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**CATASTROPHIZING AND PAIN
MEASURES OF EMOTION AS PREDICTORS OF COGNITIVE STYLE**

Jacqueline A. Ellis, B.Sc.N., M.Sc.N.

**A thesis submitted to the Faculty of Graduate Studies and Research in partial
fulfillment of the requirements for the degree of
Doctor of Philosophy
Department of Psychology**

Carleton University

Ottawa, Ontario

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CATASTROPHIZING AND PAIN: MEASURES OF EMOTION AS
PREDICTORS OF COGNITIVE STYLE

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

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Abstract

Catastrophizing is a construct that has been found to consistently emerge as an important predictor of negative outcomes for individuals dealing with pain. The current research explored the construct of catastrophizing within a theoretical model that facilitates a linkage between emotion, cognition, and pain. The first study was designed primarily to determine which emotions are associated with catastrophizing in response to pain, and whether these responses are pain-specific or general characteristics of individuals who catastrophize. The second study addresses primarily the question of consistency in catastrophizing across pain situations. The relationship between catastrophizing cognitions and emotionality in response to pain was examined in 130 university students. Subjects in both studies were classified as catastrophizers or non-catastrophizers based on the type of cognitions reported in response to finger pressure pain.

The first study assessed trait and state positive and negative emotionality, fear of pain, and emotional coping, in subjects that underwent pain induced by finger pressure. Subjects classified as catastrophizers reported greater fear, anger, sadness, hostility and guilt than non-catastrophizers in response to finger pressure pain. Catastrophizers and non-catastrophizers had similar scores on measures of state and trait positive emotionality, trait negative emotionality, fear of pain, and emotional coping. The second study examined the consistency of catastrophizing responses to finger pressure pain and headache pain in subjects pre-selected for headaches. Catastrophizers with recurrent headaches reported significantly greater sadness than catastrophizers unselected for headaches. Of the 13 subjects with headaches that were classified as catastrophizers in response to finger pressure pain, 10 subjects also catastrophized in response to headache pain. However, a number of subjects that did not catastrophize in response to finger pressure pain did catastrophize in response to

headache pain. The implications of this finding relative to the importance of situational characteristics in regard to pain are discussed.

Taken together, these findings suggest that catastrophizing is a situational response to pain and that catastrophizing cognitions co-occur with heightened negative emotions. The results also suggest that the number of individuals who catastrophize increases with the salience of the pain stimulus.

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Many people supported me through my years of study and I am grateful for that support. My son Matthew was only a year old when I began this journey and he just finished grade one, thus he has started on his own journey. My daughter Anne has watched this thesis unfold, always amazed at how "my teacher" and "Daddy" scribbled all over many early versions of the finished product. Throughout my six years as a graduate student my children both helped me and pulled me away when I clearly needed to "get a life".

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CHAPTER ONE

Introduction

There is a converging body of evidence suggesting that cognitive activity has a profound effect on human behaviour. In response to stress and anxiety some individuals will focus on the negative aspects of a situation and expect the worst outcomes (Ellis & Harper, 1961-1975). This process is characterized by what are frequently termed cognitive errors, dysfunctional cognitions, negative self-referent ideation, catastrophizing, or simply negative thinking (Ellis, 1970; Beck, Rush, Shaw & Emery, 1979; DeRubeis & Beck, 1988). This area has been studied for a number of years in an attempt to facilitate understanding of anxiety-related conditions, depression, and even sports performance (Beck, 1967; Ingram & Kendall, 1987).

Similar cognitive processes have been identified in response to laboratory and clinical pain. In particular, negative cognitions, often called "catastrophizing," have been found to be associated with increased pain intensity (Spanos, Stani & Brazil, 1981), and decreased pain tolerance time (Hevnenan, Tremouw, Gano, Kirkland & Heiden, 1990) in laboratory pain research, and increased disability, inactivity, and emotional distress in clinical pain research (Rosentiel & Keete, 1983; Turner & Clancy, 1986; Main & Waddell, 1991). Results from studies that assess negative cognitions in response to pain parallel results reported in the anxiety literature. The basic tenet, that it is more important to avoid negative thinking than it is to engage in positive thinking, seems to hold true for a number of situations including pain (Ellis & Abrams, 1994; Ingram & Kendall, 1987; Turk & Rudy, 1992).

Catastrophizing as a cognitive response to pain has primarily been viewed within a theoretical framework that is composed of constructs related to coping. Catastrophizing was first described in research proposed to understand what coping strategies individuals use to successfully manage dental pain (Chaves & Brown, 1978).

1987) Within a coping framework, coping strategies are considered to be of primary importance in determining an individual's pain experience. However, the role of catastrophizing cognitions have been reported as a major contributor to the negative outcomes and emotional distress often associated with pain (Lefebvre, 1981; Gil, Williams, Keefe, & Beckham, 1990; Ingram, Atkinson, Slater, Saccuzo, & Garfin, 1990). No particular type or mix of coping strategies has been shown to be superior for pain reduction and some individuals continue to catastrophize even while using coping strategies (Fernandez & Turk, 1989; Spanos, et al., 1981). It has been suggested that catastrophizing may be better viewed as part of an emotional response to pain (Turk & Rudy, 1992; Jensen, Turner, Romano, & Karoly, 1991). Negative emotions, such as frustration, fear, and anxiety, have been shown to increase reported pain intensity (Zelman, Howland, Nichols, & Cleeland, 1991). Similar findings were reported in studies measuring the effect of negative cognitions on reported pain (McCaul, Monson, & Maki, 1992; Bruehl, Carlson, & McCubbin, 1993).

Catastrophizing consistently emerges as an important predictor of negative outcomes with respect to pain. The construct has been primarily viewed from either a coping model or a cognitive model. These models have most often been used to examine catastrophizing within the context of pain-related outcomes. What remains unclear about catastrophizing, is why it occurs, and what factors other than pain determine catastrophizing. This research examines the role of emotion in the prediction of catastrophizing. The construct of catastrophizing is examined within an emotion model that makes explicit a link between emotion, cognition, and pain. Pain is by definition an emotional experience and catastrophizing is associated with pain. Investigating catastrophizing from within the framework of emotion theory may clarify how emotion and cognitions link to influence pain behavior.

Research Focus

This research examines catastrophic thought and pain using the conceptual framework of Differential Emotions Theory (DET) (Izard, 1977, 1991). Within this framework, catastrophizing is viewed as part of an affective-cognitive structure that is triggered by the experience of pain. According to DET, certain cognitions are reliably associated with certain emotions, and individuals have different thresholds for experiencing emotion. Hence, individuals will experience differing amounts of negative emotionality and negative cognitions when experiencing pain. In this research, it is proposed that negative emotions, such as fear, sadness, and anger, may be the motivation for catastrophizing cognitions. The negative emotions that are essential for defining an experience as painful are also associated with particular cognitions.

In the first study, trait and state measures of emotion, fear of pain, and cognitive measures of coping were examined to see if they differentiated catastrophizers from non-catastrophizers. This was done to specify more clearly the link between the emotional and the cognitive response to pain and to provide information about the determinants of catastrophizing. Measuring emotion from a trait and state perspective clarifies, in part, if catastrophizers respond to situations in their daily life with heightened emotionality or if this response is specific to pain. Subjects underwent a trial of finger pressure pain and described their thoughts, feelings, and imaginings in writing immediately afterwards. Subjects' responses were classified as predominately catastrophizing or non-catastrophizing based on the prevalence of the type of cognitions present in the written testimony. This method of evaluating catastrophizing responses to pain is currently the "gold standard" used in pain research.

Subjects in the second study were preselected for headaches. They recorded their cognitions during one episode of headache, then underwent a pain trial identical

to subjects in the first study. It was hypothesized that individuals who catastrophized in response to a laboratory pain stimulus would also catastrophize in response to headache pain. In this regard this research evaluated whether catastrophizing is an enduring response to pain in general that is central to the individual, or specific to various pain experiences.

An exploratory component of this study examined the effect of past pain experience on cognitive style. Subjects indicated which painful conditions they experienced and the painfulness of each, on a numerical rating scale. This component of the study was prompted by recent investigations that suggested excessive exposure to pain, or to painful conditions, may contribute to a negative focus with respect to future pain (Turk & Rudy, 1992). An alternative perspective to this suggests catastrophizers may have similar pain histories as non-catastrophizers, but perceive their conditions as more painful.

The following sections provide a historical perspective of the understanding of pain and the nociceptive processing system. Attention is directed at the evolution from normative models to an understanding of the individual differences which help define the complexity of the pain experience. Research from laboratory and clinical pain studies related to catastrophizing will be reviewed, and current conceptualizations of catastrophizing will be presented. Finally, Differential Emotions Theory (Izard, 1977, 1991) will be presented as a framework from which to understand the determinants of catastrophizing.

Theories of Pain

Recognition of the importance of pain in shaping human experience extends as far back as recorded history. All cultures and civilizations communicated some understanding of pain and the treatment of pain through pictures or writings (Bonica, 1990). Conceptualizations of pain have evolved over time but common threads extend

throughout history to the present. The experience of pain as a multidimensional phenomena, encompassing sensory, emotional, behavioral, social, and spiritual dimensions, can be found in the writings of the ancient Egyptians, Greeks, Indians and Chinese (Bonica, 1990).

As evidence accumulated about the anatomy and physiology of the peripheral and central nervous system, the study of pain became focused on physiological mechanisms. The traditional notion, that pain was an affective phenomena centered in the heart, was disavowed. Fierce controversies erupted among physiologists, psychologists, and philosophers over the conceptualization of pain. Was it rooted in the psyche and primarily an emotional phenomena, or in the soma, and purely the product of stimulation to nerves, spinal cord and brain (Bonica, 1990)? Strong (1895), suggested a middle ground by conceptualizing pain as a phenomena with a bodily sensation and an emotional reaction to the sensation. This gave scientific recognition to both the sensory and the affective aspects of pain.

Two competing physiologic paradigms, prominent during the 19th, and first half of the 20th century, were the specificity theory and the intensive theory. The specificity theory viewed pain as a distinct sensation similar to hearing, vision, taste, and touch. Specific nerves transmitted impulses to skin and organ receptors for four cutaneous modalities, namely, touch, warmth, cold, and pain (Boring, 1942). Alternatively, the intensive theory recognized pain as a general sensation resulting from excessive stimulation in regular nerve fibers, not in specific pain fibers (Dallenbach, 1939).

Following this, pain research continued to build on theories from previous years. It emphasized the expanding knowledge about the physiologic mechanisms of pain perception and integrated the affective response to pain. Theories such as the central summation theory and the sensory interaction theory accounted for this duality but in a

relatively linear fashion (Melzack, 1973). There was a presumed one-to-one relationship between the intensity of the stimulus, and the pain response. This did not explain examples of tissue damage without pain, and of an apparent lack of pathology associated with severe pain.

The gate control theory of pain was first proposed by Melzack and Wall (1965), and has been expanded upon in the past 30 years (Melzack & Casey, 1968, Melzack, 1973, Melzack & Wall, 1982; Wall & Melzack, 1994). It has provided a framework for understanding the effects of psychological variables, at a physiological level, on the modulation of pain perception. Powerful inhibitory and excitatory mechanisms have been proposed, which activate complex physiological and psychological processes. These processes affect the transmission and relay of impulses at numerous points in what is now viewed as a complex interactive nociceptive processing system (McGrath, 1990, Bonica, 1990).

The main tenet of the gate control theory is that peripheral nerve fibers carry nociceptive impulses to the dorsal horn of the spinal cord, where the first of a series of modulating or gating systems send some impulses up the spinal cord and others back to the periphery to initiate reflex motor responses. Ascending lateral tracts relay impulses to the ventrobasal thalamus and somatosensory cortex where sensory discriminative information, such as intensity and location, is processed (Melzack & Casey 1968). A medial system of ascending tracts carries impulses to the hypothalamus and limbic systems where motivational and affective responses, such as anger and fear, are triggered. Descending inhibitory systems, mediated by endogenous opioids and activated by sensory and psychological mechanisms, provide natural pain relief (McGrath, 1990, Melzack, 1990).

Melzack and Casey (1968) proposed three dimensions to the human pain experience: a sensory-discriminative dimension, a cognitive or central control

dimension, and a motivational-emotional dimension. Chapman (1985) modified this model slightly to include a social-cultural dimension, and emphasized the ways each component of the pain experience can affect the others (Chapman & Turner, 1990). These interacting dimensions influence behavior, cognitions, and emotions, with respect to pain and pain-related events.

Negative Cognitions and Pain

Recent pain research has focused on understanding the variability in pain response among individuals subjected to identical nociception. This research has been performed primarily in laboratory settings with healthy volunteer subjects. A number of studies reported that subjects consistently fell into one of two groups based on their willingness to tolerate the painful stimulus. A behavioral dichotomy based on tolerance time, that is, the number of seconds an individual will endure pain, provided support for classifying individuals into groups. Tolerance scores clustered at each end of the distribution with some individuals enduring the pain stimulus for a relatively short period of time and others lasting the time limit, which was typically three to five minutes (Spanos & Brazil, 1984; Chen, Dworkin, Haug, & Gehrig, 1989a; Chen, et al., 1989b; Peters & Schmidt, 1990; Geisser, Robinson, & Pickren, 1992).

Subjects classified as "pain tolerant" differed from subjects classified as "pain sensitive" primarily in regard to the types of cognitions they reported during the pain trial (Turk, Meichenbaum, & Genest, 1983; Heyneman, et al., 1990; Geisser, et al., 1992). Subjects in the "pain sensitive" group reported more negative cognitions than subjects in the "pain tolerant group". Understanding how cognitive responses, in particular negative cognitions, are associated with pain furthers our understanding of how and why individuals who experience similar nociceptive input will experience different amounts of pain and distress and will tolerate painful stimuli differently.

Negative cognitions in response to clinical pain were first described by Chaves and Brown (1978, 1987) in a dental setting. Dental patients reported their thoughts after receiving a mandibular block injection prior to dental restoration. Cognitions were identified as either helping the individual cope with pain and distress, or, focusing the individual's attention on the negative aspects of the situation. Activities such as positive self-talk, distraction, or imagining and concentrating on pleasant imagery, were proposed to help the individual cope with the pain. These divert attention away from the painful stimulus. Cognitions which were focused on the pain of the injection, and the inability of the individual to cope with the pain were classified as negative cognitions, and were referred to as "catastrophizing" cognitions. The individuals who predominately engaged in these cognitions were labeled "catastrophizers." Since the initial work of Chaves and Brown (1978, 1987) a growing body of research in laboratory and clinical settings has examined the effects of cognition on pain response. In particular, negative cognitions, which continue to be called "catastrophizing," have received considerable attention.

Dimensions and Definitions of Catastrophizing

A single, precise definition of catastrophizing has not been endorsed in the literature. However, there is general agreement that it involves a negative perspective with regard to painful stimuli. Focusing on, and exaggerating, the sensory dimensions of the noxious input, describing negative emotions such as fear and anger, expressing worry about harmful physical, emotional, and social effects of pain, and expressing a lack of confidence in one's ability to cope with the pain, have all been classified as catastrophizing cognitions (Spanos, Radtke-Bodorik, Ferguson, & Jones, 1979; Chaves & Brown, 1987, Spanos, et al., 1981, Spanos, Hodgins, Stam, & Gwynn, 1984, Heyneman, et al., 1990, Brown, 1982). These dimensions are typically indexed

by self-statements, descriptions of the persons' thoughts, feelings, and imaginings, or by endorsing responses on a questionnaire

Chaves and Brown (1987) viewed catastrophizing as cognitions that exaggerated the fearful aspects of a dental procedure. Dental patients focused on their feelings, and the physical manifestations of fear such as a pounding heart, and sweaty palms, preceding and during an injection. Spanos and colleagues (1979, 1981, 1984) suggested that individuals catastrophized when they focused on or exaggerated the noxious aspects of the painful stimuli and expressed their inability to cope with the pain. In response to finger pressure pain statements such as "My finger is killing me. It feels like it is being crushed," "I really wanted to take it out," "I knew I couldn't last," indicated a negative focus and fear of failure to endure the pain. Rosentiel and Keefe (1983) developed a measure of pain-related coping strategies for individuals experiencing painful conditions, which included statements that reflect worry ("I worry all the time about whether it will end"), and hopelessness ("I feel like I can't go on"). Brown (1982) interviewed individuals with headache pain and reported cognitions that described the negative impact of pain on the individual's career and family-life ("I think about how my work is suffering," "My marriage is being ruined") (p. 1, Appendix O). Other conceptualizations of catastrophizing that more generally describe a negative orientation to pain include catastrophizing as a cognitive error (Gil, et al., 1990), a negative strategy (Turk & Rudy, 1992) or a faulty appraisal (Jensen, et al., 1991). For the purposes of this research subjects were classified as catastrophizing if they: a) focused on or exaggerated the noxious aspects of the pain, b) expressed worry about negative outcomes, c) expressed coping failure, or d) expressed negative emotions in relation to the pain.

Laboratory Studies

A number of laboratory studies examined the effects of cognitive activity on pain perception within a framework of testing interventions designed to reduce pain (Spanos et al , 1981, Spanos & Brazil, 1984, Harris & Rollman, 1985, Spanos, Perlini, & Robertson, 1989, Devine & Spanos, 1990) Subjects typically performed a baseline pain trial and then were instructed to use cognitive coping strategies during a post-intervention pain trial. The coping strategies which subjects were instructed to use varied considerably among studies but could be categorized as either imagery, self-statements, or attention diversion (Fernandez, 1986). Pain intensity, threshold, tolerance, and on-going cognitive activity were typically the variables measured. Cognitive activity was assessed by asking subjects to describe their thoughts, feelings, and imaginings, either in writing or in a tape-recorded interview, during or immediately after the pain stimulus. Transcripts of the subjects cognitions were then coded for catastrophizing, coping, or neutral cognitions.

Catastrophizing cognitions were consistently associated with increased pain and decreased tolerance (Spanos, et al , 1981, Vallis, 1984, Heyneman, et al , 1990, Geisser, et al , 1992). The extent to which individuals succeeded in using cognitive strategies to decrease pain was, in part, determined by their ability to attend away from the noxious aspects of the pain situation, and suppress negative cognitions (Spanos, Horton, & Chaves, 1975, Meichenbaum, 1977, Spanos, Brown, Jones, & Horner 1981, Spanos, et al , 1989). The presence of positive cognitions was not as important as the absence of negative cognitions for decreasing pain from baseline pain trials (Harris & Rollman, 1985, Heyneman et al , 1990). Individuals who continued to have catastrophizing cognitions while using coping strategies reported less pain reduction than those that avoided such negative cognitions (Spanos et al , 1989).

Studies that examined spontaneous cognitive activity prior to cognitive coping interventions reported the same association between negative cognitions and pain, as the intervention studies. There was wide variability in reported pain at baseline. Individuals that were able to self-generate coping strategies reported less pain and greater tolerance than individuals that focused on or exaggerated the negative aspects of the noxious stimulus (Geisser, et al., 1992, Harris & Rollman, 1985, Spanos, et al., 1984).

Expectancy and absorption were found to mediate the use of coping strategies, negative cognition, and pain reduction (Marino, Gwynn, & Spanos, 1989, Devine & Spanos, 1990). Specifically, reported pain reduction was affected by subjects' expectations about their ability to successfully use coping strategies (Spanos & O'Hara, 1989-90). Subjects who expected to be successful at reducing their pain were more likely to do so than those who did not. In addition, information that induced negative expectations had a more potent effect than positive information, or no information, on pain reduction (Marino, et al., 1989, Fernandez & Turk, 1992, Ellis, Spanos, & Morley, 1993). Subjects given positive information about their ability to use coping strategies may have been more persistent in trying to use these strategies than subjects given negative information. Subjects who reported being most absorbed in coping cognitions reported greater reduction in pain and fewer negative cognitions (Chaves & Barber, 1974, Stam & Spanos, 1980, Spanos & O'Hara, 1989-90).

Taken together, these studies suggest that catastrophizing cognitions play a primary role in determining pain response including success in using cognitive strategies to decrease pain. Catastrophizing seems to be influenced by absorption in cognitive strategies and expectancy information related to coping ability.

Clinical Studies

Parallel to laboratory pain research, research on chronic pain has proceeded primarily from within a coping framework. The underpinning of this body of research is the search for effective coping approaches and questions about how patients manage their thoughts, behaviours, and emotions to deal with pain. That individual differences in coping with pain are important is suggested by variability in outcome measures such as activity, disability, depression, or distress, in individuals with similar physical pathology.

Catastrophizing in the clinical pain literature has been primarily assessed with the Coping Strategies Questionnaire (CSQ) (Rosentiel & Keefe, 1983). The CSQ is a 44-item measure that has seven subscales which measure the extent that pain patients use a variety of cognitive and behavioral coping strategies to manage pain.

Catastrophizing is one, six-item subscale of the CSQ. Although the other items on the CSQ assess ways in which individuals cope with pain, the catastrophizing items have been described as maladaptive strategies because they are associated with negative outcomes (Keefe, Brown, Wallston, & Caldwell, 1989).

In patients with chronic back pain, high scores on the CSQ catastrophizing subscale were associated with depression, inactivity, and anxiety and were the best predictor of disability (Rosentiel & Keefe, 1983, Turner & Clancy, 1986, Main & Waddell, 1991, Spinhoven, Cory, & Linssen, 1991). Patients with severe pain or patients that had a poor understanding of the nature and duration of their pain were more likely to score higher on the CSQ-catastrophizing subscale (Estlander & Harkkapa, 1989; Estlander, 1989; Williams & Keefe, 1991). Hadjistavropoulos and Craig (1994) categorized patients with acute and chronic low back pain according to whether their pain was congruent or incongruent with findings from their physical exam. Patients with pain that was incongruent with findings from their physical exam

reported greater CSQ catastrophizing scores, disability, analgesic use, and emotionality, than the patients with congruent findings

In patients with rheumatoid arthritis CSQ-catastrophizing scores were found to be stable over a six month period and were positively correlated with pain, physical disability, and depression (Keefe et al , 1989) Catastrophizing was the best predictor of pain severity, health status, and psychological distress for patients with osteoarthritis (Keefe et al , 1987) Similarly, higher scores on the CSQ catastrophizing subscale were the most important predictor of pain and distress in patients with phantom limb pain (Hill, 1993)

Recognition for the importance of cognitive variables in determining outcomes for individuals with painful conditions has lead to a proliferation of questionnaires that assess negative cognitions These have all been used with patients experiencing chronic pain to asses their subjective cognitive experience Examples are the Inventory of Negative Thoughts in Response to Pain (INTRP) (Gil et al , 1990), the Pain Cognitions Questionnaire (Boston, Pearce, & Richardson, 1990), the Cognitive Evaluation Questionnaire (Philips, 1989), the Cognitive Errors Questionnaire (Lefebvre, 1981) and the Automatic Thoughts Questionnaire (Hollon & Kendall, 1980) A similar pattern of results was found with all of these measures Negative cognitive activity was consistently associated with greater pain intensity, psychological distress, anxiety, depression, social withdrawal, and behavioral disruption This was irrespective of whether it was defined as negative self-statements, cognitive errors, or automatic thoughts (Philips, 1989, Boston, et al , 1990, Gil, et al , 1990, Osman, Bunger, Osman, & Fisher, 1993, Ingram, et al , 1990)

The presence of negative cognitions with respect to pain is associated with different outcomes than positive or neutral cognitions This finding consistently emerges from the clinical and laboratory pain literature Catastrophizing has taken on

a negative connotation, in that it is associated with "poor coping." As suggested by Turk and Rudy (1992) "The most important factor in poor coping, both in laboratory and clinical pain, appears to be the presence of catastrophizing rather than differences in adaptive coping strategies" (p. 113). However, the implicit view that is sometimes suggested is that catastrophizing is an enduring subject characteristic that causes poor coping. As an enduring characteristic this view suggests that the cognitive response to pain is primary and determines the outcomes and the negative emotions consequent to the negative cognitions. This perspective requires further investigation as it is not clear if the negative outcomes found between catastrophizing and pain are due to stable subject characteristics or a specific pain-related response. Additionally, while negative emotional responses are associated with catastrophizing the role of these affects is not clear.

