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Coping Strategies of Chronic and Acute Pain Patients: Clinical and Experimental Pain

by

Brenda Leigh Ferguson

Thesis submitted to the School of Graduate Studies and Research in partial fulfillment of the requirements for the Master of Arts degree in Psychology

University of Ottawa, 1990

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Abstract

Few studies have compared chronic pain patients to other pain populations and/or have exposed chronic pain patients to experimental acute pain. The present investigation sought to investigate the coping strategies of chronic pain, acute pain patients and pain-free controls in three areas: 1) Clinical pain; 2) Experimental acute pain and 3) Non-pain stressors. Forty-five subjects were obtained, 15 in each of three groups: 1) chronic pain (pain experienced for over one year); 2) acute pain (pain experienced for less than six months); and 3) pain-free but physically disabled controls. Clinical pain coping strategies were assessed with the Coping Strategy Questionnaire (CSQ) while coping with a non-pain stressor was assessed by the Ways of Coping. Experimental acute pain was induced with a pressure pain device (Forgione & Barber, 1971). Pain tolerance and pain ratings were taken. Following the acute-pain induction procedure, each subject's cognitions were scored and rated for the presence of two types of cognitions: catastrophizing and non-catastrophizing. The results indicated that non-catastrophizers kept their finger in the pain apparatus longer and rated the sensations as less painful. No significant differences however, were found among the three groups with respect to pain tolerance, pain ratings or
cognitive style. In addition, no significant differences were found among the groups on a measure of coping with non-pain stressors. However, significant differences were found among the three groups in the area of coping with clinical pain. The chronic pain group scored higher than the control group on a subscale measuring catastrophizing strategies. In addition, the chronic pain group scored significantly higher than both groups on the factors of the CSQ. They scored higher on a Helplessness factor and on a Catastrophizing factor, reflecting a use of "negative" or "maladaptive" cognitions in coping with clinical pain. Self-efficacy theory may account for these negative cognitions.
Acknowledgements

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Curriculum Studiorum

Brenda L. Ferguson was born on March 2, 1959 in Ottawa, Ontario. She received the Bachelor of Arts degree, with honours in Psychology from the University of Ottawa, in 1981.
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Introduction

One of the most universal forms of human stress is pain. It is also one of the most frequent complaints doctors encounter. It has been suggested that 80% of patients who consult physicians do so for pain-related problems (Bresler, 1979). In particular, chronic low back pain is one of the most common pain complaints and disables an estimated 7 million Americans (Clark, Bosnell & Shapiro, 1977). The cost of chronic pain in the United States has been estimated to total 60 billion dollars annually (Bonica, 1980). These costs include hospitalization, medication and surgical costs, in addition to loss of work productivity, loss of income and disability and/or litigation payments. Pain has plagued mankind for hundreds of years. Despite its prevalence however, it has only been within the last two decades that concentrated efforts have been made to identify and understand various aspects of the pain experience.

Pain varies in intensity, quality, duration and meaning. Important distinctions must therefore be made between chronic and acute pain. Clinically, acute pain is defined as pain of less than six months duration. Acute pain is usually associated with a well-defined cause and normally has a characteristic time-course and vanishes
after healing has occurred. It normally has a rapid onset, termed the phasic component. This is followed by the tonic component, which may persist for variable periods of time. Clinically, increases in autonomic arousal and a temporary increase in medication intake have been reported (e.g., Sternbach, 1974; Wall, 1979). Some examples of acute clinical pain are, the pain accompanying childbirth, postsurgical pain, dental pain and sprains.

Acute pain can be easily produced in the laboratory. Experimental or laboratory pain is therefore a special form of acute pain. Here, pain may be induced by nociceptive stimulators such as electric shock, radiant heat and pressure pain.

Clinically, chronic pain is usually defined as pain that has persisted for longer than six months. Three types of chronic pain have been delineated (Turk, Meichenbaum & Genest, 1983). First, chronic periodic pain is acute in nature but reoccurs chronically over time. For example migraine headaches and trigeminal neuralgia. Second, chronic progressive pain is defined as pain which accompanies malignancies. Finally, the most common form of chronic pain is chronic intractable pain which is defined as pain that persists longer than six months but is not the result of a malignant disease process such as cancer. Low back pain is a form of chronic intractable pain for it varies in intensity and severity, yet is present most of
the time. Chronic pain patients are normally characterized by a long term decrease in activity, increased use of medication, depression and a general preoccupation with pain (e.g., Sternbach, 1974).

In the past, the understanding of pain was based primarily on neuroanatomical and/or neurophysiological studies which assumed a simple one-to-one relationship between a stimulus and sensation. For example, acute pain was seen as a sign of real or impending tissue damage, a signal of an underlying biological dysfunction. Treatment was therefore targeted at investigating and treating the dysfunction, the assumption being that once the cause of the pain was eliminated, the pain itself should vanish.

Neuroanatomical and/or neurophysiological approaches to chronic pain however, have been extremely disappointing. Historically, most physicians treated chronic pain with their knowledge of treating acute pain. They prescribed analgesics and narcotics and disregarded the psychological and/or behavioral components of chronic pain. Not surprisingly, therapy outcomes were often discouraging and the patient may have been blamed for the continuing pain problem. There was, and continues to be, a tendency for health care professionals to label these chronic pain patients as "malingers" (Orzesiak & Perrine, 1987); the pain is "psychogenic" and is not "real" pain. Health care professionals now recognize that there is no simple or
direct relationship between the extent of tissue damage and the amount of pain subjectively experienced. They are beginning to incorporate psychological and behavioral aspects into their treatment of chronic pain.

Pain is a very complex phenomena and various definitions of pain have tried to encompass all of its aspects. The International Association for the Study of Pain's (IASP) task force on taxonomy has defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (IASP, 1979, p.250). This definition incorporates two important aspects of pain. The complex relationship between the extent of tissue damage and the amount of pain subjectively experienced. Additionally, it addresses pain's multidimensional nature, which encompasses cognitive, affective and sensory components. Subjective pain therefore is not solely determined by sensory input but is influenced also by cognitive, affective and behavioral variables.

The role of cognitions in the treatment and management of chronic pain has recently received much attention. This is in part due to the belief that chronic pain patients often are viewed as suffering from chronic pain because they are "bad copers". That is to say, they do not deal with their pain effectively, but employ strategies which maintain or exacerbate the pain problem. In addition,
traditional medical interventions largely have failed to alleviate chronic pain (Turk et al., 1983; Turner & Chapman, 1982a). Consequently, the role of psychological variables in pain perception and management has generated considerable scientific research (Liebeskind & Paul, 1977; Melzack & Wall, 1965; Weisenberg, 1977). In particular cognitive and cognitive-behavioral methods of pain reduction recently have received much attention (Tan, 1982; Turk et al., 1983; Turner & Chapman, 1982a; 1982b; Weisenberg, 1977). Their efficacy in the treatment of chronic pain and acute pain however, has yet to be firmly established in the research literature.

In summary, chronic pain is distinct from acute pain. Acute pain is functional for it serves as a signal of underlying tissue damage and is likely to be cured if treated appropriately. Chronic pain however rarely serves to signal an underlying biological dysfunction and is often difficult to treat and manage.

