor solution.

3.11 Hypothesis Testing with the Two-factor Solution

Recall that children high on emotion-focused coping were hypothesized to have higher fear ratings compared to children with low emotion-focused coping. Conversely, it was expected that children high on problem-focused coping would have lower fear ratings compared to participants low on problem-focused coping.

3.11.1 Fear of Needles. A 2 (Problem-focused coping: High, Low) X 2 (Emotion-focused coping: High, Low) univariate analysis of covariance (ANCOVA) was run with Gender (Male, Female) as a covariate and fear as the dependent variable to examine the construct validity of the two-factor solution. Descriptive statistics for the ANCOVA are presented in Table A1 (see Appendix C). High and low coping groups were created using a median split. For example, the median for problem-focused (PF) coping was 2.779. Participants whose mean PF coping was above 2.779 were classified as "high", while participants whose PF coping was below the median were classified as "low". The median for EF coping was 2.166.

Gender was a significant covariate in the two-factor ANCOVA, F (1, 120) = 11.697, p = 0.001. Between subjects comparisons revealed significant main effects of both PF and EF coping, as well as a significant interaction. Specifically, participants low on PF coping had higher mean fear of needles (M = 5.300) compared to those high on PF coping (M = 4.120), F (1, 120) = 4.640, p = 0.033. Consistent with the hypothesized effect, participants high on EF coping had higher mean fear of needles (M = 6.255) compared to those low on EF coping (M = 3.164), F (1, 120) = 30.020, $p < 0.001$. Finally, the PF X EF coping interaction was accounted for by high PF moderating the relationship between high EF coping and high fear scores, F (1, 120) = 3.935, p = 0.050 (see Figure 2). In other words, when children employed high amounts of problem-focused coping along with high emotion-focused coping, they had lower mean fear compared to participants who were high on emotion-focused coping only.

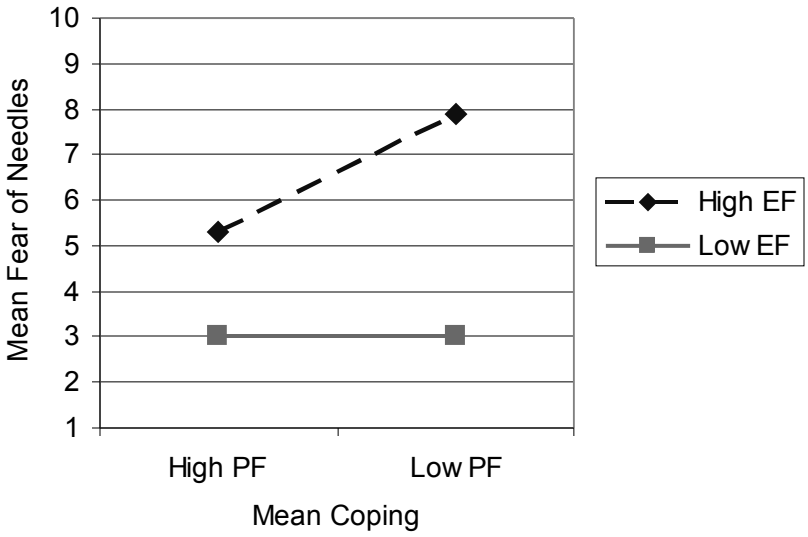

Figure 2. Problem-focused (PF) by Emotion-focused (EF) Coping Interaction Examining Mean Fear of Needles Ratings for the Two-factor Solution

3.11.2 Pessimism. Participants were asked to identify "one good thing about needles" in an open-ended response format. Recall that it was expected that participants coded as "pessimistic[17]" would have higher mean emotion-focused coping compared to positive individuals. There was no hypothesized effect for problem-focused coping. These responses were coded as either positive or pessimistic by two independent coders. Missing values were coded as pessimistic because they were interpreted as equivalent to a "no" response to the question "Can you think of one good thing about getting a needle?". Of 171 codes, the two raters agreed on 167 (i.e., 97.6% agreement). Disagreements were resolved through discussion.

Independent samples *t*-tests were run to examine categorical pessimism data examining the SPSS output line with equal variances not assumed. The pessimism category was set as the grouping variable (i.e., positive, pessimistic), while mean PF and EF coping were set as the dependent variables. Contrary to the hypothesized effect, there was no mean difference between positive ($N = 263$) and pessimistic ($N = 14$) participants for EF coping, $t(60) = 0.127$, $p = 0.899$. However, positive individuals had higher mean PF coping ($M = 2.837$) compared to pessimistic individuals ($M = 2.372$), $t(60) = 1.773$, $p = 0.040$.

3.11.3 Coping Factor Correlations. Correlations were run to examine the relationship between emotion- and problem-focused mean coping. Recall that an emotion-focused coping

[17] "Pessimistic" was defined as the inability to identify "one good thing" about getting a needle.

factor, if extracted, was expected to be negatively correlated with other extracted coping factors. Problem-focused correlated at $r = 0.446$, $p < 0.001$ with emotion-focused. This is contrary to the hypothesized relationship, which would have seen emotion-focused coping negatively correlated with problem-focused coping.

3.12 Hypothesis Testing with the Three-factor Solution

Recall that children high on emotion-focused coping were hypothesized to have higher mean fear ratings compared to those low on emotion-focused coping. Conversely, it was expected that children high on cognitive distraction and positive self-statements coping would have lower fear ratings compared to participants low on these types of coping.

3.12.1 Fear of Needles. A 2 (Cognitive distraction: High, Low) X 2 (Emotion-focused coping: High, Low) X 2 (Positive self-statements: High, Low) univariate analysis of covariance (ANCOVA) was run with Gender (Male, Female) as a covariate to examine the construct validity of the three-factor solution. Descriptive statistics for the ANCOVA are presented in Table A2 (see Appendix C). High and low coping groups were created using a median split. The medians[18] were 2.142 for cognitive distraction, 2.142 for emotion-focused, 3.714 positive self-statements.

Gender was a significant covariate in the two-factor ANCOVA, $F(1, 116) = 5.655$, $p = 0.019$. Between subjects comparisons revealed a significant main effect of only emotion-focused coping. Specifically, as was hypothesized, participants high on EF coping had higher mean fear of needles ($M = 5.619$) compared to those low on EF coping ($M = 3.218$), $F(1, 16) = 13.219$, $p < 0.001$. The main effects of cognitive distraction, $F(1, 116) = 0.428$, $p = 0.514$, and positive self-statements were both non-significant, $F(1, 116) = 0.963$, $p = 0.328$, as were all the interactions.

3.12.2 Power. The power of a statistical test is the probability of rejecting the null hypothesis when it is actually false. Several factors affect power including sample size, design, alpha (i.e., the p value which is used as criterion to reject the null hypothesis), effect size, and standard error of the mean (Howell, 2002). Typically, 80% power is considered desirable (Howell, 2002).

For the three-factor analysis, the observed power to detect a main effect of cognitive distraction was 9.9% and for a main effect of positive self-statements was 16.4%. In contrast, there was 95.0% power to detect a main effect of emotion-focused coping, the only mean difference that emerged as significant in the present analysis. In order to have 80% power to

[18] It is merely a strange coincidence that both positive self-statements and emotion-focused coping have the same median. These calculations were double-checked for errors.

detect a main effect of cognitive distraction (observed difference of 0.417, *MSE* = 6.502), a minimum of 2348 participants would be needed; for positive self-statements (observed difference of 0.623, *MSE* = 6.502), a minimum 1052 would be needed.

For the interactions (two two-way and one three-way), power ranged between 5.3% and 12.1%. These power values are extremely low, to the extent that the null hypotheses cannot be rejected with any degree of certainty. In order to have 80% power to detect the smallest of the three two-way interactions (observed difference of 0.582, *MSE* = 6.502), a minimum of 1202 participants would be needed.

3.12.3 Pessimism. Independent samples *t*-tests were run to examine categorical pessimism data.

The pessimism category was set as the grouping variable, while mean cognitive distraction, EF, and positive self-statements coping were set as the dependent variables. Contrary to the hypothesis, there was no mean EF coping difference between positive and pessimistic participants, $t(60) = 0.222$, $p = 0.825$. However, positive individuals had higher mean cognitive distraction coping ($M = 2.448$) compared to pessimistic individuals ($M = 1.847$), $t(60) = 2.084$, $p = 0.009$. Positive individuals also had higher mean positive self-statements coping ($M = 3.525$) compared to pessimistic individuals ($M = 2.868$), $t(60) = 2.309$, $p = 0.019$.

3.12.4 Coping Factor Correlations. Correlations were run to examine the relationship between mean coping for the three factors: cognitive distraction, emotion-focused, and positive self-statements. Recall that an emotion-focused coping factor, if extracted, was expected to be negatively correlated with other extracted coping factors. Cognitive distraction correlated at $r = 0.453$, $p < 0.001$ with emotion-focused and $r = 0.569$, $p < 0.001$ with positive self-statements. Emotion-focused and positive self-statements correlated at 0.400, $p < 0.001$. This is contrary to the hypothesized relationship, which would have seen emotion-focused coping negatively correlated with the other coping factors.

4. Summary and Conclusions

The present study was conducted to develop and preliminarily validate a questionnaire to measure how children cope with needles. A 42-item draft questionnaire was administered to grade six students who had recently received a hepatitis B immunization. Following item and factor analysis, there were two versions of the questionnaire: a 19-item CNQ-P with two subscales (CNQ-P2: problem- and emotion-focused) and a 20-item CNQ-P with three subscales

(CNQ-P3: positive self-statement, emotion-focused, and cognitive distraction); each with its own relative advantages and disadvantages.

4.1 Psychometrics of Two Versus Three Factors

4.1.1 Two Subscale CNQ-P. While the CNQ-P2 is more parsimonious in its number of subscales, most of the information gleaned from the CNQ-P3 is preserved in the two subscale version, albeit in a higher-order form. The value of this parsimony is most apparent in the power available to statistically test hypotheses. Specifically, the CNQ-P2 design is smaller, less cumbersome, and requires fewer participants in order to test effects. This advantage was demonstrated in the results of the ANCOVA, which indicated significant effects of both problem- and emotion-focused coping on fear, as well as a significant interaction. The present study had insufficient power to detect smaller sized main effects for the larger, CNQ-P3, design, which had eight design cells compared to the CNQ-P2's four.

Where the disadvantages of the CNQ-P2 are most evident is in examination of the factor analysis output. In particular, this two-factor solution accounts for a less than desirable amount of the response variance and the factor loadings are not quite as high as they are in the CNQ-P3. These elements make for less predictive power built into the CNQ-P2.

4.1.2 Three Subscale CNQ-P. Based on the present analysis, the three subscale version of the CNQ-P is much like the two subscale version. By adding the third factor, more of the response variance is able to be accounted for by the scale, which is an advantage of this version. Further, when we consider problem-focused coping as being composed of two lower-order subscales, it is possible to test the differential effects of cognitive distraction and positive self-statements coping. There was insufficient power in the present study to detect these differences, if they exist.

Some research has suggested that it may be important to differentiate between approach- and avoidance-oriented problem-focused coping in order to detect positive coping effects in the context of procedural pain like needles (Bennett-Branson & Craig, 1993; Brophy & Erickson, 1990; Gil, Thompson, Keith, Tota-Faucette, Noil et al., 1993; Gil et al., 1991; Lynch et al., 2006; Reid et al., 1998; Scheier & Carver, 1992; Stevens, 1991-2; Stevens & Terner, 1992-3). However, the results of the present study suggest that high use of problem-focused coping, in general, is associated with less fear of needles. This is not to say that there can not be differences in the relative effectiveness of the lower-order (i.e., cognitive distraction, positive self-

statements) problem-focused coping behaviours. But to test this hypothesis, a three-factor model would be necessary.

4.2 Construct Validity of Two Versus Three Factors

4.2.1 Two Subscale CNQ-P. The two subscale (problem- and emotion-focused coping) CNQ-P is consistent with theoretical conceptualizations of coping reported in the literature (see Lazarus & Folkman, 1987). Specifically, problem-focused coping is associated with lower fear of needles ratings. The presence of high problem-focused coping also moderates the fear of needles ratings for participants who also reported high use of emotion-focused coping. Also, participants who were able to identify a positive aspect of being immunized had higher mean problem-focused coping scores compared to participants who were unable to identify one. These findings indicate that problem-focused coping is indeed a positive approach to employ to cope with fear of needles. As is reported in the literature (Anshel, 1996; Compas, Malcarne et al., 1988; Crombez et al., 2003; Fields & Prinz, 1997; Folkman et al., 1986; Reid et al., 1998), high use of emotion-focused coping was found to be associated with high fear of needles ratings. This was consistent with the hypothesized effect. There was no relationship between participants' ability to identify a positive thing about being immunized and emotion-focused coping. In the literature, pessimistic, or negatively valenced, thinking is a strong predictor of, or analogous to, catastrophizing, a sub-component of emotion-focused coping (Caryk & Walker, 1986; Davey & Levy, 1999; Sinclair, 2001; Wickramasekera, 1986).

There are several possible issues that may have contributed to the null relationship between emotion-focused coping and pessimism in the present study. First, the cell size for the pessimistic group was small; only 14 participant responses were coded as pessimistic.

Second, this item format was originally included in the questionnaire as a means of finishing the questionnaire with a positive item, to make it more appealing to teachers. It is possible that this item is not a good proxy measure of pessimistic thinking. More detailed measures of optimistic and pessimistic thinking do exist (Ey et al., 2005; Stipek, Lamb, & Zigler, 1981). However, while running this study, teachers were already concerned about the length of time necessary for data collection so expansions on the presently reported procedure would not have been advisable.

A third influence could be that the emotion-focused coping subscale is not fully composed of catastrophizing items. In fact, some of the items may be considered relatively helpful coping behaviours (e.g., "I look for comfort from someone or something around me"), which could dilute the strength of association of this subscale with pessimistic thinking. Although previous procedural pain research refutes this supposition suggesting that any coping behaviour that involves focus on the emotional aspects of the coping process is likely to lead to increased child distress (Blount, Piira, Cohen, & Cheng, 2006).

Finally, a fourth candidate for problems in the test of pessimism is the coding scheme itself. Both neutral responses and missing data were coded as pessimistic under the present scheme, which could dilute the negativity expected in this category. One strategy to deal with this issue would have been to remove the neutral responses and the missing values from the pessimistic code category and then to re-run the analysis. However, the sample size of this category was already alarmingly small; any further cuts would have exacerbated this power problem. As a result, this item will be re-examined in Study 2 with a larger sample size.

4.2.2 Three Subscale CNQ-P. Similar to the results of the CNQ-P2, high emotion-focused coping on the CNQ-P3 was associated with higher mean fear of needles ratings. Though there were no significant main effects of cognitive distraction or positive self-statements coping, participants who were able to identify a good thing about being immunized had higher mean coping for both of these subscales.

The CNQ-P3 had insufficient power to detect most of the effects in the three-factor design. Power analyses revealed that a total of at least 1052 participants would be needed to

detect the main effect sizes reported in the present study. One of the primary aims of the following study will be to recruit a larger sample in order to adequately test these and other hypotheses. However, given the small effect sizes for these main effects, it is unlikely that a small increase in sample size will contribute to significant results of statistical analysis.

4.3 Determining Scale Structure using the CNQ-P

Recall that decision-making about structuring a coping assessment tool should consider both how the different types of coping uniquely predict outcome (predictive element) and the relationship between the different types of coping (relational element). The resulting structures for the CNQ-P2 and CNQ-P3 are reviewed in the following sections.

4.3.1 Scale Structure for the CNQ-P2. Results indicated that there were unique predictive elements to both the problem-focused and emotion-focused subscales of the CNQ-P2; each contributed to its own between-subjects effect. However, the two subscales are also positively correlated indicating that there is a relatively equivalent relational element between them. Referring back to Table 3, this pattern (B) of predictive and relational elements indicates that either a subscale version of the CNQ-P2 should be used, or the two subscales could be merged. In this case, the latter option is not useful since the two subscales predict outcomes differently. Therefore, the CNQ-P2 is best structured as two separate subscales: problem- and emotion-focused.

4.3.2 Scale Structure for the CNQ-P3. Results indicated that there were equivalent, null predictive elements to both the cognitive distraction and positive self-statements subscales of the CNQ-P3, while the emotion-focused subscale had a predictive element. The three subscales are also positively correlated indicating that there is a relatively equivalent relational element between them. Referring back to Table 3, this pattern (A) of predictive and relational elements indicates that either a full-scale version of the CNQ-P2 should be used or the two equivalent (relational and predictive) subscales could be merged or eliminated. Because emotion-focused coping has a unique predictive element, its effect may be diluted in a full-scale version. Therefore, a subscale version is favoured.

The option of eliminating the cognitive distraction and positive self-statements scales also seems like a poor choice given (1) the inadequate power to detect their effects in this investigation and (2) that there is a unique predictive element of problem-focused coping in the CNQ-P2. Therefore, it seems that the best structure of the CNQ-P3 is to merge cognitive

distraction and positive self-statements, essentially making the CNQ-P3 equivalent to the CNQ-P2. Prior to making this structure final, further investigation is needed to determine if cognitive distraction and positive self-statements are more viable subscales when the design has more power to test their effects.

4.4 Summary of the CNQ-P2 Versus CNQ-P3 Comparison

In summary, the two and three subscales CNQ-P are very similar in item content. Lack of statistical power limited a full examination of their relative advantages and disadvantages in the present study. It is likely prudent at this stage to maintain all of the items required to compose the two scales and to continue to test them both in future studies. The next study in the present program of research is designed to continue this comparison of the two and three subscale CNQs with a larger sample size.

4.5 Future Directions

The present study had a very narrow focus on grade six students because initially the CNQ-P was being developed as a tool to measure coping with hepatitis B immunizations. In addition to limiting the available study population, this focus made for limited generalizability of the resulting scale. Also, it is well-established that coping responses change across the preschool, childhood, and adolescent years (Fields & Prinz, 1997). The following study in this program of research will include a wider age band with whom to test the CNQ.

While fear of needles has significant implications for children's experience with painful procedures and medical care, there are other outcomes that could be of interest for validation of a *Coping with Needles Questionnaire*. In particular, pain and anxiety are commonly measured outcomes in the context of painful procedures (e.g., Bachanas & Blount, 1996; Bennett-Branson & Craig, 1993; Crombez et al., 2003; Fradet, McGrath, Kay, Adams, & Luke, 1990; Goodenough, Thomas, Champion, Perrott, Taplin, von Baeyer et al., 1999; Jacobson et al., 2001; Siegel & Smith, 1989). Lazarus and Folkman (e.g., 1987;1991) also suggest that children's ability to cope should be related to feelings of self-efficacy; that is, their perceived ability to deal with the stress of getting a needle. All three of these additional outcomes will be assessed in the following study.

SECTION C - STUDY 2 DEVELOPMENT AND VALIDATION OF THE *COPING WITH NEEDLES QUESTIONNAIRE*

1. Validation of the *Coping with Needles Questionnaire*

1.1 Introduction

The goal of the present study was to continue development and validation of the *Coping with Needles Questionnaire* (CNQ) using a wider age band and a larger sample size. In addition to measuring fear of needles and pessimism as part of establishing the construct validity of the CNQ, assessment of participants' anxiety, pain, and self-efficacy was added to the present study.

1.2. Establishing Construct Validity

1.2.1 Coping Type and Fear. Recall from Study 2 that Children high on emotion-focused coping were hypothesized to have higher fear ratings compared to children with low emotion-focused coping. Conversely, it was expected that children high on problem-focused coping would have lower fear ratings compared to participants low on problem-focused coping. .

1.2.2 Coping Type and Pain, Anxiety, and Self-efficacy. Pain and anxiety are commonly measured negative outcomes in the context of painful procedures (e.g., Bachanas & Blount, 1996; Bennett-Branson & Craig, 1993; Crombez et al., 2003; Fradet et al., 1990; Goodenough, Thomas, Champion, Perrott, Taplin, von Baeyer et al., 1999; Jacobson et al., 2001; Siegel & Smith, 1989), while children's ability to cope well should be related to feelings of self-efficacy (e.g., Lazarus & Folkman, 1987; 1991). Therefore, high emotion-focused coping was hypothesized to be associated with higher mean anxiety and pain, as well as lower self-efficacy. Conversely, it was expected that children high on problem-focused, cognitive distraction, and positive self-statements coping would have lower mean anxiety, and pain ratings, as well as higher self-efficacy ratings compared to participants low on these types of coping.

1.2.3 Pessimism. Recall from Study 1 that it was expected participants coded as "pessimistic" would have higher mean emotion-focused coping compared to non-pessimistic individuals. There was no hypothesized effect for problem-focused, cognitive distraction, or positive self-statements coping. Although in Study 1, mean problem-focused coping and its derivatives was significantly higher among non-pessimistic individuals.

1.2.4 Relationship between Coping Factors. An emotion-focused coping factor, if extracted, was expected to be negatively correlated with other extracted coping factors.

2. Method

2.1 Participants

Participants were 306 children and adolescents (39.9% male) ranging in age from 10 to 18 (M = 12.91). There were 68 10- and 11-year-olds, 154 12- and 13-year-olds, 48 14- and 15-year-olds, and 36 16-, 17- and 18-year-olds. Since data collection was not directly tied to a needle procedure, participants were asked to estimate how long it had been since their last experience with a needle. Thirty-two percent estimated that they had had a needle within the month prior to completing the questionnaire[19]; 38.6% less than a year prior; 16.7% over a year; and 12.4% could not remember.

2.2 Measures

2.2.1 Coping with Needles Questionnaire. The CNQ (see Appendix D) is a self-report scale that asks children to rate how much (1 = very unlike me to 5 = very like me) each of 27 statements reflects how they coped with a needle. The 5-point Likert scale was chosen as it is commonly used among similar coping assessment tools (e.g., Reid et al., 1998). It was designed to assess coping strategies that children might use during the span before, during, and after being immunized. Twenty-one[20] of the items were drawn from the results of Study 1 analyses, while six new items were written based on additional strategies participants had identified in Study 1 in response to the question "Can you think of anything else you do or think about when you get a needle that we didn't put in the questionnaire?". These new items were: I talk to the nurse; I focus on something else; I don't think about it; I get a headache; I don't look; and I feel dizzy.

Not all new items suggested by the Study 1 participants were included. Only those that were endorsed by at least two participants were included as new CNQ items because we were less interested in idiosyncratic coping behaviours than we were in those that are common patterns of coping behaviour among our study 1 sample of school-aged children. The most commonly cited new item among Study 1 participants was "I focus on something else". Fifteen Study 1 participants identified this as a missing item. Interestingly, "I feel dizzy and/or get a headache" was reported among eight participants. Though dizziness and headaches are

[19] Data were collected around the same time that many grade six students are immunized for the second dose of hepB, which likely accounts for the large percentage of children endorsing that they were immunized within the last month.

[20] Recall that the item "I tell myself I can handle it" was deleted from the analysis in Study 1 for having a high bivariate correlation with another item. However, because low sample size may have contributed to an unstable factor solution and because the present study included older children for whom the word "handle" is at a more than appropriate reading level, it was re-entered into the questionnaire.

considered stress rather than coping responses within the theoretical paradigm of the present program of research, these two items were included in the new version of the CNQ to determine if they would load among the coping subscales in factor analysis. In particular, it was considered valuable information to observe whether or not these two items loaded on the emotion-focused coping subscale. If these two items, which reflect psychosomatic stress responses, loaded strongly along with the emotion-focused coping items from Study 1, support would be lent to the argument that this factor is better conceptualized as a stress, rather than a coping, response.

Any of the previous items that had referred to "immunization" in Study 1 were also re-written with the word "needle" instead to make the questionnaire more broadly relevant (e.g., blood draws).

2.2.2 Anxiety, fear, pain, and self-efficacy. Participants were asked to rate their anxiety, fear, pain and self-efficacy on either (1) a 100 mm Visual Analogue Scale (VAS; Gracely, 1979) by making a mark across a horizontal line that is 100 mm long; or (2) on a Numeric Rating Scale (NRS[21]) by circling the number from 0 to 10. The same anchors at the top and bottom of the VAS and NRS were used. For the VAS, the distance between the participant's mark and the left side of the line is measured and assigned a corresponding score that can range from 0 – 100 millimetres. For the NRS, the number that the participant circled is entered as his/her score. Two scale formats were used as part of an honours student's thesis examining differences in mean ratings and responses sets across the two scales. Note that no significant means differences in ratings were found between the two scale formats (McCormick, 2008), such that the scales were collapsed for the purposes of the present research.

2.2.3 Pessimism. In an open-ended written question, participants were asked if they could think of one good thing about getting immunized. Their written responses were then coded by two independent raters as either (a) positively or (b) negatively/neutrally valenced.

2.2.4 Additional items. Participants were also asked to indicate their age and gender, and to estimate how long it had been since their last needle.

2.3 Procedure

2.3.1 Recruitment and Data Collection. The present study was approved by the University of Saskatchewan Behavioural Research Ethics Board (Beh 04-179). Participants were recruited from 15 elementary and high schools in rural and small-city Saskatchewan. Principals

[21] There is no original article for the Numeric Rating Scale. However, its validity has repeatedly been demonstrated in investigations with adults (Jensen, Karoly, & Braver, 1986).

were contacted by telephone, fax (see Appendix E), and/or email (see Appendix F) for permission to distribute consent forms (see Appendix G) to their students. Repeat contacts were made by a new medium[22] on two occasions for schools that did not respond to the research request. A total of 127 schools were contacted from five Saskatchewan school divisions. Approval to conduct the study was granted in 15 schools (11.8%).

Consent forms were mailed to participating schools. A total of 1152 consent forms were mailed. Once consent forms were returned, a package containing questionnaires and instructions were mailed to teachers. Questionnaires were group administered in the participants' classrooms. Only the students with consent completed the questionnaires. A total of 306 questionnaires (26.6% of eligible students at participating schools) were returned by mail. All of the schools that had received consent forms returned some proportion of questionnaires. The lowest response rate was four questionnaires of 170 distributed consent forms (2.4%); the highest was 115 of 160 (71.9%).

Participants were asked not to write their names on the questionnaires. Age, gender and school were the only pieces of identifying information that were collected. In addition to completing the CNQ, participants were also asked to estimate how long it had been since their last needle. Finally, participants rated their anxiety, fear, pain, and self-efficacy from 0 (e.g., not at all scared) to 10 (e.g., extremely scared). Finally, participants were asked to identify one "good thing" about being immunized.

[22] Most initial contacts were made by fax. If there was no response to the fax, an email was sent, when the email address was available. The final option for contact was to telephone principals directly.

3. Results

3.1 Data Cleaning

3.1.1 Outliers. Standardized scores for each dependent variable were examined to look for univariate outliers. Cases with standardized scores of $z \geq 3.29$ ($p < 0.001$, two-tailed test) are potential outliers. In larger samples some scores in excess of 3.29 are expected, however, in the present sample there are none. The largest standardized score is 2.458.

3.1.2 Response Variability. There were 5 questionnaires where all of the CNQ items had '1's circled as responses. Four of these questionnaires belonged to males, there was one each of 11-, 12-, and 16-year-olds, and two 13-year-olds. These five questionnaires were excluded from the analysis.

3.1.3 Missing Data. Typically, when there are only a few missing data points and when they are randomly distributed among the variables in the study, the best strategy is to leave them as missing (Tabachnick & Fidell, 2001). In the present study, the most data that were missing for the CNQ items was three, which is less than 1% of the data. These were left as missing. None of the dependent variables were missing any data. Therefore, missing data were much less an issue in Study 2 compared to Study 1, possibly because the questionnaire was shorter.

3.1 Preliminary Analysis

3.1.1 Gender. Independent samples *t* tests were run to test for any differences in anxiety, fear, pain ratings between males and females. Females had higher anxiety ($M = 4.886$ versus 3.097), $t(304)$ -4.646, $p < 0.001$; higher fear ($M = 3.924$ versus 1.975), $t(293.156)$ -5.411, $p < 0.001$; higher pain ($M = 3.818$ versus 1.928), $t(300.787)$ -6.110, $p < 0.001$; and lower self-efficacy ($M = 6.349$ versus 7.191) $t(304)$ 2.217, $p < 0.001$, ratings compared to males. Therefore, gender was included as a covariate in subsequent analyses.

3.2.2 Time lag. One-way analysis of variance (ANOVA) was run to test for an effect of how long it had been since participants estimated they had had their last needle (time lag). The ANOVA found significant effects of time lag for all four dependent variables. Therefore, time lag was included as a covariate in subsequent analyses.

For anxiety, participants whose time lag was less than a year had higher ratings ($M = 4.950$) compared to participants whose time lags were less than a month ($M = 3.628$) and over a year ($M = 3.807$), $F(3, 301) = 3.356$, $p = 0.019$. Participants whose time lag was less than a year had high fear of needles ratings ($M = 3.992$) compared to participants whose time lag was less

than a month ($M = 2.324$), F (3, 301) = 5.668, $p = 0.001$. Similarly, for pain, participants whose time lag was less than one year had higher pain ratings ($M = 3.814$) compared to participants with less than a month lag ($M = 2.279$), F (3, 301) = 3.424, $p = 0.018$. Finally, participants with a time lag of less than a year had lower self-efficacy ratings ($M = 6.118$) compared to participants whose time lag was less than a month ($M = 7.183$) and over a year ($M = 7.494$), while participants whose time lag was over a year also had higher self-efficacy than participants who could not recall when they had their last needle ($M = 6.121$), F (3, 301) = 5.136, $p = 0.002$.