Perception of Analogue Pain in Chronic Pain Patients

A number of studies have examined response to experimental and clinical pain within the same individual. Chronic pain patients experiencing a number of painful conditions including chronic low back pain, temporomandibular pain, fibromyalgia and cervico-brachial disorder (upper limb and neck pain) underwent experimental pain trials using heat, pressure, or electric shock as the pain stimuli (Malow, Grimm, & Olson, 1980, Peters & Schmidt, 1991, Gibson, LeVasseur, & Helme, 1991, Lautenbacher, Rollman, & McCain, 1994). The aim of this research was to determine if chronic pain patients responded differently to experimental pain stimuli as compared to healthy control subjects. A difference in pain perception among chronic pain patients would suggest an altered nociceptive processing system which could contribute to, or account for their chronic pain. The results to date are inconclusive.

Two models that predict an opposite response to experimental pain in patients with chronic pain have been proposed. Chapman (1978) suggested that chronic pain

patients have an exaggerated focus on painful stimuli and are particularly sensitive to any physical signs of distress. This hypervigilance model predicts that chronic pain patients would demonstrate a lower threshold and tolerance for experimental pain stimuli. Conversely, Rollman (1983) suggested that chronic pain patients would evaluate experimental pain stimuli within the context of their current level of pain. By downward comparison they would judge the experimental pain to be less severe when compared to their experience of chronic pain. According to this adaptation level model, chronic pain patients would have a higher pain threshold and tolerance than control subjects.

The results of studies examining these propositions have not consistently supported one model over another. Of 16 studies reported in the literature, seven studies (Huskisson & Hart, 1972, Wolskee & Gracey, 1980, Nahboff, Cohen, Schandler, & Heinrich, 1981, Cohen, Nahboff, Schandler, & Heinrich, 1983, Yang, Richlin, Brand, Wagner, & Clark, 1985, Lipman, Blumenkopf, & Parris, 1987, Hapidou & DeCatanzaro, 1988) reported that chronic pain patients perceived increased pain thresholds, six studies (Malow et al., 1980, Sandrin, Martignon, Miceli, Alfonsi, Sances, & Nappi, 1986, Schmidt & Brands, 1986, Scudds, Rollman, Harth, & McCain, 1987, Brands & Schmidt, 1987, Langermark, Jensen, Jensen, & Olsen, 1989) reported decreased pain thresholds, and three studies (Eklom & Hansson, 1987, Hansson, Eklom, Lindblom, & Marchettini, 1988, Boureau, Luu, & Doubrere, 1991) reported no significant difference between chronic pain patients and healthy control subjects.

A number of studies used sensory decision theory (SDT) to examine differences in pain perception between chronic pain patients and healthy controls. SDT views pain perception as having two components, the discrimination of sensory information, and bias for labeling a stimulus as painful (Clark, 1974). It was hypothesized that chronic

pain patients would exhibit a difference in their ability to discriminate painful stimuli as compared to healthy control subjects therefore suggesting that chronic pain patients have some alteration in their neurologic system which contributes to their chronic pain. The results of these studies have been equivocal. Of four studies, two (Yang, et al., 1985, Malow, et al., 1980) reported that chronic pain patients were less able to discriminate painful stimuli as compared to healthy subjects, one study (Peters & Schmidt, 1992) reported no difference, and one study reported poorer discriminability in chronic pain patients, but only for mildly painful stimuli (Schandler & Heinrich, 1981). Threshold was increased in chronic pain patients in three studies (Peters & Schmidt, 1992, Yang et al., 1985; Naliboff, et al., 1981) and decreased in one study (Malow et al., 1980). The tendency to report a stimulus as painful was increased in one study (Malow et al., 1980) and decreased in one study (Peters & Schmidt, 1992).

Taken together the results of these studies do not support the view that chronic pain patients consistently differ from healthy control subjects in a predictable manner. The failure to consider individual differences in both the chronic pain patients and the healthy controls may have influenced the results. Chronic pain patients and healthy control subjects were each viewed as homogeneous groups based on their pain history.

The present research investigates catastrophizing in response to pain as an enduring style irrespective of pain history. From this perspective it is hypothesized that subjects with recurrent headaches will show a similar response to headache pain and laboratory pain.

Catastrophizing as a Construct

Although catastrophizing is viewed by many as key to understanding variability in pain response, there remain important questions about what catastrophizing is and why it occurs. The construct of catastrophizing has been portrayed in the laboratory and clinical pain literature in a number of ways. Catastrophizing is often implicitly

viewed as an enduring, trait-like cognitive response to pain, in that individuals are classified as "catastrophizers." This classification is typically based on cognitive style in response to one type of pain and in one setting or situation (Chaves & Brown, 1987, Heyneman, et al., 1990, Geisser, et al., 1992). While researchers have examined the response of chronic pain patients to experimental pain, studies have not examined cognitive style in response to pain in the same individual in response to different types of pain that occur in different settings. If catastrophizing is an enduring trait-like response to pain it should occur, to some extent, irrespective of the type of pain stimulus or situational characteristics. The stability of catastrophizing has not been extensively documented, with the exception of two studies that reported that scores on measures of catastrophizing were stable over a six-week (Sullivan, Bishop, & Pivik, 1995) and over a six-month (Keefe, et al., 1989) time period. Both of these studies used self-report questionnaires and did not assess directly the individuals response. In the Keefe et al., (1989) study catastrophizing was assessed twice in arthritis patients with respect to their joint pain and as such, there was no cross-situational component to the study.

This current research assessed and compared the subjects' cognitive response to finger pressure pain in a laboratory setting, with their response to headache pain. This component of the research addresses whether catastrophizing is a general response to pain or a response to specific types of pain. Assessing cognitive response to pain in a laboratory pain setting and a naturally occurring setting will clarify the cross-situational nature of catastrophizing.

Catastrophizing has been linked to coping either as an ineffective or a maladaptive coping strategy (Rosentiel & Keefe, 1983, Keefe, et al., 1987), as a mechanism that interferes with the use of coping strategies (Spanos, et al., 1979), or most recently as part of an emotional reaction to pain (Turk & Rudy, 1992).

The conceptualization of catastrophizing within a coping framework has been questioned (Sullivan & D'Eon, 1990, Jensen, et al., 1991; Turk & Rudy, 1992). Coping strategies are viewed as active attempts by individuals to manage the impact of pain on their lives (Turk, et al., 1983). Positive outcomes should result from successful coping. Catastrophizing does not fit this view and has not been found to be associated with positive outcomes. One area of support for catastrophizing as distinct from cognitive coping strategies comes from a study by Lawson, Reesor, Keefe, & Turner (1990). They factor analyzed the CSQ from 620 chronic pain patients and found two robust factors: conscious use of cognitive coping strategies, and self-efficacy beliefs concerning ability to manage pain. There was also a third, less stable factor, that reflected avoidance of pain by attending to non-pain related activity. Items from the catastrophizing scale did not consistently load on any of these three factors. These results suggest that catastrophizing may not be directly related to coping and that alternate conceptualizations are required to develop our understanding of this construct.

The coping interference view of catastrophizing arises primarily from laboratory pain research where subjects are instructed to use distraction or imagery strategies to reduce pain. In a think-aloud assessment of cognitions, subjects say what is going on in their minds during the pain trial. It is clear, when listening to subjects describe their thoughts, that if they are focusing on the pain they are not attending to the strategy (Ellis, et al., 1993). Catastrophizing captures the subject's attention and disrupts the flow of thoughts about the imagery or distraction task. Measures of absorption support the relationship between catastrophizing, strategy use, and pain reduction. That is, subjects who report greater absorption in imagining also show less catastrophizing and greater pain reduction (Spanos & O'Hara, 1989-90). This may explain, in part, the mechanism by which catastrophizing exerts its influence in regard to cognitive coping

strategies. However, it does not suggest why catastrophizing occurs nor why, for some subjects, it persists even when they are instructed to use coping strategies.

The most recent view of catastrophizing, and the one adopted in this research, is that catastrophizing is part of an emotional response to pain but not necessarily synonymous with the emotions that accompany pain. Catastrophizing is distinctly cognitive in that it is primarily defined by statements and images that focus on the negative aspects of the pain experience but these cognitions are also part of the negative emotional experience that occurs with respect to pain. Theoretical questions about the construct of catastrophizing relate to whether there is distinct information for understanding pain experience in the cognitive reactions to pain that is not available when examining only the emotional response to pain. Is the construct of catastrophizing separate from negative emotionality or should it be considered an artifact of the negative emotions that individuals experience when in pain? *

Turk and Rudy (1992) suggested that the underlying construct measured by the multitude of questionnaires assessing negative cognitions is actually negative affect. Similarly, Lawson and colleagues (1990) suggested that catastrophizing may be conceptually and empirically distinct from cognitive coping and may be better understood as an emotional factor in the pain experience. The possibility of overlap is suggested by correlations among measures of negative cognitive activity and other affective states, such as anxiety, depression, and fear. For example, the catastrophizing subscale of the CSQ was significantly correlated with the three subscales and with the overall score on the INTRP (Gil, et al., 1990). Similarly, the hopelessness factor on the Pain Cognitions Questionnaire (Boston, et al., 1990) was correlated with depression. Sullivan and colleagues (1995) reported significant correlations between a recently developed measure of catastrophizing called the Pain Catastrophizing Scale (PCS) and measures of anxiety, depression, negative affectivity and fear of pain.

Sullivan and D'Eon (1990) suggested that measurement redundancy may underlie the relationship between catastrophizing and depression, as measured by the CSQ (Rosentiel & Keefe, 1983). When they removed items from the catastrophizing subscale judged to be reflective of depressive symptomatology they found no relationship between depression and the remaining subscales. Thus they concluded that catastrophizing, at least as measured by the CSQ, may be more indicative of dysphoria than pain-related cognition. Similarly, Affleck, Tennen, Urrows, and Higgins (1992) found no relationship between catastrophizing and pain severity in patients with arthritis, when depression was held constant. However, a recent study by Geisser, Robinson, Keefe, and Weiner (1994) did find support for catastrophizing as separate from depression. They used path analysis to examine the relationship between catastrophizing, depression, and scores on the McGill Pain Questionnaire (Melzack, 1975). Catastrophizing mediated the relationship between depression and the affective and evaluative components of pain, while depression was related to the sensory aspect alone. Sullivan and colleagues (1995) found that catastrophizing was the best predictor of pain intensity even after controlling for depression, anxiety, fear and negative affect. They suggested that catastrophizing is related to these affective states, but not conceptually confounded with them. Thus there is overlap between catastrophizing and negative emotionality in that negative emotionality is a component of catastrophizing. Both catastrophizing and negative emotionality may contribute distinct information to our understanding of pain responses. Trying to understand and delineate the overlap between cognition and emotion is a challenge complicated by the temporally related nature of cognitions and emotions. As has been discussed and debated in the literature for many years it appears impossible to reliably determine which is antecedent or causal (Lazarus, 1984; Izard, 1991).

In summary, while the literature suggests that the most important factor in coping with pain is the absence of catastrophizing and that catastrophizing may be associated with emotion, this link has not been fully explored or understood. A primary goal of this research is to investigate the relationship between negative emotionality, catastrophizing, and pain, within a model of emotion as opposed to a model of coping, or a cognitive model.

The Role of Emotion

Research and theory on emotion occupy a large and complex body of literature. Constructs central to theories of emotion include definitions of emotion, primary emotions; emotion-language; the role of emotion in organizing and motivating behavior, temporal links between emotion and cognition, and the neurophysiologic effects of emotion. A number of theories and competing paradigms attempt to incorporate current and past research to explain the purpose, the process, and the outcome of emotion. Theories have similarities and differences in the way they view the nature and importance of emotion and its effects on behavior.

Darwin (1872/1965) was among early theorists to propose a biological-evolutionary focus to emotion. He suggested that emotions were a central organizing factor in animal behavior and were associated with action patterns that were adaptive for survival. Plutchik (1962) described eight behavioral patterns that accompany basic emotions. Zajonc (1980) suggested that emotions may be associated with certain thoughts and actions that are inborn and serve to promote adaptation and survival. Izard (1977, 1991), Tompkins (1962, 1963) and Ekman (1973) described universal facial expressions that accompany different emotions. They stress the communication of emotion as important to human development and survival. Others disagree that emotions are primary. They suggest that arousal or activation is most important and the perception and expression of emotion is secondary (Duffy, 1957, 1962, Schachter

& Singer, 1962) Schachter (1964) proposed that all emotions have common arousal patterns or physiological reactions and it is the cognitive structure that leads to the labelling of this arousal as a particular emotion. This is consistent with early writing by William James that suggested change in physiological state was the central event and immediate cause of emotion (Kagan, 1984).

A point of debate in the emotion literature is the relationship between, and importance of, cognition and emotion. Lazarus (1984) suggests the issue of central importance is the effect of cognition on emotion. He maintains that cognition is a necessary precondition of emotion. A situation elicits emotion only after meaning is evoked for the individual by cognitive processes such as evaluation, attribution, and appraisal. In opposition to this view Zajonc (1980, 1984) suggests that emotion and cognition are two separate and partially independent systems. Each system can be activated separately although they typically operate conjointly. Emotions can be elicited without prior cognitive activity and can influence cognitive processes. Similarly, Izard (1977, 1991, 1993) argues in favor of an interactive system where emotions can be activated by cognitions or directly by other emotions.

Differential Emotions Theory

Differential Emotions Theory (DET) (Izard, 1977, 1991) makes explicit the interactive link between cognitions and emotions in a construct called affective-cognitive structures. Central to DET (Izard, 1977, 1991) is the conceptualization of emotion as a motivator and organizer of behavior. Building on the work of Darwin (1872/1965), and Tompkins (1962, 1963), DET views emotions as basic to the evolution and adaptation of human beings. Each of 12 basic emotions have unique motivational properties and tend to facilitate and direct perception, thought, and action, in a manner specific to the emotion (Plutchik, 1990; Izard, 1991). For example, fear is often associated with a narrowing of the perceptual field, and with thoughts and

actions that are related to escape or avoidance (Plutchik, 1990). This "tunnel vision" focuses attention on what is threatening, to the exclusion of less relevant stimuli. From an evolutionary perspective this is adaptive for the survival of the species when it removes the individual from physical danger.

It can also be explanatory with respect to pain behavior, although not necessarily adaptive. For example, women in labour report more anger, fear, and pain as labour progresses (Leventhal, Leventhal, Shacham, & Easterling, 1989; Odent, 1991). During the transition phase of labour when uterine contractions increase in intensity, duration, and number, women often exhibit behaviors or statements indicative of escape or attack. This is a time when women may demand to be allowed to leave the hospital, try to climb out of bed even when encumbered with monitoring equipment, or lash out physically or verbally at a support person (Sherwen, Scoloveno, & Weingarten, 1993). Women may express fear of dying, fear of losing control, and fear of a negative outcome for the baby (Odent, 1991). These behaviors, which may not be "adaptive" given the setting, are consistent with the fear and anger response (Berkowitz, 1993; McGuire & Troisi, 1990; Plutchik, 1990).

Catastrophizing seems to fit logically within DET as the cognitive complement to pain activated emotions such as fear, anger, and sadness. Specific emotion concepts such as emotion activation, emotions as motivators, emotion thresholds, and affective-cognitive structures, seem to have explanatory power and will be described as they relate to pain.

Emotion Activation

The activation of emotion, according to DET, can be either a cognitive or non-cognitive process. Izard (1993) proposes four separate but highly interactive systems for emotion activation: neural, sensorimotor, motivational, and cognitive. In the example of pain-activated emotion, Izard suggests the anger and fear associated with

pain can be activated without cognitive mediation via the neural and sensorimotor systems (Izard, 1993) Support for this was found in cross-sectional and longitudinal studies of infants that received immunization injections Anger was observed as early as 2 months of age and was stable over the first 18 months of life (Izard, Hembree, Dougherty, & Spizzirri, 1983, Izard, Hembree, & Huebner, 1987) Ledoux (1989) and Melzack (1990) both proposed a physiological explanation for pain-activated emotion whereby nociceptive input ascends neural pathways to the limbic system where emotion is activated directly.

Cognitive theories of emotion activation typically view cognition as an antecedent of emotion (Frijda, 1988, Lazarus, 1966, 1984) Emotions are generated and maintained as a result of cognitive processes such as appraisals, beliefs, motivations, and attributions In the example of pain-activated fear, self-statements such as “Oh no, this is going to hurt” might initiate the emotion of fear. The multidimensional experience of fear includes cognitive, perceptual, autonomic, and neurochemical effects in addition to the “feeling state” that is typically associated with fear DET views cognition as one initiator of emotion but argues in favor of a reciprocal relationship whereby emotion can activate certain emotion-associated cognitions (Izard, 1992) For example, pain from inadvertently hitting one’s thumb with a hammer is often associated with the feeling and expression of anger The anger is instantaneous and the thoughts follow in rapid succession This happens in milliseconds and it may not be possible to know which comes first, the emotion or the cognition (Izard, 1991).

Affective-Cognitive Structures

DET makes explicit the emotion-cognition link in a term called affective-cognitive structures which may be important to the understanding of what activates and maintains catastrophic thought in relation to pain. “When emotion becomes linked

to a mental image, symbol, or thought, there emerges a feeling-thought bond, an affective cognitive structure" (Izard, 1991 p. 14). An emotion reliably cues particular types of cognitions, thoughts and images (Izard, 1977, 1991). This is similar to the construct of schemata as a way of organizing information into memories, images and scripts (Bower, 1981; Dar & Leventhal, 1993). The fear and anger typically associated with pain would cue particular cognitions, memories, and images. Reciprocally, catastrophizing cognitions such as focusing on the aversive aspects of the situation would evoke negative emotions.

DET suggests that emotions have activation thresholds which vary across individuals and show stability within the individual over time (Izard, Libero, Putnam, & Haynes, 1993). This is relevant to the current research because it suggests that certain emotions are more frequently and more easily activated for some people than they are for other people. Thus if pain, or the thought of pain, reliably triggers fear and anger, the cognitions associated with these emotions would be prominent. Also catastrophizing as an enduring cognitive approach to pain would be mediated by emotion activation and would be expressed as an affective-cognitive structure.

Support for the stability of emotions was found in two longitudinal studies. The first examined the expression of emotion by infants receiving routine immunizations (Izard et al., 1987). The pain-associated expression of anger and sadness at 2-7 months of age was the best predictor of these emotions at 19 months of age. Soothability, defined as time from needle penetration to quietude, varied across infants and remained stable over the 19 months of the study. Izard and colleagues (1987) suggested that in slow soothers the connection between anger and aversive stimulation may be stronger than in fast soothers. These early experiences might be the beginning of an enduring response-style to pain that is characterized by greater fear, anger, and sadness. The cognitions that accompany these emotions would become more

prominent as the child developed greater verbal expression. The tendency to experience greater negative emotionality with respect to pain may be evident from birth and this may initially contribute to a greater vulnerability or sensitivity to pain. The cognitive components of pain experience such as memories, appraisals, beliefs, and attitudes, may be shaped developmentally from this early tendency to experience strong negative emotions when in pain. The babies in the immunization study clearly differed in the strength of their emotional reactions to injection pain. It is unlikely that the emotional reaction was secondary to the cognitive appraisal of the situation as threatening or to any self-statements about the aversive aspects of injections. Early pain experiences may be primarily emotional with the cognitive components developing over a lifetime of pain experience.

Additional support for the stability of individual differences in emotion expression is found in infant developmental and adult personality research. For example, anger and sadness in response to separation, and fearfulness and shyness in novel situations, have demonstrated cross-situational and temporal stability in infants and children (Kagan, Resnick, & Snidman, 1988; Hyson & Izard, 1985). Watson and Tellegen (1985) reviewed a number of published studies of self-reported mood and found positive and negative affect to be robust and stable constructs in adults. Izard and colleagues (1993) examined the stability of emotions over three years in women after childbirth. They reported individual stability in the over-all emotion experience, despite changes in group means for the discrete emotions.

According to DET, the emotion-activating systems are influenced by individual differences in emotion expression, social variables, and environmental conditions (Izard, 1993). Once activated, emotions have specific links to cognitions, memories, images, etc. Individuals that exhibit catastrophic thought as an enduring response to pain may also have lower thresholds for fear and anger when confronted with a

situation that involves pain. Their cognitive response may be the "marker variable" for their emotional response.

In summary, catastrophizing has been described as a response to pain that is associated with negative outcomes such as distress, disability, depression, anxiety, inactivity and generally "poor coping." Catastrophizing has been proposed as an example of an ineffective strategy for managing pain, as a mechanism that interferes with coping strategy use, and as an emotional response to pain. Cognitive interventions such as imagery, distraction, thought stopping, etc., have been shown to decrease catastrophizing which is in turn associated with pain reduction. What remains unclear is what determines catastrophizing, why it occurs, and, if it is an enduring trait-like response to pain. Though it has been suggested by a number of investigators (Lawson, et al., 1990; Turk & Rudy, 1992) that catastrophizing may be best understood as an emotional response to pain this research is the first work to investigate catastrophizing from a framework of emotion theory.

CHAPTER TWO

Hypotheses to be Tested

The primary goal of this study is to further our understanding of the concept of “catastrophizing” in relation to pain. The first study in this investigation examines the emotional characteristics that differentiate “catastrophizers” from “non-catastrophizers” taking a trait and state perspective. The second study examined the stability of cognitive style across an experimental pain experience as compared to a clinical pain experience.

In regard to the first study, the primary hypothesis was that greater negative emotionality would be reported in daily life (trait negative emotionality) and in response to pain (state negative emotionality), by catastrophizers than by non-catastrophizers. Second, it was hypothesized that catastrophizers would report greater difficulty controlling their emotions when faced with difficult life situations. Third, it was hypothesized that catastrophizers would report greater fear of pain than non-catastrophizers. In regard to pain, it was hypothesized that catastrophizers would report greater pain during the finger pressure trial, as has been previously reported. In addition, it was predicted that catastrophizers would endure the pain stimulus for a shorter duration than non-catastrophizers.