The primary purpose of the present investigation was twofold. First, to determine how an individual's cognitions influenced their ability to cope with clinical pain and/or an acute pain stimulus. Second, to determine how chronic pain patients differ from others on a variety of pain measures. Three pain groups were utilized in the investigation: 1) chronic pain patients; 2) acute pain patients and 3) physically disabled patients with no pain.
The following review examines the concept of coping and how one may cope with a stressor such as pain or physical disability. The relationship between cognitions and behavior and how cognitions are assessed are then reviewed. Finally, the research dealing with cognitive coping strategies and various types of pain, such as experimental and clinical pain, are reviewed.
Review of the Literature

Coping with a Stressor

One can consider chronic pain, acute clinical pain, acute experimental pain and/or a physical disability as stressors. Each varies in duration. Elliott & Eisdorfer (1982) have proposed four broad categories of stressors that differ primarily in their duration.

1. Acute, time-limited stressors, such as going parachute jumping, awaiting surgery, or encountering a rattlesnake; 2. Stressor sequences, or series of events that occur over an extended period of time as the result of an initiating event such as job loss, divorce, or bereavement; 3. Chronic intermittent stressors such as conflict-filled visits to in-laws or sexual difficulties, which may occur once a day, once a week, once a month; and 4. Chronic stressors such as permanent disabilities, parental discord, or chronic job stress, which may or may not be initiated by a discrete event and which persists continuously for a long time. (p. 150-151)

In the present study, the chronic pain and control groups could be classified as dealing with chronic stressors while the acute pain group is dealing with an acute, time-limited stressor. In addition, the chronic pain, acute pain and control groups will be dealing with an
acute, time-limited stressor during the investigation’s acute pain-induction procedure.

By what means can a person cope with a stressor such as chronic or acute pain? Lazarus and his colleagues have developed a theory of psychological stress and coping to address this question (e.g., Coyne & Lazarus, 1980; Lazarus & Folkman, 1984). The overall theoretical framework is transactional in that the person and the environment are seen as an ongoing relationship of reciprocal action, each affecting and in turn, being affected by the other. The theory identifies two processes, cognitive appraisal and coping, as critical mediators of stressful person-environment relationships.

Cognitive appraisal is a process through which the person evaluates whether a particular encounter with the environment is relevant to his/her well-being, and if so, in what ways. Thus, according to Roskies and Lazarus (1980) how a person psychologically copes with stress depends upon his cognitive view of the situation. The individual’s appraisal is seen as a dynamic process that changes according to the person’s anticipated consequences of an event, its importance to his/her well-being and the perceived resources he/she has available to cope with the threat. The appraisal process changes as events change.

Coping is defined as a person’s constantly changing cognitive and behavioral efforts to manage specific external
and/or internal demands that are appraised as taxing or exceeding the person's resources (Lazarus & Folkman, 1984). Such coping efforts serve two main functions: the management or alteration of the person-environment relationship that is the source of stress (problem-focused coping) and/or the regulation of stressful emotions (emotion-focused coping) (Folkman & Lazarus, 1980; Lazarus & Folkman, 1984).

Weisenberg (1984) has also argued that the amount of perceived control may be a crucial element in coping with pain. In summary, how a person copes with a stressor such as pain depends upon their appraisal of the threat, the perceived consequences and the resources available to cope.

**Cognitions and Coping**

Several cognitive theorists (e.g., Ellis, 1962; Beck, 1976) hold that belief systems influence a person's "cognitions" or appraisals of his environment and are critical determinants of his/her experiences and emotions. In simpler terms, what we think affects how we deal with a situation. How can a researcher however, assess an individual's private cognitive efforts to deal with a stressful situation in a systematic, reliable and valid manner?
Some researchers have proposed a "think-aloud" approach based upon self-report data provided by subjects (Genest & Turk, 1981; Meichenbaum & Butler, 1979; Merluzzi, Glass & Genest, 1981). Here, the person may be asked to think aloud during the task, or may be interrupted at various points and asked for a report or administered a questionnaire after the task is completed. As many authors have indicated, there are inherent problems in such cognitive assessment methods (see for example, Genest & Turk, 1981; Kendall & Hollon, 1980; Meichenbaum, Burland, Gruson & Cameron, 1980; Meichenbaum & Butler, 1979; Nisbett & Ross, 1980; Nisbett & Wilson, 1977). One difficulty is distinguishing post-hoc rationalizations from the subject's actual thoughts during the experiment. Another is that the verbalization of thoughts itself, may change the thought process. Finally, demand characteristics and social desirability influences have been noted (Nisbett & Ross, 1980; Spanos, Hodgins, Stam & Gwynn, 1984). Despite these difficulties however, they conclude that one can reliably elicit self-reports and reliably relate the resultant information in a meaningful way to performance (Genest & Turk, 1981; Turk, Meichenbaum & Genest, 1983).

Self-report methods have been used to assess cognitions in chronic pain patients, acute clinical pain and acute experimental pain.
Cognition and Pain

Cognitive coping strategies appear to be important in understanding how individuals adapt to pain. Copp (1974) interviewed over 100 patients who were dealing with various painful experiences. She found that most had developed coping strategies, that is to say, ways to tolerate, minimize or reduce their pain. Cognitive strategies are attempts to directly modify thought processes in order to attenuate pain.

Taxonomy of cognitive strategies

Spanos and his colleagues (Spanos, Radtke-Bodorik, Ferguson & Jones, 1979) have reviewed several taxonomies of pain reducing strategies and have developed four specific categories for classifying cognitive activity in relation to pain. These are then divided into two general categories: (A) Cognitive coping strategies and (B) Maladaptive cognitions. The cognitive coping strategies include: (i) Distraction: attention-diversion and coping self-statements; (ii) Coping imagery: imaginative inattention, imaginative transformation of pain and imaginative transformation of context and (iii) Relaxation: somatization and disassociation. Maladaptive cognitions include: (i) Catastrophizing: negative self-statements, catastrophizing thoughts and catastrophizing images.
In summary, there are two general classifications of pain reducing strategies. First, cognitive coping strategies refer to cognitions that attempt to reduce the intensity of the pain experience and secondly, those cognitions that would seem likely to worsen the experience are classified as "catastrophizing", "negative" or "maladaptive cognitions".

**Acute pain: Experimental Studies**

Experimental studies have indicated that cognitive coping strategies play a role in the perception of both clinical and experimental pain. There is evidence suggesting that cognitive strategies are effective in attenuating experimentally induced pain, such as muscle ischemia, cold pressor pain and pressure pain. In experimental pain studies, training in the use of cognitive strategies for pain control has been shown to increase pain tolerance and thresholds and decrease pain ratings. Spanos, Horton and Chaves (1975) found that subjects who used cognitive coping strategies showed a greater increase in pain threshold. Other studies have also indicated a greater increase in pain tolerance from pre- to post-testing, when compared to controls, when cognitive coping strategies were employed (Blitz & Dinnerstein, 1971; Kanfer & Goldfoot, 1966; Meichenbaum & Turk, 1976). Finally, decreases in pain magnitude have been reported by
subjects employing a variety of cognitive strategies (Chaves & Barber, 1974; Chaves & Doney, 1976; Barber & Cooper, 1972).

A review by Sanders (1979) therefore concluded that pain tolerance and to a lesser extent, pain threshold and/or subjective pain ratings, can be significantly attenuated by a variety of cognitive strategies.

**Acute pain: Clinical Studies**

More recently, investigators have begun to explore the use of cognitive strategies in the attenuation of pain in clinical settings. Langer, Janis and Wolfer (1975) found that surgical patients, using experimenter-suggested cognitive coping strategies, involving the use of imagery, required fewer analgesics post-operatively and were released from the hospital sooner than patients who received only preparatory information or no intervention.