3.2.3 Age. Bivariate correlations were run to test for a relationship between age and the four dependent variables. There were no significant correlations. In fact, the highest Pearson correlation was $r = -0.038$, $p = 0.510$.

3.3 Reliability and Item Analysis[23]

In addition to the 21 CNQ items that resulted from Study 1 analysis, five additional items were entered into item analysis. These were new items that had been written based on participant feedback in Study 1.

3.3.1 Response Distributions. Response distributions were used to identify ceiling and basement effects in individual items. Specifically, variable frequencies were examined to identify items that had 80% or more of participants endorsing either the extreme top (i.e., '5' – "very much like me") or extreme bottom (i.e., '1' – "very unlike me") of the Likert scale. One item was had 82% of responses at the bottom of the scale at this check. This emotion-focused item (i.e., "I cry") loaded strongly on both the two- and three-factor solutions in Study 1. Because of its strong psychometrics in the previous study, this item was preserved in item analysis at this stage.

3.3.2 Item Discrimination. Item discrimination measures an item's effectiveness in discriminating between high and low overall scorers (Burisch, 1984; Crocker & Algina, 1986). To assess item discrimination for a subscale test, Pearson correlations can be used to find the correlation between an individual item and its overall subscale score. For the present analysis, the first step was to examine item-total correlations between the items and the overall scale to circumvent inflating the correlation coefficient. One item that correlated negatively with the overall CNQ was excluded at this step. Twenty-six items remained in item analysis at this stage. This item was one of the new items that had been drafted following Study 1.

[23] Other types of reliability and validity not covered in the present program of research are briefly reviewed in the General Discussion (see section 4.3)

The next step was to form subscales, which would be used to further examine item-total correlations[24]. For this item analysis, four subscales were derived based on the factor analysis in Study 1: problem-focused, cognitive distraction, emotion-focused, and positive self-statements. Recall that problem-focused is a higher-order factor that subsumes cognitive distraction and positive self-statements, with the addition of one item.

Some of the new items were initially included on more than one subscale (usually cognitive distraction and positive self-statements) because of ambiguity about which subscale they belonged to. At this stage, new items were over-included across subscales to ensure that all potentially contributing items to a subscale would be included in factor analysis. Items that had low or negative item-total correlations or those that decreased the subscale reliability (i.e., Cronbach's alpha) were excluded.

For the problem-focused subscale, 17 items were examined. All 17 had item-total correlations that exceeded 0.25 so none were deleted from analysis at this stage.

For the cognitive distraction subscale, nine items were examined. One item had an item-total correlation of 0.250 that decreased the subscale reliability. This was one of the newly drafted items. It was deleted from the cognitive distraction subscale[25].

For the emotion-focused subscale, 10 items were examined. Two items had item-total correlations of less then 0.200 that decreased the subscale reliability. One was an item from Study 1 that had a low loading on Factor 2 , one was new. Both were excluded from the analysis at this stage.

Recall that in Study 1 there was one emotion-focused item that loaded in the three-factor solution but not the two-factor one. The subscale reliability statistics for this subscale were examined to ensure that none of the new items were problematic in a different way from the three-factor examination described above. For the two-factor emotion-focused subscale, the same two items are excluded (i.e., one new, one old). Maintaining the endeavour to be over-inclusive about the items included for factor analysis as long as their psychometrics are acceptable in item analysis, all of the items from the three-factor emotion-focused subscale will be included in the present factor analysis; both when forcing two and three factors.

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[24] In all cases, "item-total correlations" refer to the correlation between an individual item and the overall scale or subscale mean, assuming the item of interest is deleted.

[25] Though this item was deleted for the cognitive distraction subscale, it was kept for both the problem-focused and positive self-statements subscales.

As a check to determine the suitability of having kept the item with positive skew at the response distribution check, reliability statistics were re-examined with it deleted for the emotion-focused subscale. The overall subscale reliability decreased when it was deleted and the strength of several item-total correlations was decreased. This result indicates that it was likely appropriate to have kept this item in the analysis. Factor analysis will serve as a final check.

For the positive self-statements subscale, eight items were examined. All eight had item-total correlations that exceeded 0.25 so none were deleted from analysis at this stage.

The final step in item discrimination was to re-examine the full-scale item-total correlations with the remaining 24 items. All 24 had item-total correlations that exceeded 0.25 so none were deleted from analysis at this stage.

3.3.3 Internal Consistency. Cronbach's alpha was used to assess internal consistency, which is defined as the extent to which item responses obtained at the same time correlate highly with each other (Nunnally, 1978). It is equivalent to the mean of all possible split-half coefficients (Nunnally, 1978). The higher the alpha, the more reliable is the scale or subscale.

The internal consistency statistics (Cronbach's alpha) for each of the three theoretical subscales (i.e., established by consensus vote) and the full-scale CNQ at this stage of the analysis are presented in Table 9

Table 9. Internal Consistency Statistics for the CNQ Subscales as they were Established by Consensus Vote

Full-Scale CNQ	Problem-focused	Cognitive Distraction	Emotion-focused	Positive Self-statements
$\alpha = 0.875$	$\alpha = 0.854$	$\alpha = 0.759$	$\alpha = 0.819$	$\alpha = 0.805$

When Cronbach's alpha is very high, it may reflect redundancy and less variance in the scale and may not discriminate well between participants (Nunnally, 1978). If subscale alphas were higher than 0.8, bivariate correlations were examined to identify subscale items that were very highly correlated (i.e., $r \geq 0.7$). Nunnally (1978) suggests that these highly correlated items should be considered for deletion.

Two items had a bivariate correlation of 0.702 but had somewhat unique content: "I worry too much about the needle" and "I keep thinking the needle will hurt a lot". One item reflects anxiety about the needle, while the other reflects anxiety about pain. Since both anxiety and pain are variables of interest in the present design, it was thought that it may be important to

preserve both items, at least until factor analysis, to see how they performed. Further, the correlation is high but just past the cut-off of 0.700 and in Study 1 these two items had a correlation of 0.505.

3.4 Factor Analytic Method

Data from administered CNQs were analysed using maximum likelihood (ML) factoring with an oblique rotation. See Study 1 for a complete discussion of the rationale for choosing this specific analysis. It was expected that items would load on either a two- or three-factor solution as has been reported in the literature (e.g., Phipps et al., 1998; Reid et al., 1998) and in Study 1 of the present program of research.

3.5 Item Analysis as Part of Factor Analysis

3.5.1 Salient Factor Loadings. Items with factor loadings lower than 0.350 were removed from the analysis (see Appendix D for complete list of items).

3.5.2 Communalities. For the present study, items that had communalities less than .25 were deleted from the scale.

3.5.3 Variables per Factor. Stable solutions require an adequate ratio of variables to factors. Gorsuch (1983) reported that it is generally difficult to replicate factors with fewer than five or six salient variables per factor. As the analysis was conducted, it was necessary to be mindful of this criterion because it should not have become the case that fewer variables were included in the final scale than would be needed to compose reliable factors.

3.6 Assumptions of Factor Analysis

3.6.1 Number of Individuals. The ratio of individuals needed for factor analysis is thought to be at least five per variable entered into the analysis but not less than 100 (Gorsuch, 1983). A more general rule is that sample sizes of 100 are considered poor, 200 as fair, 300 as good, 500 as very good, and 1000 as excellent (Comrey, 1992). The required sample size also depends on magnitude of correlations and number of factors: if there are strong, reliable correlations and a few, distinct factors, a smaller sample size is adequate.

There were 24 items remaining after item analysis. Therefore, at least 120 participants were needed to run a factor analysis. In fact, 301 participants had data entered into the factor analysis, which represents a “good” sample size by Comrey’s standards.

3.6.2 Normality. Distributions of the 29 variables were examined. Transformations of these variables were examined but were largely inadequate in correcting for the skewness

problems as was found in Study 1 (see Table 5). For reasons outlined in Study 1, and because transformations are largely unhelpful in achieving normality, skewness was not corrected for in the present study.

3.6.3 Linearity. The existence of skewness for many variables raises the possibility of curvilinearity for some pairs of variables. However, transformations are unfavourable in the context of the present study for reasons outlined in the above section.

3.6.4 Determinant of a Matrix. The determinants for both the two- and three-factors solutions are 0.002, which is distant enough from zero to indicate that this assumption of factor analysis is met (P. Grant, personal communication, 2004). Recall that in Study 1, both solutions had determinants at zero, which was thought to be a result of inadequate sample size. Given that the determinant is not zero in the present study, and that the sample size is good, this understanding of the determinants in the previous study is reasonable.

3.6.5 Bartlett's Test of Sphericity. For the two-factor solution, the null is rejected, $\chi 2$ (136) = 1778.571, $p < 0.001$. For the three-factor solution, the null is also rejected, $\chi 2$ (136) = 1822.876, $p < 0.001$. Meeting this assumption is a positive sign because it indicates that there are significant relationships between the items despite the presence of skewness in the variables.

3.6.6 Kaiser-Meyer-Olkin Measure of Sampling Adequacy. For the two- and three-factor solutions, the KMO values are 0.858 and 0.852, respectively, which represent "meritorious".

3.7 Results of the Two-factor Solution

For the two-factor solution, a total of seven items were removed over three executions[26] of the factor analysis. The remaining 17 items, and their factor loadings, are presented in Table 10. Only loadings greater than the cut-off of 0.35 are included. This solution accounts for a cumulative percentage of 46.478% of the variance. This is somewhat low by the standards in the literature. Researchers suggest that between 50-60% of the variance should be accounted for by factor solutions in the behavioural sciences (Child, 2006; Comrey, 1992; Gorsuch, 1983; Pett et al., 2003).

[26] Each time items were removed from the factor analysis, the factor loadings changed somewhat so further factor analyses were run until a final solution was obtained. It was never the case that variables moved from one factor to another following the deletion of some items. Rather, it tended to be the case that the strength of the factor loadings would change modestly.

Table 10. Factor Loadings Greater than 0.035 for Study 2 Items Assuming a Two-factor Solution

Item	Factor 1	Factor 2
I tell myself it's not so bad	.730	
I tell myself I can handle it	.695	
I try and think about the positive things about getting immunized	.681	
I tell myself it will be okay	.667	
I try to be brave	.657	
I remind myself why I have to get immunized	.578	
I try to think of different ways to make the needle go better	.511	
I tell myself the next one will go better	.421	
I imagine doing something else	.416	
I take deep breaths	.394	-.360[27]
I worry too much about the needle		-.756
I keep thinking the needle will hurt a lot		-.737
I cry		-.695
I feel dizzy		-.637
I get a headache		-.589
I look for comfort from someone or something around me		-.510
I talk to a friend about how I feel		-.404

[27] Note that Factor 2 loadings are negative because of their orientation in four quadrant space relative to Factor 1 following oblique rotation. That is, Factor 1 loadings fall above the x axis, while factor y loadings fall below it.

3.8 Distribution of Coping

High and low coping groups were created on each of the two factors, emotion-focused and problem-focused, using a median split. The median for problem-focused was 2.625, emotion-focused was 2.222[28], cognitive distraction was 2.125, and positive self-statements was 3.125. Scores equal to or above the median are "high", while scores below are "low". Frequencies were examined to determine what portion of participants were high on only one of problem- (PF) or emotion-focused (EF) coping. The majority of participants were high on both PF and EF (see Figure 3). The second largest group was participants low on both PF and EF coping.

3.9 Results of the Three-factor Solution

For the three-factor solution, a total of seven items were removed over three executions of the factor analysis. The remaining 17 items, and their factor loadings, are presented in Table 11. Only loadings greater than the cut-off of 0.35 are included. This solution accounts for a cumulative percentage of 54.260% of the variance.

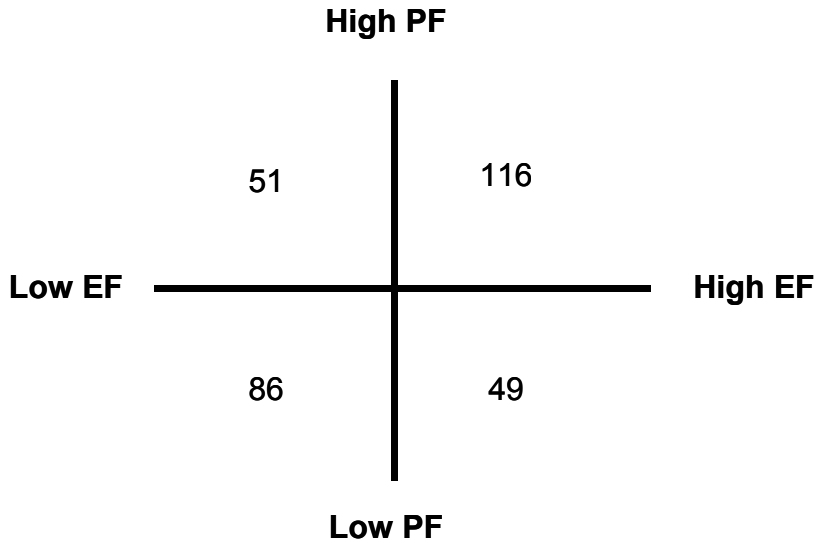

Figure 3. Distribution of Participant Coping across Four Quadrants of High (≥ median split) versus Low (< median split) Problem-focused (PF) and Emotion-focused (EF) Coping

[28] Recall that the emotion-focused coping subscale was the same considering both the two- and three-factor solution in this study.

Table 11. Factor Loadings Greater than 0.035 for Study 2 Items Assuming a Three-factor Solution

Item	Factor 1	Factor 2	Factor 3
I tell myself it's not so bad	.761		
I tell myself I can handle it	.719		
I try to be brave	.673		
I tell myself it will be okay	.638		
I try and think about the positive things about getting needle	.605		
I remind myself why I have to get a needle	.488		
I take deep breaths	.415	.403	
I worry too much about the needle		.773	
I keep thinking the needle will hurt a lot		.763	
I cry		.683	
I feel dizzy		.640	
I get a headache		.560	
I look for comfort from someone or something around me		.509	
I talk to a friend about how I feel		.397	
I imagine doing something else			-.854
I imagine being somewhere else			-.708
I try to think of different ways to make the needle go better			-.361

3.10 Factor Naming

Factors were named based on their high loading items with cautious attention paid to moderate and low loadings. Based on the way that their items overlap on Factor 1 for the two-factor solution, Factors 1 and 3 are considered to be subscales of a higher-order, "problem-focused coping" factor. Factor 1 is named "positive self-statements", while Factor 3 is named "cognitive distraction". Factor 2 was mostly consistent across both the two- and three-factor solutions. Factor 2 represents "emotion-focused coping".

3.11 Construct Validity

Once factors are named in factor analysis, the next step is to verify the factor structure by establishing the construct validity of the factors. In the present study, construct validity was assessed by the extent to which the two- and three-factor structures predict relationships established in existing literature. Specifically, participants were asked to rate anxiety, fear of needles, pain, and self-efficacy and to identify "one good thing about getting a needle". Recall that it was expected that high emotion-focused coping, which emerged as Factor 2 in both factor solutions, would be associated with higher mean fear, anxiety, and pain scores and lower self-efficacy. On the other hand, problem-focused coping and its derivatives, cognitive distraction and positive self-statements, were hypothesized to be associated with lower mean fear, anxiety, and pain scores and higher self-efficacy. The literature suggests that cognitive distraction may even be more advantageous than positive self-statements.

Two separate sets of construct validity analyses were run: one using the two-factor solution and one using the three-factor solution.

3.12 Multivariate Analysis of Variance

Multiple analysis of variance (MANOVA) is used to see the main and interaction effects of categorical variables on multiple dependent interval variables (DVs). MANOVA uses one or more categorical independent variables as predictors, like ANOVA, but unlike ANOVA, there is more than one dependent variable. Where ANOVA tests the differences in means of the interval dependent for various categories of the independent(s), MANOVA tests the differences in the centroid (three-dimensional combination of DVs) of means of the multiple interval dependents, for various categories of the independents (Tabachnick & Fidell, 2001).

There are two major situations in which MANOVA is used. The first is when there are several correlated dependent variables, and the researcher desires a single, overall statistical test on this set of variables instead of performing multiple individual tests. The second, and in some cases, the more important purpose is to explore how independent variables influence some patterning of response on the dependent variables. Here, one contrasts combinations of the dependent variables (DVs) to test hypotheses about how the independent variables (IVs) differentially predict them (Tabachnick & Fidell, 2001). The test has the advantage of being able to tell the researcher which combination of DVs is most strongly predicted by the IVs. When

comparing two models of IVs, MANOVA can also be helpful as a criterion for reducing to a smaller, more easily modeled number of variables.

Multiple analysis of covariance (MANCOVA) is similar to MANOVA, but interval IVs may be added as "covariates." These covariates serve as control variables for the independent factors, serving to reduce the error term in the model (Tabachnick & Fidell, 2001). Like other control procedures, MANCOVA can be seen as a form of "what if" analysis, asking what would happen if all cases scored equally on the covariates, so that the effect of the factors over and beyond the covariates can be isolated.

3.13 Assumptions of MANOVA

3.13.1 Independence. This is the basic assumption that all observations (i.e., participants) are independent of one another. It is the most serious of all violations. Random sampling as part of data collection is adequate to meet this assumption (Tabachnick & Fidell, 2001). Therefore, the assumption of independence is met in the present analysis.

3.13.2 Equality of Variance-Covariance Matrices. The second assumption requires that there not be substantial differences in the amount of variance of one group versus another for the same variables (Tabachnick & Fidell, 2001). MANOVA examines all elements of the covariance matrix of the dependent variables for differing variances; if the groups are approximately the same size, a violation has minimal impact. The Box's *M* Test tests the null hypothesis that the observed covariance matrices of the DVs are equal across groups, which is the desirable condition.

The following guidelines for testing this assumption are offered by Tabachnick and Fidell (2001): (1) if sample sizes across groups are equal then robustness of significance tests is expected and you can disregard the outcome of Box's *M* test, which Tabachnick and Fidell describe as "notoriously sensitive" (p. 330). However, if sample sizes are unequal and Box's *M* test is significant at $p < 0.001$, then robustness is not guaranteed. The more numerous the DVs, and the greater the discrepancy in cell sample sizes, the greater the potential distortion in alpha levels. Tabachnick and Fidell suggest that if cells with smaller samples produce larger variances and covariances, the significance test is too liberal and Pillai's criterion should be used instead of Wilks' lambda (the default criterion) to evaluate multivariate significance (Tabachnick & Fidell, 2001). Another option to deal with violation of this assumption would be to randomly delete cases from the larger cell, as long as adequate power can be maintained.

For the two-factor solution, the Box's $M = 116.427$, F (30, 777961.403) $= 3.760$, $p < 0.001$, indicating that the assumption has been violated. However, examination of cell variances shows that in all cases for both IVs, the variances in the smaller cells are larger than (in one case equal to) those in the larger cells. This indicates that Box's M for this analysis is too liberal. As Tabachnick and Fidell suggest, Pillai's criterion will be used to evaluate multivariate significance, instead of Wilks' Lambda.

For the three-factor solution, the Box's $M = 207.770$, F (70, 27277.847) $= 2.767$, $p < 0.001$, indicating that the assumption has been violated. However, examination of cell variances shows that in all cases for both IVs, the variances in the smaller cells are larger than those in the larger cells. Pillai's criterion will be used to evaluate multivariate significance, instead of Wilks' Lambda.

3.13.3 Normality. This assumption requires that all DVs be multivariate normal, and that the joint effect of the two variables is normally distributed. As there is no direct test for multivariate normality, researchers should test for the univariate normality of each variable; although this does not guarantee multivariate normality, any departures from univariate normality are usually inconsequential (Tabachnick & Fidell, 2001). Additionally with larger sample sizes (i.e., cells larger than 20) violations of this assumption have little impact because the Central Limit Theorem says that the sample mean vectors (i.e., centroid) are approximately multivariate normally distributed, even if the individual observations are not. Furthermore, transformations carry some drawbacks.

For the present study, three DVs are significantly skewed: fear (positive), pain (positive), and self-efficacy (negative). This finding is not unexpected since the literature has documented that most children and adolescents report little pain and distress related to needles and other painful procedures. Because MANOVA tends to be robust to violation of this assumption when large samples are examined (Tabachnick & Fidell, 2001), the analysis was conducted without transformations. As a check, the analysis was re-run on the transformed DVs. No appreciable differences in results were found (see Appendix H).

3.13.4 Outliers. MANOVA is especially sensitive to outliers and their impact on Type I error. Because there is no direct test for multivariate outliers in MANOVA, the strategy is to examine univariate outliers. In the present study there are none (see Section 3.2).

3.13.5 Linearity. This is the assumption that there is a straight-line relationship between two variables, where one or both of the variables can be combinations of several variables (Tabachnick & Fidell, 2001). Linearity should be examined between these variables to assess the presence of any non-linear relationships. Deviations from linearity reduce the power of the statistical test because (1) the linear combinations of DVs do not maximize the separation of groups for the IVs, and (2) covariates do not maximize adjustment for error.

Residual plots are examined to test the linearity assumption. If assumptions are met, the residuals will be nearly rectangularly distributed with a concentration of scores along the center. Examination of the plots shows rectangular shapes to the plots. The assumption of linearity is met.

3.13.6 Sphericity. MANOVA requires that there be some degree of correlation between the DVs. Bartlett's Test of Sphericity is a $\chi 2$ test of this assumption. If significant ($p < 0.05$), this test indicates that the residual covariance matrix is not proportional to an identity matrix. In other words, a relationship between the variables exists. For the two-factor solution, $\chi 2(9) = 351.985$, $p < 0.001$. For the three-factor solution $\chi 2(9) = 351.709$, $p < 0.001$. Therefore, sphericity is not a problem.

3.13.7 Multicollinearity and Singularity. Multicollinearity and singularity are problems with the correlation matrix that occur when variables are too highly correlated (Tabachnick & Fidell, 2001). Multicollinearity occurs when the DVs are too highly correlated. The dependent variables should not have high multicollinearity, as this indicates redundant dependent measures and decreases statistical efficiency. Tabachnick and Fidell (2001) suggest that 0.900 and above qualify as "high" correlations (p. 82). There are no bivariate correlations between the DVs that exceed 0.900, therefore multicollinearity is not a problem in this analysis.

With singularity, the dependent variables are redundant. That is, one of the variables is equal to some linear combination of two or more of the other variables. If singularity exists, MANOVA will abort because the inversion of the factor matrix will not run. The factor matrix was successfully inverted in the present analysis of both the two- and three-factor solutions; therefore there is no problem with singularity.

3.14 Hypothesis Testing with the Two-factor Solution

Recall that high mean emotion-focused coping was hypothesized to be associated with higher mean anxiety, fear, and pain ratings, as well as lower mean self-efficacy ratings.

Conversely, it was expected that children high on problem-focused coping would have lower mean anxiety, and pain ratings, as well as higher mean self-efficacy ratings compared to participants low on problem-focused coping.

3.14.1 Anxiety, Fear, Pain, and Self-efficacy. A 2 (Problem-focused coping: High, Low[29]) X 2 (Emotion-focused coping: High, Low) multivariate analysis of covariance (MANCOVA) was performed on four dependent variables: anxiety, fear, pain, and self-efficacy. Adjustment was made for two covariates: Gender (Male, Female) and Time lag (Less than one month, Less than one year, Over one year, and Can't remember). Descriptive statistics for the MANCOVA are presented in Table A3 (see Appendix C). It was expected that high emotion-focused coping would be associated with higher fear, anxiety, and pain ratings, as well as lower self-efficacy ratings. High problem-focused coping was hypothesized to be associated with the opposite or neutral outcomes.

Gender was a significant covariate in the multivariate tests, F (4, 291) = 3.962, p = 0.004, as was time lag, F (4, 291) = 2.552, p = 0.039. Multivariate tests revealed a significant multivariate effect of emotion-focused coping (EF) but not problem-focused coping, as well as a significant EF by PF coping interaction. Because omnibus MANCOVA shows significant multivariate effects, it is appropriate to investigate further the nature of the relationships among the IVs and DVs using univariate Fs (Tabachnick & Fidell, 2001).

Examination of the between-subjects univariate effects shows a main effect of gender for the DVs fear, F (1, 294) = 5.746, p = 0.017, and pain, F (1, 294) = 12.240, p = 0.001. There was a significant effect of time lag for fear, F (1, 294) = 4.928, p = 0.027, pain, F (1, 294) = 7.949, p = 0.005, and self-efficacy, F (1, 294) = 4.135, p = 0.043. Estimated marginal means for the covariates are not printed as part of the MANCOVA output. However, the direction of these effects is known from preliminary analyses (see Section 3.1).

In terms of the independent variables, there was no effect of PF for any of the DVs (see Table 12). However, there was a significant main effect of EF coping whereby participants high on EF coping had higher mean ratings for anxiety, fear, and pain, and lower ratings on self-efficacy, compared to those low on EF coping. There were significant interactions between EF and PF coping for each of the four DVs. The pattern of the interaction for anxiety, fear, and pain was similar; it shows that high PF moderated the negative effect of high EF coping. In other

[29] High and low coping groups were created using a median split. Scores above the median are "high", while scores below are "low".

words, when children employed high amounts of problem-focused coping along with high emotion-focused coping, they had lower mean fear, anxiety and pain, as well as higher self-efficacy, compared participants who were high on emotion-focused coping only. An illustration of this relationship is shown in Figure 4 using anxiety as the DV. The figures for the dependent variables pain and fear have an analogous pattern to self-efficacy (see Figure 4) and, thus, were not included as figures in this section. Notably, for these interactions, the lowest DV ratings were associated with the group of individuals low on both EF and PF coping. For self-efficacy, the interaction represents PF moderating the negative impact of high EF coping on self-efficacy ratings (see Figure 5).

Table 12. Two-factor Solution Means, Standard Deviations, *F* Statistics, and Significance Values for the Univariate Between Subjects Effects of Problem-focused (PF) and Emotion-focused (EF) Coping

Dependent variables	**PF category**	**Mean**	**St. Dev.**	***F***	***P***
Anxiety	Low *n* = 145	4.389	0.266	0.495	0.482
	High *n* = 155	4.652	0.262		
Fear	Low	3.312	0.236	0.595	0.441
	High	3.567	0.233		
Pain	Low	3.531	0.216	0.466	0.495
	High	3.323	0.213		
Self-efficacy	Low	6.327	0.272	0.919	0.339
	High	6.693	0.269		
Dependent variables	**EF category**	**Mean**	**St. Dev.**	***F***	***P***
Anxiety	Low *n* = 145	2.995	0.271	60.937	<0.001
	High *n* = 155	6.047	0.270		
Fear	Low	1.830	0.240	86.034	<0.001
	High	5.049	0.239		
Pain	Low	2.291	0.220	50.974	<0.001
	High	4.563	0.220		
Self-efficacy	Low	7.910	0.277	48.878	<0.001
	High	5.110	0.276		

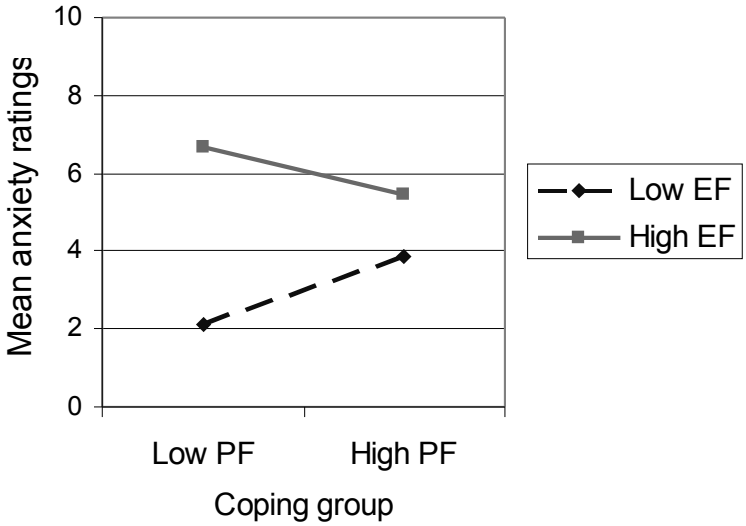

Figure 4. Emotion-focused by Problem-focused Interaction for Mean Anxiety Ratings

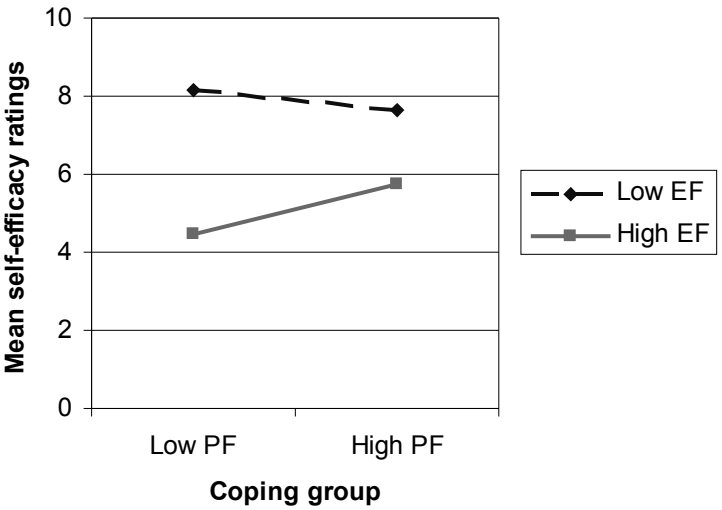

Figure 5. Emotion-focused by Problem-focused Interaction for Mean Self-efficacy Ratings

To investigate the effects of the IVs on all combinations of the DVs, a series of lack of fit multivariate tests are run. These tests also allow the researcher to examine effect sizes (i.e., partial η^2) to see which combination of DVs is best predicted by the IVs. If the null is rejected, it implies that the current model cannot adequately account for the relationship between the response variable and the predictors (LEAD Technologies Inc., 2004).