In regard to the second study, the catastrophizing assessment and the headache diary were examined in order to determine if catastrophizing occurred across both situations. It was hypothesized that individuals who catastrophized in response to finger pressure pain would also catastrophize in response to headache pain.

An exploratory component of this study was the effect of past pain on cognitive style. The view of Turk and Rudy (1992) that excessive past pain leads to a negative outlook with regard to future pain is contrasted with the view that catastrophizers may have had similar pain experience but perceived it as more painful. It was hypothesized

that catastrophizers and non-catastrophizers would not differ in the types of painful conditions that they experienced, but that catastrophizers would rate these condition as more painful than non-catastrophizers

CHAPTER THREE

Method

Prescreening Measures

Subjects in Study 1 were preselected on the Pain Catastrophizing Scale (PCS) and Subjects in Study 2 were preselected for headaches. Following is the methodology for these preselection procedures.

Pain Catastrophizing Scale (Appendix A). Subjects in Study 1 were preselected for tendency to catastrophize based on their scores on the PCS (Sullivan, et al., 1995). The PCS is a 13-item self-report measure of catastrophizing ideation in response to pain. It is purported to measure catastrophizing as a trait-like characteristic and can be used in individuals not experiencing pain. Items are scored on a scale of 0 (not at all) to 4 (all the time) and are derived from examples of catastrophizing ideation provided by Spanos, et al. (1979, 1981), Chaves and Brown (1987) and Rosentiel and Keefe (1983). Factor analysis of the PCS yielded three subscales which were labelled "rumination", "magnification", and "helplessness". The subscales derived from these items had internal consistency coefficients of .87, .66, and .78 respectively and the reliability was .87 (Chronbach's alpha).

For the purposes of this research subjects were selected as catastrophizers if their total PCS score was above 29, or as non-catastrophizers if they scored below 21 on the PCS. These scores correspond to the upper and lower thirds of the total distribution of PCS scores, the method of classification used by Sullivan et al., (1995). An equal number of men and women were recruited into the study because a significant gender effect was reported, with women scoring higher than men on the PCS (Sullivan et al., 1995). The PCS was administered to 743 students enrolled in Introductory Psychology. A total of 514 questionnaires were returned and 506 questionnaires contained a complete data set and were used for subject selection.

Study 2. Subjects in Study 2 were pre-selected for headaches. Subjects who experienced headaches on a regular basis were instructed to answer five questions about their headaches. These five questions inquired about the frequency, intensity, duration, and life impact of their headaches. The questions were taken from Lacroix and Barbaree (1990). (Appendix B) The headache questions were administered to 743 students enrolled in Introductory Psychology. There were 236 students who reported at least one headache day per month, and at least one to four headaches in the last six months, that lasted at least two to six hours.

Study 1

Subjects

Seventy five subjects were preselected based on their scores on the PCS and were recruited by phone to participate in the study. Initially 30 catastrophizers and 30 non-catastrophizers were randomly selected from all catastrophizers and non-catastrophizers. As data collection was in progress it was discovered that many subjects that were classified as catastrophizers on the PCS were not catastrophizing on the finger pressure trial. Therefore 15 additional catastrophizers were recruited into the study to obtain a reasonable sample size in the catastrophizer group.

No subjects needed to be excluded based on circulatory or musculoskeletal problems that would cause them excessive pain or present undue risk during the finger pressure trial and no subject had taken analgesic medication in the 24 hours prior to the study.

Measures

Fear of Pain Questionnaire (FPQ-III) (Appendix C) The FPQ-III is a 30-item questionnaire designed to measure fear in response to a series of statements that are indicative of a situation that would cause pain (McNeil & Rainwater, 1993). The FPQ-III yields three subscale scores and a total score. The subscales are Severe Pain, Minor

Pain, and Medical Pain McNeil and Rainwater (1993) determined these by a three factor solution to a principal components analysis in which Severe Pain accounted for 55% of the variance, Minor Pain 18%, and Medical Pain 13% for a total of 86% of the variance in the scores. In a series of four studies with college students and inpatient chronic pain patients, they showed that the FPQ-III has a high over-all internal consistency (Chronbach's $\alpha = .92$) and high internal consistency for each of the three subscales (α coefficients = .88, .87, .87 respectively). Test-retest reliability was high for the total scale ($\alpha = .74$) and for the subscales ($\alpha = .69, .73, .76$ respectively).

The FPQ-III is the only measure of pain-related fear that is appropriate for use with individuals not currently experiencing pain. Other instruments that measure fear of pain have been developed for individuals experiencing chronic pain but have not been tested on non-clinical samples (Gil, et al., 1989, McCracken, Zayfert, & Gross 1992). The FPQ-III was developed and tested with a population of university students, and appears to measure fear-related pain as a trait-like phenomena (McNeil & Rainwater, 1993). Hursey and Jacks (1992) used the FPQ-III with headache sufferers and found good internal consistency, construct validity, and concurrent validity.

Constructive Thinking Inventory (CTI-S) (Appendix D) The short form of the CTI is a 52-item measure adapted from a longer version with 108 items. The CTI is a self-report measure of automatic constructive and destructive thoughts that are important for solving problems in everyday living (Epstein, 1993). Examples of constructive and destructive thoughts were taken from the work of cognitive therapists (Ellis, 1962, Beck, 1976; Meichenbaum, 1977) and student diaries from a class on emotions (Epstein & Meier, 1989). The CTI was designed to measure "experiential intelligence", which Epstein and Meier (1989) believe describes learning that occurs

from experience and encompasses practical, social, and emotional intelligence (Epstein, 1993).

The CTI has a global scale of constructive thinking and six main scales (emotional and behavioral coping, categorical and esoteric thinking, personal superstitious thinking, and naive optimism) that describe different ways that individuals think constructively or destructively. Items are scored on a 5-point scale and range from definitely false to definitely true. A 5-item validity scale is included to check for carelessness in responding and failures in comprehension. The scales were derived from factor analysis and have the following reliability coefficients: global constructive thinking (.86); emotional coping (.83), behavioral coping (.76), categorical thinking (.77), esoteric thinking (.83), naive optimism (.63), and validity (.52) (Epstein, 1993).

The construct validity of the CTI has been demonstrated in a number of studies that examined constructive thinking in relation to school performance, success in the workplace, social success, and emotional and physical well-being (Epstein & Meir, 1989). When compared to other self-report coping scales such as the Attribution Style Questionnaire (Peterson, Semmel, Von Bayer, Abramson, Metalsky, & Seligman, 1982), the Internal-External Locus of Control Scale (Rotter, 1962), the Social Support Questionnaire (Sarason, Levine, Basham, & Sarason, 1983) and the Hardiness Scale (Schmied & Lawlor, 1986), the CTI compared favorably or was superior for predicting workplace success, "productive load" (defined as socially and personally useful activities), and mental and physical well-being (Epstein & Katz, 1992, Epstein & Meir, 1989).

Differential Emotions Scale, Trait Form and State Form (DES-IV) (Appendix E, F). The DES-IV is a 36-item self-report measure of discrete emotions. Each emotion has three corresponding items which are scaled from 1 (rarely or never) to 5

(often), the scores are summed to give a scale score for each emotion. The factor structure of the DES-IV justifies the formation of a positive emotionality scale by summing interest, joy, and surprise, and a negative emotionality scale by summing sadness, anger, disgust, contempt, hostility, fear, shame, shyness, and guilt (Izard, et al., 1993).

The trait form asks the individual how often in their daily life they experience these feelings and the state form asks how often in the past week. The trait form was used without change. The state form was adapted to reflect the individual's feelings while their finger was in the pressure apparatus. The adaptation suggested by C. Izard, (personal communication, December, 1994) involved changing the instruction statement only.

A number of studies have contributed evidence for the validity of measuring discrete emotions. Reliability coefficients for the emotion scales range from .56 to .85 (Blumberg & Izard, 1985, 1986; Fridlund, Schwartz, & Fowler, 1984). The DES-IV was found to be stable over three years in a personality-emotion study with new mothers (Izard, et al., 1993).

Pain Rating Scale (Appendix G) Subjects were instructed in the use of an 11-point, numerical rating scale taken from Chapman and Syrjala (1990). Scale anchors range from 0 (No pain at all) to 10 (The worst pain imaginable). The numerical rating scale is an adaptation, for oral response, of the visual analogue scale which is a 10 cm line anchored by descriptors at both ends. Oral response is essential for this research because the finger pressure apparatus precludes any type of written response during the pain trial. Numerical rating scales have a significant positive correlation with other measures of pain intensity and can be used in oral or written format (Jensen, Karoly, & Braver, 1986; Chapman & Syrjala, 1990; Abbott, Gray-Donald, Sewitch, Johnston, Edgar, & Jeans, 1992). These scales are easily understood by most people and require

limited instruction (Chapman & Syrjala, 1990) Abbott and colleagues (1992) found that patients in hospital preferred a numeric scale over a visual analogue scale. An 11-point scale was chosen to provide consistency with related research on catastrophizing and pain (e.g. Heyneman, et al., 1990, Spanos, et al., 1979, Chaves & Brown, 1987).

Catastrophizing Assessment The degree to which subjects catastrophized during the pain stimulus was assessed with four open-ended questions taken from Spanos, et al., (1981) (Appendix II). The open-ended questions concern the thoughts, imaginings, and feelings that subjects experienced while their finger was in the pressure device. Subjects provided written answers to the questions. This was followed by an interview conducted by the investigator. The purpose of the interview was to ensure the data was complete and unambiguous. The rating criteria used to classify the written testimony were taken from Spanos et al., (1979) and Heyneman et al., (1990). Catastrophizing was defined as focusing on or exaggerating the aversive aspects of the situation ("I couldn't stop thinking about the pain", "My finger was being crushed"), thoughts reflecting fear, worry, or negative outcome ("I hope it won't damage my finger"), coping failure or negative self-evaluation ("I didn't know if I could take much more"). Coping thoughts were defined as those that reflected strategy use such as distraction, imagery, or positive self-statements, for the purpose of decreasing pain and emotional distress ("I told myself not to worry, it's almost over", "I counted backwards to distract myself from the pain"). Neutral content reflects procedural details or subject matter unrelated to the experiment ("I was thinking about how busy I was and how many assignments I have due"). Subjects received a global rating of "catastrophizer", or "non-catastrophizer" based on the predominance, which refers to the number and the intensity, of each type of cognition in their transcripts. In laboratory pain research global judgements are considered to be the "gold standard".

for defining catastrophizers and non-catastrophizers (Chaves & Brown, 1987, Spanos, et al , 1981, Brown, 1982)

Coder Training Two independent raters coded the transcripts. Each coder was given a coding manual (Appendix I) similar to that developed by Brown (1982) and Taenzer (1983) which defined coping, catastrophizing, and neutral cognitions. Coders were trained using prepared examples of written testimony that unambiguously reflected coping, catastrophizing, and neutral cognitions and they were then given ten transcripts to code as a practice exercise before coding transcripts from Study 1. Inter-rater reliability was calculated by dividing the number of agreements by the total possible agreements (Burns & Grove, 1993). There was 88% agreement on the practice transcripts so the first 15 transcripts from Study 1 were coded. Inter-rater reliability was calculated on these 15 transcripts in order to ensure consistency in the interpretation of the coding criteria. There was 93% agreement on the first 15 transcripts so the remaining transcripts were coded and an inter-rater reliability of 88% agreement was achieved. Both raters independently coded all transcripts and subjects received a rating of catastrophizer only when both raters were in agreement. If a subject was rated as a catastrophizer by one rater and a non-catastrophizer by the other rater the subject was considered to be a non-catastrophizer.

Pain History Past experience with pain was assessed with 10 questions taken from Slade, Troup, Lethem, and Bentley (1983) (Appendix J). Subjects were asked if they ever experienced pain from six externally produced sources (fractures, childbirth, joint pains, dentistry, sports training, injections) and four internally produced sources (headache, menstrual pain, sore throat, stomach pain). Subjects rated the severity of the pain on the same 11-point rating scale used for the pain trial.

Pain Apparatus A strain-gauge device modified from Forgione and Barber (1971) was used to produce focal pressure pain (Appendix K). This modified device

has been used in a number of laboratory pain studies (Spanos, et al . 1984, Dubreuil, Endler, & Spanos, 1987-88, Harris & Rollman, 1985) The subject's middle finger of the non-dominant hand, was placed beneath a tapered wedge which was then lowered onto the first phalanx of the digit Constant pressure was applied by means of a 2000 gram weight attached to the wedge Prior to use, the apparatus was calibrated by the engineering department at the Rehabilitation Center, and the weight fixed at the appropriate point The apparatus was checked and approved by Dr Pfeiffer at Health Services.

Pain Threshold Subjects were instructed to provide a pain rating when they first experienced the stimulus as painful A stopwatch was activated to count the number of seconds from the time the bar was lowered onto the subject's finger to threshold

Pain Tolerance Subjects were instructed to say "Stop" and then call out a pain rating when they wanted their finger removed from the pressure apparatus The stopwatch which was activated when the bar was lowered onto the subject's finger was stopped when it was raised Tolerance was defined as the total number of seconds subjects kept their finger in the apparatus The bar was lifted after three minutes (180 seconds) if subjects did not reach tolerance Chen and colleagues (1989b) found a three minute ceiling time sufficient to differentiate pain sensitive from pain tolerant individuals in a series of pain studies measuring tolerance

Analgesic Usage Subjects were asked if they had taken any type of analgesic medications within the last 24 hours No subjects answered yes to this question

Procedure

The study was conducted by the primary investigator and lasted approximately 45 minutes Subjects received one course credit for their participation Subjects were given a brief introduction to the study and asked to sign a consent form (Appendix I.) They were then administered the pre-trial measures which included the DES-IV Trait

Form, the FPQ-III, the CTI-S and the Pain History questionnaire. They were instructed in the use of the Numerical Pain Rating Scale and were shown the finger pressure apparatus. Subjects were instructed to rate their pain twice during the trial, at Time 1 (threshold) and at Time 2 (tolerance) as indicated above. Subjects were instructed to keep their finger in the pressure device as long as possible, but were assured that the bar would be removed when they said "Stop." These subjects who had not withdrawn their finger prior to the 180 seconds (3 minutes) were asked to remove their finger and to give a pain rating. Subjects were unaware of the three minute time limit at the beginning of the trial.

When verbal instructions were complete, subjects placed the middle finger of the non-dominant hand in the wooden saddle of the pressure apparatus. The bar with the weight attached was lowered onto the subject's finger and the stopwatch was started.

After the pain trial subjects answered four open-ended questions describing their thoughts and feelings while their finger was in the pressure device, and the DES-IV state form. Subjects were then thanked for their participation in the study and given a debriefing summary (Appendix M).

Study 2

Subjects

To recruit subjects with headaches the five headache questions (Appendix B) were administered to 743 Introductory Psychology students as previously indicated. A total of 236 students (85 males, 151 females) identified themselves as having headaches on a regular basis. Of this group, 64 subjects that experienced at least two headaches per month of moderate intensity, and lasting at least 2 hours, were recruited by phone to participate in a two-part study that examined their headache experience and their response to a laboratory pain stimulus. No subjects had to be excluded from

the study due to circulatory or musculoskeletal problems that would have caused them excessive pain, or present undue risk, during the finger pressure trial

Measures

Headache Diary (Appendix N) Subjects were instructed to record information in a diary-like booklet during the time they were experiencing headache. Subjects were requested to rate the intensity of their headache on an 11-point numerical scale (Appendix G) 30 minutes after first noticing the headache, two hours later, and again two hours later, if the headache persisted. Subjects were asked to record their thoughts and feelings and anything they did to help themselves cope with the headache. The questions from the Catastrophizing Assessment (Appendix H) were adapted to reflect headache pain instead of finger pressure pain. A coding manual (Appendix O) was developed that reflects catastrophizing and coping statements as they relate to headache pain. Examples of catastrophizing statements specific to headache pain include "My head was really killing me," "I was worried I wouldn't be able to finish my work on time because of my headache."

Two independent raters coded the headache diaries and gave each subject a classification of catastrophizer or non-catastrophizer based on the strength and predominance of catastrophizing, coping, or neutral cognitions present in the diaries. Inter-rater reliability was calculated on the first ten diaries in order to ensure consistency in the interpretation of the coding criteria. There was 80% agreement on the first ten diaries so the remaining 46 diaries were classified. Inter-rater reliability calculated on all 56 of the headache diaries was 80% agreement. Similar to Study 1 subjects received a rating of "catastrophizer" only if both raters agreed. If a subject was rated as a "catastrophizer" by one rater and a "non-catastrophizer" by the other rater the subject was considered to be a "non-catastrophizer."

Catastrophizing Assessment. (Appendix H) The four open-ended questions from Study 1 were used in Study 2. The raters coded the transcripts from Study 2 as if it were a continuation of Study 1.

The following additional measures were administered as described in the Measures Section of Study 1: Fear of Pain Questionnaire III (Appendix C); Constructive Thinking Inventory-S (Appendix D); Differential Emotions Scale IV, Trait Form, State Form (Appendix E, F); Numerical Pain Scale (Appendix G); Pain History (Appendix J), Threshold, Tolerance, and Analgesic Usage

Procedure

Subjects attended an information session at which they were given a brief introduction to the study and the headache diary. The headache diary contained instructions for completion and where to contact the investigator to schedule the laboratory session. Subjects signed a consent form (Appendix P) and were questioned about musculoskeletal or circulatory conditions that might have caused them undue pain or risk during the finger pressure trial. Subjects were then informed that they would receive a follow-up phone call in two weeks, to inquire about the headache diary, and every two weeks thereafter until they completed the study or withdrew. After completion of the headache diary subjects completed the laboratory component of the study which followed the identical procedure described in Study 1. After the completion of the laboratory component subjects were given a debriefing sheet (Appendix Q) and thanked for their participation in the study.

The scripts for the phone recruitment of subjects, for conducting Study 1, and for conducting Study 2, are in Appendix R, S, and T respectively.

CHAPTER FOUR

Results

The results of Study 1 will be presented in the first section and this will be followed by the applicable tables and figures. Then the results for Study 2 will be presented followed by a section that examines variables across the two studies. The tables and figures applicable to Study 2 are at the end of the results section. The reliability coefficients for all the scales used are included in Appendix U. The correlations between all variables for Study 1 and Study 2 are in Appendix V and Appendix W respectively.

Study 1

Sample Evaluation. All variables were examined for missing data, normality, linearity, outliers, and homogeneity of variance. Missing data was found on two questions and was replaced with the group mean for that question. According to Tabachnick and Fidell (1989), subjects with standardized scores greater than three are classified as potential outliers. One subject had z scores greater than three on four state emotion variables (anger, guilt, shame, sadness) and, as such, was deleted from further analyses. The Levene test (Stevens, 1992) for homogeneity of variance indicated that the responses to state anger violated the homogeneity assumption. A number of transformations of state anger were tried unsuccessfully. Examination of the group variances for state anger indicated that the larger variance was associated with the smaller group ($n = 18$). Analyses of data under these circumstances can result in an F value that is too liberal, thus allowing the null hypothesis to be rejected too often (Stevens, 1992). Under such circumstances, non-parametric tests are recommended (Stevens, 1992), and the Mann-Whitney test was used to analyze this variable when appropriate.

Subjects

Subjects ranged in age from 18-22 years, with the exception of two subjects who were 26 and 40 years of age respectively. Eighteen subjects (8 men, 10 women) were classified as catastrophizers and 56 subjects (31 men, 25 women) were classified as non-catastrophizers, based on their written responses after the finger pressure trial.

Gender Differences

Gender differences were found on pain reports and are noted under the section entitled Pain Measures. No other variables used in the analyses were found to differ by gender.

Pain History

Subjects indicated which of nine painful conditions they experienced by rating the intensity of the pain on a 0 to 10-point numerical scale. A question regarding childbirth was included in the measure but was not analyzed due to a low response rate. Table 1 presents the mean pain scores, numbers, and percentages of catastrophizers and non-catastrophizers that experienced each condition. Catastrophizers and non-catastrophizers were similar with respect to the number of subjects that endorsed each condition, with the exception of fractures, joint pains, and sports training. A greater percentage of catastrophizers as compared to non-catastrophizers experienced these conditions. With respect to fractures, 50 % of the catastrophizers and 37 % of the non-catastrophizers said they experienced a fracture, 83 % of the catastrophizers and 61 % of the non-catastrophizers said they experienced joint pains, and 83 % of the catastrophizers and 70 % of the non-catastrophizers experienced pain related to sports training. Chi-square tests on these distributions did not reach statistical significance. The group means for pain were not significantly different, but catastrophizers consistently reported slightly more pain than non-catastrophizers. The exception was dental pain, where non-catastrophizers reported

slightly more pain than catastrophizers. The differences in the means ranged from .05 to .83.

Discrete Emotions

The trait version of the Differential Emotions Scale was administered prior to subjects undergoing the pain stimulus. Subjects were instructed to consider how often in their daily lives they experience the following 12 emotions: joy, interest, surprise, sadness, anger, disgust, contempt, hostility, fear, shame, shyness, and guilt. In the State version of the Differential Emotions Scale, subjects responded to the questions in accordance with how they felt during the pain trial. Negative emotionality is defined as the sum of the scores on the nine negative emotion variables (sadness, anger, disgust, contempt, hostility, fear, shame, shyness, guilt) and positive emotionality is defined as the sum of the scores on the three positive emotion variables (joy, interest, surprise).

Means scores on both the trait and state forms of positive and negative emotionality were examined for differences between subjects classified as catastrophizers ($n = 18$) and non-catastrophizers ($n = 56$). MANOVA was used to examine group differences on these four variables as recommended by Tabachnick & Fidell (1989). No attempt was made to equalize the sample sizes as this inequality reflects actual differences in the population. Results indicated state negative emotionality was the one variable that differed significantly between catastrophizers and non-catastrophizers. Examination of the means indicated that catastrophizers experienced significantly greater negative emotionality ($M = 50.06$) than non-catastrophizers ($M = 38.25$), $F(1, 72) = 9.07$, $p < .001$, during the finger pressure trial.

Negative Emotionality. The nine emotion variables that comprise state negative emotionality were entered as the dependent variables into a between groups MANOVA. Univariate tests indicated that state fear and state anger differed

significantly between subjects classified as catastrophizers and non-catastrophizers. Examination of the means indicated that catastrophizers experienced significantly greater fear ($M = 9.66$) than non-catastrophizers ($M = 5.01$), $F(1, 72) = 34.57$, $p < .001$. Catastrophizers experienced significantly greater anger ($M = 5.56$) than non-catastrophizers ($M = 4.07$), $F(1, 72) = 6.35$, $p < .05$. The result for state anger was corroborated with the Mann-Whitney test $Z = -2.31$, $p < .05$. Table 2 presents the means and standard deviations by group for the trait and state emotion variables. Figure 1 and Figure 2 present a graphical representation of the means of the discrete emotions that comprise trait and state negative emotionality.