Employing a different pain population Tan, Melzack and Poser (1980) examined the efficacy of stress-inoculation training as a preventive intervention for the attenuation of acute clinical pain from a knee arthrogram. One group received stress inoculation, another attention-placebo and the third was a control group. The stress inoculation group was exposed to a variety of cognitive and behavioral coping techniques. The investigators reported no significant differences between the groups on subjective
pain ratings or the rating of pain behaviors. The
researchers concluded that the stress inoculation training
may have been too brief or that the intensity of the pain
resulting from the knee arthrogram was relatively low and
and brief, reaching a peak at around 30 seconds.
Consequently, patients may not have been able to employ the
various coping strategies.

**Chronic pain: Clinical studies**

Few studies have investigated the relationship between
chronic pain and cognitive coping strategies. In fact, it
is often assumed that chronic pain patients suffer from
pain because they do not cope. Rosenstiel and Keefe (1983)
were some of the first investigators to conduct a study
which looked at how patients adjust to chronic pain,
elucidating the role of coping strategies in chronic
pain. They administered the **Coping Strategy Questionnaire**
(Rosenstiel & Keefe, 1983) to chronic pain patients in
order to assess the extent to which subjects reported using
six different cognitive coping strategies and one
behavioral coping strategy when they felt pain. The
cognitive coping strategies included: 1) reinterpreting
pain sensations, 2) coping self-statements, 3) ignoring
pain sensations, 4) catastrophizing, 5) diverting attention
and 6) praying or hoping. The behavioral coping strategy
was increasing activity level. When the results were
factor analyzed three factors were evident. The first factor, Cognitive Coping and Suppression, included coping self-statement, ignoring pain sensations and reinterpreting pain sensations strategies. The second factor, Helplessness, included catastrophizing and increasing activity level strategies. Finally, the third factor, called Diverting Attention and Praying included diverting attention and praying/hoping strategies (Appendix G).

Rosenstiel and Keefe concluded that the use of coping strategies is related to adjustment to chronic pain. Specifically, patients who relied on Attention Diversion and Praying/Hoping as a coping strategy were more impaired in performing daily activities and had higher ratings of pain. Those scoring high on the Helplessness factor were more depressed and anxious. Keefe and his colleagues have since investigated the use of pain coping strategies in osteoarthritis patients (Keefe, Caldwell et al., 1987) and myofascial pain dysfunction (Keefe & Dolan, 1986). These studies support previous investigations which found that the success in dealing with pain is more a function of refraining from use of the catastrophizing strategy than the use of any other particular strategy (Chaves & Brown, 1978; Spanos, Radtke-Bordorik, Ferguson & Jones, 1979).
Extending the Rosenstiel & Keefe study to include another type of pain group (acute pain) and a control group would provide valuable information. What type of strategies are employed to deal with a chronic painful condition as opposed to self-limiting acute pain? In addition, how does a control group who may suffer from the occasional headache or backache differ from the two pain groups?

**Chronic pain: Experimental studies**

A few studies have been conducted employing chronic pain patients in an experimental pain condition (Brands & Schmidt, 1987; Naliboff, Cohen, Schandler and Heinrich (1981); Rollman, 1983; Schmidt & Brands, 1986). There are two psychological theories which suggest that chronic pain patients will behave differently from healthy control subjects in an acute pain situation. These two opposing theories are the adaptation level theory and the hypervigilant theory. The adaptation level theory states that "pain patients would evaluate experimental pain within the context of their previous experience with pain. The model predicts that pain patients would have higher pain thresholds than controls because of extensive previous experiences with pain" (Cohen, Naliboff, Schandler & Heinrich, 1983, p. 244).
The other hypothesis suggests that chronic pain patients are hypervigilant to somatic cues and display lower pain thresholds since these patients are preoccupied with any pain sensations (Chapman, 1978). According to the hypervigilent theory, it would be predicted that chronic pain patients would attend more to the stimulus and would have lower pain thresholds.

Naliboff, Cohen, Schandler and Heinrich (1981) have conducted research which suggests that pain patients have a higher threshold to painful stimuli since these patients have numerous painful experiences. Employing signal detection methodology, they compared radiant heat thresholds and ratings provided by low back pain patients, chronic respiratory patients and non-patient controls. They found that chronic pain patients had higher pain thresholds than chronic respiratory patients and non-patient controls. That is, they were less likely to label a stimulus as painful. In addition, the chronic pain patients had poorer discrimination at lower intensity levels, than normal subjects. These studies appear to support the adaptation level theory. Similarly, Rollman (1979) hypothesized that an individuals' judgement of pain is based upon comparisons with other pain levels. That is, chronic pain patients would use their own internal discomfort as an anchor in assessing externally induced pain.
Malow, Grimm and Olson (1980) and Schmidt and Brands (1986) however, have conducted research which appears to support the hypervigilent theory. Malow and his colleagues employed signal detection methodology with myofascial pain dysfunction (MPD) syndrome patients and found that they reported lower thresholds than non-patients with the Forgie and Barber (1971) pain stimulator and significantly lower discriminability in a signal detection task. A subsequent experiment by Malow & Olson (1981) found similar distinctions between unimproved and improved MPD patients. The improved group showed an increase in pain threshold, sensitivity and ability to discriminate between different levels of painful stimulation. The unimproved group showed no change.

Schmidt and Brands (1986) compared chronic low back pain patients and control subjects on eight successive cold pressor tests. The chronic low back pain patients demonstrated poorer persistence behaviour than the control subjects during the cold pressor test. Furthermore, in contrast to the control group, no learning process could be observed in the chronic low back pain group. Their pain tolerance did not change after repeated exposures to the acute pain stimulus.

These contradictory findings suggest that a clearer understanding of the effects of chronic pain on pain
sensitivity is required. A study bridging both the experimental and clinical pain areas, as well as employing both chronic and acute pain patients, may contribute valuable information to this area.

In conclusion, coping has been defined as cognitive and behavioral efforts used to manage a taxing event. People in pain have been widely reported to use cognitive strategies to cope with their pain. Two main types of cognitive strategies have been delineated: 1) cognitive coping strategies and 2) catastrophizing. Cognitive coping strategies have been shown to increase pain tolerance to an acute pain stimulus in experimental studies which employed pain-free controls. Refraining from the use of a catastrophizing strategy has been shown to be useful in controlling both experimental pain and clinical pain.

Only a few clinical and/or experimental pain studies however have employed chronic pain subjects. Clinically, Rosenstiel and Keefe were one of the first to develop a questionnaire which categorizes the types of coping strategies employed by chronic pain patients. In experimental pain studies, two main theories have been postulated concerning how chronic pain patients would react to an acute pain stimulus. Research results have been conflicting, supporting both the adaptation level theory and the hypervigilent theory.
Research Hypotheses

Cognitive coping strategies play a role in the perception of both clinical and experimental pain. Few studies have investigated how chronic pain and acute pain patients cope with their pain. Even fewer have compared different types of pain populations with reference to both clinical and experimental pain. Inappropriate control groups such as university volunteers are also frequently employed. The present investigation attempts to overcome these inadequacies. A physically disabled comparison group is chosen in an attempt to control for the extent of functional disability across the three groups. The investigation also compares how three different pain populations (chronic pain patients, acute pain patients and pain-free physically disabled controls) cope with both clinical pain and an acute pain stimulus.

The hypotheses to be investigated are these:

1. Does the duration of suffering from a stressor, such as pain, affect cognitive and/or behavioral strategies which are used to cope with clinical pain? For example, chronic pain patients must cope with their pain for a long period of time. Conversely, an acute pain patient sees his or her pain as being time-limited. Control subjects, however, only deal with pain in acute, time-limited ways such as when they experience a headache or hit their finger.
2. Similarly, does the chronic experience of pain affect the cognitive strategies which are employed to deal with an experimental acute pain stimulus? Do chronic pain, acute pain and pain-free controls employ similar cognitive strategies?