For all combinations of the DVs, the null hypothesis is not rejected. The smallest effect size was for pain and self-efficacy in combination, $F\,(48, 540) = 0.930$, $p = 0.610$, $\eta^2 = 0.076$.

The largest effect was for anxiety independently, F (24, 270) = 1.325, p = 0.146, η^2 = 0.104. This means that the present model best accounts for the way that participants rated their anxiety; though it significantly accounts for all four DVs, in all combinations.

3.14.2 Pessimism. Participants were asked to identify "one good thing about needles" in an open-ended response format. These responses were coded as positive or pessimistic by two independent coders. Missing values were coded separately. Of 301 codes, the two raters agreed on 292 (i.e., 97.0% agreement). Disagreements were resolved through discussion. It was expected that participants high on emotion-focused coping would have a harder time identifying one good thing because this coping approach is thought to be associated with pessimistic thinking.

A one-way analysis of variance was run to examine categorical pessimism data. It was expected participants coded as "pessimistic" would have higher mean emotion-focused coping compared to non-pessimistic individuals. There was no hypothesized effect for problem-focused, cognitive distraction, or positive self-statements coping. The pessimism category was set as the grouping variable (pessimistic, positive), while mean PF and EF coping were set as the dependent variables. Twenty-seven participants were coded as pessimistic while 259 were coded as positive. Eleven participants were missing this piece of data. There was no mean difference between positive, pessimistic, missing data participants for PF coping, F (2, 296) = 0.099, p = 0.906. However, pessimistic individuals had higher mean EF coping (M = 2.871) compared to positive individuals (M = 2.197) and those who were missing this data (M = 2.254), F (2, 296) = 7.035, p = 0.001.

3.14.3 Coping Factor Correlations. Correlations were run to examine the relationship between emotion- and problem-focused mean coping. An emotion-focused coping factor was expected to be negatively correlated with other extracted coping factors. Problem-focused correlated at r = 0.499, $p < 0.001$ with emotion-focused.

3.15 Hypothesis Testing with the Three-factor Solution

Recall that high emotion-focused coping was hypothesized to be associated with higher mean anxiety, fear, and pain ratings, as well as lower mean self-efficacy ratings. Conversely, it was expected that children high on cognitive distraction coping would have lower mean anxiety,

and pain ratings, as well as higher mean self-efficacy ratings compared to participants low on cognitive distraction coping.

3.15.1 Anxiety, Fear, Pain, and Self-efficacy. A 2 (Positive self-statements coping: High, Low[30]) X 2 (Emotion-focused coping: High, Low) X 2 (Cognitive distraction coping: High, Low) multivariate analysis of covariance (MANCOVA) was performed on four dependent variables: anxiety, fear, pain, and self-efficacy. Adjustment was made for two covariates: Gender (Male, Female) and Time lag (Less than one month, less than one year, over one year, and can't remember). Descriptive statistics for the MANCOVA are presented in Table A4 (see Appendix C).

It was expected that high emotion-focused coping would be associated with the highest fear, anxiety, and pain ratings, as well as the lowest self-efficacy ratings. High cognitive distraction was hypothesized to be associated with the lowest fear, anxiety, and pain ratings, as well as the highest self-efficacy ratings.

Gender was a significant covariate in the multivariate tests, F (4, 287) = 3.946, p = 0.004, but time lag was not, F (4, 287) = 2.310, p = 0.058. Multivariate tests revealed a significant multivariate effect of emotion-focused coping (EF), F (4, 287) = 25.6967, $p < 0.001$, but not cognitive distraction (CD), F (4, 287) = 0.230, p = 0.291, or positive self-statements (PS) coping, F (4, 287) = 1.949, p = 0.102. There was a significant CD by EF coping interaction, F (4, 287) = 3.712, p = 0.006, but none of the other two-way or the three-way interactions were significant. Because omnibus MANCOVA shows significant multivariate effects, it is appropriate to investigate further the nature of the relationships among the IVs and DVs using univariate Fs (Tabachnick & Fidell, 2001).

For the covariates, examination of the between-subjects univariate effects shows a main effect of gender for the DVs fear, F (1, 290) = 6.208, p = 0.013, and pain, F (1, 294) = 12.363, p = 0.001. There was a significant effect of time lag for fear, F (1, 290) = 4.031, p = 0.046, pain, F (1, 290) = 6.778, p = 0.010, and self-efficacy, F (1, 290) = 3.930, p = 0.048. Estimated marginal means for the covariates are not printed as part of the MANCOVA output. However, the direction of these effects is known from preliminary analyses (see Section 3.1).

Means, standard deviations, F, and p statistics for the univariate between-subjects comparisons are presented in Table 13. In terms of the independent variables, there was no effect

[30] High and low coping groups were created using a median split. Scores above the median are "high", while scores below are "low".

of CD or PS for any of the DVs (see Table 13). However, there was a significant main effect of EF coping whereby participants high on EF coping had higher mean ratings for anxiety, fear, and pain, and lower ratings on self-efficacy, compared to those low on EF coping. There were significant interactions between EF and CD coping for each of the four DVs and an interaction between EF and PS coping for pain. The pattern of the EF by CD coping interactions for anxiety, fear, pain, and self-efficacy were similar; they show that CD moderates the negative effect of EF coping. Specifically, participants high on both CD and EF coping have lower mean anxiety, fear and pain, as well as higher self-efficacy compared to participants high on EF alone. An illustration of this relationship is shown in Figure 6 using anxiety as the DV. The figures for the dependent variables pain and fear have an analogous pattern to self-efficacy (see Figure 4) and, thus, were not included as figures in this section. Notably, for these interactions, the lowest DV ratings were associated with the group of individuals low on both EF and PF coping. The PS by EF coping interaction represents PS moderating the negative impact of high EF on self-efficacy ratings (see Figure 7).

Table 13. Three-factor Solution Means, Standard Deviations, *F* Statistics, and Significance Values for the Univariate Between Subjects Effects of Cognitive Distraction (CD), Emotion-focused (EF), and Positive Self-statements (PS) Coping

Dependent variables	**CD category**	**Mean**	**St. Dev.**	***F***	***p***
Anxiety	Low $n = 149$	4.422	0.304	0.008	0.931
	High $n = 151$	4.457	0.268		
Fear	Low	3.371	0.269	0.234	0.629
	High	3.544	0.237		
Pain	Low	3.258	0.248	0.802	0.371
	High	3.554	0.219		
Self-efficacy	Low	6.625	0.309	0.013	0.911
	High	6.579	0.273		
Dependent variables	**EF category**	**Mean**	St. Dev.	***F***	***p***
Anxiety	Low $n = 149$	2.756	0.300	64.952	<0.001
	High $n = 151$	6.122	0.281		
Fear	Low	1.751	0.266	85.444	<0.001
	High	5.164	0.249		
Pain	Low	2.288	0.245	42.894	<0.001
	High	4.524	0.230		
Self-efficacy	Low	8.106	0.305	50.154	<0.001
	High	5.098	0.286		

Dependent variables	PS category	Mean	St. Dev.	*F*	*P*
Anxiety	Low $n = 149$	4.444	0.287	0.000	0.983
	High $n = 151$	4.435	0.286		
Fear	Low	3.696	0.254	1.765	0.185
	High	3.219	0.253		
Pain	Low	3.766	0.235	4.725	0.031
	High	3.046	0.234		
Self-efficacy	Low	6.313	0.292	1.963	0.162
	High	6.891	0.291		

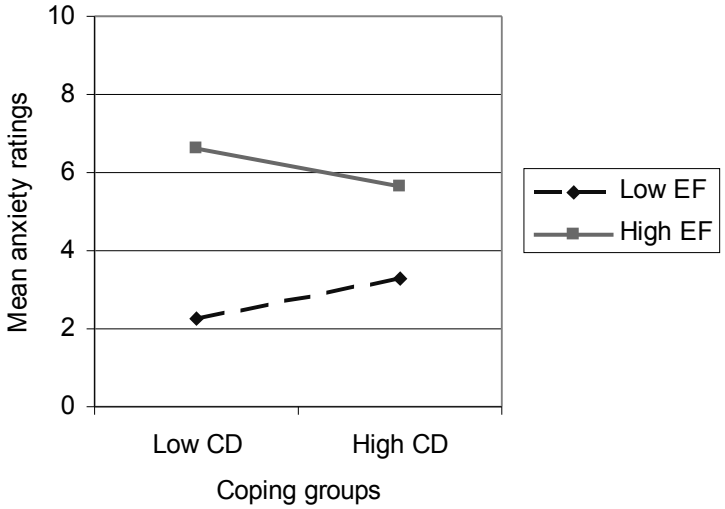

Figure 6. Emotion-focused by Cognitive Distraction Interaction for Mean Anxiety Ratings

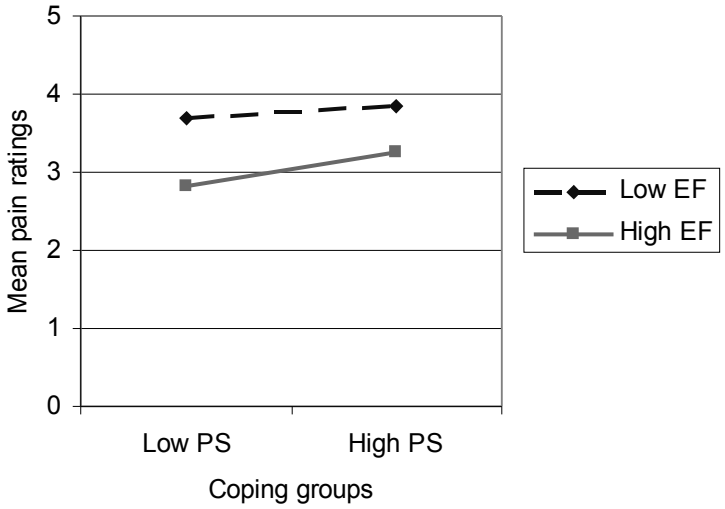

Figure 7. Emotion-focused by Positive Self-statements Interaction for Mean Pain Ratings

To investigate the effects of the IVs on all combinations of the DVs, a series of lack of fit multivariate tests are run. These tests also allow the researcher to examine effect sizes (i.e., partial η^2) to see which combination of DVs is best predicted by the IVs. If the null is rejected, it implies that the current model cannot adequately account for the relationship between the response variable and the predictors (LEAD Technologies Inc., 2004).

For all combinations of the DVs, the null hypothesis is not rejected. The smallest effect size was for pain and self-efficacy in combination, F (90, 490) = 0.884, p = 0.761, η^2 = 0.140. The largest effect was for anxiety independently, F (45, 245) = 1.423, p = 0.049, η^2 = 0.207. This means that the present model best accounts for the way that participants rated their anxiety; though it significantly accounts for all four DVs, in all combinations.

3.15.2 Pessimism. A one-way analysis of variance was run to examine categorical pessimism data. The pessimism category was set as the grouping variable, while mean PF and EF coping were set as the dependent variables. Twenty-seven participants were coded as pessimistic while 259 were coded as positive. Eleven participants were missing this piece of data.

It was expected participants coded as "pessimistic" would have higher mean emotion-focused coping compared to non-pessimistic individuals. There was no hypothesized effect for problem-focused, cognitive distraction, or positive self-statements coping. There was no mean difference between positive, pessimistic, missing data participants for CD coping, F (2, 296) = 0.705, p = 0.495, or PS coping, F (2, 296) = 0.307, p = 0.736. However, pessimistic individuals

had higher mean EF coping ($M = 2.871$) compared to positive individuals ($M = 2.197$) and those who were missing this data ($M = 2.254$), $F\ (2, 296) = 7.035$, $p = 0.001$.

3.15.3 Coping Factor Correlations. Correlations were run to examine the relationship between mean coping for three factors: emotion-focused, cognitive distraction, and positive self-statements. Recall that an emotion-focused coping factor was expected to be negatively correlated with other extracted coping factors. Emotion-focused correlated at $r = 0.454$, $p < 0.001$ with cognitive distraction and $r = 0.431$, $p < 0.001$ with positive self-statements. Positive self-statements correlated at $r = 0.557$, $p < 0.001$ with cognitive distraction.

4. Summary and Conclusions

The present study was conducted to continue development and validation of the *Coping with Needles Questionnaire* (CNQ). Compared to the previous study in this program of research, this study included a larger sample size, a wider age range for participants, and three additional measures of construct validity: anxiety, pain, and self-efficacy. A 26-item draft questionnaire was administered and participants were asked to retrospectively report their coping, fear, anxiety, pain, and self-efficacy related to their most recent experience with a needle procedure. Following item and factor analysis, there was one version of the questionnaire with two possible subscale divisions using the same 17 items. Each subscale division has its own relative advantages and disadvantages. Recall from Section C - Study 1, subsection 1.4 that general coping (i.e., a full-scale CNQ score) is not used in the present research because it would lack predictive utility.

4.1 Psychometrics of Two Versus Three Factors

4.1.1 Two Subscale CNQ. The item content of the two subscale (CNQ2) and the three subscale (CNQ3) CNQ is identical and subscale reliabilities are all in excess of 0.80, which indicates that the CNQ in both forms is reliable. As was discussed in the summary and conclusions for Study 1, the CNQ2 is more parsimonious and provides for more power to statistically test hypotheses because the design is smaller, less cumbersome, and requires fewer participants per cell in order to test small effects. While this advantage was readily demonstrated in Study 1, where low power was an issue, it was less apparent in the results of the MANCOVAs for Study 2. Both the CNQ2 and CNQ3 boasted significant main effects of emotion-focused coping (EF) and significant interactions between EF coping and a component of problem-focused coping (PF; cognitive distraction contributed to the interaction in the CNQ3 analysis).

In the present study, the CNQ2 continues to account for a less than desirable amount of the response variance though the salience of the factor loadings are comparable to those of the CNQ3. The problem of low variance accounted for in the CNQ2 makes for less predictive power and suggests that there are other factors contributing to the coping behaviour of participants beyond the items in the questionnaire. In a way, this limitation is not surprising given that item analysis proceeded with the goal of paring down the total number of items so that the resulting CNQ subscales would have the potential to be used in busy clinical contexts to identify children who might need help coping with needles. To that end, as long as the tool functions in its designed capacity to predict which children are likely to have a difficult time coping with needles, its predictive purpose is fulfilled. However, the retrospective design in the present study did not allow for a priori predictions about how participants would cope with needles; this is a goal of the third and final study in this program of research.

4.1.2 Three Subscale CNQ. Based on the present analysis, the three subscale version of the CNQ is identical in item content to the CNQ2. By adding the third factor, more of the response variance is able to be accounted for by the scale, which is an advantage of this version. Further, it is possible to test the differential effects of cognitive distraction (CD) and positive self-statements (PS) coping using the CNQ3. Even with the larger sample size in this study compared to Study 1, there are no main effects of either CD or PS. However, both CD and PS moderate the impact of EF coping.

Some research has suggested that it may be important to differentiate between approach- and avoidance-oriented problem-focused coping in order to detect positive coping effects in the context of procedural pain like needles (Bennett-Branson & Craig, 1993; Brophy & Erickson, 1990; Gil, Thompson, Keith, Tota-Faucette, Noil et al., 1993; Gil et al., 1991; Lynch et al., 2006; Reid et al., 1998; Scheier & Carver, 1992; Stevens, 1991-2; Stevens & Terner, 1992-3). The results of the present study do not support this hypothesis. Neither CD nor PS contributed to lower anxiety, fear, pain, or higher self-efficacy score in isolation. Both types of problem-focused coping moderated the negative impact of high EF coping, though this was only a significant effect for pain when considering PS.

A final disadvantage of the CNQ3 that warrants discussion is that one subscale only has three items. Gorsuch (1983) suggests that subscales composed of less than five or six items are unreliable and should be avoided when possible. In the case that a higher order solution gives you the same information and predictive power, it may be advisable to avoid using a subscale with so few items.

4.2 Construct Validity of Two Versus Three Factors

4.2.1 Two Subscale CNQ. The two subscales (problem- and emotion-focused coping) of the CNQ2 are consistent with theoretical conceptualizations of coping reported in the literature (see Lazarus & Folkman, 1987). Specifically, the presence of high problem-focused coping moderates emotion-focused coping. When participants had high scores on both PF and EF coping, they had lower anxiety, fear, pain, and higher self-efficacy ratings compared to participants who were high on EF and low on PF coping.

Interestingly, the lowest mean anxiety, fear, and pain ratings, and the highest mean self-efficacy ratings were recorded by the group of participants low on both PF and EF coping. This is not surprising given that participants who do not consider getting needles stressful (i.e., painful, anxiety/fear provoking) have no need to cope; recall that coping by definition in this program of research is a response to a stressor (Lazarus & Folkman, 1984). Contrary to the results of Study 1, there was no relationship between identifying a good thing about getting a needle (i.e., the absence of pessimism) and problem-focused coping.

As is reported in the literature (Anshel, 1996; Compas, Malcarne et al., 1988; Crombez et al., 2003; Fields & Prinz, 1997; Folkman et al., 1986; Reid et al., 1998), high use of emotion-focused coping was found to be associated with high anxiety, fear, and pain ratings, as well as low self-efficacy ratings. Contrary to the null finding in Study 1, pessimism was associated with higher mean emotion-focused coping in the present study. This relationship was expected as it is reported in the literature (Caryk & Walker, 1986; Davey & Levy, 1999; Sinclair, 2001; Wickramasekera, 1986), and there was a larger sample of pessimistic responses in the present study (i.e., 27 versus 14), contributing to higher power of statistical testing.

In Study 1 there was also concern about including neutral and missing responses to the coding of pessimism could have diluted the negativity expected in this category. The results of this analysis suggest that it works to include both neutral responses like “I guess it helps you in some way or else I wouldn't be getting it” with clearly negative ones like “nothing at all they do it hurt really bad”. However, it was appropriate to analyse the missing data for this question separately as these children had lower mean emotion-focused coping compared to children coded as pessimistic.

There are limitations to the way that pessimism was measured in the context of the present program of research (i.e., open-ended). Note that this question was included on the questionnaire mostly as a means of ending the survey on a positive query. This goal had two purposes: to make the study more appealing to adults consenting study participation; and to provide children with a positive way to think of needles.

4.2.2 Three Subscale CNQ. Similar to the results of the CNQ2, high emotion-focused coping on the CNQ3 was associated with higher mean anxiety, fear, and pain, as well as lower self-efficacy. This is to be expected since the two subscales are identical.

High scores on the cognitive distraction and positive self-statements subscales were not associated as was expected with lower anxiety, fear, and pain, or of higher self-efficacy. In Study 1, the CNQ3 had insufficient power to detect most of the effects in the three-factor design. Power remains a problem in the present investigation since only 300 children were surveyed, but the Study 1 power analysis indicated that over 1000 participants would have been needed to detect these main effects.

Though the null effects of CD and PS can be interpreted as a power issue in this study, one also needs to consider the meaning of a small effect size that requires over 1000 participants to detect. Individuals within the clinical context for which this questionnaire is bound will be primarily interested in how well the CNQ subscales predict the needle experience of small sets of children. In fact, some might even argue that the subscales need to be predictive for a sample size of just one child so that interventions can be targeted individually as needed. In such a case, the meaning of a very small effect is negligible. As a result, the lack of power in this design is seen as a minor to irrelevant issue.

Where the additional power in Study 2 was most evident was the interpretability of significant effects for the CNQ3. Both PS and CD contributed to moderation of emotion-focused

coping. The CD interaction for self-efficacy and the PS interaction for pain fit the same moderation pattern as was reported for problem-focused coping in Study 1; the presence of high CD or PS contributed to an increase in self-efficacy ratings or a decrease in pain for high EF participants, compared to participants high on only EF coping.

The remaining cognitive distraction by emotion-focused coping interactions for anxiety, fear, and pain fit the same pattern as the PF by EF coping interactions for the CNQ2. That is, when participants had high scores on both CD and EF coping, they had lower anxiety, fear, pain, and higher self-efficacy ratings compared to participants who were high on EF coping alone. Again, it is logical that individuals who are not distressed by being immunized appear not to need to cope; those low on both problem- and emotion-focused coping have the lowest anxiety, fear, and pain ratings, as well as the highest self-efficacy ratings overall.

Overall, these interactions can be summarized by saying that the presence of high cognitive distraction (or positive self-statements for pain) coping decreases the negative impact of emotion-focused coping on the dependent variables. Whether participants low on all types of coping stand out as having the lowest anxiety, fear, and pain ratings, and the highest self-efficacy ratings overall depends on the interaction in question.

Based on the results of studies 1 and 2, it does not seem to be the case that being high on coping overall (i.e., high on both EF and PF coping) is a negative indication. This finding is contrary to the suggestion of Worchel and colleagues (1987) who stated that the use of high overall coping and, in particular, contradictory strategies like positive self-statements and emotion-focused coping, indicates ineffective coping. Rather, it appears that being high on emotion-focused coping is associated with more negative retrospective reports of needle experience including higher anxiety, fear, pain, and lower self-efficacy. Further, the addition of high use of other problem-focused strategies moderates the negative impact of emotion-focused coping. It remains to be seen whether the same relationship will be demonstrated when the CNQ is used to make a priori predictions of outcome in Study 3.

4.3 Determining Scale Structure using the CNQ

Recall that decision-making about structuring a coping assessment tool should consider both how the different types of coping uniquely predict outcome (predictive element) and the relationship between the different types of coping (relational element). The resulting structures for the CNQ2 and CNQ3 are reviewed in the following sections.

4.3.1 Scale Structure for the CNQ2. Results indicated that there were unique predictive elements to both the problem-focused and emotion-focused subscales of the CNQ2. Emotion-focused coping contributed to a significant main effect, while problem-focused coping moderated the negative relationship between emotion-focused coping and the dependent variables. The two subscales are also positively correlated indicating that there is a relatively equivalent relational element between them. Referring back to Table 3, this pattern (B) of predictive and relational elements indicates that either a subscale version of the CNQ2 should be used or the two subscales could be merged. In this case, the latter option is not useful since the two subscales predict outcomes differently. Therefore, the CNQ2 is best structured as two separate subscales: problem- and emotion-focused.

4.3.2 Scale Structure for the CNQ3. Results indicated that there were unique predictive elements to cognitive distraction and positive self-statements subscales in the form of interactions with emotion-focused coping, while the emotion-focused subscale had a unique predictive element in the form of a between-subjects effect. The three subscales are also positively correlated indicating that there is a relatively equivalent relational element between them. Referring back to Table 3, both patterns (A) and (B) are represented. There are equivalent relational elements across the three subscales. While emotion-focused coping has a unique predictive element compared to both other subscales (B), cognitive distraction and positive self-statements have equivalent predictive elements (A) in that they both predict the same pattern of moderation in interaction with emotion-focused coping. These results indicate that either a subscale version of the CNQ3 should be used or cognitive distraction and positive self-statements could be merged. In the interest of parsimony, the latter option is preferred. Therefore, the CNQ3 is best structured as two separate subscales: emotion-focused and a merger of cognitive distraction and positive self-statements, in fact the merger produces the CNQ2.

4.4 Summary of the CNQ2 versus CNQ3 Comparison

In summary, the two and three subscales CNQ are identical in item content and both have good internal consistency and validity indications. As a result, there does not appear to be a compelling psychometric reason to choose either the CNQ2 or the CNQ3. Both provide essentially the same information in terms of construct validity and each has a limitation that limits the predictive power and reliability of the solution. For the CNQ2, the issue is one of low variance accounted for, while for the CNQ3 it is an issue of a subscale thin on items. Because both the CNQ2 and CNQ3 can be examined using the same questionnaire, it is possible to maintain both solutions as options for future research. However, upon examination of the predictive and relational elements of the two possible scales, results indicate that in the interest of parsimony alone, the CNQ2 should likely be considered the superior scale.

While the problem-focused subscale and its derivatives provide important information about the moderation of emotion-focused coping, it is ultimately high emotion-focused coping that is of greatest interest for screening purposes. This is the subscale that children score highest on when they are also reporting high levels of anxiety, fear, pain, and low levels of self-efficacy. The effect of emotion-focused coping is also robust to the extent that it even emerged in Study 1 where limited power was a significant issue. Therefore, the question of a two- versus three-factor solution may be one of limited importance. What appears to be of primary relevance based on the results of Study 1 and 2 is how participants score on emotion-focused coping since this subscale robustly correlates with negative outcome variables (e.g., pain). Therefore, the CNQ has potential utility as a screening tool. More detailed recommendations for using the CNQ as a screening tool will be outlined in the general discussion section.

4.5 Future Directions

The first two studies in this program of research were designed to develop and validate a coping with needles questionnaire. With these tasks complete, the goal of Study 3 is to use the CNQ to make a priori predictions about how children will experience getting an immunization, as determined by their coping. A second goal of Study 3 will be to use a repeated measures design to examine the extent to which children learn to cope better given more experience with a stressor, in this case, an immunization.

SECTION D: STUDY 3 INVESTIGATING THE RELATIONSHIP BETWEEN CHILDREN'S SELF-REPORTED COPING STRATEGIES AND REPEATED IMMUNIZATION PAIN

1. Validation of the *Coping with Needles Questionnaire*

For a subset of children, needles are significantly painful, unpleasant, and anxiety provoking (Humphrey, et al., 1992), indicating that this routine procedure is a source of stress. While in the past, research emphasized inducing children's compliance with painful procedures such as needles (Peterson, 1989; Siegel & Smith, 1989), more recently researchers have begun to investigate how children cope and in particular, what constitutes efficacious, or successful, coping.

According to Rudolph and colleagues (1995), researchers know only a modest amount about the efficacy of children's attempts to cope with painful medical procedures and even less about the relative efficacy of particular coping strategies. Little research has been done to expand this literature in the last 10 years (e.g., Slifer, Tucker, & Dahlquist, 2002). Furthermore, little is known about how children's coping changes in response to multiple exposures to the same procedure over time, despite the fact that coping has long been recognized as a temporally and situationally specific (Folkman, 1984; Lazarus & Folkman, 1984). The goal of the proposed research is to examine the relationship between coping strategies and outcome in the context of repeated immunization pain in order to determine (a) what type of coping strategies are associated with better experience; and (b) how coping responses change over time.

Understanding which types of coping strategies lead to better needle experiences could be very informative for the purposes of researchers and clinicians who seek to design interventions to help children cope with painful procedures. In particular, some research has indicated that interventions may be more effective if matched to children's typical coping behaviour in a given context (Christiano & Russ, 1998; Fanurik et al., 1993; Smith, Ackerson, & Blotcky, 1989; Stevens, Pfost, & Rapp, 1987). However, before needle intervention research can proceed in examining the effectiveness of matching interventions to children's coping strategies, there is need for improvement in our understanding of children's coping. Specifically, for a matched intervention to have utility, it should be the case that children have a dominant approach to coping. However, no research exists which would indicate that this is the case.

1.1 Distribution of Coping

Researchers suggest that children will initially try a large variety of coping responses to manage a given stressor (Roth & Cohen, 1986; Siegel & Smith, 1989; Worchel et al., 1987). In other words, in the context of a relatively novel stressor, most children should not have a dominant type of coping responses. Rather, they should start out by trialing the whole range of strategies available to them, which may include some problem- and some emotion-focused strategies. Therefore, while it is possible to identify individual coping responses as belonging to one type or another (see Section A for a complete review of coping frameworks), it seems that individuals are likely to demonstrate a variety of coping responses to a given stressor. In fact, coping responses may even be conflicting at times (Roth & Cohen, 1986). While this blending of coping responses may be typical, researchers have nonetheless been able to establish that certain types of coping are associated with more successful coping outcomes than others.

1.2 Type of Coping Responses as Predictors of Outcome

Medical procedures such as needles have been conceptualized as stressors over which individuals have little control, that are typically short-duration, and that have immediate outcome indicators (Fields & Prinz, 1997). Based on these characteristics, Roth and Cohen (1986) suggest that avoidant coping might be the strategy of choice for coping with immunizations.