Pain

Pain variables included the number of seconds subjects took to first report pain (threshold), the number of seconds subjects kept their finger in the pressure apparatus (tolerance), and pain intensity at threshold and tolerance measured on a 0 to 10-point numerical scale. Given that a number of studies report differences in pain perception between men and women (Spanos & O'Hara, 1990; Geisser, et al., 1992; Ellermeier & Westphal, 1995), the four variables were examined in a cognitive style by gender MANOVA. The only variable that was significantly different by gender was pain reported at threshold. Women reported greater pain ($M = 4.34$) than men ($M = 2.87$) at threshold, $F(1, 70) = 7.10$, $p < .01$. There was a main effect for cognitive style which indicated that catastrophizers and non-catastrophizers differed significantly on pain intensity reported at tolerance and on time to tolerance. The means indicated that catastrophizers reported greater pain at tolerance ($M = 7.22$) than non-catastrophizers ($M = 6.09$), $F(1, 70) = 3.97$, $p < .05$, and catastrophizers kept their fingers' in the pressure device for a shorter time period ($M = 87.39$ seconds) than non-catastrophizers ($M = 125.54$ seconds), $F(1, 70) = 6.10$, $p < .01$. (See Table 3)

Predictors of Catastrophizing

The hypothesis that measures of emotion would predict catastrophizing was tested by a standard multiple regression using state and trait negative emotionality, the emotional coping scale from the Constructive Thinking Inventory, and fear of pain. All variables were entered at this stage because it was felt that each variable would add to the prediction of cognitive style. The regression was statistically significant, $R = .39$, $F(4, 69) = 3.22$, $p < .01$, and state negative emotionality was the only variable that contributed significantly to the regression $t = -2.97$, $p < .001$. The total percentage of the variance in catastrophizing accounted for by state negative emotionality was 16% (See Table 4).

State negative emotionality is composed of nine variables which were entered into a standard multiple regression to predict cognitive style. The regression was significant, $R = .63$, $F(9, 64) = 4.73$, $p < .001$, and state fear $t = -4.72$, $p < .001$ and state anger, $t = -2.49$, $p < .05$, contributed significantly to the regression. The total variance in cognitive style accounted for by state fear and state anger was 40 % (See Table 5). The correlations of the state and trait predictor variables are included in Table 6.

Table 1

<u>Pain History Pain Intensity Ratings by Cognitive Style</u>								
Condition	Catastrophizer				Non-catastrophizer			
	<u>M</u>	<u>SD</u>	<u>n</u>	<u>%</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>%</u>
Fractures	6.33	1.73	9	50	5.63	2.38	21	37
Joint Pains	5.20	2.46	15	83	4.41	2.12	34	61
Dentistry	4.53	1.73	15	83	5.07	2.49	54	96
Sports Training	4.80	2.37	15	83	4.23	2.16	39	70
Injections	3.61	2.40	18	100	3.38	2.53	55	98
Menstrual Pain*	6.67	2.60	9	90	6.12	2.68	25	100
Headache	5.5	1.69	18	100	5.04	2.51	56	100
Sore Throat	4.35	1.73	17	94	4.34	2.36	55	98
Stomach Pain	5.94	1.89	17	94	5.6	2.60	56	100

Note Catastrophizers ($\underline{n} = 18$), Non-Catastrophizers ($\underline{n} = 56$), *Menstrual Pain (women) Catastrophizers ($\underline{n} = 10$), Non-catastrophizers ($\underline{n} = 25$), No differences are significant

Table 2.

<u>Trait and State Emotions by Cognitive Style</u>						
Emotion	Form	Cognitive Style				p
		Catastrophizer		Non-catastrophizer		
		<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	
Joy	Trait	10.11	1.94	10.62	1.95	.01
	State	5.61	2.72	6.23	3.07	
Interest	Trait	10.44	1.76	10.37	1.69	
	State	9.44	2.75	9.37	2.32	
Surprise	Trait	8.89	1.91	8.25	2.42	
	State	6.94	2.55	6.21	2.61	
Fear	Trait	7.33	2.40	6.57	2.48	
	State	9.67	4.03	5.02	2.47	
Disgust	Trait	7.61	2.15	6.52	2.35	
	State	4.44	2.09	3.73	1.97	
Guilt	Trait	8.39	2.09	7.91	2.58	
	State	5.39	2.59	4.28	2.36	
Hostility	Trait	7.44	2.83	6.66	2.92	
	State	4.67	2.17	3.84	1.92	

Note Catastrophizers ($n=18$), Non-catastrophizers ($n=56$) DES state and trait form, maximum score = 15

Table 2 (continued)

<u>Trait and State Emotions by Cognitive Style</u>						
		Cognitive Style				
		Catastrophizer		Non-catastrophizer		
Emotion	Form	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	p
Shame	Trait	8.94	2.51	8.23	2.53	
Shame	State	5.44	3.05	4.25	2.05	
Anger	Trait	9.00	2.74	8.45	2.47	< .05
	State	5.56	2.81	4.07	1.93	
Sadness	Trait	8.67	2.50	8.07	2.8	
	State	5.06	2.26	4.34	2.32	
Shyness	Trait	7.89	2.14	7.43	2.48	
	State	5.78	2.67	4.64	2.43	
Contempt	Trait	7.00	2.47	6.80	2.34	
	State	4.06	1.39	4.07	1.72	

Note Catastrophizers ($n=18$), Non-catastrophizers ($n=56$) DES state and trait form, maximum score = 15

Table 3.

<u>Pain Measures by Cognitive Style and Gender</u>				
Variable	<u>M</u>	<u>SD</u>	<u>F</u>	<u>p</u>
Threshold Time In Seconds				
Catastrophizer	28.72	19.99	59	
Non-catastrophizer	34.48	24.19		
Men	38.41	26.67	2.04	
Women	27.14	17.21		
Pain Rating at Threshold				
Catastrophizer	4.00	1.71	72	
Non-catastrophizer	3.43	2.02		
Men	2.87	1.75	7.1	.01
Women	4.34	1.89		
Tolerance Time In Seconds				
Catastrophizer	87.39	55.53	6.1	.01
Non-catastrophizer	125.54	55.19		
Men	129.85	56.23	1.34	
Women	101.11	55.41		

Note $df = (1,70)$, Catastrophizer ($n = 18$), Non-catastrophizer ($n = 56$)

Men ($n = 39$), Women ($n = 35$)

Table 3 (continued)

<u>Pain Measures by Cognitive Style and Gender</u>				
Variable	<u>M</u>	<u>SD</u>	<u>F</u>	<u>p</u>
Pain Rating at Tolerance				
Catastrophizer	7.22	1.26	3.97	< .05
Non-catastrophizer	6.09	2.08		
Men	5.87	1.97	3.78	< .05
Women	6.91	1.83		

Note. df = (1,70), Catastrophizer (n = 18), Non-catastrophizer (n = 56)

Men (n = 39), Women (n = 35)

Table 4

<u>Regression Analysis Predicting Catastrophizing from Emotion Variables</u>				
Variable	β	t	p	Zero-order r
CTI-emotional coping	.22	1.88		.11
Fear of Pain	.10	-.83		-.10
State Negative Emotionality	-.35	-2.96	.01	-.33
Trait Negative Emotionality	-.02	-.17		-.14

Note. $N = 74$, CTI = Constructive Thinking Inventory, $R^2 = .16$

Table 5

Regression Analysis Predicting Cognitive Style from State Negative Emotions

Variable	β	t	p	Zero-order r
State Fear	-.51	-4.72	< .01	-.57
State Anger	-.46	-2.49	< .05	-.28

Note N = 74, $R^2 = .40$

Table 6

<u>Correlations Among State and Trait Variables Predicting Cognitive Style</u>							
Scale	cat	fear	CTI- emotion	trait negative	trait positive	state negative	state positive
cat	—						
fear	- .10	—					
CTI- emotion	.11	.33*	—				
trait negative	-.14	.29*	.14	—			
trait positive	-.02	.11	.17	.02	—		
state negative	-.33*	.19	.21*	.35*	.12	—	
state positive	-.03	.06	.11	-.04	.33*	.47*	—

Note N = 74, * $p < .01$, cat=cognitive style (1 =catastrophizer, 2 =non-catastrophizer)
 fear =fear of pain, CTI-emotion = CTI-emotional coping, trait negative =trait negative
 emotionality, trait positive=trait positive emotionality, state negative =state negative
 emotionality, state positive= state positive emotionality

Figure 1 Differential Emotion Scale State Negative Emotions by Cognitive Style

Figure 2 Differential Emotions Scale Trait Negative Emotions by Cognitive Style

Study 2

Sample Evaluation Sixty-four headache diaries were distributed and 57 subjects completed both the headache diary and the finger pressure component of this study. Reasons for not completing the study included withdrawing from Introductory Psychology, personal/family problems, and lack of time due to work commitments. Prior to analysis all variables were examined for missing data, normality, linearity, outliers, and homogeneity of variance. Using the same criteria as described in Study 1, one subject with z scores greater than three on three discrete emotion variables (disgust, hostility, guilt) was considered to be an outlier and was deleted from the analyses. State sadness violated the assumption of homogeneity of variance and the larger variance was associated with the smaller group size. As in Study 1, transformations were not successful so state sadness was analyzed with the Mann-Whitney test.

Subjects

Of the 56 subjects in this study, 13 subjects (10 women, 3 men) were classified as catastrophizers and 43 subjects (18 women, 25 men) were classified as non-catastrophizers based on their written testimony after the finger pressure trial.

Headache Variables Headaches were assessed with five variables that described the frequency, average intensity, length, and perception of headaches as a problem for the individual. The typical or modal subject had one headache per week that lasted between two and 12 hours and was of moderate intensity. The majority of subjects ($n = 32$) viewed their headaches as a moderate problem, or as a moderate to severe problem ($n = 8$). Examination of pain intensity ratings in the headache diaries indicated that at the time of onset the average pain intensity rating was 5.9 (0-10 point scale). Catastrophizers reported slightly greater pain ($M = 6.46$), and non-catastrophizers slightly less pain ($M = 5.73$) than the sample mean. The differences between

catastrophizers' and non-catastrophizers' and men's and women's pain intensity ratings were not statistically significant

Gender Differences

Subjects were preselected for headaches and an equal number of men ($n = 28$) and women ($n = 28$) were recruited into the study. The total sample is balanced for gender but the catastrophizer group has more women ($n = 10$) than men ($n = 3$). This is consistent with other studies that report higher levels of catastrophizing among women (Geisser et al., 1992; Sullivan et al., 1995; Jensen, Nygren, Gamberale, Goldie, & Westerholm, 1994). A number of variables were found to differ by gender. Due to the predominance of women in the catastrophizer group this precludes examining these variables by cognitive style.

In order to examine the differences between catastrophizers and non-catastrophizers, it was decided to conduct analyses on variables that also differed by gender only with data for women. The 10 women catastrophizers and 18 women non-catastrophizers were compared to see if the predictors of catastrophizing described in Study 1 held in this sample of subjects with headaches.

Discrete Emotions

A between groups MANOVA was performed with state and trait negative emotionality, and state and trait positive emotionality as the dependent variables. There was no significant difference between women catastrophizers and non-catastrophizers with respect to trait and state positive emotionality or trait negative emotionality. State negative emotionality approached significance ($p = .054$) and catastrophizers experienced greater state negative emotionality ($M = 51.6$) than non-catastrophizers ($M = 40.0$). The nine emotion variables that comprise negative emotionality were entered as the dependent variables in a between groups MANOVA. The three negative emotions that differed significantly between catastrophizers and

non-catastrophizers with headaches were disgust $F(1, 26) = 8.07, p < .01$, hostility $F(1, 26) = 4.55, p < .05$, and sadness $F(1, 26) = 14.68, p < .01$ (See Table 7). The result for state sadness, examined as part of the MANOVA on the negative emotion variables was corroborated with the Mann-Whitney test. This test indicated that catastrophizers experienced significantly greater sadness ($M = 7.30$) than non-catastrophizers ($M = 3.77$), $Z = -2.30, p < .05$, during the time their finger was in the pressure apparatus. Figure 3 presents a graphical representation of the means of the state negative emotion variables for subjects with headaches.

Predictors of Catastrophizing in Subjects with Headaches

As in Study 1, state and trait negative emotionality, fear of pain, and emotional coping were entered into a standard multiple regression to test if they predicted cognitive style in the entire sample ($N = 56$). The over-all regression was not significant, $R = .31, p = .23$, however, state negative emotionality approached significance $t = -1.96, p = .054$. This finding was predicted and a standard multiple regression predicting cognitive style from the nine negative emotion variables was performed. The regression was significant, $R = .66, F(9, 46) = 4.01, p < .001$, and indicated that state sadness was the best predictor of catastrophizing $t(46) = -4.7, p < .001$. State sadness accounted for 44 % of the variance in cognitive style (See Table 8).

Headache Diaries and Similarity of Cognitive Response

Based on their cognitions in the headache diary, 33 subjects were classified as catastrophizers and 23 subjects were classified as non-catastrophizers. Of the 13 subjects that were classified as catastrophizers on the finger pressure trial, 10 (77 %) of these subjects were also classified as catastrophizers based on their headache diaries ($\chi^2(1) = 6.93, p < .01$). Of the 43 subjects that were classified as non-catastrophizers on the finger pressure trial, 20 (47 %) of these subjects were classified

as non-catastrophizers on the headache diary. The other 23 (53%) subjects did not catastrophize in response to finger pressure pain but did catastrophize in response to headache pain.

Comparisons Between Subjects With Headaches and Subjects Unselected for Headaches

Subjects in Study 1, (unselected for headaches) were compared to subjects in Study 2 (headache sufferers) on the emotion and pain variables. The means for the emotion and pain variables, collapsed across cognitive style, were similar for non-headache and headache sufferers and none were significantly different, with the exception of sadness. Sadness was examined within a cognitive style by headache status, between groups ANOVA. The main effects for headache status and cognitive style were significant and the interaction of headache status by cognitive style was also significant $F(1, 126) = 5.37, p < .05$. The means indicated that during the finger pressure trial, catastrophizers with headaches experienced greater sadness ($M = 7.38$) than catastrophizers without headaches ($M = 5.06$). There was no significant difference in reported sadness experienced on a daily basis (trait sadness) between catastrophizers with headaches ($M = 9.46$), and catastrophizers without headaches ($M = 8.67$), $p = .15$. Figure 4 is a graphical presentation of the means of the discrete emotions for catastrophizers with headaches and catastrophizers without headaches.

Combined Sample

In order to get a picture of catastrophizers and non-catastrophizers responses to the emotion and pain variables with a larger sample, the sub-samples from Study 1 and Study 2 were combined. The subjects in both samples were university students with similar demographic characteristics such as age, gender, education, etc. Each sample has a smaller proportion of catastrophizers in comparison to non-catastrophizers. In the combined sample the number of catastrophizers was 31 and the number of non-

catastrophizers was 99. There was a predominance of women ($n = 20$) as compared to men ($n = 11$) in the catastrophizer group so variables were examined for gender differences before group comparisons were made. There were 56 men and 43 women in the non-catastrophizer group.

Pain Variables In Study 1 pain at threshold differed by gender, and pain at tolerance and tolerance time differed by cognitive style. In Study 2 pain intensity at tolerance and seconds to pain tolerance did not differ significantly between female catastrophizers and female non-catastrophizers but the means were in the appropriate direction. In the combined sample the four pain variables (threshold time, threshold pain, pain at tolerance, tolerance time) were examined in a cognitive style by gender MANOVA. The main effect for gender was significant and examination of the means indicated that at tolerance, men reported significantly less pain ($M = 5.55$) than women ($M = 6.95$), $F(1, 126) = 8.49$, $p < .01$ and men kept their fingers in the pressure device longer ($M = 139.77$ seconds) than women ($M = 89.26$ seconds), $F(1, 126) = 3.92$, $p < .01$.

The main effect for cognitive style was significant and examination of the means indicated that at tolerance catastrophizers reported significantly greater pain ($M = 7.32$) than non-catastrophizers ($M = 5.88$), $F(1, 126) = 10.07$, $p < .01$ and catastrophizers kept their finger in the pressure apparatus for less time ($M = 80.41$ seconds) than the non-catastrophizers ($M = 126.22$ seconds), $F(1, 126) = 13.80$, $p < .001$.

The cognitive style by gender interaction effect was significant and examination of the group means indicated that men classified as non-catastrophizers kept their fingers in the pressure device significantly longer ($M = 149.98$ seconds) than women non-catastrophizers ($M = 95.27$ seconds), $F(1, 126) = 3.92$, $p < .05$.

Discrete Emotions A MANOVA was performed with trait negative, trait positive, state negative and state positive emotionality as the dependent variables and cognitive style as the independent variable. Similar to Study 1 and Study 2 state negative emotionality was the only variable to differ significantly between the groups $F(1, 126) = 12.35, p < .01$. In Study 1 anger and fear differed significantly by cognitive style and in Study 2 sadness differed by cognitive style. A MANOVA performed on the nine emotions that comprise state negative emotionality indicated that additional emotion variables differed significantly between catastrophizers and non-catastrophizers. Catastrophizers experienced significantly greater anger, fear, guilt, hostility and sadness than non-catastrophizers. Disgust and shame approached significance with p values of .053 and .054 respectively (see Table 9). Figure 5 presents the means of the state negative emotions in graphical format for the combined sample.

Table 7

Trait and State Emotions by Cognitive Style in Female Subjects with Headaches

		Cognitive Style				
		Catastrophizer		Non-catastrophizer		
Emotion	Form	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>p</u>
Joy	Trait	11.5	1.27	10.22	1.99	
	State	5.80	2.74	6.39	2.4	
Interest	Trait	10.1	2.23	9.72	1.81	
	State	9.4	3.24	9.11	3.14	
Surprise	Trait	8.5	2.27	7.72	1.53	
	State	7.5	2.95	8.0	3.4	
Fear	Trait	6.6	1.35	7.0	1.94	
	State	7.5	3.37	6.39	3.07	
Disgust	Trait	5.9	1.6	6.33	2.17	
	State	4.80	1.55	3.44	.98	< .01
Guilt	Trait	6.9	2.28	7.89	1.88	
	State	5.60	2.84	4.5	1.54	
Hostility	Trait	6.0	2.0	7.44	2.45	
	State	5.30	2.36	3.67	1.68	< .05

Note Catastrophizers (n=10), Non-catastrophizers (n=18) DES state and trait form, maximum score = 15

Table 7 (continued)

Trait and State Emotions by Cognitive Style in Female Subjects with Headaches

		Cognitive Style				
		Catastrophizer		Non-catastrophizer		
Emotion	Form	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>p</u>
Shame	Trait	7.3	1.64	7.89	2.27	
Shame	State	5.70	2.67	5.17	2.46	
Anger	Trait	8.1	1.91	8.56	1.69	
	State	5.40	2.46	3.89	1.94	
Sadness	Trait	9.3	2.31	9.28	1.67	
	State	7.3	3.5	3.78	1.35	.01
Shyness	Trait	6.4	1.17	7.22	1.99	
	State	5.5	2.42	5.61	3.05	
Contempt	Trait	5.70	2.26	6.06	1.89	
	State	4.50	1.43	3.56	1.29	

Note Catastrophizers ($n=10$), Non-catastrophizers ($n=18$) DES state and trait form, maximum score = 15

Table 8

Regression Analysis Predicting Catastrophizing from State Emotions in Subjects with Headaches

Variable	β	t	p	Zero-order r
State Sadness	-.90	-4.73	< .01	-.48

Note. N = 56, $R^2 = .44$

Table 9

State Emotion Variables by Cognitive Style in the Combined Sample

Variable	Cognitive Style				p
	Catastrophizer		Non-catastrophizer		
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	
Fear	8.67	3.83	5.19	2.55	.001
Anxiety	5.51	2.69	4.32	2.16	.05
Sadness	6.03	2.88	4.38	2.16	.01
Guilt	5.54	2.81	4.45	2.08	.05
Disgust	4.61	1.85	3.87	1.81	.053
Hostility	5.00	2.17	4.00	1.95	.05
Shame	5.61	2.81	4.65	2.24	.054
Shyness	5.51	2.50	4.93	2.57	
Surprise	7.29	2.84	6.68	2.94	
Interest	9.25	3.03	9.38	2.54	
Joy	5.83	2.64	6.64	2.89	
Contempt	4.32	1.83	4.32	1.42	

Note. Catastrophizers ($n = 31$), Non-catastrophizers ($n = 99$). DES emotion scales, maximum score = 15

Figure 3 Differential Emotions Scale State Negative Emotions by Cognitive Style for Subjects with Headaches

Figure 4 Differential Emotions Scale State Negative Emotions for Catastrophizers With and Without Headaches

Figure 5 Differential Emotions Scale State Negative Emotions by Cognitive Style in the Combined Sample (N = 130)

CHAPTER FIVE

Discussion

Study 1

The initial hypothesis that individuals who catastrophize experience greater negative emotionality both in their daily lives and in response to finger pressure pain was not supported. Catastrophizers did experience greater negative emotionality, but only in response to the laboratory pain situation. On a daily basis catastrophizers and non-catastrophizers reported similar degrees of positive and negative emotions. This suggests that catastrophizing is a situational reaction that accompanies pain. Pain is, by definition, a negative emotional experience and some individuals may experience greater degrees of negative emotions than others. The increased fear and anger that was found to co-occur with catastrophizing reports apparently affected subjects' perception of, and tolerance for, the pain stimulus. As in previous studies, subjects classified as catastrophizers reported more intense pain and endured the pain stimulus for a shorter time than subjects classified as non-catastrophizers (Spanos, et al., 1981, Spanos, et al., 1989, Geisser, et al., 1992, Sullivan, et al., 1995).

Catastrophizers and non-catastrophizers did not differ on the emotional coping scale of the Constructive Thinking Inventory. The finding that catastrophizers and non-catastrophizers control their emotions in a similar manner with respect to problem solving and daily hassles supports the proposition that catastrophizers have a heightened emotional response only with respect to pain. The heightened negative emotionality does not extend to other aspects of living. This result must be interpreted with caution because the reliability of the scale was low with this sample ($\alpha = .66$). Epstein (1993) reported a reliability of .83 for this scale with a sample of 292 university undergraduate students. It is not clear why the measure did not work well with this sample of subjects. There were no indications, by missing data or queries

during the administration of the measure, that subjects did not understand the questions

Unexpectedly, fear of pain did not contribute significantly to the prediction of cognitive style. The Fear of Pain Questionnaire assesses fear in painful situations, some of which many people have never experienced. For example, items such as being burned by a lit cigarette on the face, being in a car accident, or having a terminal illness that causes one daily pain, do not address common experiences. In those instances subjects answered about their expectations as to how they would feel. Individual's projected feelings of fear in a pain situation may not be as salient as their actual emotional response to pain. Most people have a reasonable fear of painful situations and this expectation for fear of pain is similar for catastrophizers and non-catastrophizers. What seems to differ is the fear that catastrophizers actually experience while undergoing the pain stimulus.