3. Both hypervigilence theory and adaptation level theory suggest that chronic pain affects pain sensitivity in an experimental acute pain situation. Research, however, has supported both of these opposing theories. If chronic pain patients are hypervigilent to somatic cues, then it is expected that the chronic pain group will have higher pain ratings and reduced pain tolerance during the acute pain-induction procedure, when compared to the acute pain and control groups. If, however, the chronic pain group exhibits more pain tolerance and reports lower pain ratings, support will be given to the adaptation theory.

4. Pain tolerance and subjective pain ratings have been shown to be influenced by cognitive coping strategies. It is expected, therefore, that those individuals who are classified as catastrophizers during the acute pain-induction procedure will exhibit lower pain tolerance and higher subjective pain ratings when compared to the non-catastrophizers.
5. Since coping theory suggests that one’s coping efforts are dynamic, changing to manage specific demands, it is hypothesized that an individual’s cognitive coping style will not be consistent across the different pain conditions and/or dealing with a non-pain stressor. For example, those who are classified as catastrophizers during the acute pain-induction procedure will not necessarily cope with their clinical pain in a similar manner.

6. Finally, chronic pain patients are often viewed by health care professionals as generally being “bad copers”. Do they indeed typically deal with non-pain stressors in their life differently from acute pain and control groups?
Method

Subjects

A total of 45 subjects participated in the study. All subjects satisfied the following minimum criteria:
(a) were between 18 - 70 years of age;
(b) demonstrated sufficient command of the English language to complete the written questionnaires;
(c) had attended school beyond Grade 6;
(d) were not diagnosed as having rheumatoid arthritis or any other disease which may have affected their hands and/or fingers in any capacity;
(e) had no residual brain dysfunction due to head trauma; and
(f) consented to participate.

Chronic pain outpatients were recruited from the Outpatient Clinic of The Rehabilitation Centre and a Sports Injury Clinic in a large medical complex. Fourteen chronic pain patients were from The Rehabilitation Centre (93%) while one patient was from the Sports Injury Clinic. Chronic pain was defined as pain that had persisted longer than one year. Ten of the subjects were women (67%).
Table 1

Summary of Descriptive Data: Group Means and Chi Square Analyses

<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
<th>Acute Pain</th>
<th>Control Group</th>
<th>Row Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (yrs)</strong></td>
<td>15</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>41.1</td>
<td>39.4</td>
<td>43.1</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>8.2</td>
<td>13.0</td>
<td>15.6</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
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<td></td>
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<tr>
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<td>4</td>
<td>6</td>
<td>15</td>
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<tr>
<td>Married</td>
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<td>8</td>
<td>8</td>
<td>24</td>
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<tr>
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<td>2</td>
<td>3</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>X 2 = 0.68</td>
<td>NS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Work Status</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Working</td>
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<td>33</td>
</tr>
<tr>
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<td>4</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td></td>
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<td>NS</td>
<td></td>
<td></td>
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<tr>
<td><strong>Education Level</strong></td>
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<td>1</td>
<td>2</td>
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<tr>
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<td>5</td>
<td>5</td>
<td>18</td>
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<td>6</td>
<td>10</td>
<td>9</td>
<td>25</td>
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<td></td>
<td>X 2 = 3.04</td>
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<td><strong>Disability Insurance</strong></td>
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<td>12</td>
<td>8</td>
<td>29</td>
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<tr>
<td>Collecting</td>
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<td>3</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>X 2 = 2.52</td>
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<td></td>
<td></td>
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<td><strong>Litigation</strong></td>
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<td>14</td>
<td>12</td>
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</tr>
<tr>
<td>Settlement</td>
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<td>1</td>
<td>0</td>
<td>5</td>
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<tr>
<td>Settled</td>
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<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>X 2 = 9.37</td>
<td>NS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Yates corrected Chi square analyses
NS (Not Significant)
The mean age of the chronic pain sample was 41.1 years (SD = 8.2) (Table 1). Mean duration of time since onset of pain was 3.7 years.

With respect to pain location: 53.3% (n=8) had back pain; 26.7% (n=4) had neck and shoulder pain and; 20.0% (n=3) had chronic pain in other areas (Table 2).

Acute pain subjects were recruited from three sources. Five were outpatients at The Rehabilitation Centre, while the majority (67%) were recruited from a Sports Injury Clinic in a large medical complex. One patient was referred by an orthopedic surgeon in private practice. Acute pain was defined as pain that had persisted for less than six months and excluded those subjects whose current pain was simply an exacerbation of a long-standing pain problem.

Of the 15 acute pain subjects, nine were males (60%) and the mean age was 39.4 years (SD =13.0) (Table 1). The mean duration of time since pain onset was 3.8 months. Twenty-six percent had pain located primarily in either their back (n=4) or their neck and shoulder (n=4). The majority, 46.7% (n=7), had pain primarily located in other areas (Table 2).

A total of fifteen control subjects were recruited from outpatients (87%, n=13) and inpatients (13%, n=2) at The Rehabilitation Centre. The mean age was 43.1 years (SD=15.76) (Table 1). Ten males (67%) and five females (33%) served as controls. The control subjects consisted of
Table 2

Breakdown of Pain Locations by Group

<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
<th>Acute Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Low Back Pain</td>
<td>33.3 %</td>
<td>6.7 %</td>
</tr>
<tr>
<td>Neck only</td>
<td>20.0 %</td>
<td>0.0 %</td>
</tr>
<tr>
<td>Back &amp; Neck</td>
<td>20.0 %</td>
<td>13.3 %</td>
</tr>
<tr>
<td>Shoulder</td>
<td>6.7 %</td>
<td>26.7 %</td>
</tr>
<tr>
<td>Knee</td>
<td>6.7 %</td>
<td>13.3 %</td>
</tr>
<tr>
<td>Leg</td>
<td>0.0 %</td>
<td>33.3 %</td>
</tr>
<tr>
<td>Foot</td>
<td>0.0 %</td>
<td>6.7 %</td>
</tr>
<tr>
<td>Other</td>
<td>13.3 %</td>
<td>0.0 %</td>
</tr>
</tbody>
</table>
amputees (n=3), paraplegics (n=10) and those diagnosed as old polio (n=2). The amputee subjects had one or both of their legs and/or feet amputated. All paraplegics had normal sensation in both of their hands and arms. In addition, amputees or paraplegics who reported pain such as phantom limb pain, low back pain or any other persistent pain condition, were excluded from the study.

Chi square analyses determined that there were no significant differences among the chronic pain, acute pain and control groups with respect to: age, marital status, level of education, disability insurance, litigation and work status (Table 1).

**Apparatus**

The pressure pain apparatus was a modified version of one developed by Forgione and Barber (1971) (see photo, Appendix A). The subject's index finger was placed upon a small elevated wooden stand and a lever with a brass weight at the end was lowered onto the finger. The apparatus produced a constant focal pressure of 2000 grams to the second phalanx of the index finger.

There are several types of experimental acute pain stimuli: cold pressor, radiant heat, electric shock, muscle-ischemia and pressure pain. Pressure pain was chosen for a number of reasons. It produces a continuously
building aching pain, similar in some respects to different kinds of clinical pain. This is in contrast to electric shock which is episodic in nature. Second, the trial length for pressure pain normally varies between two to five minutes, allowing the subject some time to employ cognitive strategies. In contrast, a muscle-ischemia procedure which has a maximum tolerance ceiling of 55 minutes (Smith, Egbert, Markowitz, Mosteller & Beecher, 1966) would tax the subject's cognitive strategies repertoire. Conversely, electric shock would require a limited number of cognitive strategies for maximal pain tolerance.