Examination of Roth and Cohen's (1986) theory in the context of the three-factor typology of coping has yielded similar predictions. Some authors perceive that the use of approach coping, involving active attempts to alter the situation, is maladaptive in an uncontrollable situation (e.g., a needle) because such efforts would be futile and thus are likely to lead to frustration (Compas, Forsythe et al., 1988; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Weisz, 1990).

In the context of chronic pain, Reid, Gilbert and McGrath (Reid et al., 1998) found that children who perceived they had greater control over their pain and their emotions when they were experiencing pain used more approach and problem-focused avoidance strategies and less emotion-focused avoidance strategies. This is similar to studies with adults (Jensen & Karoly, 1991) and consistent with social learning theory (Bandura, 1977), which suggests that perceptions of control lead to the use of adaptive coping strategies.

Following these theoretical perspectives, one might expect that avoidant coping responses, which involve either (a) managing emotional reactions or (b) diverting attention away

from the uncontrollable stressor, would be most successful in the context of uncontrollable painful procedures. Both types of responses involve managing distress but not futilely attempting to alter the stressful situation. However, the literature does not support the success of both types of coping; emotion-focused coping may actually be a detriment to dealing with pain.

Research has indicated that emotion-focused avoidance and, in particular, internalizing kinds of coping (Brophy & Erickson, 1990; Gil, Thompson, Keith, Tota-Faucette, Noil et al., 1993; Gil et al., 1991) are associated with less successful outcomes (e.g., higher pain, functional disability) for children in the context of chronic pain (Lynch et al., 2006; Reid, Dubow, & Carey, 1995; Reid et al., 1998) and postoperative pain (Bennett-Branson & Craig, 1993) compared to other types of coping. Children who report using emotion-focused avoidance strategies are thought to freely express and ruminate on negative emotions (i.e., catastrophize), which may impair the use of more adaptive coping strategies, such as positive self-talk or distraction (Reid et al., 1998), and may lead to higher pain intensities by increasing the affective/motivational components of pain (Melzack & Wall, 1965). Therefore, it seems that rather than emotion-focused avoidance being a successful type of coping in the context of painful procedures, it may in fact be associated with the most unsuccessful outcomes.

While research has demonstrated that avoidant coping may be most helpful for children's coping with acute pain, little work has been done to demonstrate the specific efficacy of the problem-focused type of avoidant responses. Because problem-focused coping as defined by Lazarus and Folkman (1984) can include both approach and avoidant coping responses, the effect that this type of coping has on experience with needles may be equivocal. Research has demonstrated that both approach and problem-focused avoidant coping is associated with positive chronic pain outcomes for children (Reid et al., 1995; Reid et al., 1998) and adults (Jensen & Karoly, 1991). However, theory suggests that approach coping may not be helpful for acute pain because direct attempts to change the situation may be futile in uncontrollable circumstances (Compas, Forsythe et al., 1988; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Roth & Cohen, 1986; Weisz, 1990). The present investigation sought to examine the effectiveness of problem-focused coping with immunization pain.

1.3 Stability of Coping over Time

Siegel and Smith (1989) suggest that children who have better pain experiences (i.e., lower anxiety, fear, pain, and higher self-efficacy) have learned what coping responses to a given

stressor are most helpful through trial and error. However, there is little literature regarding whether or not children can take what they learn about coping from their previous experience and apply their knowledge to subsequent stressors of the same type. If children do apply what they learn from experience, one would expect to see children pare out the less helpful coping responses over time in favour of the helpful (or at least neutral) ones. This learning phenomenon has been reported among adolescents coping with sickle cell disease pain (Gil, Thompson, Keith, Tota-Faucette, Noil et al., 1993) but no investigations with school-age children have been reported to date.

In order to examine the stability of coping over time in the context of acute pain, a multi-dose immunization series for hepatitis B (hepB) was considered. Until the fall of 2006 when this study began, hepB immunizations were administered as a course of three doses over a six-month period, making this immunization series an excellent candidate stressor for the aforementioned research design. However, in 2006, Public Health in Saskatchewan switched to a two dose series of hepB that is separated by six months, thus limiting the power of the design to test learning effects.

1.4 Operationalizing Outcome

Compas (1987) notes that the term 'coping' does not imply an effective outcome in reducing distress; coping merely reflects a strategy or response and does not ensure the reduction of unpleasant experiences like pain and distress. For the most part, investigators have focused on either global adjustment or observer ratings of distress and coping during medical procedures as indications of outcome (Rudolph et al., 1995), yet coping researchers have pointed out that successful outcomes may be subjective (Folkman et al., 1986; Rudolph et al., 1995; Siegel & Smith, 1989). Studies have demonstrated that there are discrepancies between children's overt manifestations of distress and their self-reported pain and anxiety, especially in older children (Hilgard & LeBaron, 1982). Inconsistencies in the relations between coping and objective (observer) versus subjective (self-report) outcomes have also been documented (Hubert et al., 1988; Weisz, McCabe, & Dennig, 1994). Therefore, self-report measures of the outcomes of interest (i.e., anxiety, fear, pain, and self-efficacy) were obtained in the present study.

1.5 Hypotheses

1.5.1 Time. It was expected that participants would use less mean emotion-focused coping over two administrations of the hepB vaccine. In other words, the mean for emotion-focused coping was expected to be lower at Time 2 than it had been at Time 1. The mean for problem-focused coping was expected not to change with time.

1.5.2 Coping Type. It was expected that participants high on emotion-focused coping would have the higher mean anxiety, fear, and pain ratings, as well as the lower self-efficacy ratings compared to participants low on emotion-focused coping. It was expected that children high on problem-focused coping would have lower mean anxiety, fear, and pain ratings, as well as higher self-efficacy ratings compared to participants low on problem-focused coping.

1.5.3 Coping Type Interaction. It was expected that high problem-focused coping would moderate the negative effect of high emotion-focused coping on the dependent variables (i.e., anxiety, fear, pain, and self-efficacy ratings).

1.5.4 Pessimism. Recall from Study 1 and 2 that it was expected participants coded as "pessimistic" would have higher mean emotion-focused coping compared to non-pessimistic individuals. There was no hypothesized effect for time on pessimism data given that pessimism is conceptualized as a stable personality characteristic

1.5.5 Relationship between Coping Factors. An emotion-focused coping factor, if extracted, was expected to be negatively correlated with other extracted coping factors.

2. Method

2.1 Participants

Participants were 91 grade six students (65.4% male) from seven different Saskatoon and surrounding area elementary schools who were receiving hepatitis B (hepB) immunizations. Six participants were lost to attrition from Time 1 to Time 2. As will be discussed in the results section, seven more were excluded for inadequate Time 1 data. Of the 78 participants included in the analyses: at Time 1, all 78 participants had complete pain and self-efficacy data, 69 had complete anxiety and fear data; at Time 2, all 78 participants had complete anxiety, fear, pain, and self-efficacy data. Because hepB immunizations occur in grade six in Saskatchewan, all of the participants were 11 or 12 years old.

2.2 Measures

2.2.1 Coping with Needles Questionnaire. The CNQ is a self-report scale that asks children to rate how much (1 = very unlike me to 5 = very like me) each of 16 statements reflects how they coped with a needle (see Appendix I). The 5-point Likert scale was chosen as it is commonly used among similar coping assessment tools (e.g., Reid et al., 1998). It was designed to assess coping strategies that children might use during the span before, during, and after being immunized.

2.2.2 Anxiety, fear, pain, and self-efficacy. Participants were asked to rate their anxiety, fear, pain and self-efficacy on a Visual Analogue Scale (VAS; Gracely, 1979) by making a mark across a horizontal line that is 100 mm long. The distance between the participant's mark and the left side of the line is measured and assigned a corresponding score that can range from 0 – 100 millimetres.

2.2.3 Pessimism. In an open-ended written question, participants were asked if they could think of one good thing about getting immunized. Their written responses were then coded by two independent raters as either (a) positively or (b) negatively/neutrally valenced.

2.2.4 Additional items. Participants were also asked to indicate whether they were male or female.

2.3 Procedure

2.3.1 Hepatitis B Immunization Schedule. Children in Grade 6 receive their hepatitis B immunization at their schools in two doses separated by approximately six months. In the following sections, the initial immunization will be referred to as "Time 1" and the second as "Time 2".

2.3.2 Recruitment and Data Collection. The present study was approved by the University of Saskatchewan Behavioural Research Ethics Board (Beh 04-179). Participants were recruited from seven elementary schools in Saskatoon and surrounding area. Principals were contacted by telephone, letter or fax (see Appendix J) for permission to distribute consent forms (see Appendix K) to their students. Repeat contacts[31] were made on at least two occasions for schools that did not respond to the research request. A total of 16 schools were contacted from two school divisions. Approval to conduct the study was granted in seven schools (43.8%). Most of these schools had also participated in Study 1 the year before.

Consent forms were mailed to or dropped off at participating schools. Approximately 250 consent forms were distributed. A total of 95 consent forms were returned (38% of eligible students at participating schools). Arrangements were made with grade six teachers for research assistants to come in and collect data on the date that students were scheduled to be immunized. However, this procedure did not always work as intended because, for some of the schools, the teachers were never informed about what date the Public Health nurse was going to come in and do the immunizations so the actual date of the immunization was a surprise to the teachers. As a result, some of the participants completed the questionnaire a week or two after their immunization. Based on teacher report, the largest lag between immunization and questionnaire date was 13 days.

Questionnaires were group administered in the participants' classrooms. Only the students with consent completed the questionnaires. Participants were asked not to write their names on the questionnaires. Gender was the only piece of identifying information that was collected on the questionnaires. Each questionnaire was assigned a participant number. A separate list linking participant names to numbers was kept by the researcher so that each participant could be given the correct numbered questionnaire at the second data collection sessions. In the database, Time 1 and 2 data were linked by participant numbers only. In addition

[31] Most initial contacts were made by letter. If there was no response to the letter, a telephone call was made. The final attempt at contact was to telephone principals a second time.

to completing the CNQ, participants were also asked to rate their anxiety, fear, pain, and self-efficacy from 0 (e.g., not at all scared) to 10 (e.g., extremely scared). Finally, participants were asked to identify one "good thing" about being immunized.

3. Results

3.1 Data Cleaning

3.2.1 Outliers. Standardized scores for each dependent variable were examined to look for univariate outliers. Cases with standardized scores of $z \geq 3.29$ ($p < 0.001$, two-tailed test) are potential outliers (Tabachnick & Fidell, 2001). There were two outliers in the sample, both for baseline self-efficacy ratings; one rated by a female, one by a male. These outliers were deleted from the analysis.

3.1.2 Response Variability. There were two questionnaires where all of the CNQ items had '1's circled as responses. Both of these questionnaires belonged to males. These two questionnaires were excluded from the analysis.

3.1.3 Missing Data. Typically, when there are only a few missing data points and when they are randomly distributed among the variables in the study, the best strategy is to leave them as missing (Tabachnick & Fidell, 2001). In the present study, there were 13 questionnaires for which missing data were a significant issue. Across both the IVs (i.e., CNQ) and DVs (i.e., Time 1 and 2 self-reports of anxiety, fear, pain, and self-efficacy) these 13 questionnaires were missing at least 15 data points and as many as 54 data points. These 13 questionnaires were excluded from the analysis. The remaining questionnaires were missing at most 3 CNQ items, which is less than 1% of the data. These were left as missing. Some of the questionnaires were missing baseline data for anxiety and fear; these questionnaires were kept in the dataset but the missing values were excluded case by case in hypothesis testing. The final sample included 78 participants.

3.2 Preliminary Analyses

For all of these preliminary analyses, there are both Time 1 and Time 2 data to discuss separately. In all cases, Time 1 data will be reported first, followed by Time 2 data. As part of the *hypothesis testing* section, repeated measures designs will be used so that time will be discussed as a variable at that point.

3.2.1 Gender. Independent samples *t* tests were run to test for any differences in mean anxiety, fear, pain, or self-efficacy ratings between males and females. Only complete cases are

considered. For Time 1 data, there were no significant mean differences between males and females for any of the dependent measures. However, at Time 2, females had higher anxiety (M = 5.004 versus 2.400), t(76) 3.583, p = 0.001; fear (M = 3.619 versus 1.488), t(39.819) 3.034, p = 0.004; and pain (M = 3.396 versus 1.337), t(37.561) -6.110, p = 0.001, compared to males. Because there was a systematic difference in the effect of gender comparing Time 1 and Time 2 data, it was entered as a covariate in hypothesis testing to avoid confounding it with possible effects of time as a variable.

3.2.2 School. It was not possible[32] to collect information about which individual nurses administered immunizations to which participants. However, typically only one or two nurses were in attendance for immunization clinics. Therefore, school effects were examined as a proxy indication of possible nurse effects using one-way analysis of variance (ANOVA). There were no differences in anxiety, fear, pain or self-efficacy ratings across schools for either Time 1 or Time 2 data.

3.2.3 Frequency of Negative Immunization Experience. Frequencies were examined to determine what percentage of the study sample had high ratings of anxiety, fear, pain, and low ratings of self-efficacy. For the purpose of this demonstration, "high" ratings were those greater than or equal to 7 out of 10, while "low" ratings were those less than or equal to 3 out of 10. These are conventions commonly reported in the literature (Humphrey et al., 1992; McGrath, Hsu, Cappelli, Luke, & et al., 1990). Of the ratings for Time 1: 11.6% had high fear, 11.6% had high anxiety, 7.7% had high pain, 5.1% had low self-efficacy. Of the ratings for Time 2: 9.0% had high fear, 20.5% had high anxiety, 2.6% had high pain, 11.5% had low self-efficacy.

3.3 Hypothesis Testing of Distribution of Coping and Learning

3.3.1 Distribution of Coping. High and low coping groups were created on each of the two factors, problem- and emotion-focused, using a median split. A single cut- point was used for both Times 1 and 2 using the median from Time 1 coping data. The median for problem-focused was 2.900, while the median for emotion-focused was 1.864. Scores above the median are "high", while scores below are "low". Frequencies were examined to determine what proportion of participants were high on only one of problem- (PF) or emotion-focused (EF) coping. Similar to the distribution reported in Study 2, the majority of participants were high on both PF and EF

[32] Administrative approval for this type of data collection was not provided by Public Health.

coping (see Figure 1) at Time 1. The second largest group was participants low on both PF and

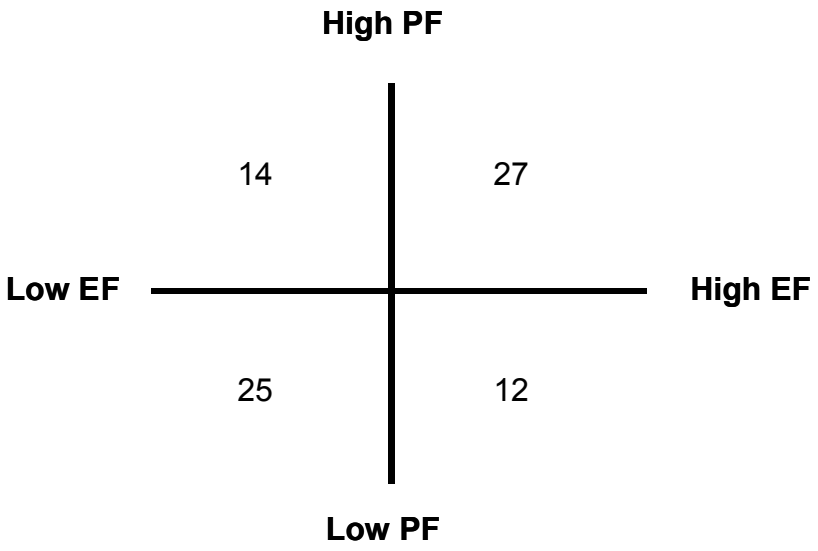

Figure 8. Distribution of Participant Coping across Four Quadrants of High (≥ median split) versus Low (< median split) Problem-focused (PF) and Emotion-focused (EF) Coping at Time 1

EF coping.

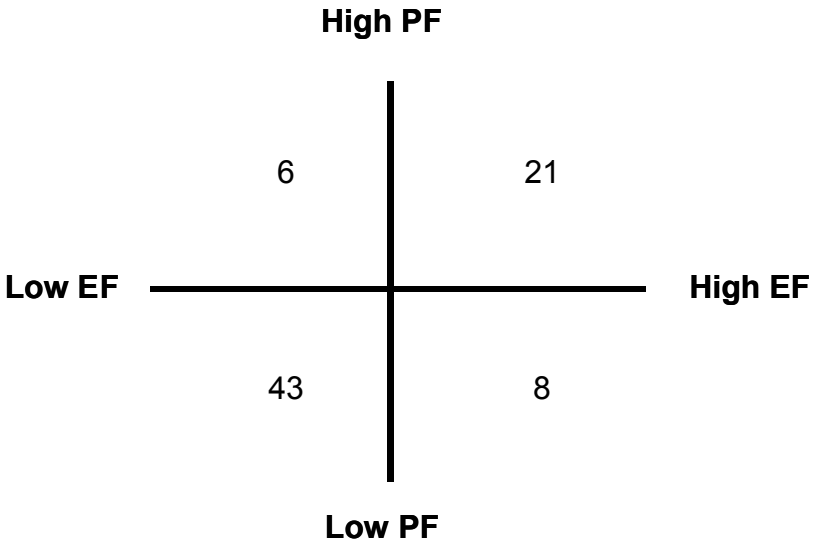

Figure 9. Distribution of participant coping across four Quadrants of High (≥ median split) versus Low (< median split) Problem-focused (PF) and Emotion-focused (EF) Coping at Time 2

The distribution of coping changed somewhat at Time 2 such that the majority of participants were low on both PF and EF coping (see Figure 9). The second largest group was participants high on both PF and EF coping. Very few participants were high on only one type of coping.

To determine whether or not the change in coping distributions from Time 1 to 2 was significant, a McNemar Test was run on categorical PF and EF coping data. The McNemar Test is a nonparametric test for two related dichotomous variables (LEAD Technologies Inc., 2004). It tests for changes in responses using the chi-square distribution and is useful for detecting changes over time. It was expected that the mean for emotion-focused coping would be lower at Time 2 than it had been at Time 1. The mean for problem-focused coping was expected not to change. There was a significant change in the distributions of both PF, $p = 0.004$, and EF coping, $p = 0.041$, coping over time. Specifically, the movement was mostly of participants who had been high on PF and/or EF coping at Time 1; these participants were likely to become low on both EF and PF at Time 2.

3.3.2 Type of Coping Responses as Predictors of Outcome. While it is possible to examine both two and a three subscale versions of the CNQ, only the two subscale CNQ was examined for hypothesis testing in the present study. The two subscale CNQ has a slight advantage over the three subscale version because it is more parsimonious (see Study 2, Summary and Conclusions for a full discussion). This is a particularly relevant issue with the present sample size, which is small relative to studies 1 and 2. Also, as will be discussed in Section 3.5.2, inadequate power is an issue in this study, even when the relatively more powerful two subscale CNQ is examined.

3.3.3 Multivariate Analysis of Variance. Recall from Study 2 that multiple analysis of variance (MANOVA) is used to see the main and interaction effects of categorical variables on multiple dependent interval variables (Tabachnick & Fidell, 2001). Multiple analysis of covariance (MANCOVA) is similar to MANOVA, but interval IVs may be added as "covariates." These covariates serve as control variables for the independent factors, serving to reduce the error term in the model (Tabachnick & Fidell, 2001). In the present study, the repeated measures variable, time, is added to the MANOVA design. MANOVA is an alternative to repeated measures ANOVA in which responses to the levels of the within-subjects IV (i.e., time) are simply entered as separate DVs.

3.4 Assumptions of MANOVA

3.4.1 Independence. This is the most basic assumption that all observations (i.e., participants) be independent of one another. It is the most serious of all violations. Random

sampling as part of data collection is adequate to meet this assumption (Tabachnick & Fidell, 2001). Therefore, the assumption of independence is met in the present analysis.

3.4.2 Equality of Variance-Covariance Matrices. Box's M = 346.088, F (108, 5150.789) = 2.370, p <0.001, indicating that the assumption has been violated. However, examination of cell variances shows that in all cases for both IVs, the variances in the smaller cells are larger than (in one case equal to) those in the larger cells. This indicates that Box's M for this analysis is too liberal. As Tabachnick and Fidell suggest, Pillai's criterion will be used to evaluate multivariate significance, instead of Wilks' Lambda.

3.4.3 Normality. This assumption requires that all DVs be multivariate normal, and that the joint effect of the two variables is normally distributed. As there is no direct test for multivariate normality, researchers should test for the univariate normality of each variable; although this does not guarantee multivariate normality, any departures from univariate normality are usually inconsequential (Tabachnick & Fidell, 2001).

For the present study, all four DVs are significantly skewed at both Time 1 and Time 2: anxiety (positive), fear (positive), pain (positive), and self-efficacy (negative). This finding is not unexpected since the literature has documented that most children and adolescents report little pain and distress related to needles and other painful procedures. MANOVA tends to be robust to violation of this assumption when large samples are examined (Tabachnick & Fidell, 2001), but the sample in this study is not large. The analysis was conducted with and without transformations. The analysis using the transformed DVs demonstrated no appreciable differences in results compared to the analysis with untransformed DVs (see Appendix L). The analysis with untransformed DVs is presented here because of its advantage in interpretability of mean differences.

3.4.4 Outliers. In the present study there were two outliers that were deleted in the *Data Cleaning* section (see Section 3.2). The remaining data are free of outliers.

3.4.5 Linearity. Residual plots are examined to test the linearity assumption. If assumptions are met, the residuals will be nearly rectangularly distributed with a concentration of scores along the center. Examination of the plots shows rectangular shapes to the plots. The assumption of linearity is met.

3.4.6 Sphericity. MANOVA requires that there be some degree of correlation between the DVs. Bartlett's Test of Sphericity is a $\chi 2$ test of this assumption. If significant ($p < 0.05$), a

relationship between the variables exists. Sphericity is not a problem in this analysis for either the between subjects, $\chi 2(9) = 122.874$, $p < 0.001$, or within subjects effects, $\chi 2(9) = 122.874$, $p < 0.001$. For the three-factor solution $\chi 2(9) = 26.935$, $p = 0.001$.

3.4.7 Multicollinearity and Singularity. Multicollinearity and singularity are problems with the correlation matrix that occur when variables are too highly correlated (Tabachnick & Fidell, 2001). There are no bivariate correlations between the DVs that exceed 0.900, therefore multicollinearity is not a problem in this analysis.

With singularity, the variables are redundant. That is, one of the variables is equal to some linear combination of two or more of the other variables. If singularity exists, MANOVA will abort because the inversion of the factor matrix will not run. The factor matrix was successfully inverted in the present analysis; therefore there is no problem with singularity.

3.5 Hypothesis Testing of Type of Coping and Time

3.5.1 Anxiety, Fear, Pain, and Self-efficacy. A 2 (Problem-focused coping: High, Low) X 2 (Emotion-focused coping: High, Low) multivariate analysis of covariance (MANCOVA) with Time as a within subjects variable was performed on four dependent variables: anxiety, fear, pain, and self-efficacy. Adjustment was made for one covariate, gender (Male, Female). Despite concerns raised in preliminary analyses, gender was not a significant covariate in the multivariate tests, $F(4, 61) = 0.983$, $p = 0.424$. Therefore, the MANOVA was re-run with this covariate removed. Descriptive statistics for the MANCOVA are presented in Table A5 and A6 (see Appendix C).

Recall that it was expected that high emotion-focused coping would be associated with higher mean fear, anxiety, and pain ratings, as well as lower self-efficacy ratings. High problem-focused coping was hypothesized to be associated with the opposite or neutral outcomes. Finally, it was expected that high problem-focused coping would moderate the negative effect of high emotion-focused coping on the dependent variables (i.e., anxiety, fear, pain, and self-efficacy ratings). Note that there was no hypothesis for Time, nor one for a Time by Coping interaction, on mean fear, anxiety, pain, and self-efficacy ratings. However, Time is entered into the MANOVA design as a within subjects variable allowing the means for the dependent variables at the two time points to be entered into the design separately.

Multivariate tests revealed a significant multivariate effect of emotion-focused coping (EF) but not problem-focused coping (PF). The EF by PF coping interaction was not significant

in this analysis. In terms of within subjects effects, there was no significant multivariate effect of time, F (4, 62) = 1.552, p = 0.198, but a significant time by PF interaction, F (4, 62) = 5.310, p = 0.001. Because omnibus MANOVA shows significant multivariate effects, it is appropriate to investigate further the nature of the relationships among the IVs and DVs using univariate Fs (Tabachnick & Fidell, 2001).

Examination of the between subjects, univariate effects showed that there was no effect of PF for any of the DVs (see Table 14).

Table 14. Means, Standard Deviations, *F* Statistics, and Significance Values for the Univariate Between Subjects Effects of Problem-focused (PF) and Emotion-focused Coping (EF)

Dependent variables	**PF category**	**Mean**	**St. Dev.**	***F***	***P***
Anxiety	Low $n = 32$	2.846	0.439	2.627	0.110
	High $n = 37$	3.808	0.400		
Fear	Low	1.182	0.406	3.225	0.077
	High	2.799	0.370		
Pain	Low	1.738	0.338	3.907	0.052
	High	2.641	0.308		
Self-efficacy	Low	8.175	0.365	0.085	0.772
	High	8.318	0.332		
Dependent variables	**EF category**	**Mean**	**St. Dev.**	***F***	***P***
Anxiety	Low $n = 35$	2.096	0.407	17.196	<0.001
	High $n = 34$	4.558	0.432		
Fear	Low	1.201	0.377	16.136	<0.001
	High	3.409	0.400		
Pain	Low	1.440	0.313	10.757	<0.001
	High	2.939	0.333		
Self-efficacy	Low	9.125	0.338	12.678	<0.001
	High	7.368	0.359		

However, there was a significant main effect of EF coping whereby participants high on EF coping had higher mean ratings for anxiety, fear, and pain, and lower ratings on self-efficacy, compared to those low on EF coping. There were no significant interactions between EF and PF coping for any of the four DVs.

Examination of the within subjects, univariate effects showed that the only significant effect of time was for self-efficacy whereby participants rated their self-efficacy higher at Time 1 ($M = 8.688$) than at Time 2 ($M = 7.806$), $F(1, 65) = 6.396$, $p = 0.014$. Similarly, the time by PF interaction was significant only for self-efficacy, $F(1, 65) = 6.410$, $p = 0.014$. While there was no change in the self-efficacy ratings of high PF copers over time, low PF copers had significantly higher self-efficacy at Time 1 than at Time 2.

3.5.2 Power. The power of a statistical test is the probability of rejecting the null hypothesis when it is actually false. Several factors affect power including sample size, design, alpha (i.e., the *p* value which is used as criterion to reject the null hypothesis), effect size, and standard error of the mean (Howell, 2002). Typically, 80% power is considered desirable (Howell, 2002).

The observed power to detect a main effect of PF ranged from 5.9% to 49.5%. In contrast, there was 89.9% to 98.3% power to detect a main effect of emotion-focused coping. In order to have 80% power to detect the largest of the effects of PF, which was for pain (observed difference of 0.903, $MSE = 25.745$), a minimum of 992 participants would be needed.

For the PF by EF coping interaction, power ranged between 5.0% and 11.2%. These power values are extremely low. In order to have 80% power to detect the largest of the interactions, which was for fear (observed difference of differences is 0.827, $MSE = 5.144$), a minimum of 236 participants would be needed.

3.5.3 Pessimism. Participants were asked to identify "one good thing about needles" in an open-ended response format. These responses were coded as either positive or pessimistic by two independent coders. Missing values were coded separately. Of 91 codes[33], the two raters agreed on 89 (i.e., 97.8% agreement). Disagreements were resolved through discussion. It was expected participants coded as "pessimistic" would have higher mean emotion-focused coping compared to non-pessimistic individuals. There was no hypothesized effect for time on pessimism data given that pessimism is conceptualized as a stable personality characteristic.

[33] Coding was completed prior to data cleaning and preliminary analysis.

A one-way analysis of variance was run to examine categorical pessimism data. The pessimism category was set as the grouping variable, while mean PF and EF coping were set as the dependent variables. For Time 1 data, there were only six participants in the pessimistic category, compared to 37 and 25 in the positive and missing data categories respectively. No significant effect of pessimism category was found at Time 1 but this is not surprising given the very small cell size for the pessimism category.

The small cell sizes for pessimism data were even more of a problem at Time 2 than they were at Time 1. There were seven participants in the pessimistic category, and only one with missing data; the remaining participants were coded as positive ($n = 70$). Not surprisingly, there was no effect of pessimism on either mean PF or EF coping at Time 2.

The Time 2 pessimism analysis was re-examined using independent samples *t*-tests with the lone missing data case excluded. There was no mean difference between positive and pessimistic participants for either PF coping, $t(75) = 1.380$, $p = 0.172$, or EF coping, $t(75) = 0.956$, $p = 0.342$.