Pain History The initial hypotheses were that catastrophizers would have experienced a greater number of painful conditions than non-catastrophizers. Or alternatively, the pain history for both groups would be similar but catastrophizers would rate the conditions as more painful than non-catastrophizers. Catastrophizers and non-catastrophizers had similar pain experiences and rated the intensity of these pain experiences in a similar manner. Catastrophizers tended to consistently rate the experience as slightly more painful than non-catastrophizers but the differences between the two groups were small and did not reach statistical significance. One limitation of the measure used is that it assesses common painful conditions, that most people have experienced. With the exception of fractures, conditions like headache, stomach pain, sore throat, and dental pain have been experienced by most people at least once in their lives. Thus it was not possible to differentiate the two groups based on a history of trauma or a condition associated with long term pain. However, given

the age and developmental stage of this sample of subjects one would not expect to find a large number of individuals with chronic illness associated with pain.

A number of interrelated factors may account for the development of catastrophizing in response to pain which include genetic predisposition, family modeling or early experience. Izard, et al. (1987) suggests that infants show individual stability in the expression of anger and sadness as a response to the pain associated with inoculation. Emotion expression at 2-7 months of age was predictive of emotion expression at 19 months of age. One factor related to catastrophizing could be a genetic predisposition towards heightened emotional reactivity with respect to pain in general, which may be the foundation for the development of a catastrophizing cognitive style. Brown, O'Keefe, Sanders and Baker (1986), reported on the prevalence of coping and catastrophizing cognitions in children from eight to 13 years of age, in response to imagined pain and stress situations. They reported that children employed less catastrophizing and more coping cognitions as they got older and children that employed primarily catastrophizing cognitions in response to imagined pain and stress scored higher on a measure of trait anxiety. Similarly, LeBaron, Zeltzer and Fanurik (1989) described a group of children that exhibited catastrophizing cognitions in response to a cold pressor task. These children, compared to the others that focused on positive aspects of the experience, had a lower tolerance time and rated the pain as more intense. Interestingly, the parents of these children reported a similar negative focus with respect to everyday bumps and bruises.

Family modeling may also be a factor contributing to cognitive style. A body of literature exists that suggests that individuals learn pain behaviors within the context of the family (Violon & Giurgea, 1984, McGrath, 1990, Turner & Romano, 1990, Nicassio & Radojevic, 1993). Excessive negative focus and exaggerated pain behavior may be reinforced or extinguished depending on what is socially acceptable behavior.

for a particular family. For example, if mother identifies herself as being "unable to cope" with pain and one of the children exhibits similar behaviors with respect to pain then it would be reasonable for this family to accept this child's behavior.

Alternatively, two parents that cope with pain in a stoical fashion might convey to their children at an early age that it is unacceptable to display excessive reactions to pain.

It is clear from inoculation studies (Izard, et al., 1983; Craig, McMahon, Morrison, & Zaskow, 1984; Izard, et al., 1987) that very young infants exhibit fear and anger in response to injection pain which is relatively innocuous compared to the pain that hospitalized infants endure. A growing body of literature suggests that the repeated procedural pain that premature infants suffer in a neonatal intensive care unit may have negative effects on their physical and psychological development (Fitzgerald, 1994; Anand & McGrath, 1995). If an individual has a genetic predisposition to a heightened emotional response to pain, and their first year of life is fraught with many painful experiences they may be at risk to develop a catastrophizing cognitive style as they mature.

Longitudinal research aimed at examining the emotional and cognitive response to pain through childhood and adolescence might illuminate the process by which individuals learn to cope with pain and clarify why some individuals seem to focus on the negative or respond with negative emotions to pain, and others de-emphasize this aspect of the experience. A longitudinal design might also help answer questions about what outcomes, if any, are associated with catastrophizing.

Study 2

Catastrophizers experienced heightened negative emotionality in response to the pain stimulus, similar to Study 1. However, the pattern of the discrete emotions that comprise negative emotionality was different for these headache subjects.

Catastrophizers in Study 1 reported more fear than catastrophizers in Study 2. This may be related to three factors: 1) environmental, 2) personal experience and/or, 3) increased sadness in headache subjects.

Subjects in Study 2 received their headache diagnoses in the laboratory where the second phase of the study, which included the pain trial, was to be conducted. Thus subjects had the opportunity to familiarize themselves with the researcher and the physical characteristics of the lab. Although subjects did not see the pressure apparatus they were free to ask questions about the pain trial. Fear of the unknown may have been more prominent for subjects in Study 1 as their only contact with the researcher prior to the pain trial was a brief telephone conversation.

A second factor that may partially explain the dampened fear was that subjects with headaches have more experience related to coping with pain. These subjects may have more confidence in their ability to cope with pain because it is something they do on a regular basis with respect to their headaches. Pain is a familiar experience or state of being for these individuals and does not evoke as much fear as it does for subjects without headaches. Slightly lower scores on the fear of pain questionnaire for both catastrophizers and non-catastrophizers with headaches suggests that pain and fear may not be as closely linked for headache sufferers as it is for individuals that do not cope with headaches on a regular basis. Contrary to this position Hursey and Jacks (1992) reported greater fear of pain in headache sufferers as compared to control subjects.

A third factor may be the presence of increased sadness in the emotion pattern of catastrophizers with headaches. Emotions occur in patterns and interact dynamically. The elevation of one emotion, or a pattern of emotions is associated with the suppression of other emotions (Izard, 1972, 1991). Izard and Schwartz (1986) conducted a series of studies in which subjects were instructed to imagine a situation

associated with anger. The pattern of emotions for these subjects was increased anger, hostility, disgust, and contempt, and decreased sadness and fear. The increased anger and anger-associated emotions had the effect of suppressing sadness and fear.

Catastrophizers in Study 2 experienced significantly greater sadness than catastrophizers in Study 1 which may have had a suppressing effect on the expression of fear. The mean for state sadness for catastrophizers was almost twice as high as the mean for non-catastrophizers. Comparisons between subjects with headaches and subjects not selected for headaches indicated that non-catastrophizers in both studies scored similarly on trait and state sadness. It was the catastrophizers with headaches that reported the most sadness in response to finger pressure pain. The mean for state sadness was significantly higher for catastrophizers with headaches compared to catastrophizers unselected for headaches.

High scores for sadness as a response to finger pressure pain in catastrophizers with headaches is an important finding and may add to our understanding of the relationship among catastrophizing, depression, and pain. Catastrophizing has been found to be related to depression and associated with negative outcomes in individuals with chronic pain. There is debate about the overlap between catastrophizing and depression and whether catastrophizing is a separate construct or a symptom of depression (Jensen, et al., 1991, Romano & Turner, 1985, Sullivan & D'Eon, 1990, Geisser, et al., 1994, Novy, Nelson, Berry, & Averill, 1995). In subjects with recurrent headaches, catastrophizing in response to finger pressure pain was correlated with sadness ($r = .48$) and sadness was the dominant emotion in the pattern of emotions experienced by these subjects. In response to an acute pain stimulus catastrophizers experienced a pattern of emotions similar to those reported by Izard in a series of studies on adults with depression (Izard & Schwartz, 1986) and girls with depression (Blumberg & Izard, 1986). However, subjects in Study 2 were not chronic pain

patients recruited from a pain clinic. These were healthy university students with episodic headaches that would not be expected to have rates of depression any higher than the norms for this age group. Sadness may be the overlap, or the shared emotional experience, among pain, depression, and catastrophizing. It could be suggested that experiencing negative affect in association with pain is adaptive. In this regard, such affect could moderate and direct behavior aimed at coping with the headache.

DET suggests that emotions primarily motivate behaviors which are adaptive for survival. The experience of sadness is associated with feelings of heaviness, lack of energy, inability to concentrate, and the need for decreased environmental stimuli (Izard, 1991). In the case of the headache subjects, the sadness was associated with cognitions that described the need for sleep, darkness, peace and isolation. This is adaptive with respect to altering the physiologic processes responsible for the headaches. Although it may be considered maladaptive when sleeping and isolation interfere with social obligations such as school and work. The process takes on a disturbing or miserable tone when the cognitions and emotions interact in such a manner that the focus becomes obsessive. The following description of internal dialogue from a subject's headache diary illustrates this point. "If only I could just take a nap. But I have to go to work. Maybe I'll call in sick, I feel awful. But I called in sick last week with a headache. I'm afraid I'll loose my job. Why do I get these awful headaches. Why can't I just sleep"

In both studies, subjects that reported a predominance of catastrophizing cognitions in response to the laboratory pain stimuli also reported elevated levels of negative emotions. Given the relatively benign nature of the laboratory pain stimulus as compared to a chronic pain condition, it is not surprising that some individuals with chronic pain often display chronically elevated levels of negative emotions. Pain, by definition produces negative emotions directly, as was evident in the laboratory, and it

may also produce negative emotions indirectly via the effects of pain on an individual's life circumstances. Withdrawal from social and recreational activities, job loss, divorce, etc., are all associated with chronic pain. These events are also associated with such feelings as anger, sadness, frustration, shame and guilt (Jensen, et al., 1991, Turk & Rudy, 1992, Craig, 1994). Pain is not synonymous with depression and many individuals with chronic pain are not depressed (Banks & Kerns, 1996). However, pain is one factor that is instrumental in inducing negative emotions, and altering life circumstances in such a way as to further induce negative emotions, which are a substantial part of depression. Rudy, Kerns, & Turk (1988) reported the direct link between pain and depression to be non-significant. The significant intervening variables that helped to explain depression in individuals with chronic pain were perceived life interference and loss of self control. The significant emotional experience associated with these variables may well be sadness.

The data from the second study suggest that, in certain individuals, even intermittent pain of short duration can produce increased sadness. Catastrophizers with headaches exhibited a pattern of emotion similar to individuals with depression. Banks and Kerns, (1996) proposed a diathesis-stress framework for understanding depression and chronic pain that is applicable to the current study. Diathesis is defined as a biological or psychological characteristic of a person that increases their likelihood of developing a disease or condition (Banks & Kerns, 1996). Catastrophizers in the second study displayed a vulnerability to pain that was expressed as increased negative emotionality, with sadness as the dominant emotion. According to the diathesis-stress framework an increase in pain-related stressors that exceed the coping resources of these individuals would put them at risk for developing depression. Stressors specific to pain might be an increase in the intensity, frequency, or duration of their headaches, or the development of an acute condition that is associated with

repeated painful episodes. It would be informative to follow the catastrophizers with headaches, in a longitudinal design, to see if the burden of pain was associated with a higher incidence of depression as compared to a group of non-catastrophizers and headache-free controls.

Interestingly, sadness was the dominant emotion experienced by catastrophizers during the time their finger was in the pressure apparatus, as measured by the Differential Emotions Scale. However, cognitions specific to sadness were not evident in the finger pressure testimony. What was most prominent was persistent and graphic descriptions of the pain. For example, "Slicing sensation where rod was placed, spikes driven into my finger (little needles), like someone was trying to pull off my finger." One subject described the pain using color: "I started to see a faint tinge of reddish-orange color surrounding my finger and the device. When I asked for the pressure to stop the pain was a bright red and I could feel the heat of the color in my finger." Another subject described a process of being unable to focus away from the pain: "I tried looking down or away from it so as not to focus on the pain. My eyes began to lose focus and it seemed that the area around my finger was cloudy."

The finger pressure pain for these subjects was an intense experience that could not be ignored. The pain may have evoked the emotion of sadness in a stimulus-response manner because sadness is experienced frequently with respect to their headaches. Instead of describing the sadness, subjects described the pain. This is speculative because emotions were not measured during the headache episode and so the pattern of emotions experienced during the headache episode is undocumented. An interesting area for further study might be the consistency of emotional and cognitive response to acute episodic or chronic pain. Specifically, measuring state emotion with the DES state form immediately after an acute pain stimuli and after the onset of

headache to see if the emotional response to pain is similar, irrespective of stimuli, for individuals classified as catastrophizers

Headache Diaries and Similarity of Cognitive Response A small number of subjects exhibited a similar cognitive and emotional response to the finger pressure pain and to their headache pain. For other subjects the finger pressure trial did not challenge their coping resources or pose enough of a threat to effect a negative emotional and cognitive response. Of the 13 subjects that catastrophized on the finger pressure trial, ten of these subjects also catastrophized in response to headache pain. Three subjects catastrophized in response to finger pressure pain but did not catastrophize in response to headache pain. For these subjects, the demand characteristics of the finger pressure trial were such that they experienced negative emotions and catastrophizing cognitions. These characteristics were apparently not present during the headache episode.

There were 23 individuals that catastrophized in response to headache pain and did not catastrophize in response to finger pressure pain. This greater proportion of subjects that catastrophized in response to headache pain as compared to finger pressure pain is consistent with the literature that suggests that in addition to the pain itself, social, psychological, and physiological factors all influence an individual's response to pain (Malone & Strube, 1988, Wade, Price, Hamer, Schwartz, & Hart, 1990, Jensen, et al., 1991, Craig, 1994). Interestingly, the perceived painfulness of both pain stimuli were very similar. The mean finger pressure pain rating at tolerance was 6.05 (SD = 1.84) and the mean headache-pain rating at onset was 5.91 (SD = 1.98). This would suggest that the painfulness of the stimuli was not the primary motivator for subjects' cognitive and emotional response to both situations. Pain experience is multidimensional and the nociception may not always be the determining factor in evoking catastrophizing cognitions.

It was evident in the headache diaries that subjects viewed their headache pain as more threatening and disruptive to their daily activities, and uncontrollable than the finger pressure pain. This is consistent with a number of studies that reported an association between catastrophizing and beliefs about pain as being uncontrollable, pain as interfering with daily activities, and pain as indicative of a harmful condition (Lefebvre, 1981, Ingram, et al., 1990, Jensen & Karoly, 1991). Statements like "I am worried I won't get my work done because of my headache" and "I don't need this right now because I have too much to do" were commonly expressed in the headache diaries. The duration of the headache and likelihood of relief was often expressed as being out of the subjects' control. For example "I'm starting to wonder if this headache will go away but I'm also wondering if it is the kind that will last for more than two days" or "Why isn't this headache going away fast enough? I need instant relief everything around me is throbbing". The threat to the subject's well being was also emphasized in the headache diaries. For example "I am feeling like I am so unhealthy. Sometimes when my migraines are so bad I get scared that I have a serious problem. I start imagining that I have a tumor or something". This is an example of how complex cognitive processes can motivate emotions. DEF emphasizes the interactive, feedback, feedforward process that link emotion and cognition and influence behavioral outcomes. In this example the focus on the potential for this headache to be indicative of a life threatening brain tumor serves to augment the suffering component of headache. The fear of a brain tumor becomes adaptive if it motivates an individual to focus on why these headaches occur and to seeking treatment or make life-style adjustments to prevent or decrease future headaches.

In contrast to this, many subjects in the finger pressure component of the study expressed relief that the pain stimulus was not as bad as they expected it to be. For example "I was slightly scared before my finger went in the device but once it was in

there I felt almost slightly relieved because it wasn't as painful as I thought it would be." Other subjects exercised their option to remove their finger as soon as the stimulus became too painful. For example "I didn't like the discomfort so I removed it." Most subjects evaluated the finger pressure apparatus as being non-threatening and in some cases inconsequential. For example "I was bored. I was going to ask if I could read my book but I didn't want to seem like a macho "pain can't hurt me" tough guy." Or in response to the question that asked about thoughts and feelings one subject wrote "Impatient. I did not feel the experiment was stupid, but I wondered what this had to do with headaches." These types of statements were typical for both Study 1 and Study 2 and are reflected in the smaller proportion of catastrophizers as compared to non-catastrophizers in both studies.

Catastrophizing is not a rigid or invariant response to pain. Rather it is related to a number of factors including how people interpret the demand characteristics of a pain situation. It was clear that as the threat value and uncontrollability of the pain experience increased (i.e. the headache episode) so did the tendency to catastrophize. It is suggested that this, in conjunction with a predisposition to respond to pain with heightened fear and other negative emotions, leads to a catastrophizing response. As the demand characteristics escalate (i.e. the pain or threat increases) the number of subjects that catastrophize will increase.

The hypothesis that catastrophizing is a cross-situational response to pain received some support, as did the counter hypothesis that catastrophizing is a situational response to pain. Further research is needed to understand why some people interpret a pain situation as threatening and worthy of catastrophizing and others do not. The small group of subjects that catastrophized in both situations may be particularly vulnerable to the negative effects of pain.

Combined Sample

Gender Differences Not unexpectedly, men and women differed on a number of pain and emotion variables. Gender differences have been reported in previous studies examining pain (Spanos, Cross, & Watson, 1987, Geisser, et al., 1992, Ellermeier & Westphal, 1995), fear of pain (McNeil & Rainwater, 1993) and catastrophizing (Sullivan et al., 1995). In the current research women reported greater fear of pain than men, however, both men and women were consistent with the norms for their gender groups (McNeil & Rainwater, 1993). Women also tolerated the pain stimulus for a shorter time period and rated it as more intense than men.

Gender differences have been reported on all of the scales of the Constructive Thinking Inventory, and norms have been developed for men and women separately (Epstein, 1993). Similarly the awareness and expression of emotion varies among individuals with respect to a number of factors including age (Hyson & Izard, 1985, Izard & Schwartz, 1986, Kagan, et al., 1988, Craig, 1994), culture (Ekman, 1973, Matsumoto, 1993), and gender (Endler & Parker, 1990, Epstein, 1993, Cole, Zahn-Waxler, & Smith, 1994, Davis, 1995).

Women scored higher on some, but not all, of the state and trait emotion variables. Similarly women tended to score lower on the emotional coping scale indicating that negative emotions tended to interfere more with decision making in daily living. However, both women and men scored consistent with the norms for their respective groups on this scale (Epstein, 1994).

In the laboratory situation there were almost twice as many women classified as catastrophizers as compared to men. From the perspective of Differential Emotions Theory this would be viewed as women having lower thresholds for experiencing certain emotions and a greater propensity to experience a range of emotions. Thus the cognitions that are associated with the negative emotions that accompany pain are

more in evidence for women. Women may be more aware of, and willing to report, experiencing emotion because the expression of emotions such as sadness and fear may be more socially acceptable for women than men (Perry, Perry, & Weiss, 1989, Davis, 1995, Izard & Youngstrom, in press)

Combined Sample The pattern of emotions in the combined sample corroborates and accentuates what was found in each study separately. The increased sample size in the combined sample supports the separate findings of Study 1 and Study 2 that the two groups are similar on the trait variables.

Emotions such as hostility and guilt, that were not statistically significant in either study individually, were significant in the combined sample. However, by examining the pattern of emotions for each study separately we were able to see the impact of sadness in Study 2. In the combined sample sadness is higher in catastrophizers but the difference is obscured by combining selected and unselected subjects for headaches. Catastrophizers exhibit a different emotional response to pain than non-catastrophizers but catastrophizers as a group also differ in their pattern of negative emotionality. The frequent headaches that subjects in Study 2 experience influenced their emotional response to an acute pain stimulus.

General Discussion

The primary difference between catastrophizers and non-catastrophizers appears to be a pattern of heightened negative emotionality in response to pain. Negative and positive emotions experienced on a daily basis (trait emotions) are not significantly different for catastrophizers and non-catastrophizers, nor is positive emotionality in response to pain. Negative emotionality was a response specific to pain and did not extend to a general negative outlook on life, as indicated by similar scores for catastrophizers and non-catastrophizers on all scales of the Constructive Thinking

Inventory. Catastrophizing as a response to pain does not appear to be a manifestation of the general personality trait of neuroticism.

Differential Emotions Theory appears to provide a useful framework for understanding the catastrophizing cognitions that co-occur with the negative emotions in a pain situation. Izard (1977, 1991, 1993) suggests that an emotion reliably cues or generates a particular type of cognition, and emotions form bonds with particular thoughts or images, and with other emotions. This position is supported by the relationship between catastrophizing and heightened negative emotions found in both studies. Catastrophizing fits as the cognitive component of the cognitive-affective structures associated with pain. For example, fear, anger and sadness are three emotions that commonly interact, especially with respect to pain (Wade, et al., 1990, Berkowitz, 1993, Craig, 1994). Cognitions and images associated with these emotions and disturbing memories were described in the headache diaries and finger pressure transcripts. For example, a feeling of sadness or gloominess is evoked by the following scene described in a headache diary: "It's dark and lonely. Flashes of purple light hitting dark pools of water. Dead trees lying on cold damp ground. It's dark, cold, quiet." For another subject the experience of headache pain evoked memories of her deceased uncle: "Trying to imagine close relatives who recently died of cancer. They knew the real meaning of suffering. I also thought about my uncle and all the good times I had with him (before he died)." Or an image that evokes both sadness and perhaps fear: "I see fire shades of orange and yellow in the middle of an extreme blackness. Seems to be a silhouette of a house. My images are flashing quickly in front of the fiery house. I see familiar objects such as a soft stuffed dog, my doll, a bright sky." Similarly, Bryant (1993) reported that unpleasant autobiographical memories were associated with increased pain severity in a sample of chronic pain patients.

The benefit of viewing catastrophizing as part of a cognitive-affective structure is that the construct of catastrophizing remains clearly identified as cognitive and is not confounded with emotion. A catastrophizing statement such as "I couldn't stop thinking about the pain" is a thought not an emotion. The emotion associated with that thought may be fear, but it confuses the construct of catastrophizing by labeling the cognition as the emotion. Differential emotions theory recognizes a reciprocal causal relation between emotion and cognition but views each as a distinct entity (Izard, 1991, 1993). Each discrete emotion has three interacting components: neurochemical processes, neuromotor activity, and a distinct quality of consciousness, or a feeling state (Izard, 1977, 1991, 1993). Catastrophizing cognitions contribute to the suffering or "miserableness" of a pain experience to the extent that they motivate and maintain emotions. For example, the image described in the headache diary of dead trees and dark pools of water is disturbing in that it evokes in the reader a feeling of sadness, gloominess, or isolation. The image, separated from its concomitant emotion, becomes simply a poetic description of a woodland scene. Catastrophizing cognitions separated from their emotions lose their power to influence behavior.

Strengths and Limitations: A strength of this research is that the construct of catastrophizing is viewed from a novel theoretical framework which is well developed and well supported by empirical studies. The state and trait forms for the measures of emotion, which were central to this research, are well validated and have been used for many years in emotion research. A particular strength related to emotion assessment is the fact that 12 discrete emotions were assessed with respect to pain. This was motivated by the view that emotions form patterns and it is essential to consider the pattern and not to just assess one or two key emotions (Izard & Youngstrom, in press). This may prove to be an important concept for future pain research that attempts to understand quality of life issues for people in pain.

Disgust, shame, hostility, and guilt were emotions experienced by catastrophizers in response to finger pressure pain. Although these are not typically considered pain affects they are part of the qualitative experience of pain for some individuals. It may not be obvious why someone would feel guilt or shame with respect to finger pressure pain yet the over-all emotional effect of pain is composed of more than the fear, anger, and sadness, that are typically associated with pain. From a clinical perspective the simple question "How do you feel?" may elicit a more complete picture of the patient's pain experience than the specific question "How does your pain make you feel?" Negative emotions such as guilt, shame, disgust, or hostility may be linked to the pain indirectly and not typically associated with pain in the clinician or the patient's mind but they are still part of this individual's qualitative experience. The suffering component of pain may be associated primarily with the emotions fear, anger, and sadness but the other negative emotions, and the suppression of positive emotions such as joy, interest, and surprise, should be considered.