When pressure pain is compared to other forms of experimentally-induced pain, such as a cold-pressor task, the physical characteristics remain constant from subject to subject. The response to the stimulus is relatively unmodified by physiological variables such as vasomotor activity and/or the physical characteristics of the subject (Forgione & Barber, 1971). For example, the amount of muscle and/or fatty tissue in a finger does not vary extensively from subject to subject. Finally, the stimulus is safe (Forgione & Barber, 1971; Turk, Meichenbaum & Genest, 1983). The device was medically approved for use in this study. It was advised, however, that rheumatoid arthritic patients who had finger joint involvement be excluded from the study.
Following is a list of some of the studies in which the device has been used. No adverse reactions have been reported: Barber & Cooper 1972; Brown, Fader & Barber 1973; Chaves & Barber 1974; Chaves & Scott 1979; D'Eon, 1984; Harris & Rollman, 1983; Malow & Olson 1981; Reesor, 1986; Reesor & Craig, in press; Scott & Barber 1977; Spanos, Barber & Lang 1974; Spanos, Hodgins, Stam & Gwynn 1984).

Procedure

Subjects recruited from The Rehabilitation Centre were contacted by telephone or in person. They were asked to participate in a study looking at how people deal with pain. Similarly, the investigator contacted acute pain subjects from a Sports Injury Clinic. Here, notices (Appendix B) stating that a graduate student was looking for acute pain subjects to participate in a research study, were left on the receptionist's desk and were filled in by those who chose to do so. Subjects were told that the assessment involved two short batteries of questionnaires and a pressure pain apparatus which may cause them some discomfort. Appointments were scheduled for those who agreed to participate in the study.
Upon arrival subjects were greeted by the researcher. She reiterated that the assessment would take 45 - 90 minutes and consisted of questionnaires and a pressure pain apparatus that might cause them some discomfort. Each subject was shown the pressure pain apparatus. They were then asked to read and sign the consent form (Appendix C).

A flow chart of the procedure is outlined in Appendix D. Briefly, the assessment proceeded as follows: (1) Interview; (2) Assessment battery #1; (3) Acute pain-induction procedure, Trial #1; (4) Cognitive style interview; (5) Acute pain-induction procedure, Trial #2; (6) Cognitive style interview and; (7) Assessment Battery #2. A detailed description of all assessment instruments appears in Appendices F, G, H, K, L and M.

1) Interview

Each subject was first interviewed in a structured fashion (Appendix E) by the investigator and his/her responses were recorded. Demographic and descriptive data such as their age, marital status, occupation, education, present work status, current medication intake, disability allowance and pending litigation were obtained. Chronic and acute pain subjects were asked the location of their pain, how long they had been experiencing pain and whether the pain onset had been spontaneous or had been due to an accident. All 45 subjects were asked to describe any
previous experiences with pain (other than the current pain problem).

2) Assessment Battery #1

All subjects were administered a test battery prior to the acute pain-induction procedure. The McGill Pain Questionnaire (MPQ), Cognitive Style Questionnaire (CSQ) and State-Trait Anxiety (State-Anxiety) Inventory were included in this battery. To obtain a measure of each subject's present level of pain, the McGill Pain Questionnaire (MPQ) (Appendix F) was administered. It must be noted that the control subjects were asked to respond to all questionnaires, even if they were not relevant to their status. For example, they were administered the MPQ even though they were not suffering from any pain at the time of the assessment.

Chronic pain patients have been shown to employ a number of cognitive and behavioral strategies in dealing with their clinical pain (Copp, 1974; Rosenstiel & Keefe, 1983). To assess how chronic pain, acute pain and a control group which does not suffer from ongoing clinical pain, deal with clinical pain, the Cognitive Style Questionnaire (CSQ) was administered (Appendix G). Scores on six cognitive subscales and one behavioral subscale were calculated.
Finally, the State-Trait Anxiety Inventory (State-anxiety) was administered (Appendix H) for two reasons. First, to determine the extent of each subject's psychological distress, prior to the acute pain-induction procedure. Second, acute pain patients are often described as being more anxious than chronic pain patients (Sternbach, 1974).

3) Acute Pain-Induction Procedure

Trial #1.

A modified version of the Forgione-Barber (1971) Strain Guage Pain Stimulator was used to apply a 2000 gram weight to the second phalanx of the subject's index finger. The acute pain-induction procedure consisted of two trials. One index finger was placed in the pressure pain apparatus on Trial #1 and on Trial #2, the other index finger was used. The use of the right and left index finger on Trial #1 was randomized across all subjects. The investigator's instructions to the subjects is outlined in Appendix I.

Subjects were instructed to try to keep their finger in the apparatus for at least one minute and for as long after one minute as possible. Subjects were also told that if at any time the pain became too intense, they could stop the procedure.

The subjects were asked to rate the intensity of the pain on a 0 to 10 scale (Appendix J) where: 0 represented
"no pain"; 1 "just recognizable as pain"; 5 "moderate pain" and; 10 "excruciating pain". This final number was defined as the point at which the subject wanted to stop the procedure. Subjects were asked every 20 seconds to give a number from the scale that best corresponded to the intensity of the pain they were experiencing.

After the subject’s finger was placed in the pressure pain apparatus, a stop watch was started. Every 20 seconds the investigator said "rate" and the subjects' numerical response was recorded. If the subject was able to keep his/her finger in the apparatus for a total of four minutes, the investigator lifted the bar off the finger and stated that Trial #1 had been completed. The investigator then administered the Cognitive Style Interview Protocol.

4. Cognitive Style Interview Protocol

Both closed and open-ended questions were administered to subjects immediately following the removal of their finger from the apparatus on Trial #1 and Trial #2. The Cognitive Style Interview Protocol (Appendix K) was adapted from the Structured Interview Schedule for Pain (Genest, 1979; Turk et al., 1983) and was designed to assess the subject's cognitions during the preceding trial. Each subject was asked to describe, in detail, any thoughts and/or feelings they remembered thinking while his/her finger was in the apparatus. Their responses were tape recorded.
This assessment served a number of purposes. First, it provided information about whether or not subjects engaged in self-generated strategies to reduce pain during the trial. Second, it allowed subjects to be classified according to their predominant cognitive style for data analyses.

5) Acute pain-induction procedure

Trial #2

The acute pain-induction procedure was repeated for Trial #2 with the following exception. Before the subject's finger was placed in the pressure pain apparatus, the investigator stated that during Trial #2, other than removing their finger from the apparatus, the subject was to "do anything you can to reduce the pain". Research has shown that providing subjects with permission to use coping strategies that are already in their repertoire encourages activation of existing coping skills (Avia & Kanfer, 1980).

6) Cognitive Style Interview

The Cognitive Interview Protocol (Appendix K) was repeated following Trial #2.

7) Assessment Battery #2

Following the acute pain-induction procedure, the second series of tests was administered. These tests are
outlined in Appendices L and M. The second battery included the Jette Functional Status Index and the Ways of Coping scale. First, to determine if the acute pain, chronic pain and control groups were similarly disabled, their extent of functional disability was assessed. The Jette Functional Status Index (Appendix L) consists of 25 daily activities such as putting on a sweater and washing dishes, and asks each respondent to rate each activity in terms of (1) how much pain is involved when engaged in the activity, (2) how difficult it is to perform the activity, and (3) the degree of assistance needed to perform the activity. The Jette FSI provided an index of each subject's functional impairment.