3.5.4 Coping Factor Correlations. Correlations were run to examine the relationship between emotion- and problem-focused mean coping. Recall that emotion-focused coping was expected to be negatively correlated with other extracted coping factors. Problem-focused coping correlated at $r = 0.591$, $p < 0.001$ with emotion-focused coping[34].

4. Summary and Conclusions

The goal of the present study was to use the newly developed *Coping with Needles Questionnaire* (CNQ) to investigate the relationship between coping strategies and participants' experience with getting immunized. A secondary goal was to examine the distribution of participants' coping responses to see (a) what percentage of participants have a dominant type of coping response (i.e., problem- or emotion-focused) and (b) to see how the distribution of coping responses changes over time in response to repeated presentations of the stressor: hepatitis B (hepB) immunizations. Investigating change in coping over time was undertaken to determine whether or not participants would apply what they learned about coping at Time 1 by paring out less helpful coping responses (i.e., emotion-focused) in favour of the helpful (or at least neutral) ones (i.e., problem-focused) at Time 2. The two subscale version of the CNQ was used because it is the more parsimonious tool.

[34] See Section C - Study 1, subsection 1.4 for a discussion of why general coping is not examined in the present research.

4.1 Coping Type as Predictor of Outcome

4.1.1 Emotion-focused coping. Consistent with previous research (Brophy & Erickson, 1990; Caryk & Walker, 1986; Davey & Levy, 1999; Ebata & Moos, 1991; Gil, Thompson, Keith, Tota-Faucette, Noll et al., 1993; Gil et al., 1991; Lu, Tsao, Myers, Kim, & Zeltzer, 2007; Lynch et al., 2006; Reid et al., 1995; Reid et al., 1998; Sinclair, 2001; van den Bree, Passchier, & Emmen, 1990; Wickramasekera, 1986) and the results of studies 1 and 2, it was expected that participants high on emotion-focused coping would have the most difficult experience with needles. As was expected, participants high on emotion-focused coping had higher anxiety, fear and pain, and lower self-efficacy ratings relative to participants low on emotion-focused coping.

4.1.2 Problem-focused coping. In the present study, there was no effect of problem-focused coping and no interaction with emotion-focused coping. The literature is unclear about whether or not there should be an effect of problem-focused responses to painful procedures. The problem-focused subscale is composed of both approach and avoidant oriented response, which may negate their respective effects. Although approach-oriented coping is theoretically thought to be a problematic response to stressors like needles, the avoidant-oriented responses are thought to be most helpful in this context (Compas, Forsythe et al., 1988; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Roth & Cohen, 1986; Weisz, 1990). Therefore, the null finding for problem-focused coping could be a function of the scale having both types of coping on the same subscale. It could also be the case that problem-focused coping is neutral with respect to an effect of coping for preadolescent and adolescents dealing with immunization pain.

A third possibility for the null effect of problem-focused coping is the lack of power in the present study. Power analyses revealed that a total of at least 992 participants would have been needed to detect the main effect of problem-focused coping in the present study. As a result, the effect of problem-focused coping is small enough that its clinical utility would probably be negligible.

Had power been less of an issue in this study, it may have been feasible to test for the differential effects of positive self-statements and cognitive distraction using the three subscale CNQ, which teases apart the approach and avoidant elements of the problem-focused subscale. If it is true that the effects of the two types of coping negate one another, then the effect sizes for each type of coping examined independently may have been larger. But, because cell sizes are

decreased by adding another level to the design, more participants would certainly have been needed to test this effect.

4.1.3 Time. Little is reported in the literature about how coping changes over time in response to a common stressor. Both the change in mean coping and the change in anxiety, fear, pain, and self-efficacy ratings over time were assessed.

There was a change in the distribution of coping from Time 1 to Time 2. At Time 1, the majority of participants were high on both problem- and emotion-focused coping. At Time 2, the majority of participants were low on both types of coping. This finding suggests that, rather than participants paring out only the unhelpful coping responses (i.e., emotion-focused), they tended to cope less overall at Time 2.

In the present study, there was an effect of time whereby participants had higher self-efficacy at Time 1 than at Time 2. Since there were no corresponding increases in participants' anxiety, fear, and pain ratings, it does not seem to be the case that participants experienced the immunizations as overall more problematic at Time 2. In the context of a trend toward decreased mean coping from Time 1 to Time 2, one might interpret this finding to suggest that participants were overconfident in their ability to cope with the needle at Time 2. Consequently, they employed less coping resources and perhaps were less well prepared to deal with the stressor the second time around. The pattern of the time by problem-focused coping interaction supports this supposition somewhat. While there was no change in the self-efficacy ratings of high PF copers over time, low PF copers had significantly higher self-efficacy at Time 1 than at Time 2suggesting that they may have been under prepared. Indeed, there was no change in the self-efficacy ratings of high problem-focused participants over time suggesting that those who implemented more coping fared relatively better the second time that they were immunized. This finding highlights the importance of the relationship between coping and self-efficacy, which is consistent with the model of coping presented by Lazarus and Folkman (1984).

The effect of time in the present study is hard to interpret since there is a six month lag between Time 1 and 2, presenting a memory decay issue which limits the potential for participants to have carried detailed recollections of their experience from one immunization to the next. The implication of memory decay in the context of this study, as well as in the context of using retrospective reports of needles in studies 1 and 2, will be discussed in detail in the general discussion section.

It would have been interesting to have had a third time interval to assess the participants. If it was the case that a decrease in overall coping from Time 1 to Time 2 was associated with the decrease in self-efficacy over the same time interval, one might expect participants to reassess their coping efforts for the third presentation of the stressor to be better prepared, perhaps yielding a corresponding increase in self-efficacy.

Having both pre- and post-ratings of the outcome measures would be another way to improve the design of the present study to be able to detect a pattern of overconfidence and preparedness in response to immunizations. In fact, the original plan had been to include pre-ratings in the present investigation; however, several teachers refused to have their students participate in such a design because they were concerned that early notification of the impending needles would provide for extra worrying time. Out of respect for the teachers' wishes, and in efforts to expand an already small sample, these wishes were acted on and the pre-ratings were dropped[35].

4.2 Distribution of Children's Coping

One of the goals of the present research was to examine the distribution of participant coping to determine what percentage of them demonstrated a dominant coping approach (i.e., high on only emotion- or problem-focused). It was hypothesized that a pattern of high overall coping would be present at Time 1, which was supported. This finding is consistent with reports in the literature (Siegel & Smith, 1989; Worchel et al., 1987). If a pattern of dominance in coping were to exist, it was hypothesized that it would be most apparent at Time 2, after participants had had the opportunity to learn about what types of coping responses were most helpful. However, examination of the results suggests that dominance in coping was not a predominant pattern in the present study. Instead, at Time 2, participants were most likely to be low on both types of coping. Furthermore, the proportion of participants high on problem-focused coping only and emotion-focused coping only was actually smaller at Time 2.

While these results could be interpreted to suggest that dominance is rare and learning about coping does not occur, it should be noted that none of the types of coping that emerged as clearly advantageous in the present study. Therefore, it is not surprising that participants did not

[35] Another strategy for dealing with the teachers' concerns would have been to organize the pre-ratings for the immediate moment before participants were immunized (e.g., while waiting in line). However, most of the Public Health nurses did not provide a specific time that they were planning on arriving at the schools to do the immunizations. Therefore, research assistants would have needed to stay at the school either all morning or afternoon in order to successfully adopt this strategy.

align themselves more with problem-focused coping at Time 2. Furthermore, it is fitting that fewer participants were high on emotion-focused coping at Time 2 compared to Time 1 since this type of coping is clearly disadvantageous.

4.3 Summary

One of the implications of having only a small percentage of participants engaging in dominant coping is that matching interventions may not be merited. That is, the additional resources of matching interventions to coping would seem to only benefit a small percentage of the targeted children since most of them do not have a single dominant approach to coping. Instead, it may be more important to advocate for the implementation of the most effective intervention.

In addition to the lack of dominance, the results of the present investigation suggest that there may not be a clear advantageous type of coping with needles. However, findings clearly indicate that high use of emotion-focused coping is associated with more negative needle experience including higher anxiety, fear, and pain, as well as lower self-efficacy. While it would be informative to know the most advantageous approach to coping with needles, it may be more important to know what approach to coping is not helpful. While most children and adolescents fare well while exposed to needles procedures, it is those children who are likely to have a difficult time coping that are most significant to intervention efforts. The implications of these findings for intervention efforts will be discussed in detail in the general discussion, which follows.

SECTION E: GENERAL DISCUSSION

1. Outline

Using Lazarus and Folkman's (1984) transactional theory of coping and Reid and colleagues' (1998) development and validation of the *Pain Coping Questionnaire* as coping frameworks, the present program of research sought to elaborate on existing knowledge about how children cope with needles. When this project was undertaken, little was reported in the literature about what percentage of participants have a dominant type of coping responses (i.e., high on only one type of coping). Similarly, little was known about how coping responses change over time in response to repeated presentations of the same stressor. Because no measures existed to assess children's coping in the context of needles, the first two studies remedied this gap by developing and validating a *Coping with Needles Questionnaire* (CNQ). The final study implemented this newly developed questionnaire to investigate the relationship between coping strategies and participants' experience with getting immunized. The secondary goal was to examine the distribution of participants' coping responses, both in terms of dominance and change over time.

In the following sections, the results of the three studies in this program of research will be reviewed and integrated in the context of the overarching goals of the dissertation. Within each section, limitations and future directions will be considered. Additional limitations that were not discussed in the context of these sections will be outlined in a separate limitations section toward the end of the general discussion section. Finally, a summary section on future directions will conclude the document.

2. Coping Theory and Assessment

2.1 Two- Versus Three-Factor CNQ

Following scale development and item analysis in studies 1 and 2, the two resulting factor solutions for the CNQ were identical in item content. Both a two and a three subscale version of the CNQ were shown to have good internal consistency (i.e., alpha greater than or near 0.800) at both the subscale and overall scale levels. In terms of limitations, each solution was found to have an issue with predictive power and reliability. For the two subscale CNQ, the issue was one of lower than desirable total variance accounted for, while for the three subscale CNQ, it was an issue of having a subscale (i.e., cognitive distraction) with only three items, which is too thin to be highly reliable (Gorsuch, 1983).

Construct validity investigations indicated that both solutions contributed to essentially the same information in hypothesis testing for both retrospective accounts and actual experience with needle procedures. These findings are discussed in detail in the following section.

The factor analysis in Study 2 resulted in a two- and a three-factor solution that used the exact same item set, making it possible to maintain both solutions as options for future research. This is a desirable feature of the scale given the parity of advantages and disadvantages comparing the two solutions, providing for flexibility in future research and the potential for continued scale evaluation. Nevertheless, given similarity on all other evaluative dimensions, and in the interest of parsimony, the two subscale CNQ should be considered the superior scale.

Scale selection on the basis of parsimony is consistent with Ockham's razor, a principle which states that the explanation of any phenomenon should make as few assumptions as possible, eliminating those that make no difference in the observable predictions of the explanatory hypothesis or theory (Rodríguez-Fernández, 1999; Sober, 1975, 1981). In addition, Popper (1992) has argued that scientific preference for simplicity may be justified by a falsifiability criterion. That is, simpler theories are preferred to more complex ones because they apply to more cases than more complex ones, and are thus more easily refuted. In the case of the present research, this was apparent in superior power of a two-factor solution, which made the design more feasible to test across all three studies. Without several hundred participants, the small size of the effects resulting from an investigation with the three subscale CNQ require several hundred to a thousand participants to detect, limiting its utility.

2.2 Type of Coping as a Predictor of Needle Experience

2.2.1 Emotion-focused Coping as a Significant Predictor of Main Effects. Both the two- and three-factor CNQs compose an emotion-focused subscale. High scores on this subscale were robustly associated with relatively higher anxiety, fear, pain, and low self-efficacy ratings. This effect of emotion-focused coping was replicated in all three studies, even when limited power was an issue for testing other effects in studies 1 and 3. In Study 2, there was also a relationship between emotion-focused coping and pessimism, which was assessed by failure to identify one good thing about getting a needle. These relationships were expected as they are often reported in the literature for pain (Brophy & Erickson, 1990; Caryk & Walker, 1986; Davey & Levy, 1999; Ebata & Moos, 1991; Gil, Thompson, Keith, Tota-Faucette, Noll et al., 1993; Gil et al., 1991; Lynch et al., 2006; Reid et al., 1995; Reid et al., 1998; Sinclair, 2001; van den Bree et al., 1990; Wickramasekera, 1986), as well as general stress (Folkman & Lazarus, 1988).

Based on theoretical descriptions of cognitive appraisals and coping, one would expect emotion-focused coping to be a primary influence on individuals receiving needles (Lazarus & Folkman, 1991). This is because harm/loss or threat appraisals are theoretically associated with more antagonistic, less adaptive coping responses (e.g., catastrophizing). Also, when a stressful situation is appraised as unchangeable, the individual is more likely to adopt emotion-focused forms of coping by attempting to regulate their distress (Compas, Forsythe et al., 1988; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Roth & Cohen, 1986; Weisz, 1990).

2.2.2 Problem-focused Coping as a Null Predictor of Main Effects. Construct validity indications for the problem-focused subscale and its derivatives, cognitive distraction and positive self-statements, were less clear across the three studies. In Study 1, high problem-focused coping was associated with lower fear of needles ratings and lack of pessimism as compared to low problem-focused coping. However, this effect of problem-focused coping was not replicated in studies 2 and 3.

The literature is unclear about whether or not there should be an effect of problem-focused responses to painful procedures. The problem-focused subscale is composed of both approach and avoidant oriented responses, which may negate their respective effects. While approach-oriented coping is theoretically thought to be a problematic response to stressors like needles (Roth & Cohen, 1986), the avoidant oriented response is thought to be most helpful (Roth & Cohen, 1986) or at least most prevalent (Lazarus & Folkman, 1991) in this context. Therefore, the null finding for problem-focused coping could be a function of the scale having both types of coping on the same subscale, effectively cancelling each other out. It could also be the case that problem-focused coping is neutral with respect to an independent effect of coping for preadolescent and adolescents dealing with needles.

Reid and colleagues (1998) also found null relationships between approach and distraction coping and their outcomes of interest (i.e., emotional adjustment, pain, and functional disability) among a sample of children and adolescents with headache. Given that Reid's study factored out approach and problem-focused avoidant types of coping, it seems more likely that problem-focused coping in isolation has a neutral effect on children's experience with needles. However, Reid and colleagues examined a chronic pain stimulus, while the present investigations emphasized acute pain. There are notable differences in the predicted relationships comparing coping with chronic versus acute pain (See Section E, 2.2.1). Therefore, the effect of problem-focused coping warrants further investigation in the context of acute pain. In particular, procedural pain contexts that are longer in duration and that have fewer restrictions on children's ability to move about may be better suited to this type of coping.

Examining the three-factor CNQ, there was no effect of either cognitive distraction or positive self-statements as independent variables in Study 1, and only an effect of positive self-statements in Study 2. There, high use of positive self-statements was associated with lower pain ratings. This isolated main effect of positive self-statements seems contrary to reports in the literature, which suggest that the use of approach-oriented coping should be futile in the context of an uncontrollable stressor like getting a needle (Compas, Forsythe et al., 1988; Folkman & Lazarus, 1988; Forsythe & Compas, 1987; Weisz, 1990). Examination of the positive self-statements item content reveals that attention is indeed approach oriented. That is, the rater's attention is focused on the situation/stressor of getting a needle. For example, items include: I try and think about the positive things about getting *needle* [italics added], I tell myself I can handle *it* [italics added], I remind myself why I have to get a *needle* [italics added], etc.

Perhaps there is a theoretical division to be made between approach-oriented coping that is driven by efforts to gain control by altering the circumstance and those that seek to alter cognitions about the stress, as is the case among the items of the positive self-statements scale. Some researchers have suggested this pattern previously (Moos & Billings, 1983). Certainly, cognitions about the stressor seem like they would be amenable to change in the context of needles because there are no procedural restrictions on what children are thinking. However, there are situational elements that are required and uncontrollable. For example, the child must sit still, receive a needle, interact with a health care provider, etc. Based on this rationale, one would expect that approach oriented coping efforts would only be futile when the target is necessarily unchangeable. This rationale could account for the beneficial impact of positive self-statements in Study 2.

2.2.3 Moderation in the Interactions between Problem- and Emotion-focused Coping. The role of problem-focused coping and its derivatives as moderator variables in interactions were more consistent across the three-studies than were the main effects. In Study 1, the presence of high problem-focused coping moderated the fear ratings for participants who had also reported high use of emotion-focused coping. This interaction effect was replicated in Study 2, when retrospective reports of needle experience were examined using anxiety, fear, pain, and self-efficacy as outcomes. The same pattern of moderation was found for cognitive distraction, but there was only a moderation effect of positive self-statements for pain ratings. No problem-

focused by emotion-focused interaction was found in Study 3; recall that only the two-factor CNQ was examined in that final study.

Contrary to the position of Worchel and colleagues (Roth & Cohen, 1986; Siegel & Smith, 1989; Worchel et al., 1987), based on these interactions, it does not seem to be the case that high overall coping (i.e., high on both emotion- and problem-focused) is associated with negative outcomes. Rather, the addition of high problem-focused coping moderates the negative impact of high emotion-focused coping.

Interestingly, in Study 2, participants low on both emotion- and problem-focused coping had the lowest anxiety, fear, and pain ratings, and the highest self-efficacy ratings of all when compared to all other cells in the interaction tables. This relationship is not surprising since there should be little or no need to cope among participants who do not consider getting needles stressful (i.e., painful, anxiety/fear provoking). Recall that in this program of research, coping is a goal-directed response to a stressor (e.g., Lazarus & Folkman, 1984). Furthermore, if we consider the model presented by Rudolph and colleagues (see Figure 1), in the absence of a stressor, which begins progress through their flowchart, one would not even proceed to consider the alternate pathways of a stress versus coping response.

The supposition that cognitions in the context of needles are amenable to change, or at least influence, is supported by the interactions reported in the present program of research. Specifically, problem-focused coping and its derivatives tend to moderate the negative influence of emotion-focused coping. The emotion-focused coping subscale is largely composed of catastrophizing or negative self-talk. The pattern of the interactions suggests that when this catastrophizing is offset by the addition of problem-focused coping, children tend to have or to recall better experience with needles. Therefore, even when negative cognitions are present, it seems that some children are able to successfully change, or at least attenuate, negative thinking with another type of coping.

Another explanation for the pattern of moderation observed across interactions in this program of research is that children who were less distressed were more able to engage in additional coping responses, while children who were more distressed were only able to manage their emotional reaction with emotion-focused coping. This latter supposition is supported by the definition of emotion-focused coping presented by Lazarus and Folkman (1984) that this type of coping involves attempts to deal with emotional reactions to a stressor. If the emotional reactions

are greater, the need for emotion-focused coping would also be greater. This supposition flips the independent (emotion-focused coping) and dependent variables (anxiety, fear, pain, self-efficacy) around compared to the way they were conceived in this program of research. Further research would be needed to concretely determine the direction of influence in the relationship between distress and emotion-focused coping.

In terms of the implications for future research, if distress predicts increased use of emotion-focused coping responses, which are limited in effectiveness as coping tools, then interventions for individuals who tend to rely on emotion-focused coping will need to be targeted at an early procedural stage before distress is already very high. For example, the goal would be to catch individuals who are dominant or high on emotion-focused coping before they are highly distressed, when they are still able to make use of other strategies. To achieve this goal, it may be necessary to intervene in the waiting room or perhaps even before the hospital rather than in the procedure room, which is traditional in interventions reported in the literature (e.g., Cohen et al., 2001).

2.3 Coping Type and Implications for Screening

As part of the present program of research, considerable effort was expended to choose between a two- and a three-factor solution of the CNQ, as well, hypothesis testing was conducted to determine the relative efficacy of the two types of coping as assessed by the resulting scale. Interestingly, while the problem-focused subscale and its derivatives provide some information about the moderation of emotion-focused coping, emotion-focused coping is a much more robust and interpretable effect.

Since problem-focused coping does not clearly emerge as a beneficial type of coping, it seems that emotion-focused subscale of the CNQ has the most to offer in terms of informing intervention efforts. This is the subscale that children score highest on when they are also reporting high levels of anxiety, fear, pain, and low levels of self-efficacy following immunization. Therefore, the emotion-focused subscale of the CNQ shows promise for utility as a screening tool, which could be used to identify children who are likely to have a difficult experience with needles.

Given the strong relationship between emotion-focused coping and distress responses, it may not be necessary to administer a screening questionnaire to all children. Instead, a good marker for the need to screen might be children's previous distress reactions in response to

similar procedures (Artz et al.,1990; Bijttebier & Vertommen, 1998; Lander et al., 1992). For example, if there is a strong history for distress paired with a reliance on emotion-focused coping then intervention would likely be needed. It remains to be determined in future research whether the emotion-focused coping subscale of the CNQ would add to the predictive power of distress history in screening for children who are likely to be highly distressed by a painful procedure.

To conclude this section on coping theory, the question of a two- versus three-factor solution may be one of limited importance since the decision is concerned with the problem-focused subscale, which has been shown to have little independent effect on needle experience. When considering the CNQ, what appears to be of primary relevance is how participants score on emotion-focused coping. Future research efforts should seek to examine the utility of this subscale for screening children and adolescents who are likely to have a difficult experience with needles. Indeed, the need for such a screening tool has been documented (Slifer et al., 2002). In addition to improving the needle experience of participants, which has been repeatedly demonstrated in the literature (see Chen, Joseph, & Zeltzer, 2000; DeMore & Cohen, 2005, for reviews), such interventions may also have latent benefits like shortening procedures times. Indeed, highly anxious children tend to demonstrate the most behavioural distress (Humphrey et al., 1992; Pringle et al., 2001) and may need to be forced to comply with treatment (Bricher, 1999), which could lead to medical avoidance in the future (e.g., Pate et al., 1996).

3. Coping Dominance and Change over Time

3.1 Presence of Dominance in the Coping Distribution

Research has indicated that when faced with a stressor, children will initially try a large variety of coping responses (Roth & Cohen, 1986); these coping responses may even be conflicting at times (Christiano & Russ, 1998; Fanurik et al., 1993). In other words, at least initially, most children should not have a dominant[36] type of coping responses. Consistent with this hypothesis, in both studies 2 and 3, the majority of participants were high on both emotion- and problem-focused coping when initially queried.

While it was not the most common pattern of coping, in each study, there were smaller subsets of children who did show dominance. In Study 1, dominance was shown in 26 of 78 participants (33%); in Study 2 (Time 1), 100 of 302 participants (33%), in Study 3 (Time 1) 26 of

[36] Recall that a dominant type of coping is when children use a high amount of one type of coping (i.e., problem-focused versus emotion-focused).

91 (29%) and (Time 2) 14 of 91 participants (15%). Therefore, at least at baseline, it seems that dominance occurs in approximately one in every three children.

3.2 Implications of Coping Distribution for Interventions

The effectiveness of various cognitive and behavioural interventions for procedural pain is well-established (see Chen et al., 2000; DeMore & Cohen, 2005, for reviews). There is some evidence that suggests that there is additional benefit to matching interventions to children so that they are congruent with type of coping (Christiano & Russ, 1998; Fanurik et al., 1993). For children that engage in primarily avoidant responses to painful procedures, an avoidant intervention like distraction is congruent, while an approach intervention like information provision is incongruent. Studies in dental and experimental settings have shown that interventions that are matched or congruent with a child's coping style are more effective at reducing self-reported distress than interventions that are incongruent (Zonneveld et al., 1997).

One of the reasons why it was thought that it would be important to examine the distribution of coping responses within the present program of research was to determine what proportion of children have dominant coping. This was an important question to answer because previously in the literature dominance has been assumed but there have been no data published to support this assumption. The results of the present research suggest that approximately one-third of children are dominant on one type of coping as measured by the CNQ, which is a relatively small percentage of children for whom matching would be uncontaminated by inclination to multiple types of coping responses. Even among the third of participants who demonstrate a pattern of dominance, approximately half are dominant on the types of coping which have historically responded best to matching interventions, in this investigation, problem-focused coping. Since only a small percentage of children are truly dominant copers the utility of "matching" interventions to dominance may be limited, but this does not negate the importance of pursuing improved knowledge about how to best intervene with children to better their experience in medical contexts.

In addition to dominant problem-focused copers, a roughly equal portion of dominant copers were high on emotion-focused coping, a type of coping which is associated with negative experience with needles and is generally considered a type of coping that should be avoided. In fact, there have been intervention studies conducted where adults have been trained *not* to use emotion-focused responses to children in pain (Chambers, Craig, & Bennett, 2002). In the

present program of research, the children who were highly emotion-focused tended to have the most strongly negative responses to needles. The high levels of anxiety and fear these children experience would likely make them difficult to engage in an intervention, especially one designed to capture their attention, if they are already very distressed. They may be more likely to benefit from interventions that target them early in the process of receiving medical care (e.g., in the waiting room), before they have already become very anxious. Investigations of the most appropriate time for interventions has not been widely investigated but may be a promising area for future research.

In summary, the results of the present program of research highlight the potentially limited utility of matching interventions to coping style. In particular, few children seem to be natural candidates for matching since only a small proportion of them are dominant on problem-focused coping. Only half of the dominant children in the present research program are problem-focused, meaning that approximately 15% of eligible children would be well-suited to matching interventions based on dominance. In place of matching interventions, there may be more benefit to identifying those children who are dominant on emotion-focused coping. These are the children who had the most difficulty with needles in the present program of research and as a result, they may be hardest to impact with interventions (Manne, Jacobsen, & Redd, 1992). Some researchers suggest that it may be important to make interventions more active/interactive and interesting, to engage even the most distressed children (Dahlquist, Pendley, Landthrip, Jones, & Steuber, 2002; MacLaren & Cohen, 2005; Mason, Johnson, & Woolley, 1999).

3.3 The Effect of Time on the Emergence of Dominance

If a pattern of dominance in coping were to occur, it was hypothesized that it would be most apparent at Time 2, after participants had had the opportunity to learn about what types of coping responses were most helpful. However, when examining how the distribution of coping changed with time in Study 3, it was found that most participants were low on both types of coping at Time 2. Furthermore, the proportions of participants high on (1) problem-focused coping only and (2) emotion-focused coping only were actually smaller at Time 2. Therefore, rather than a strong pattern of dominance emerging over time, participants seemed to do less in general to cope with their immunizations the second time around.

There is some evidence that some participants were under prepared for their second immunization. Specifically, there was an effect of time whereby participants had higher self-

efficacy at Time 1 than at Time 2. Time also moderated the effect of problem-focused coping such that participants low on this type of coping had the lowest self-efficacy ratings at Time 2. There was no change in the self-efficacy ratings of high problem-focused participants over time suggesting that those who reported implementing more PF coping at Time 2 fared relatively better for the second immunization.

These effects of time on self-efficacy could be interpreted in the context of decreased coping from Time 1 to Time 2 to suggest that participants were overconfident in their ability to cope with the immunization at Time 2, which occurred six months later. Consequently, as a group they employed less coping resources and were perhaps less well prepared to deal with the stressor the second time around. To adequately test this hypothesized pattern of cycling preparedness and overconfidence, a third immunization and round of data collection would have been needed. One would hypothesize that low problem-focused copers who were less efficacious at Time 2 would react by increasing their coping efforts the third time around.

Having both pre- and post-ratings of the outcome measures would be another way to improve the design of the present study to be able to detect a pattern of overconfidence and preparedness in response to immunizations. As discussed in the summary and conclusions of Study 3, the original plan had been to include pre-ratings; however, several teachers refused to have their students participate in such a design. Given better coordination of data collection with scheduled immunizations, this would definitely be a worthy addition to the design for future investigations.

3.4 Confound of Memory Decay and its Impact on Learning

Based on the results of the examination of coping distribution and the effect of time on self-efficacy it might be tempting to conclude that children did not learn to cope better with experience. There are two major issues prohibiting this conclusion. First, it should be noted that there was not a type of coping that emerged as clearly advantageous in the present program of research. Therefore, it is appropriate that participants did not align themselves more with problem-focused coping at Time 2. Furthermore, it is fitting that fewer participants were high on emotion-focused coping at Time 2 compared to Time 1 since this type of coping is clearly disadvantageous. The second issue is that there was a six-month time-lag between the first and second immunizations in Study 3, presenting a memory decay issue which limits the potential for

participants to have carried detailed recollections of their coping experience from one immunization to the next.

The design of Study 3 was not setup to test for memory effects, which is a limitation that hinders a full analysis of this issue here. While researchers have demonstrated that children and adolescents are quite good at recalling their pain over a time interval of several months (von Baeyer et al., 2004), little is known about children's memory for their coping behaviours. One study examined the relationship between children's coping and their memory accuracy for pain reports, but this study did not assess the accuracy of participant's recall of their coping (Zonneveld et al., 1997). It would certainly be a worthy endeavour for future research to examine how well children are able to process and remember their coping efforts across various time-lags because some degree of memory would be needed in order for children to have the capacity to learn to cope better. Such an investigation would provide worthwhile information to guide the expectations of health care providers who see children routinely for painful procedures, but separated over stretches of time.