A limitation of this research is that it was based on self-report, which can be biased by a number of considerations, both known and unknown. For example, subjects reported the emotions they experienced on a daily basis and during the finger pressure trial. In order to give accurate and honest reports, subjects had to be self-aware and willing to share personal information. This report is likely subject to error. Self-awareness of emotion may vary across individuals and not be detected. An emotion may go undetected in subjects not comfortable or accustomed to reflecting on their emotions. Also, an emotion system that works appropriately remains largely out of awareness (Izard, 1991). Similarly, there is a certain social stigma associated with excessive expression of both pain and emotion. In North American culture this is particularly true for men and is a factor that must be considered when doing pain research.

2 OF 2

PM-1 3 1/2" x 4" PHOTOGRAPHIC MICROCOPY TARGET
NBS 1010a ANSI/ISO #2 EQUIVALENT

PRECISIONSM RESOLUTION TARGETS

Subjects may be unwilling to report their true feelings as there is a cultural and gender bias against "being weak in the face of pain"

A methodological limitation of this research was the absence of an emotion assessment in response to headache pain. The DES-state form could have been included as part of the headache diary and subjects could have filled it out at the onset of their headache. It was implicit from the cognitions that headache sufferers experienced heightened sadness but a measure of this would have made it explicit and would have provided information about the pattern of the other negative emotions.

Directions for Future Research A number of issues have emerged from this research that could further clarify the construct of catastrophizing. Catastrophizing is currently viewed as a unitary phenomena in that catastrophizers are defined by their cognitive response to pain, which is assumed to be similar for all individuals that catastrophize. However, catastrophizers in Study 1 and Study 2 differed in the pattern of emotions they reported in response to finger pressure pain. There may be subtypes of catastrophizers that exhibit different patterns of emotions in response to different pain situations or, the pattern of emotions may be stable, cross-situational, responses to pain. For example, heightened sadness was identified as a response to finger pressure pain in catastrophizers with headaches. In these subjects it would be interesting to assess emotions in response to headache pain, laboratory pain, and an acute procedural pain, like dental pain to see if there is a consistent pattern of emotions and if the emotions are always linked to catastrophizing. Treatment goals for individuals that exhibit heightened sadness as a response to pain might be related to preventing depression in future pain situations. For example, if these individuals were suddenly confronted with surgery or injury and rehabilitation, they might need support related to their emotional response to pain as well as good pain control.

The current research is the first to examine patterns of emotion as they relate to catastrophizing and pain. It may be useful from a treatment perspective to have an understanding of the patterns of emotion before and after treatment in patients with pain. The particular pattern of emotions may influence treatment outcomes. Understanding patterns of emotion and how they change or remain unchanged after treatment may offer insight into why cognitive-behavioral treatments are more effective for some patients than for others.

Summary: Differential Emotions Theory provides a useful framework for understanding the determinants of catastrophizing and for understanding how catastrophizing influences pain response. Subjects classified as catastrophizers were found to have a heightened emotional response that was specific to pain and not part of a broader emotional approach to life. Unexpectedly, catastrophizers were not a homogeneous group in regard to the patterns of negative emotions reported. Catastrophizers with headaches experienced greater sadness in response to pain than catastrophizers without headaches. Emotion theory provides a bridge for linking the cognitive and emotional components that are fundamental to the phenomenological experience of pain. Viewing catastrophizing as part of a cognitive-affective structure associated with pain may enable us to further develop our understanding of the interrelationship among catastrophizing, emotion, and pain.

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Appendices

Appendix A

Pain Catastrophizing Scale

Please think about past experiences that you have had that involve physical pain. Please indicate to what degree you have experienced the following thoughts or feelings when you are in pain.

0	1	2	3	4
Never		Sometimes		All the time

WHEN I FEEL PAIN.

- ☐ **1. I worry all the time about whether the pain will end.**
- ☐ **2. I feel I can't go on.**
- ☐ **3. It's terrible and I think it's never going to get any better**
- ☐ **4. It's awful and I feel that it overwhelms me**
- ☐ **5. I feel I can't stand it anymore.**
- ☐ **6. I become afraid that the pain may become worse.**
- ☐ **7. I think of other painful experiences**
- ☐ **8. I anxiously want the pain to go away.**
- ☐ **9. I can't seem to keep it out of my mind**
- ☐ **10. I keep thinking about how much it hurts.**
- ☐ **11. I keep thinking about how badly I want the pain to stop.**
- ☐ **12. There is nothing I can do to reduce the intensity of the pain.**
- ☐ **13. I wonder whether something serious may happen.**

Appendix B
Headache Assessment Questionnaire

I am interested in finding out how many people experience frequent headaches
If you experience headaches on a regular basis please answer the following questions
If you do not have recurrent headaches please skip this questionnaire

Please circle the response that applies to you

1. Approximately how frequent are your headaches?

Everyday 3 days/week 1 day/week 2 days /month 1 day/month
other _____?

2. Approximately how long do your headaches last?

1 hour or less 2-6 hours 7-12 hours 13-18 hours 19-24 hours More than 24
hours
other _____?

3. What is the over-all intensity of your headaches?

Very mild, aware of it only when attending to it Mild, can be ignored at times
Moderate, can not ignore Severe, difficult to concentrate
Extremely intense, incapacitating

4. Approximately how many headaches have you had within the past 6 months

None 1-4 5-8 9-14 15-20 more than 20

5. Please indicate to what degree headaches are currently a problem for you.

No problem Slight problem Moderate problem
Moderately severe problem Very severe problem

Appendix C

Fear of Pain Questionnaire

INSTRUCTIONS The items listed below describe painful experiences. Please look at each item and think about how **FEARFUL** you are of experiencing the **PAIN** associated with each item. If you have never experienced the **PAIN** of a particular item please answer on the basis of how **FEARFUL** you expect you would be if you had such and experience. Use the answers below to rate your **FEAR** of **PAIN** in relation to each event.

ANSWERS

1	2	3	4	5
Not at all	A Little	A Fair Amount	Very Much	Extreme

ITEMS

1. _____ being in an automobile accident
2. _____ biting your tongue while eating
3. _____ breaking your arm
4. _____ cutting your tongue licking an envelope
5. _____ having a heavy object hit you in the head
6. _____ breaking your leg
7. _____ hitting a sensitive bone in your elbow-"funny bone"
8. _____ having a blood sample drawn with a hypodermic needle
9. _____ having someone slam a heavy car door on your hand
10. _____ falling down a flight of concrete stairs
11. _____ receiving an injection in your arm
12. _____ burning your fingers with a match
13. _____ breaking your neck
14. _____ receiving an injection in your hip/buttocks
15. _____ having a deep splinter in the sole of your foot probed and removed with tweezers
16. _____ having an eye doctor remove a foreign particle stuck in your eye

17. _____ receiving an injection in your mouth
18. _____ being burned on your face by a lit cigarette
19. _____ getting a paper-cut on your finger
20. _____ receiving stitches in your lip
21. _____ having a foot doctor remove a wart from your foot with a sharp instrument
22. _____ cutting yourself while shaving with a sharp razor
23. _____ gulping a hot drink before it has cooled
24. _____ getting strong soap in both your eyes while bathing or showering
25. _____ having a terminal illness that causes you daily pain
26. _____ having a tooth pulled
27. _____ vomiting repeatedly because of food poisoning
28. _____ having sand or dust blow into your eyes
29. _____ having one of your teeth drilled
30. _____ having a muscle cramp

Appendix D

Constructive Thinking Inventory-S

This is not a test but a questionnaire. A typical question is, "When bad things happen to me, I worry about them for a long time." If you are a real worrier, fill in 5, the "all true" answer. If you almost never worry, and when you do it doesn't last very long, fill in 2, "pretty much false." Use 3 the "not sure" answer, only if you can't decide on the other choices.

There is no right or wrong answer to any of the questions (except for a few silly questions such as "Most birds can run faster than they can fly.") If any question confuses you, just answer it as well as you can. (The silly questions are to check that you are paying attention. Please answer them correctly.)

Instructions. Please read each statement carefully. Fill in a number from 1 to 5 that is the most accurate response for each item. Please respond to every statement. Do not skip any. Fill in only one response for each statement.

1	2	3	4	5

All	Pretty Much	Not	Pretty Much	All
False	False	Sure	True	True

- ___1 When I have a difficult task to do, I try to think about things that will help me do my best
- ___2 I feel that people are either my friends or my enemies
- ___3 I don't get upset about little things
- ___4 I believe there are people who can project their thoughts into other people's minds

- ___ 5 If I do well on an important test, I feel like a total success and that I'll go far in life
- ___ 6 When I'm not sure how things will turn out, I usually expect the worst
- ___ 7 If people treat you badly, you should treat them the same way
- ___ 8 If I don't do well, I take it very hard
- ___ 9 Most birds can run faster than they can fly
- ___ 10 Some people can read other people's thoughts
- ___ 11 I think everyone should love their parents
- ___ 12 When I have a lot of work to do, I feel like giving up
- ___ 13 There are only two answers to any question, a right one and a wrong one
- ___ 14 When anyone disapproves of me, I get very upset
- ___ 15 If I wish hard enough for something, my wish will come true
- ___ 16 If I do something good, then good things will happen to me
- ___ 17 I get so upset if I try hard and don't do well that I usually don't try to do my best.
- ___ 18 Two plus two equals four
- ___ 19 I worry a lot about what other people think of me
- ___ 20 I believe the moon or the stars can affect other people's thinking
- ___ 21 When something good happens to me, I feel that more good things are likely to follow.
- ___ 22 There are basically two kinds of people in this world, good and bad
- ___ 23 I don't worry about things I can't do anything about
- ___ 24 I have washed my hands at least one time this year
- ___ 25 I don't believe in ghosts.
- ___ 26 I always look at the good side of things
- ___ 27 I've learned not to hope too hard, because what I've hoped for usually doesn't happen
- ___ 28 I trust most people.
- ___ 29 I like to succeed, but I don't get too upset if I fail
- ___ 30 I believe in flying saucers

- ___ 31 When I discover that someone I like a lot likes me, it makes me feel like
a wonderful person and that I can accomplish whatever I want to.
- ___ 32 When bad things happen to me, I don't worry about them for very long.
- ___ 33 I believe there are people that can see into the future
- ___ 34 I think anyone who really wants a good job can find one
- ___ 35 I have never seen anyone with blue eyes
- ___ 36 I think there are many wrong ways but only one right way to do almost
anything
- ___ 37 I try to do my best in almost everything I do
- ___ 38 I believe that most people are only interested in themselves
- ___ 39 I don't have any good luck charms
- ___ 40 When I have a lot of work to do by a deadline, I waste a lot of time
worrying about it
- ___ 41 I think more about happy things from my past than about unhappy
things
- ___ 42 I believe in good and bad magic
- ___ 43 The only person I completely trust is myself
- ___ 44 If I did not make a team I would feel terrible and think that I would never
be on any team
- ___ 45 I try to accept people as they are
- ___ 46 Water is usually wet.
- ___ 47 It is foolish to trust someone completely because if you do you will get
hurt
- ___ 48 I do not believe in any superstitions
- ___ 49 People should try to look happy, no matter how they feel.
- ___ 50 I spend a lot of time thinking about my mistakes even if there's nothing I
can do about them
- ___ 51 Almost all people are good at heart
- ___ 52 If I have something unpleasant to do, I try to think about it in a way that
makes me feel better

Appendix F
Differential Emotions Scale IV-Form

Directions. Following you will find a series of statements which persons might use to describe how they feel. Read each statement and decide how often these statements describe how you feel in your daily life. Fill in the number from the scale that corresponds with your answer, with 1 being rarely or never, and five being often.

1	2	3	4	5
Rarely or Never	Hardly Ever	Sometimes	Often	Very Often

In your daily life, how often do you

- ___ 1. Feel regret, sorry about something you did
- ___ 2. Feel sheepish, like you do not want to be seen
- ___ 3. Feel glad about something
- ___ 4. Feel like something stinks, puts a bad taste in your mouth
- ___ 5. Feel you can't stand yourself
- ___ 6. Feel embarrassed when anybody sees you make a mistake
- ___ 7. Feel unhappy, blue, downhearted
- ___ 8. Feel surprised, like when something suddenly happens you had no idea would happen
- ___ 9. Feel like somebody is a low-life, not worth the time of day
- ___ 10. Feel shy, like you want to hide
- ___ 11. Feel like what you're doing or watching is interesting
- ___ 12. Feel scared, uneasy like something might harm you
- ___ 13. Feel mad at somebody
- ___ 14. Feel mad at yourself
- ___ 15. Feel happy
- ___ 16. Feel like somebody is "good for nothing"

In your daily life, how often do you.....

- ☐ 17. Feel so interested in what you're doing that you're caught up in it
- ☐ 18. Feel amazed, like you can't believe what's happened, it was so unusual
- ☐ 19. Feel fearful, like you're in danger, very tense
- ☐ 20. Feel like screaming at somebody or banging on something
- ☐ 21. Feel sad and gloomy, almost like crying
- ☐ 22. Feel like you did something wrong
- ☐ 23. Feel bashful, embarrassed
- ☐ 24. Feel disgusted, like something is sickening
- ☐ 25. Feel joyful, like everything is going your way, everything is rosy
- ☐ 26. Feel like people laugh at you
- ☐ 27. Feel like things are so rotten they could make you sick
- ☐ 28. Feel sick about yourself
- ☐ 29. Feel like you are better than somebody
- ☐ 30. Feel like you ought to be blamed for something
- ☐ 31. Feel the way you do when something unexpected happens
- ☐ 32. Feel alert, curious, kind of excited about something unusual
- ☐ 33. Feel angry, irritated, annoyed with somebody
- ☐ 34. Feel discouraged like you can't make it, nothing's going right
- ☐ 35. Feel afraid
- ☐ 36. Feel like people always look at you when anything goes wrong

Appendix F
Differential Emotion Scale IV-State

Directions: I would like you to tell me what you were feeling during the time your finger was in the pressure apparatus. Following, you will find a series of statements which persons might use to describe how they feel. Read each statement and decide how you felt during the time your finger was in the pressure apparatus. Fill in the number from the scale that corresponds with your answer, with 1 being rarely or never, and five being very often.

1	2	3	4	5
Rarely or Never	Hardly Ever	Sometimes	Often	Very Often

During the time you finger was in the pressure device how often did you.

- ___ 1. Feel regret, sorry about something you did
- ___ 2. Feel sheepish, like you do not want to be seen
- ___ 3. Feel glad about something
- ___ 4. Feel like something stinks, puts a bad taste in your mouth
- ___ 5. Feel you can't stand yourself
- ___ 6. Feels embarrassed when anybody sees you make a mistake
- ___ 7. Feel unhappy, blue, downhearted
- ___ 8. Feel surprised, like when something suddenly happens you had no
idea would happen
- ___ 9. Feel like somebody is a low-life, not worth the time of day
- ___ 10. Feel shy, like you want to hide
- ___ 11. Feel like what you're doing or watching is interesting
- ___ 12. Feel scared, uneasy like something might harm you
- ___ 13. Feel mad at somebody
- ___ 14. Feel mad at yourself
- ___ 15. Feel happy

- ___ 16. Feel like somebody is "good for nothing"
- ___ 17. Feel so interested in what you're doing that you're caught up in it
- ___ 18. Feel amazed, like you can't believe what's happened, it was so unusual
- ___ 19. Feel fearful, like you're in danger, very tense
- ___ 20. Feel like screaming at somebody or banging on something
- ___ 21. Feel sad and gloomy, almost like crying
- ___ 22. Feel like you did something wrong
- ___ 23. Feel bashful, embarrassed
- ___ 24. Feel disgusted, like something is sickening
- ___ 25. Feel joyful, like everything is going your way, everything is rosy
- ___ 26. Feel like people laugh at you
- ___ 27. Feel like things are so rotten they could make you sick
- ___ 28. Feel sick about yourself
- ___ 29. Feel like you are better than somebody
- ___ 30. Feel like you ought to be blamed for something
- ___ 31. Feel the way you do when something unexpected happens
- ___ 32. Feel alert, curious, kind of excited about something unusual
- ___ 33. Feel angry, irritated, annoyed with somebody
- ___ 34. Feel discouraged like you can't make it, nothing's going right
- ___ 35. Feel afraid
- ___ 36. Feel like people always look at you when anything goes wrong

No pain = 0 1 2 3 4 5 6 7 8 9 10 = The worst pain imaginable
at all

Appendix H

Catastrophizing Assessment

In this experiment I am are interested in understanding what thoughts and feelings you experienced when your finger was in the pressure device. Please answer the following questions with as much detail as possible. Take your time and reflect back on what you were thinking when your finger was in the pressure device. You don't need to use full sentences or worry about punctuation or grammar. I need as much detail as possible but phrases, short descriptions or descriptive words will be fine. The following questions will help you to give a complete description of what was going through your mind while your finger was in the pressure apparatus.

- 1. Can you think about what you were experiencing while your finger was in the pressure apparatus, the sensations in your finger and how this affected you?
Can you give me a detailed description of everything you experienced during the time your finger was in the pressure apparatus?**
- 2. Now think about what thoughts and feelings you had while your finger was in the pressure apparatus. Can you describe these thoughts and feelings.**
- 3. Did you imagine any pleasant or unpleasant scenes while your finger was in the pressure apparatus? Please describe any mental pictures that formed in your mind.**
- 4. Did you do anything or think about anything to take your mind off the pain?
Can you describe what you did or thought to help you cope with the pain.**

Appendix I

Coding Manual for Catastrophizing Assessment

In this study I am interested in understanding more about the thoughts and feelings that people have when they are experiencing pain. Subjects were asked to place the middle finger of their non-dominant hand in a finger pressure device for a maximum of three minutes. They were then asked to provide written answers to four questions about their thoughts, feelings, and imaginings during the time their finger was in the pressure device. Subjects' were then interviewed to provide additional information or clarify any unclear points in their answers.

The purpose of this manual is to guide you in coding the written responses to the following four questions:

1. Can you think about what you were experiencing while your finger was in the pressure device, the sensations in your finger and how this affected you? Can you give me a detailed description of everything you experienced during the time your finger was in the pressure device?
2. Now think about what thoughts and feelings you had while your finger was in the pressure device. Can you describe these thoughts and feelings?
3. Did you imagine any pleasant or unpleasant scenes while your finger was in the pressure device? Please describe any mental pictures that formed in your mind.
4. Did you do anything or think about anything to take your mind off the pain?

Can you describe what you did or thought to help you cope with the pain?

You will notice that each written line on the transcripts has been divided into units. These units represent phrases or segments of phrases. Every unit is to be coded as catastrophizing, coping, or neutral. The definitions for each of these categories are listed below.

Catastrophizing cognitions are defined as

- Cognition that focuses on or exaggerates the pain from the finger pressure device. For example: "I couldn't stop thinking about my finger, it really hurt." "I tried to take my mind off the pain but it hurt too much." "The pain was horrible, worse than I thought it would be."
- Cognition that expresses worry about negative outcomes. For example: "I was afraid it would damage my finger or leave a bruise."
- Cognitions that express coping failure. For example: "I didn't know if I could keep my finger in much longer." "I really wanted to take my finger out." "I kept thinking I can't take this much longer, when will this be over."
- Cognitions that express negative self-evaluation or negative emotions. For example: "I felt stupid because I couldn't stand the pain." "I really hate pain, I'm sort of a chicken." "I get really scared when I'm in pain."
- Cognitions that express disturbing or painful images, or painful past events. For example: "I was thinking about the time I slammed my finger in the car door."

Coping cognitions are defined as:

- Cognition that describes the use of cognitive coping strategies such as distraction or imagery. For example: "I distracted myself from the pain by counting backwards." "I imagined I was sitting on a beach enjoying the sun." "I just thought about something else besides the pain."
- Cognitions that express positive self-evaluation. For example: "I told myself to just keep going." "I knew it would be over soon." "I told myself it's not so bad, I can take this pain."
- Cognitions that express behaviors initiated to manage pain. For example: "I concentrated on tapping my foot to keep my mind off the pain." "I tried to relax my muscles." "I took some deep breaths."

Neutral cognitions are defined as:

- Cognitions that focus on procedural details. For example: "This is an interesting place, I've never been over here before." "This pain gizmo is neat looking."

- Cognitions that describe activities irrelevant to the pain. For example "I'm really busy right now, I have two papers due tomorrow " I'm really looking forward to the break, I'm going home to visit my family."
- Statements that deny any cognitive activity. For example "My mind was blank, I wasn't thinking about anything." "I don't remember having any thoughts about the pain at all."

After you have coded each unit as coping, catastrophizing, or neutral you are to make an over-all judgement about this subject's cognitive style. This should be done based on the predominance and the strength of the type of cognitions. If the subject displays predominately catastrophizing cognitions they would be classified as a catastrophizer, predominately coping cognitions, would be classified as a coper etc.

If the subject displays both coping and catastrophizing cognitions in roughly equal amounts you will have to decide the classification based on the strength or intensity of the cognitions. For example: "I started imaging myself on the beach but my finger was really killing me and I found it hard to concentrate " "I focused on relaxing my muscles. The pain was really intense I was having trouble with it." In this case catastrophizing predominates and the coping efforts are weak. If you can not decide what style of cognitions predominates or if they focus on other things unrelated to the pain they would be classified as neutral. Please write you classification in the space provided at the top of the first page of the transcript

Fractures

No pain at all = 0 1 2 3 4 5 6 7 8 9 10 = **The worst pain imaginable**

Childbirth

[illegible]

Joint Pains

No pain = 0 1 2 3 4 5 6 7 8 9 10 = The worst
at all **pain imaginable**

Dentistry

[illegible]

Sports Training

No pain = 0 1 2 3 4 5 6 7 8 9 10 **= The worst**

pain imaginable

Injections

[illegible]

[illegible]

Sore Throat

No pain at all = 0 1 2 3 4 5 6 7 8 9 10 **The worst pain imaginable**

[illegible]

Appendix K
Finger Pressure Apparatus

Appendix L
Consent Form Study 1

Because this study may involve some discomfort, I would like you to be aware of the procedures involved before you agree to participate. The study involves one session of about 45-60 minutes. I am interested in how your thoughts, when you are in pain, relate to your emotions. I will ask you to fill out two questionnaires that ask you about your emotions, how you cope with everyday problems, and two questionnaires that ask you about your past experience with pain and fear of pain. Then you will be asked to place the middle finger of your non-dominant hand in a pressure apparatus and to rate the intensity of the sensations that you are experiencing. You will be asked to keep your finger in the pressure apparatus as long as possible but it will be removed as soon as you indicate that you have had enough. You may withdraw from the experiment at any time and still receive course credit.