Finally, to determine if chronic pain subjects deal with non-pain stressors in their life differently from the acute pain and control groups, the Ways of Coping scale (Appendix M) was administered. This questionnaire is a series of 67 items describing a wide range of thoughts and actions that people use to deal with taxing events. Each respondent is asked to apply these 67 items to a specific stressful event of their choosing.
Data Analyses

Acute Pain-Induction: Cognitive Style Assessment

Two trained raters (Appendix N) listened to each subject’s tape-recorded responses from the Cognitive Style Interview Protocol. The raters independently rated subjects’ cognitions for: (1) non-catastrophizing strategies and/or (2) catastrophizing strategies.

A scoring guide was developed for this purpose (Appendix O). The Cognitive Style Scoring Guide was adapted from those used by Genest (1979), Chaves & Brown (1972) and Spanos and colleagues (1979), and was used to rate the subjects’ cognitions. Briefly, non-catastrophizing strategies were defined as those strategies which helped the subject to cope with the acute pain stimulus. Catastrophizing strategies were defined as those strategies which interfered with the individual’s ability to cope with the acute pain stimulus.

The subjects’ cognitions on Trial #1 and Trial #2 were scored. The raters then determined each subject’s predominant cognitive style for the preceding trial and, finally, their overall predominant cognitive style.

Kappa was used as a measure of interrater agreement. The overall value of kappa was .80. Similarly, the kappa values for both non-catastrophizing and catastrophizing strategies was .80. Landis and Koch (1977) suggest that
kappa values greater than .75 represent excellent agreement beyond chance.

**Experimentwise Error Rate**

To control the experimentwise error rate, Dunn's multiple comparison procedure (Dunn, 1961) was used. Dunn's multiple comparison procedure or, alternatively, Bonferroni t (Miller, 1966) is based on what is known as the Bonferroni inequality which states that the probability of occurrence of one or more events can never exceed the sum of their individual probabilities. The level of significance is therefore divided evenly among the comparisons by the use of Dunn's tables. Thus, in the data analyses, standard statistical procedures were employed and the results were evaluated against a modified critical value of $F (F')$.

**Post-hoc Comparisons**

Post-hoc comparisons were performed when the overall $F$ was significant. Tukey's HSD (honestly significant difference) test was chosen to maintain the Type I error rate at alpha .05 while making all possible comparisons between pairs of sample means.
Results

The results are presented in the following order:

1. Effect of chronicity on coping with clinical pain.
2. Effect of chronicity on coping with acute experimental pain.
3. Effect of chronic pain on pain sensitivity.
4. Effect of cognitive style on pain tolerance and pain ratings.
5. Coping with different types of painful stressors.
6. Coping with non-pain stressors.

1. **Effects of Chronicity on Coping with Clinical Pain**

A one-way analysis of variance was used in analyzing the data for each subscale of the Coping Strategy Questionnaire. The raw scores were used in the analysis, F ratios were evaluated according to Dunn’s multiple comparison test and a significance level of .05 was selected. The mean differences among the chronic pain, acute pain and control groups failed to reach this significance level on the following CSQ subscales: diverting attention; reinterpreting sensations; ignoring
### Table 3

**Coping Strategy Questionnaire: Group Means and Univariate Analyses**

<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
<th></th>
<th>Acute Pain</th>
<th></th>
<th>Control Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Diverting Attention</td>
<td>14.7</td>
<td>5.4</td>
<td>9.2</td>
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<td>13.5</td>
<td>7.0</td>
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<tr>
<td></td>
<td><em>E</em> (2,42)</td>
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<tr>
<td>Reinterpreting Sensations</td>
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<td>3.5</td>
<td>5.4</td>
<td>5.8</td>
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<tr>
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<tr>
<td>Catastrophizing</td>
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<td>7.9</td>
<td>6.4</td>
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<td>3.8</td>
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<tr>
<td></td>
<td><em>E</em> (2,42)</td>
<td>8.22 **</td>
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<tr>
<td>Ignoring Sensations</td>
<td>15.6</td>
<td>4.7</td>
<td>13.0</td>
<td>8.8</td>
<td>15.6</td>
<td>7.8</td>
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<tr>
<td></td>
<td><em>E</em> (2,42)</td>
<td>0.63</td>
<td></td>
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<tr>
<td>Praying &amp; Hoping</td>
<td>13.9</td>
<td>8.8</td>
<td>9.1</td>
<td>8.6</td>
<td>9.9</td>
<td>7.1</td>
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<td></td>
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<tr>
<td>Coping Self-statements</td>
<td>23.3</td>
<td>4.9</td>
<td>20.0</td>
<td>7.9</td>
<td>22.6</td>
<td>8.7</td>
</tr>
<tr>
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<tr>
<td>Increasing Activity</td>
<td>14.4</td>
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<td>9.0</td>
<td>15.2</td>
<td>8.0</td>
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<td><em>E</em> (2,42)</td>
<td>3.77 **</td>
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<tr>
<td>Control over Pain</td>
<td>3.0</td>
<td>1.3</td>
<td>3.3</td>
<td>1.7</td>
<td>4.1</td>
<td>1.4</td>
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<tr>
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<td><em>E</em> (2,42)</td>
<td>2.46</td>
<td></td>
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<tr>
<td>Able to Decrease Pain</td>
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<td>1.1</td>
<td>3.1</td>
<td>1.3</td>
<td>2.8</td>
<td>1.5</td>
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<tr>
<td></td>
<td><em>E</em> (2,42)</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**p < .01**
sensations; praying and hoping; coping self-statements; control over pain and ability to decrease pain (Table 3).

The results showed highly significant differences among the three groups on the catastrophizing subscale. Post-hoc comparisons (Tukey-HSD, p < .05) revealed that the chronic pain group scored significantly higher on the catastrophizing subscale than the control group, but did not differ significantly from the acute pain group. Furthermore, the acute pain group did not differ significantly from the control group.

A multiple range test (Tukey-HSD, p < .05) also revealed that the control group scored significantly higher than the acute pain group on the increasing activity subscale. However, no significant differences were found between the acute and chronic pain or the chronic pain and control groups.

2. Effects of Chronicity on Coping with Acute Experimental Pain

A chi-square analysis was used to determine if there were significant differences among the three groups with respect to predominant cognitive style (non-catastrophizer or catastrophizer) during the pressure pain procedure. The results showed no significant differences among the chronic pain, acute pain and control groups (χ² = 1.80, df = 2) (Table 4).
Table 4

Chi Square Analysis

Catastrophizers and Non-Catastrophizers by Group

<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
<th>Acute Pain</th>
<th>Control Group</th>
<th>Row Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>Non-Catastrophizers</td>
<td>9</td>
<td>12</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>Catastrophizers</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>15</td>
</tr>
</tbody>
</table>

\[ X^2 = 1.80 \quad \text{NS} \]
3. Effects of Chronic Pain on Pain Sensitivity

Pain Tolerance

Fifty-one percent of the subjects (23/45) kept their finger in the pain apparatus for the maximum time of 480 seconds. The mean pain tolerance (Trial #1 + Trial #2) for all groups was 361.8 seconds ($SD = 144.93$) or an average of 180.7 seconds per trial. Table 5 summarizes the pain tolerance for each group. One-way ANOVAs revealed no significant differences among the three groups on Trial #1, Trial #2 and Trial #1 + Trial #2.

A two-tailed $t$-test revealed no significant difference in pain tolerance between Trial #1 and Trial #2 ($t = 0.73$, df = 44).