4. Limitations

In addition to limitations outlined in previous sections, there are two major notable areas of issue that cropped up within the present program of research, namely power and non-normality.

4.1 Power

Some of the null effects in the present program of research can be interpreted as a power issue. In both studies 1 and 3, there were effects that would have required much larger sample sizes to detect. While dismissing a null effect as a function of power is tempting, one also needs to consider the meaning of small effect sizes that require several hundred or 1000 participants to detect.

If the CNQ is to have clinical utility it is expected that health care providers will be primarily interested in how well the subscales predict the needle experience of small sets of children. In fact, some might even argue that the subscales need to be predictive enough to carry meaning for single children so that interventions can be targeted individually as needed. In such a context, the meaning of a very small effect is negligible. As a result, the lack of power in the present program of research is seen as a minor issue.

One potential solution to the difficulties with limited power in the present program of research would be to use a regression model, rather than analysis of variance, to test the effects

of coping on the outcome variables of interest. With its capacity to cope with continuous variables, regression has the advantage of using the full 5-point spread of items on the CNQ, increasing variance accounted for and, by extension, power. On the other hand, analysis of variance requires that each coping variable be dichotomized. The advantage of dichotomizing variables for analysis of variance is increased simplicity of the design and analysis; the disadvantage is a loss of power. Specifically, dichotomizing reduces the population correlation and a considerable amount of measurement information. Cohen uses the analogy that it's like throwing out a significant portion of your sample (Cohen, 1983).

4.2 Non-normality

From examination of the item distributions across the three studies, it is clear that several of the independent and dependent variables are skewed; some in the positive direction, some in the negative. For the skewed dependent variables, analyses were replicated using transformed variables with no appreciable difference in results (see Appendices H and L). The role of non-normality had for independent variables cropped up in the context of the factor analysis, contributing to diminished variance accounted for.

Non-normal distribution was expected in a questionnaire that is meant to discriminate between a majority of children, who should be coping well with needles, and a small group of children who are expected to have difficulty with needles. It was also hoped that the questionnaire resulting from these analyses will have some clinical utility for identifying children who are likely to need an intervention to help them cope better with getting needles. From a practicality standpoint, it is unlikely that a questionnaire requiring algebraic corrections of children's responses, will be useful in busy hospital or medical clinic contexts. For these reasons, skewness and kurtosis were not corrected for as part of the main analyses in the three studies reported in this document. In summary, non-normality presents limitations to the power of prediction using the CNQ but this is an expected and tolerated limitation given the nature of the phenomenon and the clinical utility of the questionnaire.

4.3 Psychometrics as part of Test Construction

As part of the present program of research, validity and reliability were established in several ways. The following is a discussion of several common psychometric properties examined as part of test construction.

Content validity is ordinarily to be established deductively, by defining a universe of items and sampling systematically within this universe to establish the test (Cronbach and Miehl, 1955). In the present program of research, content validity was established deductively by writing items based on similar published and validated coping scales and by evaluating each test item based on its theoretical adherence to coping constructs reported in the literature.

Predictive validity is typically established by demonstrating expected group differences (Cronbach and Miehl, 1955). In the present program of research, predictive validity was demonstrated through hypothesis testing. Specifically, extracted CNQ factors (i.e., emotion-focused, problem-focused) were expected to predict anxiety, fear, pain, and self-efficacy is a similar fashion to trends effects reported in the literature.

Concurrent validity is the degree to which two different measuring systems produce correlating results. It is often used to determine the validity of new measuring techniques, by comparing them with established techniques. It was not possible to directly assess concurrent validity within the present program of research because the CNQ was a novel tool and, as such, there are no other measuring systems that are directly comparable available in the literature. Nonetheless, an approximation of concurrent validity was demonstrated in that the factor structure of the CNQ resembles the structure of a similar coping questionnaire in both studies 1 and 2, the PCQ published by Reid et al. (1998).

Convergent validity is established when measures that should be related are related. Within the present program of research, there is some minor evidence for convergent validity. In particular, the expected positive relationship between pessimism and emotion-focused coping was document. A superior test of this type of validity would have seen a more rigorous measure of pessimism compared to coping groups, as well as a prediction regarding the personality disposition most aligned with other types of coping (e.g., problem-focused).

Internal consistency is the extent to which all items in a scale or test measure the same concept. Cronbach's alpha was used as the measure of internal consistency in the present program of research. Internal consistency, as measured by Cronbach's alpha, was demonstrated to be "good" or better for all subscales in both studies 1 and 2.

Test-retest reliability was not assessed within the present program of research. If fact, it would have been counter-theoretical to assess it. When defining coping as situation/stressor specific process, one would not expect there to be high consistency in coping behaviour upon

retesting because from one needle to the next it would be difficult or impossible to replicate the same person-environment relationship on which cognitive appraisal, and by extension coping, was based.

Inter-rater reliability was not assessed within the present program of research. This was a purposeful omission because coping was an intrapsychic phenomenon that was judged to be difficult for observers to rate along with self-report. However, observer ratings of coping may be a fruitful avenue for potential future research. In particular, it would be interesting and helpful to intervention efforts if parents were able to comment on their child's typical responses to needle procedures.

5. Future Directions

Potentially fruitful avenues of future research that were illuminated through the course of this program of research were discussed as part of previous sections in this general discussion. In summary, it is hoped that the *Coping with Needles Questionnaire* will have some clinical utility for identifying children that are likely to have a difficult experience with needles. Investigation into the direction of the relationship between distress and emotion-focused coping would also be a worthy endeavour to help inform identification efforts. Intervening with those children who are most likely to be distressed carries potential benefits for improving the child's experience and the efficiency of procedures.

When children have negative experiences with medical procedures, they are at risk for heightened future distress and, potentially, avoidance of medical care in the future. It seems counter-productive to force highly distressed children through medical care that is meant to improve or protect their health when, in the long-term, these are the very individuals who are likely to avoid medical care because of their negative histories and expectations. It is hoped that the results of this research will be helpful for facilitating the coping of these highly distressed children. Once they can be identified, a future challenge will be to learn how to improve intervention efforts to engage even these most distressed children who have difficulty coping on their own. Discussion of the results from the present program of research indicates that intervening at a pre-procedural stage, prior to the heightening of distress, may be a particularly appealing avenue for future research.

References

Agras, S., Sylvester, D., & Oliveau, D. (1969). The epidemiology of common fears and phobia. *Comprehensive Psychiatry, 10*(2), 151-156.

Altshuler, J. L., & Ruble, D. N. (1989). Developmental changes in children's awareness of strategies for coping with uncontrollable stress. *Child Development, 60*(6), 1337-1349.

American Psychiatric Association. (2000). *(DSM-IV-TR) Diagnostic and statistical manual of mental disorders* (4 ed.). Washington, DC: American Psychiatric Press, Inc.

Anshel, M. (1996). Coping styles among adolescent competitive athletes. *Journal of Social Psychology, 136*(3), 311-323.

Anshel, M., & Wells, B. (2000). Personal and situational variables that describe coping with acute stress in competitive sport. *Journal of Social Psychology, 140*(4), 434-450.

Bachanas, P. J., & Blount, R. L. (1996). The Behavioral Approach-Avoidance and Distress Scale: An investigation of reliability and validity during painful medical procedures. *Journal of Pediatric Psychology, 21*(5), 671-681.

Badali, M. A., Pillai, R. R., Craig, K. D., Giesbrecht, K., & Chambers, C. T. (2000). Accuracy of children's and parents' memory for a novel painful experience. *Pain Research and Management, 5*(2), 161-168.

Band, E. B., & Weisz, J. R. (1988). How to feel better when it feels bad: Children's perspectives on coping with everyday stress. *Developmental Psychology, 24*, 247–253.

Band, E. B., & Weisz, J. R. (1990). Developmental differences in primary and secondary control coping. *Journal of Clinical Child Psychology, 19*, 150-158.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Barrios, B. A., & O'Dell, S. L. (1998). Fears and anxieties. In E. J. Mash & R. A. Barkley (Eds.), *Treatment of childhood disorders* (2 ed., pp. 249-337). NY, US: Guilford Press.

Bartlett, M. s. (1950). Tests of significance in factor analysis. *British Journal of Psychology (Statistical Section), 3*, 77-85.

Baylis, F., Downie, J., & Kenny, N. (1999). Children and decision-making in health research. *IRB: A Review of Human Subjects Research, 21*(4), 5-10.

Beales, J. G., Holt, P. J. L., Keen, J. H., & Mellor, V. P. (1983). Children with juvenile chronic arthritis: Their beliefs about their illness and therapy. *Annals of Rheumatic Diseases, 42*, 481-486.

Bell, A. (1995). Universal hepatitis B immunization: the British Columbia experience. *Vaccine, 13*(Suppl 1), S77-81.

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

Bickel, P. J., & Doksum, K. A. (1977). *Mathematical Statistics*. San Franscisco: Holden-Day.

Blount, R. L., Piira, T., Cohen, L. L., & Cheng, P. S. (2006). Pediatric procedural pain. *Behavior Modification, 30*(1), 24-49.

Brewster, A. B. (1982). Chronically ill hospitalized children's concepts of their illness. *Pediatrics, 69*, 355-362.

Bricher, G. (1999). Paediatric nurses, children and the development of trust. *Journal of Clinical Nursing, 8*(4), 451-458.

Brodzinsky, D. M., Elias, M. J., Steiger, C., Simon, J., Gill, M., & Hitt, J. C. (1992). Coping scale for children and youth: Scale development and validation. *Journal of Applied Developmental Psychology, 13*(2), 195-214.

Brophy, C. J., & Erickson, M. T. (1990). Children's self-statements and adjustment to elective outpatient surgery. *Journal of Developmental and Behavioral Pediatrics, 11*(1), 13-16.

Brown, J. M., O'Keefe, J., Sanders, S. H., & Baker, B. (1986). Developmental changes in children's cognition to stressful and painful situations. *Journal of Pediatric Psychology, 11*, 343-356.

Bruck, M., Ceci, S. J., Fancoeur, E., & Barr, R. J. (1995). "I hardly cried when I got my shot!" Influencing children's reports about a visit to a physician. *Child Development, 66*, 193-208.

Bull, B., & Drotar, D. (1991). Coping with cancer in remission: Stressors and strategies reported by children and adolescents. *Journal of Pediatric Psychology, 16*, 767-782.

Burisch, M. (1984). Approaches to personality inventory construction. *American Psychologist, 39*, 214-227.

Burstein, S., & Meichenbaum, D. (1979). The work of worrying in children undergoing surgery. *Journal of Abnormal Child Psychology, 7*, 121-132.

Byrne, D. (1964). Repression–sensitization as a dimension of personality. In B. A. Maher (Ed.), *Progress in experimental personality research* (Vol. 1, pp. 169-220). New York: Academic Press.

Canadian Immunization Registry Network. (2005). *National standards for immunization coverage assessment: recommendations from the Canadian Immunization Registry Network*. Unpublished manuscript.

Caryk, C. J., & Walker, J. L. (1986). Optimism and irrational beliefs. *Psychological Reports, 59*(2, Pt 1), 457-458.

Chambers, C. T., Craig, K. D., & Bennett, S. M. (2002). The impact of maternal behavior on children's pain experiences: An experimental analysis. *Journal of Pediatric Psychology, 27*(3), 293-301.

Chambers, C. T., & Johnston, C. (2001). Developmental differences in children's use of rating scales. *Journal of Pediatric Psychology, 27*(1), 27-36.

Chen, E., Joseph, M. H., & Zeltzer, L. K. (2000). Behavioral and cognitive interventions in the treatment of pain in children. *Pediatric Clinics of North America, 47*(3), 513-525.

Child, D. (2006). *The essentials of factor analysis* (3 ed.). London, UK: Continuum International Publishing Group.

Christiano, B., & Russ, S. W. (1998). Matching preparatory intervention to coping style: The effects on children's distress in the dental setting. *Journal of Pediatric Psychology, 23*(1), 17-27.

Cohen, L. L., Blount, R. L., Cohen, R. J., Ball, C. M., McClellan, C. B., & Bernard, R. S. (2001). Children's expectations and memories of acute distress: Short- and long-term efficacy of pain management interventions. *Journal of Pediatric Psychology, 26*(6), 367-374.

Cohen, J. (1983). The cost of dichotomization. *Applied Psychological Measurement, 7(3),* 249-253.

Compas, B. E. (1987). Coping with stress during childhood and adolescence. *Psychological Bulletin, 101*(3), 393-403.

Compas, B. E., Banez, G. A., Malcarne, V., & Worsham, N. (1991). Perceived control and coping with stress: A developmental perspective. *Journal of Social Issues, 47*, 23-34.

Compas, B. E., & Boyer, M. C. (2001). Coping and attention: implications for child health and pediatric conditions. *Journal of Developmental and Behavioral Pediatrics, 22(5),* 323-333.

Compas, B. E., Forsythe, C. J., & Wagner, B. M. (1988). Consistency and variability in causal attributions and coping with stress. *Cognitive Therapy & Research, 12*(3), 305-320.

Compas, B. E., Malcarne, V. L., & Fondacaro, K. M. (1988). Coping With Stressful Events in Older Children and Young Adolescents. *Journal of Consulting and Clinical Psychology, 56*(3), 405-411.

Comrey, A. L. (1992). *A first course in factor analysis* (2nd ed. ed.). Hillsdale, N.J.: L. Erlbaum Associates.

Costello, A. (1982). Assessment and diagnosis of psychopathology. In J. L. Matson & R. P. Barrett (Eds.), *Psychopathology in the mentally retarded* (pp. 37-52). Philadelphia, PA, US: Grune & Stratton, Inc/W. B. Saunders Co.

Costello, C. G. (1982). Fears and phobias in women: A community study. *Journal of Abnormal Psychology, 91*(4), 280-286.

Cosway, R., Endler, N. S., Sadler, A. J., & Deary, I. J. (2000). The Coping Inventory for Stressful Situations: Factorial structure and associations with personality traits and psychological health. *Journal of Applied Biobehavioral Research, 5*(2), 121-143.

Crespo, L., & Cruzado, R. (1997). Assessment of coping: Adaptation and validation of the COPE-dispositional questionnaire with a sample of university students. *Analisis y Modificacion de Conducta, 23*(92), 797-830.

Crocker, L., & Algina, J. (1986). *Introduction to Classical and Modern Test Theory*. New York: CBS College Publishing.

Crombez, G., Bijttebier, P., Eccleston, C., Mascagni, T., Mertens, G., Goubert, L., et al. (2003). The child version of the pain catastrophizing scale (PCS-C): A preliminary validation. *Pain, 104*(3), 639-646.

Cronbach, L.J. & Meehl, P.E. (1955) Construct validation in psychological tests. *Psychological Bulletin*, *52*, 281-302.

Curry, S. L., Fuss, S. W., Johnsen, D. C., & DiSantis, T. A. (1988). The role of coping in children's adjustment to the dental visit. *Journal of Dentistry for Children, 55*, 231-236.

Curry, S. L., & Russ, S. W. (1985). Identifying Coping Strategies in Children. *Journal of Clinical Child Psychology, 14*(1), 61-69.

Dahlquist, L. M., Pendley, J. S., Landthrip, D. S., Jones, C. L., & Steuber, C. P. (2002). Distraction intervention for preschoolers undergoing intramuscular injections and subcutaneous port access. *Health Psychology, 21*(1), 94-99.

Davey, G. C. L., & Levy, S. (1999). Internal statements associated with catastrophic worrying. *Personality and Individual Differences, 26*(1), 21-32.

David, M., Edwards, R., & Alldred, P. (2001). Children and school-based research: "Informed consent" or "educated consent"? *British Educational Research Journal, 27*(3), 347-365.

DeMore, M., & Cohen, L. L. (2005). Distraction for pediatric immunization pain: A critical review. *Journal of Clinical Psychology in Medical Settings, 12*(4), 281-291.

Dill, J. R. (1978). *Child psychology in contemporary society*. Boston: Holbrook Press.

Dumas, J. E., Rollock, D., Prinz, R. J., Hops, H., & Blechman, E. A. (1999). Cultural sensitivity: Problems and solutions in applied and preventive intervention. *Applied & Preventive Psychology, 8*(3), 175-196.

Ebata, A. T., & Moos, R. H. (1991). Coping and adjustment in distressed and healthy adolescents. *Journal of Applied Developmental Psychology, 12*(1), 33-54.

Ellis, J., Sharp, D., Newhook, K., & Cohen, J. (2004). Selling comfort: a survey of interventions for needle procedures in a pediatric hospital. *Pain Management and Nursing, 5(4),* 144-152.

Endler, N. S., & Parker, J. D. (1990). Multidimensional assessment of coping: A critical evaluation. *Journal of Personality & Social Psychology, 58*(5), 844-854.

Ey, S., Hadley, W., Allen, D. N., Palmer, S., Klosky, J., Deptula, D., et al. (2005). A new measure of children's optimism and pessimism: The youth life orientation test. *Journal of Child Psychology and Psychiatry, 46*(5), 548-558.

Fanurik, D., Zeltzer, L. K., Roberts, M. C., & Blount, R. L. (1993). The relationship between children's coping styles and psychological interventions for cold pressor pain. *Pain, 53*(2), 213-222.

Faustini, A., Spadea, T., Fano, V., Giorgi Rossi, P., Sangalli, M., Franco, E., et al. (2001). Factors associated with hepatitis B virus immunization coverage at the beginning of a population campaign in the Lazio region, Italy. *Preventive Medicine, 33*(5), 409-414.

Ferguson, E., & Cox, T. (1997). The Functional Dimensions of Coping scale: Theory, reliability and validity. *British Journal of Health Psychology, 2*(Part 2), 109-129.

Fields, L., & Prinz, R. J. (1997). Coping and adjustment during childhood and adolescence. *Clinical Psychology Review, 17*(8), 937-976.

Finset, A., Steine, S., Haugli, L., Steen, E., & Laerum, E. (2002). The Brief Approach/Avoidance Coping Questionnaire: Development and validation. *Psychology, Health & Medicine, 7*(1), 75-85.

Folkman, S. (1984). Personal control and stress and coping processes: A theoretical analysis. *Journal of Personality & Social Psychology, 46*(4), 839-852.

Folkman, S., & Lazarus, R. S. (1988). The relationship between coping and emotion: Implications for theory and research. *Social ScienceMedicine, 26*, 309-317.

Folkman, S., & Lazarus, R. S. (1991). Coping and emotion. In A. Monat & R. S. Lazarus (Eds.), *Stress and coping: An anthology* (3 ed., pp. 207-227). New York: Columbia University Press.

Folkman, S., Lazarus, R. S., Gruen, R. J., & DeLongis, A. (1986). Appraisal, coping, health status, and psychological symptoms. *Journal of Personality & Social Psychology, 50*(3), 571-579.

Folkman, S., Lazarus, R. S., Pimley, S., & Novacek, J. (1987). Age differences in stress and coping processes. *Psychology & Aging, 2*(2), 171-184.

Forsythe, C. J., & Compas, B. E. (1987). Interaction of cognitive appraisals of stressful events and coping: Testing the goodness of fit hypothesis. *Cognitive Therapy and Research, 11*, 473-485.

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*(1), 53-60.

Fredrikson, M., Annas, P., Fischer, H., & Wik, G. (1996). Gender and age differences in the prevalence of specific fears and phobias. *Behaviour Research & Therapy, 34*(1), 33-39.

Fundudis, T. (2003). Consent issues in medico-legal procedures: How competent are children to make their own decisions. *Child and Adolescent Mental Health, 8*(1), 18-22.

Gil, K. M., Thompson, R. J., Jr., Keith, B. R., Tota-Faucette, M., Noll, S., & Kinney, T. R. (1993). Sickle cell disease pain in children and adolescents: change in pain frequency and coping strategies over time. *Journal Of Pediatric Psychology, 18*(5), 621-637.

Gil, K. M., Thompson, R. J. J., Keith, B. R., Tota-Faucette, M., Noil, S., & Kinney, T. R. (1993). Sickle cell disease pain in children and adolescents: Change in pain frequency and coping strategies over time. *Journal of Pediatric Psychology, 18*(5), 621-637.

Gil, K. M., Williams, D. A., Thompson, R. J. J., & Kinney, T. R. (1991). Sickle cell disease in children and adolescents: The relation of child and parent pain coping strategies to adjustment. *Journal of Pediatric Psychology, 16*(5), 643-663.

Goodenough, B., Kampel, L., Champion, G.D., Laubreaux, L., Nicholas, M.K., Ziegler, J.B., McInerney, M. (1997). An investigation of the placebo effect and age-related factors in the report of needle pain from venipuncture in children. *Pain, 72(3),* 383-91.

Goodenough, B., Thomas, W., Champion, G., Perrott, D., Taplin, J. E., von Baeyer, C. L., et al. (1999). Unravelling age effects and sex differences in needle pain: Ratings of sensory intensity and unpleasantness of venipuncture pain by children and their parents. *Pain, 80*(1-2), 179-190.

Goodenough, B., Thomas, W., Champion, G. D., Perrott, D., Taplin, J. E., von-Baeyer, C. L., et al. (1999). Unravelling age effects and sex differences in needle pain: Ratings of sensory intensity and unpleasantness of venipuncture pain by children and their parents. *Pain, 80*(1-2), 179-190.

Gordon, E. W. (1983). Culture and ethnicity. In M. D. Levine, W. B. Carey, A. C. Crocker & R. T. Gross (Eds.), *Developmental-behavioral pediatrics* (pp. 187-192). Philadelphia: W.B. Saunders.

Gordon, E. W., Miller, E. S., & Rollock, D. (1990). Coping with communicentric bias in knowledge production in the social sciences. *Educational Researcher, 19*, 14-19.

Gorsuch, R. L. (1983). *Factor analysis* (2 ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Gracely, R. H. (1979). Psychophysical assessment of human pain. In J. J. Bonica & V. Ventafridda (Eds.), *Advances in pain research and therapy* (Vol. 3, pp. 805-824). New York: Raven.

Hallstrom, I. (2004). Parents' and children's involvement in decision-making during hospitalisation. *NT Research, 9*(4), 263-269.

Hamilton, J. G. (1995). Needle phobia: A neglected diagnosis. *Journal of Family Practice, 41*(2), 169-175.

Hanson, C. L. (1992). Developing systemic models of the adaptation of youths with diabetes. In A. M. La Greca, L. J. Siegel, J. L. Wallander & C. Walker (Eds.), *Stress and coping in child health* (pp. 212-234). New York: Guilford Press.

Harbeck, C., & Peterson, L. (1992). Elephants dancing in my head: A developmental approach to children's concepts of specific pain. *Child Development, 63*, 138-149.

Hermann, C., Hohmeiste, J., Zohsel, K., Ebinger, F., & Flor, H. (2007). The assessment of pain coping and pain-related cognitions in children and adolescents: current methods and further development. *The Journal of Pain, 8(10),* 802-813.

Hilgard, J., & LeBaron, S. (1982). Relief of anxiety and pain in children and adolescents with cancer: Quantitative measures and clinical observations. *International Journal of Clinical and Experimental Hypnosis, 30*, 417-442.

Hodgins, M. J., & Lander, J. (1997). Children's coping with venipuncture. *Journal of Pain & Symptom Management, 13*(5), 274-285.

Holmes, H. S. (1991). Options for painless local anesthesia. *Postgrad-Med, 89*(3), 71-72.

Howe, M., Courage, M. L., & Peterson, C. (1995). Intrusions in preschoolers' recall of traumatic childhood events. *Psychonomic Bulletin and Review, 2*(130-134).

Howell, D. C. (2002). *Statistical methods for psychology* (5 ed.). Pacific Grove, CA: Duxbury.

Hubert, N. C., Jay, S. M., Saltoun, M., & Hayes, M. (1988). Approach–avoidance and distress in children undergoing preparation for painful medical procedures. *Journal of Clinical Child Psychology, 17*, 194-202.

Humphrey, G. B., Boon, C. M., van-Linden-van-den-Heuvell, G. F., & van-de-Wiel, H. B. (1992). The occurrence of high levels of acute behavioral distress in children and adolescents undergoing routine venipunctures. *Pediatrics, 90*(1 Pt 1), 87-91.

Humphreys, L. G., Ilgen, D., McGrath, D., & Montanelli, R. (1969). Capitalization on chance in rotation of factors. *Educational and Psychological Measurement, 29*(2), 259-271.

Jacobson, R. M., Swan, A., Adegbenro, A., Ludington, S. L., Wollan, P. C., Poland, G. A., et al. (2001). Making vaccines more acceptable--methods to prevent and minimize pain and other common adverse events associated with vaccines. *Vaccine, 19*(17-19), 2418-2427.

Janson, S. L., Alioto, M. E., & Boushey, H. A. (2001). Attrition and retention of ethically diverse subjects in a multicenter randomized controlled research trial. *Controlled Clinical Trials, 22*, 236S–243S.

Jay, S. M., Elliott, C. H., Katz, E. R., & Siegel, S. E. (1987). Cognitive–behavioral and pharmacologic interventions for children's distress during painful medical procedures. *Journal of Consulting and Clinical Psychology, 55*, 860-865.

Jensen, M. P., & Karoly, P. (1991). Control Beliefs, Coping Efforts, and Adjustment to Chronic Pain*1, *2. *Journal of Consulting and Clinical Psychology, 59*(3), 431-438.

Jensen, M. P., Karoly, P., & Braver, S. (1986). The measurement of clinical pain intensity: A comparison of six methods. *Pain, 27*, 117-126.

Kister, M., & Patterson, C. (1980). Children's conceptions of the cause of illness: Understanding of contagion and use of imminent justice. *Child Development, 51*, 839-846.

Kleinknecht, R. A. (1987). Vasovagal syncope and blood/injury fear. *Behaviour Research and Therapy, 25*(3), 175-178.

Kleinknecht, R. A., & Lenz, J. (1989). Blood/injury fear, fainting and avoidance of medically-related situations: a family correspondence study. *Behaviour Research & Therapy, 27*(5), 537-547.

Kleinknecht, R. A., Thorndike, R. M., & Walls, M. M. (1996). Factorial dimensions and correlates of blood, injury, injection and related medical fears: cross validation of the medical fear survey. *Behaviour Research and Therapy, 34*(4), 323-331.

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.

Kuther, T. L. (2003). Medical decision-making and minors: Issues of consent and assent. *Adolescence Vol 38(150) Sum 2003, 343-358*.

Lander, J., Hodgins, M., & Fowler-Kerry, S. (1992). Children's pain predictions and memories. *Behaviour Research and Therapy, 30*(2), 117-124.

Lapouse, R., & Monk, M. A. (1959). Fears and worries in a representative sample of children. *American Journal of Orthopsychiatry, 29*, 803-818.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.

Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality, 1*(3, Spec Issue), 141-169.

Lazarus, R. S., & Folkman, S. (1991). The concept of coping. In A. Monat & R. S. Lazarus (Eds.), *Stress and coping: An anthology* (3 ed., pp. 189-206). New York: Columbia University Press.

LEAD Technologies Inc. (2004). Statistics Package for the Social Sciences (Version 13): SPSS Inc.

Linton, L. S., Peddecord, K. M., Seidman, R. L., Edwards, C., Ross, S., Gustafson, K., et al. (2003). Implementing a seventh grade vaccination law: school factors associated with completion of required immunizations. *Preventive Medicine, 36*(4), 510-517.

Lu, Q., Tsao, J. C. I., Myers, C. D., Kim, S. C., & Zeltzer, L. K. (2007). Coping predictors of children's laboratory-induced pain tolerance, intensity, and unpleasantness. *The Journal of Pain, 8*(9), 708-717.

Lynch, A. M., Kashikar-Zuck, S., Goldschneider, K. R., & Jones, B. A. (2006). Psychosocial risks for disability in children with chronic back pain. *The Journal of Pain, 7*(4), 244-251.

Lyne, K., & Roger, D. (2000). A psychometric re-assessment of the COPE questionnaire. *Personality & Individual Differences, 29*(2), 321-335.

Maccoby, E. E. (1983). Social-emotional development and response to stressor. In N. Garmezy & M. Rutter (Eds.), *Stress, coping, and development in children* (pp. 217-234). New York: McGraw-Hill.

MacLaren, J. E., & Cohen, L. L. (2005). A comparison of distraction strategies for venipuncture distress in children. *Journal of Pediatric Psychology, 30*, 387-396.

Maddux, J. E., Roberts, M. C., Sledden, E. A., & Wright, L. (1986). Developmental issues in child health psychology. *American Psychologist, 41*, 25-34.

Manne, S. L., Jacobsen, P. B., & Redd, W. H. (1992). Assessment of acute pediatric pain: do child self-report, parent ratings, and nurse ratings measure the same phenomenon? *Pain, 48*(1), 45-52.

Marks, I. M. (1969). *Fears and phobias*. New York: Oxford University Press.

Marks, I. M. (1988). Blood-injury phobia: a review. *American Journal of Psychiatry, 145*(10), 1207-1213.

Mason, S., Johnson, M. H., & Woolley, C. (1999). A comparison of distractors for controlling distress in young children during medical procedures. *Journal of Clinical Psychology in Medical Settings, 6*, 239-248.