After the finger pressure task is completed you will fill out one questionnaire about what you were feeling when your finger was in the pressure device and respond to four open-ended questions about the thoughts and feelings you had while your finger was in the pressure device. I will read the answers to your questions and ask for more information or clarification as necessary.

I have read the above consent and I am aware that my participation in this study is voluntary. If for any reason, at any time, I wish to leave the study, I may do so without having to give an explanation and with no penalty whatsoever. Furthermore, I am aware that the data gathered in this study are confidential and anonymous with respect to my personal identity.

I have read the above form, and, with the understanding that I can withdraw at any time, and for whatever reason, I consent to participate in this study

participant's signature

date

investigator's signature

Appendix M
Debriefing Study 1

In this study I am interested in people's thoughts and emotions when they are experiencing pain. You were identified and invited to participate based on your responses to the Pain Catastrophizing Scale which you filled out during the mass testing session. In this study I asked you to fill out questionnaires about your emotions, how you cope with everyday problems, your past experience with pain and fear of pain, and finally I put your finger in a pressure apparatus. I am attempting to establish a link between people's thoughts and emotions when they are in pain and how people cope with different types of pain.

Thank you for your participation in this study. I would appreciate it if you would not disclose the procedures of this study with others, so that they will have no biased preconceptions should they decide to participate in this study.

If you have any questions or ethical concerns regarding this study, please contact any or all of the following faculty members.

Dr. J. D'Eon, 737-7350-5317 (Faculty Supervisor)

Dr. L. Pacquet 788-2600-2692, Loeb A533 (Chair of the Ethics Committee)

Dr. W. Jones, 788-2600-2648, Loeb B559 (Chair of Psychology Department)

Some of the questions in this study were of a personal nature and may have caused you anxiety or distress. Please feel free to talk to me about this now, or if you would like to speak to a counselor or a physician please call **Student Health Services** at **788-2600 ext. 6674**.

I would also like you to provide me with a pain rating at the time you answer the questions. Simply circle the number on the numerical rating scale that corresponds to the intensity of your pain.

- **Time 1 (headache onset)**

[illegible]

- 1. Can you think about what you are experiencing right now? Can you describe the sensations in your head and how this is affecting you?**
- 2. Now think about what thoughts and feelings you are having right now. Can you describe these thoughts and feelings?**

- 4. Did you do anything or think about anything to take your mind off the pain?
Can you describe what you did or thought to help you cope with the pain.**

Appendix O

Coding Manual for Headache Assessment

In this study I am interested in understanding more about the thoughts and feelings that people have when they are experiencing headache pain. Subjects were asked to keep a diary during the time they were experiencing a headache. They were asked to rate the intensity of their pain and answer four questions at the onset of their headache. The purpose of this manual is to guide you in coding the written responses to the following four questions that subjects completed:

1. Can you think about what you are experiencing right now? Can you describe the sensations in your head and how this is affecting you?
2. Now think about what thoughts and feelings you are having right now. Can you describe these thoughts and feelings?
3. Are you imagining any pleasant or unpleasant scenes right now? Please describe any mental pictures that have formed in your mind.
4. Did you do anything or think about anything to take your mind off the pain? Can you describe what you did or thought to help you cope with the pain?

Each written line on the transcripts has been divided into units. These units represent phrases or segments of phrases. Every unit is to be coded as catastrophizing, coping, or neutral. The definitions for each of these categories are listed below.

Catastrophizing cognitions are defined as:

- Cognition that focuses on or exaggerates the pain from the headache. For example: "I couldn't stop thinking about my head, it really hurt." "I tried to take my mind off the pain but it hurt too much." "The pain was horrible, worse than my last headache." "My head was splitting."
- Cognition that expresses worry about negative physical or social outcomes. For example: "This is a bad one, I hope it doesn't go on for days." "I was worried I would not be able to finish my assignments on time." "I was worried that I had a brain tumor."

- Cognitions that express coping failure. For example: "I didn't know if I could take the pain much longer. "I kept wishing it would get better " "I kept thinking I can't take this much longer, when will this headache be over " "Nothing helps to relieve this pain."
- Cognitions that express negative self-evaluation or negative emotions. For example: "I feel really frustrated with myself when I get headaches." "I just can't manage my life when I have a headache." "I get so crabby when I have a headache." "I get really scared when I'm in pain."
- Cognitions that express disturbing or painful images, or painful past events. For example: "I imagined my head was being smashed with a hammer."

Coping cognitions are defined as:

- Cognition that describes the use of cognitive coping strategies such as distraction or imagery. For example: "I distracted myself from the pain by counting ... singing etc.." "I imagined I was sitting on a beach enjoying the sun." "I just thought about something else besides the pain."
- Cognitions that express positive self-evaluation. For example: "I told myself to just keep going." "I knew it would be over soon." "I told myself it's not so bad, I can take this pain." "This headache isn't so bad, I've had worse."
- Cognitions that express behaviors initiated to manage pain. For example: "I took a nap to try and get rid of the headache " "I tried to relax the muscles my head and neck." "I took some deep breaths and tried to relax." "I massaged my temples."
- Statements indicative of medication usage. For example "I took some tylenol." "I took some of my headache pills."

Neutral cognitions are defined as:

- Cognitions that focus on activities that are irrelevant to the headache. For example: "I was on my way to the store when I saw a friend... etc."

- Cognitions that describe activities irrelevant to the pain For example "I'm really busy right now, I have two papers due tomorrow." "I'm really looking forward to the break, I'm going home to visit my family "
- Statements that deny any cognitive activity For example "My mind was blank, I wasn't thinking about anything " "I don't remember having any thoughts about the pain at all."

We are primarily interested in catastrophizing versus other types of cognitions. You do not need to spend a lot of time trying to distinguish between coping and neutral cognitions, just indicate what seems more appropriate to you

After you have coded each unit as coping, catastrophizing, or neutral you are to make a global judgement about this subject's cognitive style This should be done based on the predominance and the strength of the type of cognitions.

Appendix P
Consent Form Study 2

Because this study may involve some discomfort, I would like you to be aware of the procedures involved before you agree to participate further. This study involves two sessions. The first session should last about 20 minutes in the laboratory and 60 minutes at home. In an information session in the laboratory you will be given an overview of the study and directions for completing a headache diary. You will complete the headache diary at the time of your next headache. You will receive a follow-up phone call two weeks after you first receive the headache diary and every two weeks until you complete the study or withdraw.

When you have completed the headache diary please bring it with you to Loeb A304 to complete the last session of the study. In this part of the study I am interested in how your thoughts, when you are in pain, relate to your emotions. I will ask you to fill out two questionnaires that ask you about your emotions and how you cope with every day problems, and two questionnaires that ask you about your past experience with pain and fear of pain. Then you will be asked to place the middle finger of your non-dominant hand in a pressure apparatus and to rate the intensity of the sensations that you are experiencing.

You will be asked to keep your finger in the pressure device as long as possible but it will be removed as soon as you indicate that you have had enough. You may withdraw from the experiment at any time and still receive course credit. This session should take about 45-60 minutes.

After the finger pressure task is completed you will fill out one questionnaire about your emotions while your finger was in the pressure apparatus and respond to four open-ended questions about the thoughts and feelings you had while your finger was in the pressure device. I will read the answers to your questions and ask for more information or clarification as necessary

I have read the above consent and I am aware that my participation in this study is voluntary. If for any reason, at any time, I wish to leave the study, I may do so without having to give an explanation and with no penalty whatsoever. Furthermore, I am aware that the data gathered in this study are confidential and anonymous with respect to my personal identity.

participant's signature

date

investigator's signature

Appendix Q
Debriefing for Study 2

In this study I am interested in how people cope with pain. You were identified as having headaches from the mass testing and were invited to participate in this study based on your responses to the Headache Assessment Questionnaire. I asked you to fill out a headache diary describing your thoughts and feelings during the time you were experiencing headache. Then I asked you to fill out questionnaires about your emotions, how you cope with everyday problems, your past experience with pain and fear of pain, and finally I put your finger in a pressure apparatus. I am attempting to establish a link between people's thoughts and emotions when they are in pain and how people cope with different types of pain.

Thank you for your participation in this study. I would appreciate it if you would not disclose the procedures of this experiment with others, so that they will have no biased preconceptions should they decide to participate in this study.

If you have any questions or ethical concerns regarding this study, please contact any or all of the following faculty members:

Dr. J. D'Eon, 737-7350-5317 (Faculty Supervisor)

Dr. L. Paquet 788-2600-2692, Loeb A533 (Chair of the Ethics Committee)

Dr. W. Jones, 788-2600-2648, Loeb B559 (Department Chair)

Some of the questions in this study were of a personal nature and may have caused you anxiety or distress. Please feel free to talk to me about this now, or if you would like to speak to a counselor or a physician please call **Student Health Services at 788-2600 ext. 6674**.

Appendix R

Script for Laboratory Session Study 1 and Study 2

In this study I am interested in understanding the thoughts that go through peoples' minds when they are in pain. I will explain more specifically about each part of the study as we go along. Before we get started I would like you to read and sign this consent form. Then I will ask you some questions about your health

- Give subject consent form
- Exclusion Criteria

Are you right or left handed? Use non-dominant hand

Have you had any recent (within the past 6 months) sprains or fractures to your left/right hand?

Do you have any of the following medical conditions? Diabetes, Raynauds disease, Arthritis in your hands or fingers, hemophilia? Have you ever had any problems with the circulation in the fingers of your left/right hand?

Please turn to the first page of your booklet and fill in the information requested.

- Questionnaires

I would like you to answer some questions about emotions and problem solving and some questions about your past experience with pain. There are four questionnaires in your booklet with directions about how to fill them in. Please take your time and if you have any questions please don't hesitate to ask me

- Introduction to pressure apparatus

This study involves assessing your response to this pressure apparatus. I will ask you to place the middle finger of your left/right hand in the wooden saddle like this (demonstrate with my finger). Then I will slowly let the bar down and you will feel the pressure of the weight on your finger. Although most people find the weight uncomfortable, I would like you to try and keep your finger in the pressure apparatus as long as possible. You may remove your finger from the apparatus at any time you feel too uncomfortable. Just say "stop" and I will raise the bar

- Pain Scale

(Show pain scale) This is a 0 to 10-point scale for measuring pain intensity. Zero means no pain at all and 10 means the worst pain imaginable. I will ask you to choose a number on this scale that represents the intensity of what you are feeling at two different times while your finger is in the pressure device. Time 1 is when you first experience the sensation in your finger as pain. Just call out the number that indicates how much pain you are feeling. Time 2 is when you can no longer tolerate the pain and would like me to lift the pressure device from your finger. Just say “stop” and then give me a pain rating. Please don’t spend a lot of time thinking about the rating, just quickly state in a clear voice the number that best corresponds to the sensations you are experiencing.

- **Pain Stimulus (get stopwatch ready to activate)**

OK are you ready. I will lower the bar on your finger and I want you to call out a number when you first feel pain and then again when you can no longer tolerate the pain. (Record time and rating at threshold and tolerance)

- **Post Pain stimulus questionnaires**

For the last part of this study I would like you to fill out two questionnaires about what you experienced when your finger was in the pressure apparatus. The first is four open-ended questions. After you finish these questions I will read your answers to make sure that I understand everything that you have written. I may ask you some more questions and write some notes on your answer sheet. The final questionnaire is about what emotions you experienced when your finger was in the pressure apparatus. Please take your time and if you have any questions please don’t hesitate to ask me.

- **Debriefing**

Thank you very much for your participation in this study. (Give debriefing sheet and credit slip)

Appendix S

Script for Introductory Sessions Study 2

In this study I am interested in the thoughts that people have when they are in pain. I would like you to keep a record of what is going through your mind when you have a headache. I will distribute these headache diaries (show diary) and explain how to use them in a minute. The second part of this study involves finger pressure to the middle finger of your non-dominant hand. Before we proceed I would like you to answer some questions about your health and to read and sign a consent form.

- Distribute consent and health forms, collect after they are filled out

Check each health form as they are returned to make sure subjects do not have a medical condition that would exclude them. If they should be excluded I will tell them this privately and give them 1 credit for participating in the introductory session.

- Distribute Headache Diaries

I would like you to fill out this headache diary the next time you get a headache. The instructions are on the inside cover of the booklet. Please turn to that page and read the instructions (Give subjects a chance to read instructions). What I would like you to do is rate your headache pain using the rating scale provided and then write your answers in the booklet to the four questions that you see at the top of the next four pages. Then if you still have a headache two hours later I would like you do the same and again in two hours rate the pain and answer the questions. On the last page there is space to keep track of any medications that you might have taken to alleviate your headache. After you have completed the headache diary please call me and leave a message on my voice mail, I will call you back and schedule a session in the lab to complete the study.

Appendix T

Script for Phone Recruitment of Subjects

Study 1

Hello my name is Jackie Ellis. I am from the Psychology department at Carleton University. I am doing a study on people's thoughts and emotions when they are experiencing pain. I obtained your name from a questionnaire about the thoughts people have when they are in pain, that you filled out during the mass testing. Do you think that you would be interested in hearing more about the study?

This study involves filling out some questionnaires about your emotions, how you cope with every day problems, your past experience with pain and fear of pain. Then I will put your finger in a pressure apparatus and have you rate the intensity of the sensations that you are feeling. After that you will answer two more questionnaires about what you were thinking and feeling while your finger was in the pressure apparatus.

The study takes about 45 minutes to complete and is worth one credit. Would you be interested in participating?

- Yes Schedule session
- No Thank you for your time Good bye

Study 2

Hello my name is Jackie Ellis. I am from the Psychology department at Carleton University. I am doing a study on people's thoughts and emotions when they are experiencing pain, and how people cope with different types of pain. For this study I need people that experience headaches and I obtained your name from a questionnaire that you filled out during the mass testing. Do you think that you would be interested in hearing more about the study?

This study involves two sessions. In the first session I will give you a headache diary to fill out. In the second session you will fill out some questionnaires about your

emotions, how you cope with every day problems, your past experience with pain and fear of pain. Then I will put your finger in a pressure apparatus and have you rate the intensity of the sensations that you are feeling. After that you will answer two more questionnaires about what you were thinking and feeling while your finger was in the pressure apparatus.

This study takes about one hour in the laboratory and one hour at home and is worth 2 credits. Would you be interested in participating?

- Yes: Schedule introductory session
- No: Thank you for your time, Good bye

Appendix U
Reliability Coefficients

Table A1.

<u>Reliability Coefficients for All Scales</u>	
Scale	Chronbach's Alpha
Fear of Pain	.87
CTI-emotional coping	.66
Trait Emotions	
Anger	.77
Contempt	.66
Disgust	.69
Fear	.83
Guilt	.79
Hostility	.85
Sadness	.83
Shame	.73
Shyness	.77
Interest	.56
Surprise	.65
Joy	.78

Table A1. (continued)

<u>Reliability Coefficients for All Scales</u>	
Scale	Chronbach's Alpha
State Emotions	
Anger	85
Contempt	66
Disgust	79
Fear	93
Guilt	79
Hostility	79
Sadness	82
Shame	79
Shyness	86
Interest	67
Surprise	81
Joy	79
Pain Catastrophizing Scale	91

Appendix V

Table A2.

<u>Correlations Between All Variables for Study 1.</u>						
Variable	CTHEMOTI	FOPTOTAL	FPSTYLE	SANGER	SCONTEMP	SDISGUST
CTHEMOTI	1.00	.33**	.11	.05	.21	.21
FOPTOTAL	.33**	1.00	-.10	.03	.06	.20
FPSTYLE	.11	-.10	1.00	-.28*	.00	-.15
SANGER	.05	.03	-.28*	1.00	.59**	.69**
SCONTEMP	.21	.06	.00	.59**	1.00	.67**
SDISGUST	.21	.20	-.15	.69**	.67**	1.00
SFEAR	.12	.28*	-.57**	.34**	.10	.33**
SGUILT	.20	.13	-.19	.45**	.32**	.51**
SHOSTILE	.25*	.17	-.18	.67**	.49**	.67**
SINTERES	.13	.12	-.01	.09	.17	.19
SJOY	.04	-.14	.09	.36**	.57**	.40**
SNEGATIV	.21	.19	-.33**	.79**	.61**	.82**
SPOSITIV	.11	.06	-.01	.34**	.49**	.46**
SSADNES	.20	.14	-.13	.72**	.37**	.56**
SSHAME	.13	.09	-.22	.50**	.49**	.65**
SSHY	.07	.07	-.19	.39**	.32**	.49**
SSURPRIS	.08	.20	-.12	.30**	.31**	.43**
TANGER	.02	.03	-.09	.33**	.21	.14
TCONTEMP	.19	.22	-.04	.14	.20	.09
TDISGUST	.16	.26*	-.20	.34**	.14	.35**
TFEAR	.04	.29*	-.13	.18	.03	.19
TGUILT	.10	.12	-.08	.17	-.02	.03
THOSTILE	.09	.24*	-.12	.36**	.05	.26*
TINTERES	.05	.01	-.02	.08	.05	.05
TJOY	.29*	.03	.11	.00	.15	.03
TNEGATIV	.14	.29*	-.14	.33**	.10	.24*
TPOSITIV	.17	.11	-.02	.16	.08	.09
TSADNESS	-.01	.21	-.09	.25*	-.05	.11
TSHAME	.32**	.42**	-.12	.15	.10	.15
TSHY	.03	.16	-.08	.28*	.05	.25*
TSURPRIS	.03	.17	-.12	.24*	-.02	.11
TOLP	.19	.58**	-.25*	.12	.20	.22
TOLTI	.03	-.33**	.29*	-.06	-.02	-.25*

Table A2. (continued)

Correlations Between All Variables for Study 1						
Variable	SFEAR	SGUILT	SHOSTILE	SINTERES	SJOY	SNEGATIV
CTIEMOTI	.12	.20	.25*	.13	.04	.21
FOPTOTAL	.28*	.13	.17	.12	-.14	.19
FPSTYLE	-.57**	-.19	-.18	-.01	.09	-.33**
SANGER	.34**	.45**	.68**	.09	.36**	.79**
SCONTEMP	.10	.32**	.49**	.17	.57**	.61**
SDISGUST	.33**	.51**	.67**	.19	.40**	.82**
SFEAR	1.00	.30**	.33**	-.05	-.11	.55**
SGUILT	.30**	1.00	.74**	.27*	.19	.75**
SHOSTILE	.33**	.74**	1.00	.31**	.23	.84**
SINTERES	-.05	.27*	.31**	1.00	.25*	.22
SJOY	-.11	.19	.23	.25*	1.00	.32**
SNEGATIV	.55**	.75**	.84**	.22	.32**	1.00
SPOSITIV	.00	.42**	.45**	.74**	.74**	.47**
SSADNES	.24*	.43**	.52**	.13	.27*	.71**
SSHAME	.32**	.73**	.70**	.31**	.31**	.85**
SSHY	.20	.47**	.53**	.16	.16	.69**
SSURPRIS	.17	.50**	.50**	.50**	.34**	.51**
TANGER	.21	.09	.24*	.09	-.08	.25*
TCONTEMP	.02	-.17	.02	-.04	.03	.02
TDISGUST	.23*	.22	.38**	.18	-.14	.40**
TFEAR	.20	.10	.18	-.07	-.18	.22
TGUILT	.09	.25*	.28*	.14	-.23	.20
THOSTILE	.30*	.25*	.46**	.06	-.24*	.38**
TINTERES	-.14	.03	.07	.35**	.13	.03
TJOY	-.19	-.00	-.04	.14	.33**	.00
TNEGATIV	.22	.19	.35**	.07	-.22	.35**
TPOSITIV	-.16	.08	.07	.30**	.19	.12
TSADNESS	.17	.10	.23*	.17	-.24*	.23*
TSHAME	.19	.20	.26*	.07	-.19	.29*
TSHY	.09	.18	.30*	-.13	-.20	.31**
TSURPRIS	-.02	.14	.12	.18	-.03	.19
TOLP	.33**	.02	.06	-.03	.09	.19
TOLTI	-.43**	-.03	-.16	.08	.12	-.25*

Table A2. (continued)

Variable	Correlations Between All Variables for Study 1					
	SPOSITIV	SSADNES	SSHAME	SSHY	SSURPRIS	TANGER
CHEMOTI	.11	.20	.13	.07	.08	.02
FOPTOTAL	.06	.14	.09	.0729	.20	.03
FPSTYLE	-.01	-.13	-.22	-.19	-.12	-.09
SANGER	.34**	.72**	.50**	.39**	.30**	.33**
SCONTEMP	.49**	.37**	.50**	.32**	.31**	.21
SDISGUST	.46**	.60**	.65**	.49**	.43**	.14
SFEAR	.00	.24*	.32**	.20	.17	.21
SGUILT	.42**	.43**	.73**	.47**	.50**	.09
SHOSTILE	.45**	.52**	.70**	.53**	.50**	.24*
SINTERES	.74**	.13	.31**	.16	.50**	.09
SJOY	.74**	.27*	.31**	.16	.34**	-.08
SNEGATIV	.47**	.71**	.84**	.69**	.51**	.25*
SPOSITIV	1.00	.32**	.50**	.31**	.80**	-.01
SSADNES	.32**	1.00	.50**	.40**	.31**	.24*
SSHAME	.50**	.50**	1.00	.73**	.53**	.12
SSHY	.31**	.40**	.73**	1.00	.40**	.09
SSURPRIS	.80**	.31**	.53**	.39**	1.00	-.03
TANGER	-.01	.24*	.12	.09	-.03	1.00
TCONTEMP	-.06	.13	-.12	-.12	-.13	.44**
TDISGUST	.06	.41**	.28*	.29*	.14	.53**
TFEAR	-.03	.24*	.13	.16	.19	.38**
TGUILT	-.03	.21	.12	.15	.06	.57**
THOSTILE	-.02	.33**	.23	.21	.16	.47**
TINTERES	.30*	.02	.11	.04	.21	-.02
TJOY	.26*	.12	.10	.01	.10	-.25*
TNEGATIV	-.04	.40**	.21	.22	.09	.72**
TPOSITIV	.33**	.29*	.19	.08	.26*	.03
TSADNESS	-.04	.37**	.12	.13	.03	.55**
TSHAME	.00	.36**	.26*	.22	.15	.43**
TSHY	-.14	.39**	.18	.34**	.02	.42**
TSURPRIS	.16	.42**	.18	.10	.25*	.28*
TOLP	.10	.10	.05	.05	.16	.07
TOLTI	.05	-.08	-.15	-.30**	-.09	-.09

Table A2. (continued)