Pain Ratings

The mean pain ratings, per trial, were calculated. These ratings consisted of a number from 0 to 10 that the subject reported to the investigator every 20 seconds while his/her finger was in the pressure pain apparatus. Each subject’s pain ratings were totalled and averaged per trial. Table 6 summarizes the results for each group. There was no significant difference among the three groups.
Table 5

Pain Tolerance Summary Table:

Group Means and Univariate Analyses

<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
<th></th>
<th>Acute Pain</th>
<th></th>
<th>Control Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>(Seconds)</td>
<td>(Seconds)</td>
<td>(Seconds)</td>
<td>(Seconds)</td>
<td>(Seconds)</td>
<td>(Seconds)</td>
</tr>
<tr>
<td><strong>Trial #1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>170.9</td>
<td>77.5</td>
<td>192.3</td>
<td>83.5</td>
<td>188.6</td>
<td>70.3</td>
</tr>
<tr>
<td></td>
<td><strong>F (2,42)</strong></td>
<td>0.33</td>
<td><strong>E (2,42)</strong></td>
<td>0.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trial #2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>166.7</td>
<td>74.8</td>
<td>182.7</td>
<td>76.8</td>
<td>182.9</td>
<td>87.3</td>
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<tr>
<td></td>
<td><strong>F (2,42)</strong></td>
<td>0.20</td>
<td><strong>E (2,42)</strong></td>
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<tr>
<td><strong>Trial #1 + #2</strong></td>
<td><strong>337.7</strong></td>
<td><strong>138.4</strong></td>
<td><strong>375.0</strong></td>
<td><strong>154.5</strong></td>
<td><strong>371.5</strong></td>
<td><strong>142.3</strong></td>
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<tr>
<td></td>
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<td>0.30</td>
<td><strong>E (2,42)</strong></td>
<td>0.74</td>
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</tr>
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</table>

**Note.** Maximum seconds in Trial #1 and Trial #2 is 240;
          Maximum seconds in Trial #1 + #2 is 480.


<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
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<th>Acute Pain</th>
<th></th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td><strong>Trial #1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.3</td>
<td>1.5</td>
<td>5.6</td>
<td>2.0</td>
<td>5.8</td>
</tr>
<tr>
<td>F (2,42)</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>0.51</td>
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</tr>
<tr>
<td><strong>Trial #2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.4</td>
<td>1.5</td>
<td>4.8</td>
<td>2.3</td>
<td>5.4</td>
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<tr>
<td>F (2,42)</td>
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<td></td>
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</tr>
<tr>
<td>p</td>
<td>0.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Avg. Total</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.9</td>
<td>1.5</td>
<td>5.2</td>
<td>2.0</td>
<td>5.6</td>
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<tr>
<td>F (2,42)</td>
<td>0.48</td>
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<tr>
<td>p</td>
<td>0.62</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Note:** Avg. Total = (Trial #1 + Trial #2) / 2;

Range of pain ratings is 0-10.
The mean pain ratings on Trial #1 and Trial #2, collapsed across all three groups, were 5.9 (SD 1.7) and 5.2 (SD 2.2) respectively. A two-tailed t-test (Table 7) revealed that these mean pain ratings were significantly different.

4. Effects of Cognitive Style on Pain Tolerance and Pain Ratings

The chronic pain, acute pain and control groups were collapsed into two groups. They were either classified as catastrophizers or non-catastrophizers, according to the Cognitive Style Scoring Guide. Prior to analyzing the data, the assumption of equal variances was tested (Winer, 1971), since there were an unequal number of catastrophizers and non-catastrophizers. Homogeneity of variance was tested using the Cochran test. The degree of heterogeneity was not significant for total pain tolerance ($C (22,2) = 0.63, p = 0.23$) and total pain ratings ($C (22,2) = 0.53, p = 0.76$).

Pain Tolerance

A one-way analysis of variance revealed that the non-catastrophizers ($M = 419.5$ secs., $SD = 106.1$) kept their finger in the pain apparatus longer than the catastrophizers ($M = 245.1$, $SD = 137.4$; $F = 22.16$, $df = 1/43$, $p < .001$).


Table 7

t -Test of Mean Pain Ratings by Trial

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>DF</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial #1</td>
<td>5.9</td>
<td>1.7</td>
<td>44</td>
<td>3.53 *</td>
</tr>
<tr>
<td>Trial #2</td>
<td>5.2</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.01
Pain Ratings

When a one-way analysis of variance was performed on the total average mean pain ratings, the non-catastrophizers (M = 5.0, SD = 1.7) reported significantly lower mean pain ratings than the catastrophizers (M = 6.7, SD = 1.8, F = 10.14, df = 1/43, p < .002).

5. Coping with Different Types of Painful Stressors

The raw data on the Coping Strategy Questionnaire (CSQ) were collapsed across the chronic pain, acute pain and control groups, into the two predominant cognitive styles during the pressure pain procedure (non-catastrophizers and catastrophizers). A Cochran test (C (22,2) = 0.70) revealed that the variance of the total score on the CSQ was homogeneous across the two groups. Furthermore, tests on the homogeneity of variances of all of the subscales of the CSQ revealed that the degree of heterogeneity was not significant.

Following these tests, one-way analyses of variance were performed (Table 8). Dunn's multiple comparison test was applied and the results indicated that there were no significant differences between these two groups on the following subscales: reinterpreting sensations; ignoring sensations; praying and hoping; coping self-statements and, most importantly, catastrophizing. However, significant
<table>
<thead>
<tr>
<th>Cognitive Style</th>
<th>Non-Catastrophizers</th>
<th>Catastrophizers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Diverting</td>
<td>10.7</td>
<td>6.9</td>
</tr>
<tr>
<td>Attention</td>
<td>E (1,43)</td>
<td>6.17 *</td>
</tr>
<tr>
<td>Reinterpreting</td>
<td>4.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Sensations</td>
<td>E (1,43)</td>
<td>0.52</td>
</tr>
<tr>
<td>Catastrophizing</td>
<td>6.9</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>E (1,43)</td>
<td>0.02</td>
</tr>
<tr>
<td>Ignoring</td>
<td>15.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Sensations</td>
<td>E (1,43)</td>
<td>0.15</td>
</tr>
<tr>
<td>Praying &amp;</td>
<td>10.4</td>
<td>8.5</td>
</tr>
<tr>
<td>Hoping</td>
<td>E (1,43)</td>
<td>0.38</td>
</tr>
<tr>
<td>Coping</td>
<td>21.3</td>
<td>8.2</td>
</tr>
<tr>
<td>Self-statements</td>
<td>E (1,43)</td>
<td>0.71</td>
</tr>
<tr>
<td>Increasing</td>
<td>10.8</td>
<td>8.6</td>
</tr>
<tr>
<td>Activity</td>
<td>E (1,43)</td>
<td>4.18 *</td>
</tr>
<tr>
<td>Control over</td>
<td>3.6</td>
<td>1.5</td>
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<tr>
<td>Pain</td>
<td>E (1,43)</td>
<td>0.50</td>
</tr>
<tr>
<td>Able to</td>
<td>2.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Decrease Pain</td>
<td>E (1,43)</td>
<td>0.42</td>
</tr>
</tbody>
</table>

* p < .01
differences were found on the increasing activity and diverting attention subscales. The catastrophizers engaged in more increasing activities and more diverting attention when compared to the non-catastrophizers.

6. Coping With Non-Pain Stressors

On a measure of coping with a daily stressful event (Ways of Coping), a one-way analysis of variance and Dunn's multiple comparison procedure revealed that there were no significant differences among the chronic pain, acute pain and control groups on the subscales, with the exception of the positive re-appraisal subscale (Table 9). A multiple range test revealed that the difference was between the control group and the chronic pain group, with the control group scoring significantly higher on this subscale than the chronic pain group (Tukey-HSD, p < .05).