Mast, E. E., Williams, I. T., Alter, M. J., & Margolis, H. S. (1998). Hepatitis B vaccination of adolescent and adult high-risk groups in the United States. *Vaccine, 16*(Supplement 1), S27-S29.

McCabe, M. A. (1996). Involving children and adolescents in medical decision making: Developmental and clinical considerations. *Journal of Pediatric Psychology, 21*(4), 505-516.

McCormick, J. (2008). Comparison of Pain Intensity Ratings between the Numerical Rating Scale and Visual Analogue Scale in Children and Adolescents. Unpublished Honours' Thesis, University of Saskatchewan, 2008.

McGrath, P., Hsu, E., Cappelli, M., Luke, B., & et al. (1990). Pain from pediatric cancer: A survey of an outpatient oncology clinic. *Journal of Psychosocial Oncology, 8*(2-3), 109-124.

McWha, L., MacArthur, A., Badiani, T., Schouten, H., Tam, T., & King, A. (2004). Measuring up: results from the National Immunization Coverage Survey, 2002. *Canada Communicable Disease Report = Releve des Maladies Transmissibles au Canada, 30*(5), 37-50.

Melamed, B. G., & Siegel, L. J. (1975). Reduction of anxiety in children facing hospitalization and surgery by use of filmed modeling. *Journal of Consulting and Clinical Psychology, 43*, 511-521.

Melzack, R., & Wall, P. D. (1965). Pain mechanisms: a new theory. *Science, 150*(699), 971-979.

Merckelbach, H., de Jong, P. J., Muris, P., & van den Hout, M. A. (1996). The etiology of specific phobias: A review. *Clinical Psychology Review, 16*(4), 337-361.

Merritt, K. A., Ornstein, P. A., & Spicker, B. (1994). Children's memory for a salient medical procedure: implications for testimony. *Pediatrics, 94*(1), 17-23.

Merskey, H., & Bogduk, N. (1994). *Classification of Chronic Pain: Descriptions of Chronic Pain Syndromes and Definition of Pain Terms* (2 ed.). Seattle: IASP Press.

Miller, S. M. (1987). Monitoring and blunting: Validation of a questionnaire to assess styles of information seeking under threat. *Journal of Personality and Social Psychology, 52*, 345-353.

Miller, S. M., Brody, D. S., & Summerton, J. (1988). Styles of coping with threat: Implications for health. *Journal of Social Psychology, 54*, 142-148.

Mischel, H. N., & Mischel, W. (1983). The development of children's knowledge of self-control strategies. *Child Development, 54*, 603-609.

Mischel, W., Shoda, Y., & Rodriguez, M. I. (1989). Delay of gratification in children. *Science, 244*(4907), 933-938.

Moos, R. H. (1997). Coping Responses Inventory: A measure of approach and avoidance coping skills. In C. P. Zalaquett & R. J. Wood (Eds.), *Evaluating stress: A book of resources* (pp. 51-65). Lanham, MD: Scarecrow Education.

Moos, R. H., & Billings, A. G. (1983). Conceptualization and measuring coping resources and processes. In I. Goldberg & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects*. New York: Free Press.

National Vaccine Advisory Committee. (1999). Strategies to Sustain Success in Childhood Immunizations. *JAMA, 282*(4), 363-370.

Norton, P. J., & Asmundson, G. J. (2004). Anxiety sensitivity, fear, and avoidance behavior in headache pain. *Pain, 111*(1-2), 218-223.

Nunnally, J. C. (1978). *Psychometric theory* (2 ed.). New York: McGraw-Hill.

Ollendick, T. H., King, N. J., & Muris, P. (2002). Fears and phobias in children: Phenomenology, epidemiology, and aetiology. *Child & Adolescent Mental Health, 7*(3), 98-106.

Olshen, E., Mahon, B. E., Wang, S., & Woods, E. R. (2007). The impact of state policies on vaccine coverage by age 13 in an insured population. *Journal of Adolescent Health, 40*(5), 405-411.

Ornstein, P. A., Manning, E. L., & Pelphrey, K. A. (1999). Children's memory for pain. *Journal of Developmental & Behavioral Pediatrics, 20*(4), 262-277.

Ost, L. G., Lindahl, I. L., Sterner, U., & Jerremalm, A. (1984). Exposure in vivo vs. applied relaxation in the treatment of blood phobia. *Behaviour Research & Therapy, 22*(3), 205-216.

Ost, L. G., Sterner, U., & Lindahl, I. L. (1984). Physiological responses in blood phobics. *Behaviour Research & Therapy, 22*(2), 109-117.

Page, A. C. (1994). Blood-injury phobia. *Clinical Psychology Review, 14*(5), 443-461.

Pate, J. T., Blount, R. L., Cohen, L. L., & Smith, A. J. (1996). Childhood medical experience and temperament as predictors of adult functioning in medical situations. *Children's Health Care, 25*(4), 281-298.

Patrick, D., Bigham, M., Ng, H., White, R., Tweed, A., & Skowronski, D. M. (2003). Elimination of acute hepatitis B among adolescents after one decade of an immunization

program targeting Grade 6 students. *Pediatric Infectious Disease Journal, 22*(10), 874-877.

Pearlin, L. I., & Schooler, C. (1978). The structure of coping. *Journal of Health and Social Behavior, 19*, 2-21.

Peterson, L. (1989). Coping by children undergoing stressful medical procedures: Some conceptual, methodological, and therapeutic issues. *Journal of Consulting and Clinical Psychology, 57*, 380-387.

Peterson, L., Crowson, J., Saldana, L., & Holdridge, S. (1999). Of needles and skinned knees: children's coping with medical procedures and minor injuries for self and other. *Health Psychology, 18*(2), 197-200.

Peterson, L., & Toler, S. M. (1986). An information seeking disposition in child surgery patients. *Health Psychology, 5*(4), 343-358.

Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2003). *Making sense of factor analysis: The use of factor analysis for instrument development in health care research*. Thousand Oaks, CA: Sage Publications, Inc.

Phipps, S., Fairclough, D., Tye, V., & Mulhern, R. K. (1998). Assessment of coping with invasive procedures in children with cancer: State-trait and approach-avoidance dimensions. *Children's Health Care, 27*(3), 147-156.

Piaget, J. (1930). *The child's conception of physical causality*. London: Kegan Paul, Trench, Trebner.

Popper, K. (1992). Simplicity. In *The Logic of Scientific Discovery* (2 ed., pp. 121-132). London: Routledge.

Pringle, B., Hilley, L., Gelfand, K., Dahlquist, L. M., Switkin, M., Diver, T., et al. (2001). Decreasing child distress during needle sticks and maintaining treatment gains over time. *Journal of Clinical Psychology in Medical Settings, 8*(2), 119-130.

Pruitt, R. H., Kline, P. M., & Kovaz, R. B. (1995). Perceived barriers to childhood immunization among rural populations. *Journal of Community Health Nursing, 12*(2), 65-72.

Reid, G. J., Dubow, E. F., & Carey, T. C. (1995). Developmental and situational differences in coping among children and adolescents with diabetes. *Journal of Applied Developmental Psychology, 16*(4), 529-554.

Reid, G. J., Gilbert, C. A., & McGrath, P. J. (1998). The Pain Coping Questionnaire: Preliminary validation. *Pain, 76*(1-2), 83-96.

Ritchie, J. A., Caty, S., Ellerton, M., & Arklie, M. M. (1990). Descriptions of preschoolers' coping with fingerpicks from a transactional model. *Behavioral Assessment, 12*(2), 212-222.

Rocha, E. M. (2004). Children's memories of dental procedures: Effects of individual differences, question type and temporal delay (Doctoral dissertation, University of Saskatchewan, 2004). *Dissertation Abstracts International: Section B: The Sciences and Engineering*, NQ90557.

Roder, I., Boekaerts, M., & Kroonenberg, P. M. (2002). The Stress and Coping Questionnaire for Children (School version and Asthma version): Construction, factor structure and psychometric properties. *Psychological Reports, 91*(1), 29-36.

Rodríguez-Fernández, J. L. (1999). Ockham's Razor. *Endeavour, 23*, 121–125.

Ropero, A. M., Danovaro-Holliday, M. C., & Andrus, J. K. (2005). Progress in vaccination against hepatitis B in the Americas. *Journal of Clinical Virology, 34*(Suppl 2), S14-19.

Routh, D.K. & Sanfilippo, M.C. (1991). Helping children cope with painful medical procedures. In J. P. Bush & S. W. Harkins (Eds.), *Children in pain: Clinical and research issues from a developmental perspective*. New York, NY, US: Springer-Verlag Publishing.

Rossman, B. B. R. (1992). School-age children's perceptions of coping with distress: Strategies for emotion regulation and the moderation of adjustment. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 33*(8), 1373-1397.

Roth, S., & Cohen, L. J. (1986). Approach, avoidance, and coping with stress. *American Psychologist, 41*(7), 813-819.

Rudolph, K. D., Dennig, M. D., & Weisz, J. R. (1995). Determinants and consequences of children's coping in the medical setting: conceptualization, review, and critique. *Psychological Bulletin, 118*(3), 328-357.

Russell, F., Carapetis, J., Liddle, H., Edwards, T., Ruff, T., & Devitt, J. (2005). A pilot study of the quality of informed consent materials for Aboriginal participants in clinical trials. *Journal of Medical Ethics, 31*(8), 490-494.

Rutherford, A., & Endler, N. S. (1999). Predicting approach - avoidance: The roles of coping styles, state anxiety, and situational appraisal. *Anxiety, Stress & Coping: An International Journal, 12*(1), 63-84.

Ryan, N. M. (1989). Stress-coping strategies identified from school-age children's perspective. *Research in Nursing & Health, 12*(2), 111-122.

Ryan-Wenger, N. M. (1990). Developmental and psychometric properties of the schoolagers' coping strategies inventory. *Nursing Research, 39*(344-349).

Schechter, N. L., Zempsky, W. T., Cohen, L. L., McGrath, P. J., McMurtry, C. M., & Bright, N. S. (2007). Pain Reduction During Pediatric Immunizations: Evidence-Based Review and Recommendations. *Pediatrics, 119*(5), e1184-1198.

Scheier, M. F., & Carver, C. S. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research, 16*(2), 201-228.

Scheier, M. F., & Carver, C. S. (1993). On the power of positive thinking: The benefits of being optimistic. *Current Directions in Psychological Science, 2*(1), 26-30.

Scheier, M. F., & Carver, C. S. (2003). Self-regulatory processes and responses to health threats: Effects of optimism on well-being. In J. Suls & K. A. Wallston (Eds.), *Social psychological foundations of health and illness* (pp. 395-428). Malden, MA, US: Blackwell Publishing.

Shavers-Hornaday, V. L., Lynch, C. F., Burnmeister, L. F., & Torner, J. C. (1997). Why are African Americans under-represented in medical research studies? Impediments to participation. 2 (1–2): 31–45. *Ethnicity and Health, 2*(1-2), 31-45.

Siegel, L. J. (1983). Hospitalization and medical care of children. In E. Walker & M. Roberts (Eds.), *Handbook of clinical child psychology* (pp. 1089–1108). New York: Wiley.

Siegel, L. J., & Smith, K. E. (1989). Children's strategies for coping with pain. *Pediatrician, 16*(1-2), 110-118.

Sinclair, V. G. (2001). Predictors of pain catastrophizing in women with rheumatoid arthritis. *Archives of Psychiatric Nursing, 15*(6), 279-288.

Slifer, K. J., Tucker, C. L., & Dahlquist, L. M. (2002). Helping children and caregivers cope with repeated invasive procedures: How are we doing? *Journal of Clinical Psychology in Medical Settings, 9*(2), 131-152.

Slonim, A. B., Roberto, A. J., Downing, C. R., Adams, I. F., Fasano, N. J., Davis-Satterla, L., et al. (2005). Adolescents' knowledge, beliefs, and behaviors regarding hepatitis B: Insights and implications for programs targeting vaccine-preventable diseases. *Journal of Adolescent Health, 36*(3), 178-186.

Smith, K. E., Ackerson, J. D., & Blotcky, A. D. (1989). Reducing distress during invasive medical procedures: relating behavioral interventions to preferred coping style in pediatric cancer patients. *Journal of Pediatric Psychology, 14*(3), 405-419.

Sober, E. (1975). *Simplicity*. Oxford: Oxford University Press.

Sober, E. (1981). The Principle of Parsimony. *British Journal for the Philosophy of Science, 32*, 145–156.

Spirito, A., Stark, L. J., Grace, N., & Stamoulis, D. (1991). Common problems and coping strategies reported in childhood and early adolescence. *Journal of Youth & Adolescence, 20*(5), 531-544.

Spirito, A., Stark, L. J., & Tyc, V. L. (1994). Stressors and coping strategies described during hospitalization by chronically ill children. *Journal of Clinical Child Psychology, 23*(3), 314-322.

Spirito, A., Stark, L. J., & Williams, C. (1988). Development of a brief coping checklist for use with pediatric populations. *Journal of Pediatric Psychology, 13*(4), 555-574.

Stevens, M. J. (1989). Coping strategies of hospitalized adolescents. *Children's Health Care, 18*(3), 163-169.

Stevens, M. J. (1991-2). Interaction of coping style and cognitive strategies in the management of acute pain. *Imagination, Cognition & Personality, 11*(3), 225-232.

Stevens, M. J., Pfost, K. S., & Rapp, B. J. (1987). Modifying acute pain by matching cognitive style with cognitive treatment. *Perceptual & Motor Skills, 65*(3), 919-924.

Stevens, M. J., & Terner, J. L. (1992-3). Moderators of cognitive coping derived from attentional and parallel processing models of pain. *Imagination, Cognition & Personality, 12*(4), 341-353.

Stipek, D. J., Lamb, M. E., & Zigler, E. F. (1981). OPTI: A measure of children's optimism. *Educational and Psychological Measurement, 41*(1), 131-143.

Suls, J., & Fletcher, B. (1985). The relative efficacy of avoidant and nonavoidant coping strategies: a meta-analysis. *Health Psychology, 4*(3), 249-288.

Tabachnick, B., & Fidell, L. (2001). *Using Multivariate Statistics* (4 ed.). New York: HarperCollins College Publishers.

Tarrant, M., & Gregory, D. (2003). Exploring childhood immunization uptake with First Nations mothers in north-western Ontario, Canada. *Journal of Advanced Nursing, 41*(1), 63-72.

Thurston, C., & Church, J. (2001). Involving children and families in decision-making about health. In P. Foley, J. Roche & S. Tucker (Eds.), *Children in society: Contemporary theory, policy and practice.* (pp. 224-229). Buckingham, England: Open University Press.

Tobin, D. L., Holroyd, K. A., Reynolds, R. V., & Wigal, J. K. (1989). The hierarchical factor structure of the Coping Strategies Inventory. *Cognitive Therapy & Research, 13*(4), 343-361.

van den Bree, M. B. M., Passchier, J., & Emmen, H. H. (1990). Influence of quality of life and stress coping behaviour on headaches in adolescent male students: an explorative study. *Headache, 30*, 165–168.

von Baeyer, C. L., Marche, T. A., Rocha, E. M., & Salmon, K. (2004). Children's memory for pain: Overview and implications for practice. *The Journal of Pain, 5*(5), 241-249.

von Baeyer, C. L., Piira, T., Chambers, C. T., Trapanotto, M., & Zeltzer, L. K. (2005). Guidelines for the Cold Pressor Task as an experimental pain stimulus for use with children. *The Journal of Pain, 6*(4), 218-227.

Weinstein, P. (1990). Breaking the worldwide cycle of pain, fear, and avoidance: Uncovering risk factors and promoting prevention for children. *Annals of Behavioral Medicine, 12*(4), 141-147.

Weisz, J. R. (1990). Development of control-related beliefs, goals, and styles in childhood and adolescence: A clinical perspective. In J. Rodin, C. Schooler & K. Schaie (Eds.), *Self-directedness: Cause and effects throughout the life course* (pp. 103-145). Hillsdale, NJ: Erlbaum.

Weisz, J. R., McCabe, M., & Dennig, M. D. (1994). Primary and secondary control among children undergoing medical procedures: Adjustment as a function of coping style. *Journal of Consulting and Clinical Psychology, 62*, 324-332.

Wertleib, D., Weigel, C., & Feldstein, M. (1987). Measuring children's coping. *American Journal of Orthopsychiatry, 57*, 548-560.

Wickramasekera, I. (1986). A model of people at high risk to develop chronic stress-related somatic symptoms: Some predictions. *Professional Psychology: Research and Practice, 17*(5), 437-447.

Wiederhold, B. K., & Wiederhold, M. D. (2005). Fear of Medical Procedures. In B. K. Wiederhold & M. D. Wiederhold (Eds.), *Virtual reality therapy for anxiety disorders: Advances in evaluation and treatment* (pp. 181-188). Washington, DC, US: American Psychological Association.

Worchel, F. F., Copeland, D. R., & Barker, D. G. (1987). Control-related coping strategies in pediatric oncology patients. *Journal of Pediatric Psychology, 12*, 25-38.

Yinger, J. M. (1985). Ethnicity. *Annual Review of Sociology, 11*, 151-180.

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

Zonneveld, L. N. L., McGrath, P. J., Reid, G. J., & Sorbi, M. J. (1997). Accuracy of children's pain memories. *Pain, 71*(3), 297-302.

List of Appendices

Appendix A

Coping with Needles Questionnaire for Children (CNQ)

Below is a list of statements that show what children and adolescents might *think*, *feel* or *do* before or during a needle or immunization. Select one option for each statement depending on how much each one is like or unlike your experience by rating them from 1 = Very **unlike** me to 5 = Very **like** me.

Statements	**Very unlike me**	**Somewhat unlike me**	**Neither like or unlike me**	**Somewhat like me**	**Very like me**
1. I watch the needle go in	1	2	3	4	5
2. I try to make my mind go blank	1	2	3	4	5
3. I think that nothing will help	1	2	3	4	5
4. I say mean things to people	1	2	3	4	5
5. I remain calm and get through it	1	2	3	4	5
6. I relax my arm and/or body so the needle won't hurt as much	1	2	3	4	5
7. I keep thinking the needle will hurt a lot	1	2	3	4	5
8. I focus on the situation to see how I can make it better	1	2	3	4	5
9. I curse or swear out loud	1	2	3	4	5
10. I cooperate with the nurse	1	2	3	4	5
11. I convince myself it is not going to hurt	1	2	3	4	5
12. I ask the nurse what might help me get through it	1	2	3	4	5
13. I try and get out of it	1	2	3	4	5
14. I look away when the needle goes in	1	2	3	4	5
15. I think about what needs to be done to make the needle go better	1	2	3	4	5
16. I tell myself it will be okay	1	2	3	4	5
17. I count in my head	1	2	3	4	5
18. I talk to an adult about how I feel	1	2	3	4	5
19. I imagine the nurse or needle is something different	1	2	3	4	5

Select one option for each statement depending on how much each one is like or unlike your experience by rating them from 1 = Very **unlike** me to 5 = Very **like** me.

Statements	Very unlike me	Somewhat unlike me	Neither like or unlike me	Somewhat like me	Very like me
20. I watch the nurse get ready	1	2	3	4	5
21. I imagine being somewhere else	1	2	3	4	5
22. I yell to let off steam	1	2	3	4	5
23. I give myself a pep talk	1	2	3	4	5
24. I tell myself the next one will go better	1	2	3	4	5
25. I trust the nurse knows what she is doing	1	2	3	4	5
26. I talk to a friend about how I feel	1	2	3	4	5
27. I worry too much about the needle	1	2	3	4	5
28. I imagine doing something else	1	2	3	4	5
29. I try to think of different ways to make the needle go better	1	2	3	4	5
30. I try to be brave	1	2	3	4	5
31. I try and think about the positive things about getting immunized	1	2	3	4	5
32. I tell myself it's not so bad	1	2	3	4	5
33. I tell the nurse what I want him/her to do	1	2	3	4	5
34. I cry	1	2	3	4	5
35. I look for comfort from someone or something around me	1	2	3	4	5
36. I look away from the needle when it goes in	1	2	3	4	5
37. I ask the nurse questions	1	2	3	4	5
38. I tell myself I can handle it	1	2	3	4	5
39. I pray	1	2	3	4	5

Select one option for each statement depending on how much each one is like or unlike your experience by rating them from 1 = Very **unlike** me to 5 = Very **like** me.

Statements	**Very unlike me**	**Somewhat unlike me**	**Neither like or unlike me**	**Somewhat like me**	**Very like me**
40. I take deep breaths	1	2	3	4	5
41. I remind myself why I have to get immunized	1	2	3	4	5
42. I tell the nurse which arm is better	1	2	3	4	5

A. Can you think of anything else you do or think about when you get a needle that we didn't put in the questionnaire?

_____

_____

_____

B. Did you have an immunization this school year? Yes _____ No _____

C. How scared are you of needles?

Not at all scared Extremely scared

1 2 3 4 5 6 7 8 9 10

D. Can you think of one thing that is good about getting immunized?

_____

_____

_____

Thank you for filling out our questionnaire!

Appendix B

Consent form

Testing a new questionnaire that measures children's coping with needles

You are invited to participate in a study on children's coping with immunization pain. Please read this form carefully with your child.

Purpose and Procedure: We are developing a questionnaire to measure children's coping with needle procedures. If your child received a hepatitis B immunization this year, they are eligible to fill out our new questionnaire. The questionnaire asks children to rate how much (1 = very unlike me to 5 = very like me) each of 42 statements reflects how they coped with a needle. It takes about 5 minutes to complete the questionnaire.

Potential Risks and Benefits: There are no known risks involved in participating. The completed coping questionnaire will be posted on our research website (see below).

Confidentiality: Your child's name will not appear on any materials connected with this study except this consent form. If we use your data in a report of this research, we will not use your child's name or tell anything else about you.

Right to Withdraw: You and your child may withdraw from the study for any reason, at any time, without consequence. If you withdraw from the study at any time, any data that you have contributed will be destroyed.

Questions: If you have any questions concerning the study, please feel free to ask at any point; you are also free to contact the researchers at the numbers provided below if you have questions at a later time. This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Sciences Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (966-2084).

Consent to Participate: I have read and understood the description provided above. I consent to have my child participate in the study described above, understanding that he/she may withdraw this consent at any time.

_____ _____

(Signature of Parent) (Signature of Child)

_____

(Date)

Feedback: When the study is completed, a summary of the results will be posted on our website: www.usask.ca/childpain

If you would like the researchers to mail you information about the results of the study after it is finished, please fill out your mailing address or email address here:

_____

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Appendix C

Table A1. Study 1 Means, Standard Deviations, and Sample Size as a Function of Gender and Problem- versus Emotion-focused Coping

		Problem-focused			Emotion-focused		
		M	*SD*	*n*	*M*	*SD*	*n*
Gender	Male	2.654	0.654	45	1.849	0.752	45
	Female	3.019	0.809	58	2.649	0.913	58
	Missing	2.757	0.945	42	2.167	0.965	42

Table A2. Study 1 Means, Standard Deviations, and Sample Size as a Function of Gender and Positive Self-Statements, Emotion-focused, and Cognitive Distraction Coping

		Positive Self-statements			Emotion-focused			Cognitive Distraction		
		M	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*
Gender	Male	1.864	0.679	45	3.362	0.858	45	2.167	0.812	45
	Female	3.798	0.888	58	2.670	0.876	58	2.458	0.962	58
	Missing	3.415	1.042	42	2.145	0.968	42	2.223	1.034	42

Table A3. Study 2 Means, Standard Deviations, and Sample Size as a Function of Gender and Problem- versus Emotion-focused Coping

		Problem-focused			Emotion-focused		
		M	*SD*	*n*	*M*	*SD*	*n*
Gender	Male	2.372	0.810	118	1.817	0.727	118
	Female	2.717	0.747	183	2.54	0.914	183

Table A4. Study 2 Means, Standard Deviations, and Sample Size as a Function of Gender and Positive Self-Statements, Emotion-focused, and Cognitive Distraction Coping

		Positive Self-statements			Emotion-focused			Cognitive Distraction		
		M	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*
Gender	Male	2.769	1.015	118	1.817	0.727	118	1.974	0.790	118
	Female	3.163	0.941	183	2.541	0.914	183	2.271	0.784	183

Table A5. Study 3 Means, Standard Deviations, and Sample Size as a Function of Gender and Problem- versus Emotion-focused Coping for Time 1

		Problem-focused			Emotion-focused		
		M	*SD*	*n*	*M*	*SD*	*n*
Gender	Male	3.282	0.719	51	2.616	0.907	51
	Female	2.648	0.945	27	1.804	0.701	27

Table A6. Study 3 Means, Standard Deviations, and Sample Size as a Function of Gender and Problem- versus Emotion-focused Coping for Time 2

		Problem-focused			Emotion-focused		
		M	*SD*	*n*	*M*	*SD*	*n*
Gender	Male	2.372	0.810	118	1.817	0.727	118
	Female	2.717	0.747	183	2.541	0.914	183

How You Deal with Medical Needles

I. What age are you? ☐ **years old.**

II. For these questions, check one box:

1. **Male** ☐ **Female** ☐

2. **How long ago was your last needle?**

Less than 1 month ☐ **Less than 1 year** ☐ **Over 1 year ago** ☐ **Can't remember** ☐

III. For these questions make a mark on the line to show how you feel

1. How well do you think you deal with needles?

Not at all well ——— Very well

---

2. How nervous do you get before a needle?

Not at all nervous ——— Very nervous

---

3. How much do you think needles hurt?

Not at all ——— Very much

---

4. How scared are you of needles?

Not at all scared ——— Very scared

Read the instructions below:

Below is a list of sentences that show what children and adolescents might *think*, *feel* or *do* before or during a needle. Select one option for each sentence depending on how much each one is like or unlike you by rating them from 1 = Very **unlike** me to 5 = Very **like** me.

Statements	Very unlike me	Somewhat unlike me	Neither like or unlike me	Somewhat like me	Very like me
1. I try to make my mind go blank	1	2	3	4	5
2. I keep thinking the needle will hurt a lot	1	2	3	4	5
3. I tell myself it will be okay	1	2	3	4	5
4. I count in my head	1	2	3	4	5
5. I imagine being somewhere else	1	2	3	4	5
6. I tell myself the next one will go better	1	2	3	4	5
7. I talk to a friend about how I feel	1	2	3	4	5
8. I worry too much about the needle	1	2	3	4	5
9. I imagine doing something else	1	2	3	4	5
10. I try to think of different ways to make the needle go better	1	2	3	4	5
11. I try to be brave	1	2	3	4	5
12. I try to think about the positive things about getting a needle	1	2	3	4	5
13. I don't think about it	1	2	3	4	5
14. I get a headache	1	2	3	4	5
15. I cry	1	2	3	4	5
16. I look for comfort from someone or something around me	1	2	3	4	5
17. I tell myself I can handle it	1	2	3	4	5

Statements	Very unlike me	Somewhat unlike me	Neither like or unlike me	Somewhat like me	Very like me
18. I pray	1	2	3	4	5
19. I imagine the nurse or needle is something different	1	2	3	4	5
20. I remind myself why I have to get a needle	1	2	3	4	5
21. I talk to the nurse	1	2	3	4	5
22. I focus on something else	1	2	3	4	5
23. I tell myself it's not so bad	1	2	3	4	5
24. I don't look	1	2	3	4	5
25. I feel dizzy	1	2	3	4	5
26. I take deep breaths	1	2	3	4	5
27. Other: _____	1	2	3	4	5

IV. Can you think of <u>one good thing</u> about getting a needle? _____

_____

That's the end.

Thanks for helping!

Appendix E

UNIVERSITY OF SASKATCHEWAN

Department of Psychology

9 Campus Drive
Saskatoon, SK S7N 5A5

<date>

Dear <Principal>,

Re: Request to conduct research at <School> School
"Development of a questionnaire to assess coping in children and adolescents"

My name is Lara Spagrud and I am a graduate student in the Department Psychology at the UofS. <Administrator> of the <Division> Division has approved my research and I am contacting you to determine whether or not your school would like to participate.

I am conducting a questionnaire-based study to determine what kinds of coping are helpful and unhelpful for children and adolescents when they get needles. However, **no needles are given as part of the study.** We simply ask students to recall a time they had a needle or to imagine how they would cope with one. Last year, we ran a pilot study with grade 6 students. This year we are expanding our target age range to include students between grades 6 and 12. It is hoped that the questionnaire and the results of this study will be useful in future studies for identifying children that might need help dealing with needles. This project was approved by the University Research Ethics Board (Beh-REB#04-179), as well as by <Administrator>.

Here is what the **research involves**:

Consent forms will be sent to your school to be distributed to students. Following the UofS Research Ethics Board guidelines, only students with parental consent will be invited to participate in the study. The students themselves will also have the opportunity to decide if they want to participate or not on the day of data collection. Participating students will complete a self-report questionnaire that asks about their experience with needles and what they have done in the past to deal with them. The questionnaire is three pages long. In a previous study, it took 11- and 12-year-olds 5 to 10 minutes to complete it. It also takes about 5 minutes to introduce the questionnaires and to collect them back from the students.