Variable	<u>Correlations Between All Variables for Study 1</u>					
	TCONTEMP	TDISGUST	TFEAR	TGUILT	THOSTILE	TINTERES
CTIEMOTI	.19	.16	.04	.16	.09	.05
FOPTOTAL	.22	.26*	.29*	.12	.24*	.01
FPSTYLE	-.04	-.20	-.13	-.08	-.12	-.02
SANGER	.14	.34**	.18	.17	.36**	.08
SCONTEMP	.20	.14	.03	-.02	.05	.05
SDISGUST	.09	.35**	.19	.03	.26*	.05
SFEAR	.02	.23*	.19	.09	.30*	-.14
SGUILT	-.17	.22	.10	.25*	.25*	.03
SHOSTILE	.02	.38**	.18	.28*	.46**	.07
SINTERES	-.04	.18	-.07	.14	.06	.35**
SJOY	.03	-.14	-.18	-.23	-.24*	.13
SNEGATIV	.02	.40**	.22	.208	.38**	.03
SPOSITIV	-.06	.06	-.03	-.03	-.02	.30*
SSADNES	.13	.41**	.24*	.21	.33**	.02
SSHAME	-.11	.28*	.13	.12	.23	.11
SSHY	-.12	.29*	.16	.15	.21	.04
SSURPRIS	-.14	.14	.19	.06	.16	.21
TANGER	.44**	.53**	.38**	.57**	.47**	-.02
TCONTEMP	1.00	.37**	.22	.26*	.29*	.05
TDISGUST	.37**	1.00	.48**	.60**	.70**	-.08
TFEAR	.22	.48**	1.00	.33**	.40**	-.04
TGUILT	.26*	.60**	.33**	1.00	.61**	.05
THOSTILE	.29*	.70**	.40**	.61**	1.00	-.14
TINTERES	.05	-.08	-.04	.05	-.14	1.00
TJOY	-.01	-.14	-.23	-.34**	-.30*	.30*
TNEGATIV	.53**	.82**	.61**	.79**	.82**	-.10
TPOSITIV	.04	.11	.00	.08	-.04	.71**
TSADNESS	.34**	.68**	.44**	.72**	.77**	-.13
TSHAME	.39**	.59**	.45**	.61**	.59**	-.07
TSHY	.27*	.54**	.42**	.58**	.56**	-.25*
TSURPRIS	.04	.37**	.22	.40**	.27*	.32**
TOLP	.21	-.01	.19	-.06	-.04	.13
TOLTI	.01	-.12	-.04	-.09	-.19	-.06

Correlations Between All Variables for Study 1

Variable	TJOY	TNEGATIV	TPOSITIV	TSADNESS	TSHAME	TSHY
CTIEMOTI	.29*	.14	.17	-.01	.32**	.03
FOPTOTAL	.03	.29*	.11	.21	.42**	.16
EPSTYLE	.11	-.14	-.02	-.09	-.12	-.08
SANGER	.00	.33**	.16	.25*	.15	.28*
SCONTEMP	.16	.10	.08	-.05	.096	.05
SDISGUST	.03	.24*	.09	.11	.15	.25*
SFEAR	-.19	.22	-.16	.17	.1808	.09
SGUILT	-.00	.19	.08	.10	.20	.18
SHOSTILE	-.04	.35**	.07	.23*	.26*	.30*
SINTERES	.14	.08	.30**	.17	.08	-.13
SJOY	.33**	-.22	.19	-.24*	-.19	-.20
SNEGATIV	.00	.35**	.12	.23*	.29*	.31**
SPOSITIV	.26*	-.04	.33**	-.04	.00	-.14
SSADNES	.12	.40**	.29*	.37**	.36**	.39**
SSHAME	.10	.20	.19	.12	.26*	.18
SSHY	.01	.22	.08	.13	.22	.34**
SSURPRIS	.10	.09	.26*	.03	.15	.02
TANGER	-.25*	.72**	.03	.55**	.43**	.42**
TCONTEMP	-.01	.53**	.04	.34**	.39**	.27*
TDISGUST	-.14	.82**	.11	.68**	.59**	.54**
TFEAR	-.23	.61**	.00	.44**	.45**	.42**
TGUILT	-.34**	.79**	.07	.72**	.61**	.58**
THOSTILE	-.30*	.82**	-.04	.77**	.59**	.55**
TINTENSES	.30*	-.10	.71**	-.13	-.07	-.25*
TJOY	1.00	-.33**	.67**	-.37**	-.21	-.35**
TNEGATIV	-.33**	1.00	.02	.86**	.80**	.75**
TPOSITIV	.67**	.02	1.00	.00	.07	-.12
TSADNESS	-.37**	.86**	.00	1.00	.59**	.61**
TSHAME	-.21	.80**	.07	.59**	1.00	.68**
TSHY	-.35**	.75**	-.12	.61**	.68**	1.00
TSURPRIS	.16	.39**	.75**	.41**	.35**	.26*
TOLP	.03	.06	.13	.00	.12	-.07
TOLTI	.17	-.13	.03	-.08	-.13	-.11

Table A2. (continued)

<u>Correlations Between All Variables for Study 1</u>			
Variable	TSURPRIS	TOLP	TOLTI
CTIEMOTI	.03	.19	.03
FOPTOTAL	.17	.58**	-.33**
FPSTYLE	-.12	-.25*	.29*
SANGER	.24*	.12	-.06
SCONTEMP	-.02	.20	-.02
SDISGUST	.11	.22	-.25*
SFEAR	-.02	.33**	-.43**
SGUILT	.14	.02	-.03
SHOSTILE	.12	.06	-.16
SINTERES	.18	-.03	.08
SJOY	-.03	.09	.12
SNEGATIV	.19	.19	-.25*
SPOSITIV	.16	.10	.05
SSADNES	.42**	.09	-.08
SSHAME	.18	.05	-.15
SSHY	.10	.05	-.30**
SSURPRIS	.25*	.16	-.09
TANGER	.28*	.07	-.09
TCONTEMP	.04	.21	.01
TDISGUST	.37**	-.01	-.12
TFEAR	.22	.19	-.04
TGUILT	.39**	-.06	-.09
THOSTILE	.27*	-.04	-.19
TINTERES	.32**	.13	-.06
TJOY	.16	.03	.17
TNEGATIV	.39**	.06	-.13
TPOSITIV	.75**	.13	.03
TSADNESS	.41**	.00	-.08
TSHAME	.35**	.12	-.13
TSHY	.26*	-.07	-.11
TSURPRIS	1.00	.12	-.04
TOLP	.12	1.00	-.59**
TOLTI	-.04	-.59**	1.00

Variable Definitions

CTIEMOTI = Constructive Thinking Inventory-Emotional Coping Scale,

FOPTOTAL = Fear of Pain

FPSTYLE = Cognitive Style (1 = catastrophizer, 2 = noncatastrophizer)

SANGER = State Anger

SCONTEMP = State Contempt

SDISGUST = State Disgust

SFEAR = State Fear

SGUILT = State Guilt

SHOSTILE = State Hostility

SINTER = State Interest

SJOY = State Joy

SNEGATIV = State Negative Emotionality

SPOSITIV = State Positive Emotionality

SSADNES = State Sadness

SSHAME = State Shame

SSHY = State Shyness

SSURPRIS = State Surprise

TANGER = Trait Anger

TCONTEMP = Trait Contempt

TDISGUST = Trait Disgust

TFEAR = Trait Fear

TGUILT = Trait Guilt

THOSTILE = Trait Hostility

TINTERES = Trait Interest

TJOY = Trait Joy

TNEGATIV = Trait Negative

TPOSITIV = Trait Positive

TSADNESS = Trait Sadness

TSHAME = Trait Shame

TSHY = Trait Shyness

TSURPRIS = Trait Surprise

TOLP = Pain Rating at Tolerance

TOLTI = Seconds to Pain Tolerance

*** = $p < .05$, ** = $p < .01$.**

Appendix W

Table A3.

<u>Correlations Between All Variables for Study 2.</u>						
Variable	CTIEMOTI	FOPTOTAL	FPSTYLE	PCS	SANGER	SCONTEMP
CTIEMOTI	1.00	-.23	-.03	-.41**	-.01	.00
FOPTOTAL	-.23	1.00	-.16	.53**	-.00	-.14
FPSTYLE	-.03	-.16	1.00	-.12	-.14	-.01
PCS	-.41**	.53**	-.12	1.00	.05	.03
SANGER	-.01	-.00	-.14	.05	1.00	.43**
SCONTEMP	.00	-.14	-.01	.03	.43**	1.00
SDISGUST	-.03	.10	-.21	.23	.54**	.63**
SFEAR	-.23	.38**	-.28*	.46**	.39**	.15
SGUILT	-.13	.13	-.22	.35**	.59**	.42**
SHOSTILE	-.25	.10	-.26	.29*	.58**	.54**
SINTERES	-.11	.13	.06	.24	.15	.24
SJOY	.10	-.08	.17	-.18	.41**	.36**
SNEGATIV	-.23	.12	-.26	.38**	.70**	.65**
SPOSITIV	-.03	.15	.06	.18	.25	.33*
SSADNES	-.22	.09	-.48**	.27*	.60**	.51**
SSHAME	-.38**	.04	-.12	.39**	.32*	.53**
SSHY	-.16	-.02	.03	.33*	.26	.38**
SSURPRIS	-.04	.28*	-.06	.33*	.09	.24
TANGER	-.28*	.10	-.07	.15	.08	.09
TCONTEMP	.15	-.12	.12	-.01	.21	.14
TDISGUST	-.35**	.23	.01	.45**	.20	.27*
TFEAR	-.39**	.39**	-.10	.39**	-.00	.07
TGUILT	-.49**	.20	-.02	.43**	.08	.11
THOSTILE	-.56**	.20	.08	.41**	.04	.14
TINTERES	.15	-.15	.03	-.18	.07	.15
TJOY	.15	.08	-.24	-.21	.07	-.05
TNEGATIV	-.51**	.26	-.04	.47**	.11	.16
TPOSITIV	.14	-.02	-.17	-.16	.10	.07
TSADNESS	-.47**	.35**	-.22	.46**	-.13	-.17
TSHAME	-.47**	.15	-.02	.32*	.04	.24
TSHY	-.35**	.12	-.02	.38**	.25	.21
TSURPRIS	.02	.04	-.19	.01	.09	.07
TOLP	-.04	.43**	-.40**	.43**	.10	-.17
TOLTI	.14	-.35**	.39**	-.29*	.18	.26

Table A3. (continued)

<u>Correlations Between All Variables for Study 2</u>						
Variable	SDISGUST	SFEAR	SGUILT	SHOSTILE	SINTERES	SJOY
CTIEMOTI	-.03	-.23	-.13	-.25	-.11	.10
FOPTOTAL	.10	.38**	.13	.10	.13	-.08
FPSTYLE	-.21	-.28*	-.22	-.26	.06	.17
PCS	.23	.46**	.35**	.29*	.24	-.19
SANGER	.54**	.39**	.59**	.58**	.15	.41**
SCONTEMP	.63**	.15	.42**	.54**	.24	.36**
SDISGUST	1.00	.29*	.61**	.74**	.23	.34*
SFEAR	.29*	1.00	.55**	.37**	.18	.17
SGUILT	.61**	.55**	1.00	.62**	-.02	.21
SHOSTILE	.74**	.37**	.62**	1.00	.15	.24
SINTERES	.23	.18	-.02	.15	1.00	.48**
SJOY	.34*	.17	.21	.24	.48**	1.00
SNEGATIV	.79**	.58**	.83**	.83**	.22	.30*
SPOSITIV	.33*	.37**	.13	.24	.85**	.76**
SSADNES	.68**	.31*	.61**	.78**	.20	.19
SSHAME	.60**	.33*	.58**	.68**	.23	.16
SSHY	.42**	.28*	.58**	.37**	.10	.02
SSURPRIS	.26	.53**	.15	.21	.61**	.47**
TANGER	-.03	.04	-.12	.04	.10	-.03
TCONTEMP	-.11	.01	.03	.01	.02	-.05
TDISGUST	.33*	.38**	.33*	.37**	.21	-.02
TFEAR	.22	.33*	.22	.14	.10	.04
TGUILT	.19	.21	.26	.26	.03	.01
THOSTILE	.18	.31*	.16	.28*	-.01	-.14
TINTERES	.12	-.18	.19	.10	-.09	-.00
TJOY	.05	.16	.16	-.02	-.00	.13
TNEGATIV	.19	.29*	.21	.28*	.11	-.05
TPOSITIV	.12	.05	.24	.17	-.09	-.00
TSADNESS	.04	.24	-.05	.15	.15	-.15
TSHAME	.17	.14	.27*	.29*	.03	-.03
TSHY	.27*	.20	.34*	.31*	.11	.07
TSURPRIS	.11	.14	.21	.32*	-.11	-.14
TOLP	.11	.31*	.14	.04	.03	-.31*
TOLTI	.16	-.23	.07	.22	-.00	.24

Table A3 (continued)

Variable	Correlations Between All Variables for Study 2					
	SNEGATIV	SPOSITIV	SADNESS	SSHAME	SSHY	SSURPRIS
CTHEMOTI	- .23	-.03	-.22	-.38**	-.16	-.04
FOPTOTAL	.12	.15	.09	.04	-.02	.28*
FPSTYLE	-.26	.06	-.48**	-.12	.03	-.06
PCS	.38**	.18	.27*	.39**	.33*	.33*
SANGER	.70**	.25	.60**	.32*	.26	.09
SCONTEMP	.65**	.33*	.51**	.53**	.38**	.24
SDISGUST	.79**	.33*	.68**	.60**	.42**	.26
SFEAR	.58**	.37**	.31*	.33*	.28*	.53**
SGUILT	.83**	.13	.61**	.58**	.56**	.15
SHOSTILE	.83**	.24	.78**	.68**	.37**	.21
SINTERES	.22	.85**	.20	.23	.10	.61**
SJOY	.30*	.76**	.19	.16	.02	.47**
SNEGATIV	1.00	.34**	.82**	.81**	.68**	.33*
SPOSITIV	.34**	1.00	.22	.29*	.13	.86**
SSADNESS	.82**	.22	1.00	.60**	.43**	.15
SSHAME	.81**	.29*	.60**	1.00	.77**	.32*
SSHY	.68**	.13	.43**	.77**	1.00	.19
SSURPRIS	.33*	.86**	.15	.32*	.19	1.00
TANGER	.05	.11	.04	.15	.01	.18
TCONTEMP	.02	-.03	-.08	-.03	-.02	-.05
TDISGUST	.46**	.26	.27*	.51**	.38**	.41**
TFEAR	.26*	.24	.10	.38**	.27*	.42**
TGUILT	.26	.10	.14	.33*	.12	.19
THOSTILE	.24	.04	.03	.34*	.12	.20
TINTERES	.08	-.11	.11	.02	.05	-.16
TJOY	.05	.03	.13	-.12	-.09	-.02
TNEGATIV	.32*	.17	.17	.45**	.24	.33*
TPOSITIV	.15	-.05	.20	.05	.03	-.04
TSADNESS	.08	.15	.10	.21	.07	.32*
TSHAME	.34*	.09	.27*	.52**	.33*	.20
TSHY	.39**	.18	.24	.50**	.31*	.26
TSURPRIS	.23	-.05	.24	.23	.10	.10
TOLP	.17	-.00	.16	.16	.14	.21
TOLIT	.08	.02	.08	.02	-.04	-.14

Table A3 (continued)

Correlations Between All Variables for Study 2						
Variable	TANGER	TCONTEMP	TDISGUST	TFEAR	TGUILT	THOSTILE
CTIEMOII	-.28*	.15	-.25**	-.30**	-.40**	-.56**
FOPTOTAL	.10	-.12	.23	.39**	.20	.20
FPSTYLE	-.07	.12	.01	-.10	-.02	.08
PCS	.15	-.01	.45**	.39**	.43**	.41**
SANGER	.08	.21	.20	-.00	.08	.04
SCONTEMP	.09	.14	.27*	.07	.11	.14
SDISGUST	-.03	-.11	.33*	.22	.19	.18
SFEAR	.04	.01	.38**	.33*	.21	.31*
SGUILT	-.12	.03	.33*	.22	.26	.16
SHOSTILE	.04	.01	.37**	.14	.26	.28*
SINTERES	.10	.02	.21	.10	.03	-.01
SJOY	-.03	-.05	-.02	.04	.01	-.14
SNEGATIV	.05	.02	.46**	.27*	.26	.24
SPOSITIV	.11	-.03	.26	.24	.10	.04
SSADNES	.04	-.08	.27*	.11	.14	.03
SSHAME	.15	-.03	.51**	.38**	.33*	.34*
SSHY	.01	-.02	.38**	.27*	.12	.12
SSURPRIS	.18	-.05	.41**	.42**	.19	.20
TANGER	1.00	.20	.50**	.38**	.45**	.54**
TCONTEMP	.20	1.00	.13	-.03	.06	.02
TDISGUST	.50**	.13	1.00	.50**	.34*	.64**
TFEAR	.38**	-.03	.5**	1.00	.56**	.43**
TGUILT	.45**	.06	.34*	.56**	1.00	.62**
THOSTILE	.54**	.02	.64**	.43**	.62**	1.00
TINTERES	-.10	.10	-.05	-.04	.16	-.11
TJOY	-.36**	-.12	-.22	-.10	-.15	-.38**
TNEGATIV	.75**	.24	.74**	.70**	.74**	.79**
TPOSITIV	-.20	.07	-.04	-.02	.08	-.17
TSADNESS	.64**	-.01	.51**	.52**	.50**	.61**
ISHAME	.54**	.11	.58**	.64**	.59**	.58**
ISHY	.46**	.16	.56**	.47**	.56**	.58**
TSURPRIS	.01	.20	.18	.10	.17	.12
TOLP	.13	.11	.26	.18	.16	.17
TOLTI	-.00	.15	-.02	-.22	-.01	.08

Table A3 (continued)

<u>Correlations Between All Variables for Study 2</u>						
Variable	TINTERES	TJOY	TNEGATIV	TPOSITIV	TSADNESS	TSHAME
CTHEMOTI	.15	.15	-.51**	.14	-.47**	-.47**
FOPTOTAL	-.15	.08	.26	-.02	.35**	.15
FPSTYLE	.03	-.24	-.04	-.17	-.22	-.02
PCS	-.18	-.21	.47**	-.16	.46**	.32*
SANGER	.07	.07	.11	.10	-.13	.04
SCONTEMP	.15	-.05	.16	.07	-.17	.24
SDISGUST	.12	.05	.19	.12	.04	.17
SFEAR	-.18	.16	.29*	.05	.24	.14
SGUILT	.19	.16	.21	.24	-.05	.27*
SHOSTILE	.10	-.02	.28*	.17	.15	.29*
SINTERES	-.09	-.00	.11	-.09	.15	.03
SJOY	-.00	.13	-.05	-.00	-.15	-.03
SNEGATIV	.08	.05	.32*	.15	.08	.34*
SPOSITIV	-.11	.03	.17	-.05	.15	.09
SSADNES	.11	.13	.17	.20	.10	.27*
SSHAME	.02	-.12	.45**	.05	.21	.52**
SSHY	.05	-.09	.24	.03	.07	.33*
SSURPRIS	-.16	-.02	.33*	-.04	.32*	.20
TANGER	-.10	-.34**	.75**	-.20	.64**	.54**
TCONTEMP	.10	-.12	.24	.07	-.01	.11
TDISGUST	-.05	-.22	.74**	-.04	.51**	.58**
TFEAR	-.04	-.10	.70**	-.02	.52**	.64**
TGUILT	.16	-.15	.74**	.08	.50**	.59**
THOSTILE	-.11	-.38**	.79**	-.17	.61**	.58**
TINTERES	1.00	.50**	-.08	.84**	-.29*	-.05
TJOY	.50**	1.00	-.40**	.76**	-.35**	-.42**
TNEGATIV	-.08	-.40**	1.00	-.14	.78**	.84**
TPOSITIV	.84**	.76**	-.14	1.00	-.28*	-.13
TSADNESS	-.29*	-.35**	.78**	-.28*	1.00	.58**
TSHAME	-.05	-.42**	.84**	-.13	.58**	1.00
TSHY	-.10	-.42**	.79**	-.15	.52**	.74**
TSURPRIS	.43**	.24	.18	.71**	.00	.20
TOLP	-.14	.10	.24	.07	.29*	.01
TOLTI	.26	-.01	-.03	.20	-.25	.10

Table A3. (continued)

<u>Correlations Between All Variables for Study 2</u>				
Variable	TSHY	TSURPRIS	TOLP	TOLTI
CTHEMOTI	-.35**	.02	-.04	.14
FOPTOTAL	.12	.04	.43**	-.35**
FPSTYLE	-.02	-.19	-.40**	.39**
PCS	.38**	.01	.43**	-.29*
SANGER	.25	.09	.10	.18
SCONTEMP	.21	.07	-.17	.26
SDISGUST	.27*	.11	.11	.16
SFEAR	.20	.14	.31*	-.23
SGUILT	.34*	.21	.14	.07
SHOSTILE	.31*	.32*	.04	.22
SINTERES	.11	-.11	.03	-.00
SJOY	.07	-.14	-.31*	.24
SNEGATIV	.39**	.23	.17	.08
SPOSITIV	.18	-.05	-.00	.02
SSADNES	.24	.24	.16	.08
SSHAME	.50**	.23	.16	.02
SSHY	.31*	.10	.14	-.04
SSURPRIS	.26	.10	.21	-.14
TANGER	.46**	.01	.13	-.00
TCONTEMP	.16	.20	.11	.15
TDISGUST	.56**	.18	.26	-.02
TFEAR	.47**	.10	.18	-.22
TGUILT	.56**	.17	.10	-.01
THOSTILE	.58**	.12	.17	.08
TTITERES	-.10	.45**	-.14	.26
TJOY	-.42*	.24	.10	-.01
TNEGATIV	.79**	.18	.24	-.03
TPOSITIV	-.15	.71**	.07	.20
TSADNESS	.52**	.00	.29*	-.25
TSHAME	.74**	.20	.01	.10
TSHY	1.00	.20	.27*	-.01
TSURPRIS	.20	1.00	.19	.22
TOLP	.27*	.19	1.00	-.45**
TOLTI	-.01	.22	-.45**	1.00

Variable Definitions

CTIEMOTI = Constructive Thinking Inventory-Emotional Coping Scale,

FOPTOTAL = Fear of Pain

FPSTYLE = Cognitive Style (1 = catastrophizer, 2 = noncatastrophizer)

PCS = Pain Catastrophizing Scale

SANGER = State Anger

SCONTEMP = State Contempt

SDISGUST = State Disgust

SFEAR = State Fear

SGUILT = State Guilt

SHOSTILE = State Hostility

SINTER = State Interest

SJOY = State Joy

SNEGATIV = State Negative Emotionality

SPOSITIV = State Positive Emotionality

SSADNES = State Sadness

SSHAME = State Shame

SSHY = State Shyness

SSURPRIS = State Surprise

TANGER = Trait Anger

TCONTEMP = Trait Contempt

TDISGUST = Trait Disgust

TFEAR = Trait Fear

TGUILT = Trait Guilt

THOSTILE = Trait Hostility

TINTERES = Trait Interest

TJOY = Trait Joy

TNEGATIV = Trait Negative

TPOSITIV = Trait Positive

TSADNESS = Trait Sadness

TSHAME = Trait Shame

TSHY = Trait Shyness

TSURPRIS = Trait Surprise

TOLP = Pain Rating at Tolerance

TOLTI = Seconds to Pain Tolerance

* = $p < .05$, ** = $p < .01$

END

1 3 0 6 - 9 7

FIN