Here is the typical procedure for **schools**:

1) I will organize and send out packages of consent forms to teachers who agree to have their classes participate in this study. To aid me in this process, I ask that schools contact me with a list of participating teachers, the grade(s) that they teach, and the number of students in their classes. The questionnaire is anonymous, so I will not need a list of student names.

2) Once you receive the consent forms, please distribute them as soon as possible. We will invite students to participate only after they receive permission from their parents.

3) Once consent forms are returned, I ask for teachers to contact me with the number that they received back so that I can send out the appropriate number of questionnaires.

4) We send the questionnaires and instructions out to schools so that students can complete them at their teachers' convenience. I also include postage paid envelopes so that once the questionnaires are completed, the teachers can send them and the signed consent forms back to me.

5) We hope to collect data during the months of February and March.

I would be happy to answer any questions or concerns you might have about the research. I look forward to hearing from you soon.

Thank you very much for considering this request.

Sincerely,

Lara J. Spagrud, BA(Hon)
Doctoral Student in Clinical Psychology
Phone: 966-2039
E-mail: lara.spagrud@usask.ca
University of Saskatchewan

Carl L. von Baeyer, PhD
Research Supervisor
Professor of Psychology &
Associate Member in Pediatrics
University of Saskatchewan

Appendix F

Dear <Principal>,

Re: Request to conduct research

“Development of a questionnaire to assess coping in children and adolescents”

My name is Lara Spagrud and I am a graduate student in the Department Psychology at the UofS. I am contacting you because <Administrator> of the <Division> Division has informed me that your school might be interested in accommodating my research this semester.

I am conducting a study to determine what kinds of coping are helpful and unhelpful for children when they get needles. This study is targeted at students between grades 4 and 12. It is hoped that the questionnaire and the results of this study will be useful in future studies for identifying children that might need help dealing with needles. This project was approved by the University Research Ethics Board (Beh-REB#04-179), as well as by <Administrator>.

Here is what the **research involves**:

Consent forms will be sent to your school to be distributed to students. Following the UofS Research Ethics Board guidelines, only students with parental consent will be invited to participate in the study. The students themselves will also have the opportunity to decide if they want to participate or not on the day of data collection. Participating students will complete a self-report questionnaire that asks about their experience with needles and what they have done in the past to deal with them. The questionnaire is just under three pages long and takes between 5 and 10 minutes for 11- and 12-year-olds to complete. It also takes about 5 minutes to introduce the questionnaires and to collect them back from the students. Therefore, I typically arrange to come into classrooms for approximately 15 minutes. These appointments are made at the schools’ convenience.

Here is the typical procedure for **schools**:

1) I will organize and send out packages of consent forms to teachers who agree to have their classes participate in this study. To aid me in this process, I ask that schools contact me with a list of participating teachers, the grade(s) they teach, and the number of students in their class. The questionnaire is anonymous, so I will not need a list of student names.

2) Once you receive the consent forms, please distribute them as soon as possible. We will invite students to participate only after they receive permission from their parents.

3) Once consent forms are returned, I will need to collect them. There are two ways that we can administer the questionnaire and collect the consent forms:
a. A research assistant can travel to your school to administer the questionnaire and collect consent forms in individual classrooms; or

b. We can send the questionnaires and instructions out to your school for teachers to have their students complete, at their convenience. I would also include postage paid envelopes so that once the questionnaires are completed, the teachers can send them and the signed consent forms back to me.

We are happy to accommodate either option depending on what your staff finds most convenient. If you choose option (a), to have us visit your school, could you please email me with two or three dates that might work for us to come in? I will try and coordinate the visit to your school with other schools in PA that we are working with. We hope to collect data during the months of February and March.

I would be happy to answer any questions or concerns you might have about the research. I look forward to hearing from you soon.

Thank you very much for considering this request.

Sincerely,

Lara J. Spagrud, BA(Hon)
Doctoral Student in Clinical Psychology
Phone: 966-2039
E-mail: lara.spagrud@usask.ca
University of Saskatchewan

Carl L. von Baeyer, PhD
Research Supervisor
Professor of Psychology &
Associate Member in Pediatrics
University of Saskatchewan

Appendix G

UNIVERSITY OF SASKATCHEWAN

Your child is invited to participate in a study on children's coping with needles.
Please read this form carefully with your child.

CONSENT FORM

A study examining how children cope with needles

Purpose and Procedure: We are developing a questionnaire to measure what kinds of coping are helpful and unhelpful for children and adolescents when they get needles. **No needles are given as part of this study**. With parent permission, we ask students to fill out a short questionnaire that asks about their experience with needles and what they have done in the past to deal with them. The questionnaire is three pages long and takes about 10 minutes to complete. We arrange to give the questionnaire at the teacher's convenience. Your child's principal and teacher have approved the study already but it is still up to you and your child whether or not he/she participates.

Potential Risks and Benefits: There are no known risks involved in participating. It is hoped that the questionnaire will be useful in future studies for identifying children that might need help dealing with needles.

Confidentiality: Everything your child does in the study is confidential and anonymous. Your child's name will not be recorded on their questionnaire. If we use your child's data in a report of this research, it will be summarized along with the data from all of the other students who complete the questionnaire.

Right to Withdraw: The study is voluntary. Your child may withdraw from the study for any reason, at any time, without consequence. If your child withdraws from the study, any data that he/she has contributed will be destroyed.

Questions: If your child has any questions concerning the study, he/she is encouraged to ask at any point; parents are also free to contact the researchers at the numbers provided below if you have questions at any time. This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Sciences Research Ethics Board (Beh04-179). Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (966-2084).

Consent to Participate: I have read and understood the description provided above. I consent to have my child participate in this study, understanding that he/she may withdraw this consent at any time. At the time of data collection a copy of this form will be given to my child for to bring home.

_____ _____

(Signature of Parent) (Signature of Child)

_____

(Date)

Feedback: When the study is completed in June 2007, a summary of the results will be posted on our website:

www.usask.ca/childpain

Optional: If you would like the researchers to mail you information about the results of the study after it is finished, please fill out your mailing address or email address here:

_____

Researchers' contact information:

Lara Spagrud, BA(Hon)
Graduate student in Clinical Psychology
Department of Psychology, 9 Campus Drive
University of Saskatchewan, S7N 5A5
Phone: 966-2039
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University of Saskatchewan
Phone: 966-6676
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Appendix H

Assumptions of MANOVA

Independence. This is the most basic assumption that all observations (i.e., participants) be independent of one another. It is the most serious of all violations. Random sampling as part of data collection is adequate to meet this assumption (Tabachnick & Fidell, 2001). Therefore, the assumption of independence is met in the present analysis and transformation of the dependent variables has no bearing on this assumption.

Equality of Variance-Covariance Matrices. Using transformed data, for the two-factor solution, the Box's $M = 47.980$, $F\ (30, 76936.939) = 1.550$, $p = 0.028$, indicating that the assumption is met. For the three-factor solution, the Box's $M = 123.680$, $F\ (70, 27256.031) = 1.647$, $p = 0.001$, indicating that the assumption has just passed the criterion to be met.

Normality. For the present study, three DVs are significantly skewed: fear (positive), pain (positive), and self-efficacy (negative). The were ameliorated using square root transformations.

Outliers. Examination of standardized scores indicates that there are no outliers in the present study. Transformation of the dependent variables has no bearing on this assumption. If anything, transformation would bring outliers in closer to the mean following transformation (Tabachnick & Fidell, 2001).

Linearity. Residual plots are examined to test the linearity assumption. If assumptions are met, the residuals will be nearly rectangularly distributed with a concentration of scores along the center. Examination of the plots shows nearly perfect rectangular shapes to the plots. Transformation improved the shape of these plots marginally. The assumption of linearity is met.

Sphericity. MANOVA requires that there be some degree of correlation between the DVs. Bartlett's Test of Sphericity is a χ^2 test of this assumption. If significant ($p < 0.05$), this test indicates that the residual covariance matrix is not proportional to an identity matrix. In other words, a relationship between the variables exists. For the two-factor solution, $\chi^2(9) = 1190.965$, $p < 0.001$. For the three-factor solution $\chi^2(9) = 1185.644$, $p < 0.001$. Therefore, sphericity is not a problem.

Multicollinearity and Singularity. There are no bivariate correlations between the DVs that exceed 0.900, therefore multicollinearity is not a problem in this analysis. Transformation did not affect the result for this assumption.

With singularity, the variables are redundant. That is, one of the variables is equal to some linear combination of two or more of the other variables. If singularity exists, MANOVA will abort because the inversion of the factor matrix will not run. The factor matrix was successfully inverted in the present analysis of both the two- and three-factor solutions; therefore there is no problem with singularity.

Hypothesis Testing with the Two-factor Solution.

Anxiety, Fear, Pain, and Self-efficacy. A 2 (Problem-focused coping: High, Low[1]) X 2 (Emotion-focused coping: High, Low) multivariate analysis of covariance (MANCOVA) was performed on four dependent variables: anxiety, fear, pain, and self-efficacy. Adjustment was made for two covariates: Gender (Male, Female) and Time lag (Less than one month, less than one year, over one year, and can't remember).

Gender was a significant covariate in the multivariate tests, F (4, 291) = 3.365, p = 0.010, but time lag was not, F (4, 291) = 2.084, p = 0.083, so the analysis was re-run without it. Multivariate tests revealed a significant multivariate effect of emotion-focused coping (EF) but not problem-focused coping, as well as a significant EF by PF interaction. Because omnibus MANCOVA shows significant multivariate effects, it is appropriate to investigate further the nature of the relationships among the IVs and DVs using univariate Fs (Tabachnick & Fidell, 2001).

Examination of the between-subjects, univariate effects shows a main effect of gender for the DVs fear, F (1, 296) = 5.354, p = 0.021, and pain, F (1, 296) = 10.205, p = 0.002. Estimated marginal means for the covariates are not printed as part of the MANCOVA output. However, the direction of these effects is known from preliminary analyses (see Section X).

In terms of the independent variables, there was no effect of PF for any of the DVs (see Table A7). However, there was a significant main effect of EF whereby participants high on EF had higher mean ratings for anxiety, fear, and pain, and lower ratings on self-efficacy, compared to those low on EF. There were significant interactions between EF and PF for each of the four DVs. The pattern of the interaction for anxiety, fear, and pain was similar; it shows that high PF moderated high EF but had the opposite effect for low EF. This is the same pattern of interactions as was reported for the non-transformed data. See the main study 2 analysis section for figures.

[1] High and low coping groups were created using a median split. Scores above the median are "high", while scores below are "low".

Table A7. Two-factor Solution Means, Standard Deviations, *F* Statistics, and Significance Values for the Univariate Main Effects of Problem-focused (PF) and Emotion-focused Coping

Dependent variables	**PF category**	**Mean**	**St. Dev.**	***F***	***P***
Anxiety	Low	4.379	0.265	0.547	0.464
	High	4.652	0.262		
Fear	Low	1.431	0.076	2.801	0.095
	High	1.611	0.075		
Pain	Low	1.603	0.069	0.174	0.677
	High	1.643	0.068		
Self-efficacy	Low	1.552	0.086	0.007	0.933
	High	1.562	0.085		
Dependent variables	**EF category**	**Mean**	**St. Dev.**	***F***	***P***
Anxiety	Low	3.000	0.270	60.351	<0.001
	High	6.030	0.269		
Fear	Low	0.993	0.078	88.302	<0.001
	High	2.049	0.078		
Pain	Low	1.278	0.070	46.001	<0.001
	High	1.967	0.070		
Self-efficacy	Low	1.107	0.088	50.433	<0.001
	High	2.008	0.088		

To investigate the effects of the IVs on all combinations of the DVs, a series of lack of fit multivariate tests are run. For all combinations of the DVs, the null hypothesis is not rejected. The smallest effect size was for pain independently, $F\,(3, 293) = 0.071$, $p = 0.975$, $\eta^2 = 0.001$.

The largest effect was for nervous independently, F (3, 293) = 2.334, p = 0.023, η^2 = 0.074. This means that the present model best accounts for the way that participants rated their anxiety; though it significantly accounts for all four DVs, in all combinations.

Hypothesis Testing with the Three-factor Solution.

Anxiety, Fear, Pain, and Self-efficacy. A 2 (Positive self-statements coping: High, Low[2]) X 2 (Emotion-focused coping: High, Low) X 2 (Cognitive distraction coping: High, Low) multivariate analysis of covariance (MANCOVA) was performed on four dependent variables: anxiety, fear, pain, and self-efficacy. Adjustment was made for two covariates: Gender (Male, Female) and Time lag (Less than one month, less than one year, over one year, and can't remember).

Gender was a significant covariate in the multivariate tests, F (4, 289) = 3.116, p = 0.016, but time lag was not, F (4, 289) = 1.966, p = 0.100. Multivariate tests revealed a significant multivariate effect of emotion-focused coping (EF), F (4, 289) = 24.523, $p < 0.001$, but not cognitive distraction (CD), F (4, 289) = 0.791, p = 0.532, or positive self-statements (PS) coping, F (4, 289) = 0.961, p = 0.429. There was a significant CD by EF interaction, F (4, 289) = 3.811, p = 0.005, but none of the other two-way or the three-way interactions were significant. Because omnibus MANCOVA shows significant multivariate effects, it is appropriate to investigate further the nature of the relationships among the IVs and DVs using univariate Fs (Tabachnick & Fidell, 2001).

Examination of the between-subjects, univariate effects shows a main effect of gender for the DVs fear, F (1, 292) = 5.391, p = 0.021, and pain, F (1, 292) = 9.966, p = 0.002. Estimated marginal means for the covariates are not printed as part of the MANCOVA output. However, the direction of these effects is known from preliminary analyses (see Section X).

In terms of the independent variables, there was no effect of CD or PS for any of the DVs. However, there was a significant main effect of EF whereby participants high on EF had higher mean ratings for anxiety, fear, and pain, and lower ratings on self-efficacy, compared to those low on EF (see Table A8). There were significant interactions between EF and CD for each of the four DVs and an interaction between EF and PS for pain. The pattern of the EF by CD interactions for anxiety, fear, pain, and self-efficacy were similar; they show that CD moderates the effect of EF. Specifically, high CD decreases anxiety for high EF but increases it for low EF.

[2] High and low coping groups were created using a median split. Scores above the median are "high", while scores below are "low".

This is the same pattern of interactions as was reported for the non-transformed data. See the study 2 analysis section for figures.

To investigate the effects of the IVs on all combinations of the DVs, a series of lack of fit multivariate tests are run. For all combinations of the DVs, the null hypothesis is not rejected. The smallest effect size was for pain independently, F (7, 285) = 0.530, p = 0.812, η^2 = 0.013 and pain and self-efficacy in combination, F (13, 570) = 0.525, p = 0.919, η^2 = 0.013. The largest effect was for anxiety independently, F (7, 285) = 2.067, p = 0.047, η^2 = 0.048. This means that the present model best accounts for the way that participants rated their anxiety; though it significantly accounts for all four DVs, in all combinations.

Table A8. Three-factor Solution Means, Standard Deviations, *F* Statistics, and Significance Values for the Univariate Main Effects of Cognitive Distraction (CD), Emotion-focused Coping, and Positive Self-statements

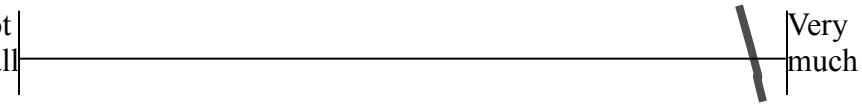
Dependent variables	**CD category**	**Mean**	**St. Dev.**	***F***	***p***
Anxiety	Low	4.434	0.303	0.002	0.968
	High	4.450	0.268		
Fear	Low	1.495	0.087	0.527	0.468
	High	1.579	0.077		
Pain	Low	1.543	0.079	2.208	0.138
	High	1.699	0.070		
Self-efficacy	Low	1.468	0.098	0.871	0.351
	High	1.589	0.086		
Dependent variables	**EF category**	**Mean**	**St. Dev.**	***F***	***p***
Anxiety	Low	2.767	0.299	63.677	<0.001
	High	6.118	0.281		
Fear	Low	0.989	0.086	83.428	<0.001
	High	2.085	0.081		
Pain	Low	1.291	0.078	37.024	<0.001
	High	1.952	0.073		
Self-efficacy	Low	1.041	0.097	52.418	<0.001
	High	2.016	0.091		

Dependent variables	PS category	Mean	St. Dev.	*F*	*p*
Anxiety	Low	4.441	0.287	0.000	0.993
	High	4.444	0.286		
Fear	Low	1.576	0.083	0.453	0.502
	High	1.498	0.082		
Pain	Low	1.699	0.075	2.182	0.141
	High	1.543	0.074		
Self-efficacy	Low	1.605	0.093	1.373	0.242
	High	1.452	0.092		

Appendix I

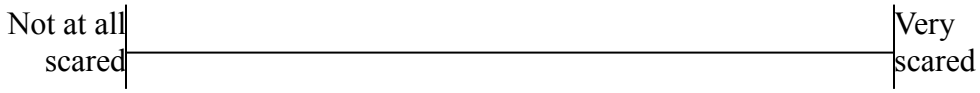
For these questions make a mark on the line to show your answer

EXAMPLE: If Sally likes animals a lot, this is how she might mark the line to answer the question, "how much do you like animals?":

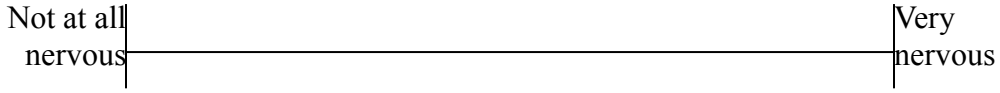


Here are some questions about how you feel:

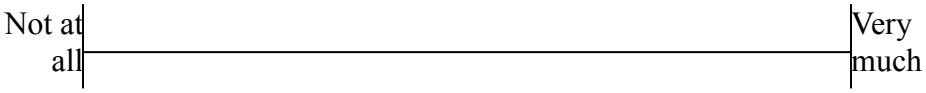
5. **How scared are you of needles?**



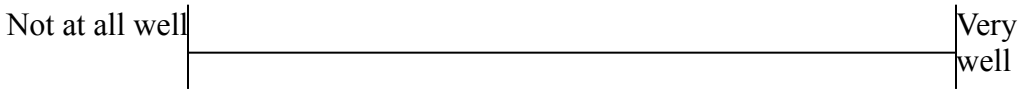
6. **How nervous do you get before a needle?**



7. **How much do you think needles hurt?**



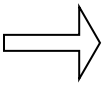
8. **How well do you think you handle needles?**



Below is a list of sentences that show what children and adolescents might *think*, *feel* or *do* before or during a needle. Select one option for each sentence depending on how much each one is like or unlike you by rating them from 1 = Very **unlike** me to 5 = Very **like** me.

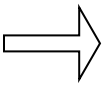
Statements	Very unlike me	Somewh at unlike me	Neither like or unlike me	Somewh at like me	Very like me
1. I try to make my mind go blank	1	2	3	4	5
2. I keep thinking the needle will hurt a lot	1	2	3	4	5
3. I tell myself it will be okay	1	2	3	4	5
4. I count in my head	1	2	3	4	5
5. I imagine being somewhere else	1	2	3	4	5
6. I tell myself the next one will go better	1	2	3	4	5
7. I talk to a friend about how I feel	1	2	3	4	5
8. I worry too much about the needle	1	2	3	4	5
9. I imagine doing something else	1	2	3	4	5
10. I try to think of different ways to make the needle go better	1	2	3	4	5
11. I try to be brave	1	2	3	4	5
12. I try to think about the positive things about getting a needle	1	2	3	4	5
13. I don’t think about it	1	2	3	4	5
14. I cry	1	2	3	4	5
15. I look for comfort from someone or something around me	1	2	3	4	5
16. I tell myself I can handle it	1	2	3	4	5
17. I pray	1	2	3	4	5

Statements	Very unlike me	Somewhat unlike me	Neither like or unlike me	Somewhat like me	Very like me
18. I imagine the nurse or needle is something different	1	2	3	4	5
19. I remind myself why I have to get a needle	1	2	3	4	5
20. I talk to the nurse	1	2	3	4	5
21. I focus on something else	1	2	3	4	5
22. I tell myself it's not so bad	1	2	3	4	5
23. I don't look	1	2	3	4	5
24. I feel dizzy	1	2	3	4	5
25. I take deep breaths	1	2	3	4	5



7. Can you remember having a needle before?

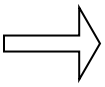
Check one: YES ☐ NO ☐



8. Can you think of <u>one good thing</u> about getting a needle?

_____

_____



9. Check one: Male ___ Female ___

That's the end.

Thanks for answering our questions! ☺

Appendix J

UNIVERSITY OF SASKATCHEWAN

August 10, 2008

<name>
<school>
<address>
Telephone: <phone>

<Date>

Dear <name>

Re: Second and final phase of data collection
Helping children who are fearful of needles to cope with their Grade 6 immunizations

Last fall, I contacted your school and received permission to conduct a brief questionnaire study that examines how grade 6 students cope with getting their Hepatitis B immunization. In the months since that initial data collection session, I have begun working with the staff at Public Health to coordinate my data collection efforts with their visit to your school. I have been informed that there will be a Hepatitis B immunization clinic at your school on <date>. I will be planning a visit to your school to collect data on that day. Similar to our first data collection session, only the students with parental consent will be approached to complete the questionnaire this second time. The parental consent forms that were signed in the fall did inform about a second data collection session in the spring. Students will also have the opportunity to opt out of the study before filling out the questionnaire, if they so choose.

If it works well for your grade 6 teacher(s), we will plan to be at the school at the same time as the public health nurses. That way we can contact the students that have consent and have them complete the research questionnaire either on their way back to class, if there is a room for us to set up in, or once the students are back in class. Whichever plan works best for the teachers, we are happy to accommodate.

Please note that there is only one questionnaire to fill out after the needle is completed. There are no questions asked of students before it happens. The questionnaire is 3 pages long and takes about 5 minutes to complete. This will be the last data collection session for this study.

Thank you for your continued support of this project, it is greatly appreciated.

Sincerely,

Lara J. Spagrud, BA(Hon)
Doctoral Student in Clinical Psychology
Phone: 966-2039
E-mail: lara.spagrud@usask.ca
University of Saskatchewan

Carl L. von Baeyer, PhD
Research Supervisor
Professor of Psychology &
Associate Member in Pediatrics
University of Saskatchewan

Appendix K

UNIVERSITY OF SASKATCHEWAN

CONSENT FORM

A study examining how children learn to cope with needles

Your child is invited to participate in a study on children's coping with needles.

Please read this form carefully with your child.

Purpose and Procedure: We are studying what children do to cope with the immunizations they are getting at school this year. With parent permission, we ask them to fill out a short questionnaire that asks children how they coped with the needle. It takes about 10 minutes for your child to participate and we arrange our visit at the teacher's convenience. Your child's principal and teacher have approved the study already but it is up to you and your child whether or not they participate.

Potential Risks and Benefits: There are no known risks involved in participating.

Confidentiality: Everything your child does in the study is confidential and we will not share it with anyone. To keep track of your child's questions from one immunization to the next, we will assign their forms a number. We will keep a list that links your child's name to their number in a locked location. When the data collection is over, we will shred the sheet that links names to numbers and no record of your child's name will remain. If we use your child's data in a report of this research, we will not use his/her name or tell anything else about them.

Right to Withdraw: The study is voluntary. Your child may withdraw from the study for any reason, at any time, without consequence and it will not affect their immunization. If your child withdraws from the study, any data that he/she has contributed will be destroyed.

Questions: If your child has any questions concerning the study, he/she is encouraged to ask at any point; parents are also free to contact the researchers at the numbers provided below if you have questions at any time. This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Sciences Research Ethics Board (Beh04-179). Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (966-2084).

Consent to Participate: I have read and understood the description provided above. I consent to have my child participate in the study described above, understanding that he/she may withdraw this consent at any time.

_____ _____

(Signature of Parent) (Signature of Child)

_____

(Date)

Feedback: When the study is completed in June 2007, a summary of the results will be posted on our website:

www.usask.ca/childpain

Optional: If you would like the researchers to mail you information about the results of the study after it is finished, please fill out your mailing address or email address here:

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Researchers' contact information:

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Appendix L

Study 3 Analysis with transformed DV data

Assumptions of MANOVA

Independence. This is the most basic assumption; it requires that all observations be independent of one another. It is the most serious of all violations. Random sampling as part of data collection is adequate to meet this assumption (Tabachnick & Fidell, 2001). Therefore, the assumption of independence is met in the present analysis.

Equality of Variance-Covariance Matrices. The Box's $M = 175.039$, F (108, 4773.170) = 1.157, $p = 0.130$, indicating that the assumption is met.

Normality. For the present study, all four DVs are significantly skewed for both Time 1 and 2: anxiety, (positive), fear (positive), pain (positive), and self-efficacy (negative). All but fear (Time 2) and self-efficacy (Time 1 and 2) were ameliorated using square root transformations. Fear (Time 2) and self-efficacy (Time 1 and 2) were fixed using log10 transformations.

Outliers. In the present study there were two outliers that were deleted in the *Data Cleaning* section.

Linearity. Residual plots are examined to test the linearity assumption. If assumptions are met, the residuals will be nearly rectangularly distributed with a concentration of scores along the center. Examination of the plots shows rectangular shapes to the plots. The assumption of linearity is met.

Sphericity. Bartlett's test indicates that for the between subjects variables, $\chi^2(9) = 117.274$, $p < 0.001$. For the within subjects factors, $\chi^2(9) = 33.186$, $p < 0.001$. Therefore, sphericity is not a problem.

Multicollinearity and Singularity. There are no bivariate correlations between the DVs that exceed 0.900, therefore multicollinearity is not a problem in this analysis. Also, the factor matrix was successfully inverted in the present analysis; therefore there is no problem with singularity.

Anxiety, Fear, Pain, and Self-efficacy. A 2 (Problem-focused coping: High, Low[3]) X 2 (Emotion-focused coping: High, Low) multivariate analysis of covariance (MANCOVA) with Time as a within subjects variable was performed on four dependent variables: anxiety, fear, pain, and self-efficacy. Adjustment was made for one covariate, gender (Male, Female). Despite

[3] High and low coping groups were created using a median split. Scores above the median are "high", while scores below are "low".

concerns raised in preliminary analyses, gender was not a significant covariate in the multivariate tests, F (4, 54) = 1.277, p = 0.291. Therefore, the MANOVA was re-run with this covariate removed.

Multivariate tests revealed a significant multivariate effect of emotion-focused coping (EF) but not problem-focused coping (PF). The EF by PF interaction was not significant in this analysis. In terms of within subjects effects, there was a significant multivariate effect of time, F (4, 55) = 50.729, $p < 0.001$, but no time by PF or EF interactions. Because omnibus MANOVA shows significant multivariate effects, it is appropriate to investigate further the nature of the relationships among the IVs and DVs using univariate Fs (Tabachnick & Fidell, 2001).

Examination of the between subjects, univariate effects shows that there was no effect of PF for any of the DVs (see Table A9). However, there was a significant main effect of EF whereby participants high on EF had higher mean ratings for anxiety, fear, and pain, and lower ratings on self-efficacy, compared to those low on EF. There were no significant interactions between EF and PF for any of the four DVs.

Examination of the within subjects, univariate effects showed that there was a significant effect of time for self-efficacy. Participants rated their ability to deal with the immunization higher at Time 1 (*Median* = -0.016) than at Time 2 (*Median* = 0.251), F (1, 58) = 9.785, p = 0.003. Participants also rated their fear of needles higher at Time 1 (*Median* = 1.283) than at Time 2 (*Median* = -0.010), F (1, 58) = 148.040, $p < 0.001$. There was a significant time by PF interaction for self-efficacy, F (1, 58) = 6.214, p = 0.016. Time moderated the effect of PF coping such that participants low on PF had the highest self-efficacy ratings at Time 1, whereas they had the lowest self-efficacy ratings at Time 2. There was no change in the self-efficacy ratings of high PF participants over time.

Table A9. Means, Standard Deviations, *F* Statistics, and Significance Values for the Univariate Between Subjects Effects of Problem-focused (PF) and Emotion-focused (EF) Coping

Dependent variables	**PF category**	**Mean**	**St. Dev.**	***F***	***P***
Anxiety	Low	1.469	0.136	1.501	0.226
	High	1.743	0.119		
Fear	Low	0.486	0.119	2.354	0.130
	High	0.787	0.104		
Pain	Low	1.134	0.120	2.351	0.131
	High	1.429	0.105		
Self-efficacy	Low	-0.183	0.086	0.798	0.376
	High	-0.052	0.075		
Dependent variables	**EF category**	**Mean**	**St. Dev.**	***F***	***P***
Anxiety	Low	1.242	0.130	14.027	<0.001
	High	1.970	0.126		
Fear	Low	0.336	0.114	12.077	<0.001
	High	0.937	0.110		
Pain	Low	.037	0.115	7.678	<0.001
	High	1.526	0.111		
Self-efficacy	Low	-0.366	0.082	16.665	<0.001
	High	0.131	0.079		