Incidental Findings

1) Group Differences

McGill Pain Questionnaire

One-way ANOVA's and Dunn's multiple comparison procedure determined that significant differences existed among the groups on all of the scales of the McGill Pain Questionnaire (Table 10). A multiple range test (Tukey-HSD, p < .05) was used to determine which group means were significantly
Table 9

Ways of Coping Scale:

Group Means and Univariate Analyses

<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
<th></th>
<th>Acute Pain</th>
<th></th>
<th>Control Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Confrontive Coping</td>
<td>5.3</td>
<td>4.0</td>
<td>7.9</td>
<td>3.9</td>
<td>5.4</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>F (2,42)</td>
<td>0.10</td>
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<td></td>
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<tr>
<td>Distancing</td>
<td>6.2</td>
<td>3.2</td>
<td>4.0</td>
<td>2.8</td>
<td>5.7</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>F (2,42)</td>
<td>1.55</td>
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<td></td>
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<tr>
<td>Self-Controlling</td>
<td>7.6</td>
<td>3.5</td>
<td>8.0</td>
<td>3.5</td>
<td>9.3</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>F (2,42)</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Seeking Social Support</td>
<td>7.9</td>
<td>3.9</td>
<td>7.2</td>
<td>5.2</td>
<td>8.1</td>
<td>3.0</td>
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<tr>
<td></td>
<td>F (2,42)</td>
<td>0.21</td>
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</tr>
<tr>
<td>Accepting Responsibility</td>
<td>3.2</td>
<td>2.8</td>
<td>2.1</td>
<td>2.1</td>
<td>3.3</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>F (2,42)</td>
<td>0.93</td>
<td></td>
<td></td>
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<tr>
<td>Escape-Avoidance</td>
<td>6.4</td>
<td>4.0</td>
<td>4.7</td>
<td>3.5</td>
<td>5.2</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>F (2,42)</td>
<td>0.69</td>
<td></td>
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<tr>
<td>Planful Problem-Solving</td>
<td>6.7</td>
<td>4.0</td>
<td>8.1</td>
<td>4.1</td>
<td>10.3</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>F (2,42)</td>
<td>2.86</td>
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<tr>
<td>Positive Re-Appraisal</td>
<td>4.3</td>
<td>2.1</td>
<td>3.8</td>
<td>3.5</td>
<td>7.6</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>F (2,42)</td>
<td>5.54 *</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

* p < .01
different. These post-hoc comparisons revealed that the chronic pain group scored significantly higher than both the acute pain and control groups on all scales of the MPQ.

A one-way analysis of covariance was used to compare the performance of the groups on the CSQ, with the Present Pain Intensity (PPI), as a covariate. The following value was obtained: Catastrophizing subscale (F(1,43) = 0.23, p = .63).

Coping Strategy Questionnaire

The scores on the CSQ subscales were collapsed into three factors (Rosenstiel and Keefe, 1983). The factors are: (1) Cognitive Coping and Suppression; (2) Helplessness and; (3) Diverting Attention and Praying. A one-way analysis of variance determined significant differences among the groups on the Helplessness factor. No other significant differences were found (Table 11). A multiple range test (Tukey-HSD, p < .05) revealed that the significant difference on the Helplessness factor was between the scores of the control group and both the chronic pain and the acute pain groups, with both the pain groups scoring significantly higher than the control group.

Reeser (1986) administered the CSQ to 80 chronic low back pain patients and did a principal component analysis of the results. His resulting factor structure was somewhat different from that of Rosenstiel and Keefe (1983).
Table 10

McGill Pain Questionnaire:
Group Means and Univariate Analyses

<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
<th>Acute Pain</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Total (PRI)</td>
<td>25.7</td>
<td>11.1</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>F (2,42)</td>
<td>12.13 *</td>
<td></td>
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<tr>
<td>Sensory</td>
<td>15.4</td>
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<td></td>
<td>F (2,42)</td>
<td>16.84 *</td>
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<tr>
<td>Affective</td>
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<td>0.8</td>
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<tr>
<td></td>
<td>F (2,42)</td>
<td>9.38 *</td>
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<tr>
<td>Evaluative</td>
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<td>1.6</td>
<td>0.9</td>
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<td></td>
<td>F (2,42)</td>
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<td>13.72 *</td>
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<tr>
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<td>1.1</td>
</tr>
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<td></td>
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<td></td>
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<td></td>
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</table>

* p < .01
Table 11

**CSD Factors:**

**Group Means and Univariate Analyses**

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<th></th>
<th>Factor 1</th>
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<th>Factor 2</th>
<th></th>
<th>Factor 3</th>
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</thead>
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<tr>
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<td>Cognitive Coping &amp; Suppression</td>
<td>Helpinglessness</td>
<td>Diverting Attention</td>
<td></td>
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<td></td>
</tr>
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<td>3.0</td>
<td></td>
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<tr>
<td>SD</td>
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<td>0.7</td>
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</tr>
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<td>0.7</td>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>p</td>
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<td>0.01 *</td>
<td>0.47</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Factor A</th>
<th></th>
<th>Factor B</th>
<th></th>
<th>Factor C</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Coping</td>
<td>Control</td>
<td>Catastrophizing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic</td>
<td>2.5</td>
<td>2.8</td>
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<td></td>
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</tr>
<tr>
<td>Pain</td>
<td>0.4</td>
<td>1.1</td>
<td>0.9</td>
<td></td>
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</tr>
<tr>
<td>Acute Pain</td>
<td>1.8</td>
<td>3.2</td>
<td>1.3</td>
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<tr>
<td>SD</td>
<td>1.0</td>
<td>1.1</td>
<td>1.1</td>
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<tr>
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</tr>
<tr>
<td>SD</td>
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<td>1.1</td>
<td>0.5</td>
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</tr>
<tr>
<td>F (2,42)</td>
<td>3.14</td>
<td>1.20</td>
<td>6.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>0.53</td>
<td>0.31</td>
<td>0.003 *</td>
<td></td>
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</tr>
</tbody>
</table>

**Note:** Factors 1, 2 & 3 are derived from Rosenstiel & Keefe (1983). Factors A, B & C are derived from Reesor (1986).

* p < .01
Reesor’s three factors were as follows: (A) Active coping strategy; (B) Control or pain self-efficacy and (C) Catastrophizing. He suggested that his factor structure was somewhat more stable due to a higher subject to variable ratio (9:1) than in the Rosenstiel and Keefe study (6:1).

The scores on the subscale were then collapsed into a different set of factors (Reesor, 1986). These three factors are: (A) Active Coping Strategy; (B) Control or Pain Self-efficacy and (C) Catastrophizing. One way analyses of variance determined significant differences among the three groups ($F(2,42) = 6.70$, $p < .01$) on the Catastrophizing factor (Table 11). Post-hoc comparisons (Tukey-HSD, $p < .05$) revealed that the chronic pain group scored significantly higher than both the acute pain and control groups on this factor.

**State Anxiety**

A one-way analysis of variance revealed the the chronic pain, acute pain and control groups did not differ significantly on the state-anxiety scale of the State Trait Anxiety Inventory (STAI) ($F = 3.12$, $df (2,42)$).

**Jette Functional Activity Scale**

One way analyses of variance were used in analyzing the data for each of the three subscales: (1) How much pain to perform task; (2) How difficult it is to perform task and; (3) How much assistance is needed. The maximum score
### Table 12

**Jette FAS:**

**Group Means and Univariate Analyses**

<table>
<thead>
<tr>
<th></th>
<th>Chronic Pain</th>
<th>Acute Pain</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>119.3</td>
<td>88.1</td>
<td>97.3</td>
</tr>
<tr>
<td>SD</td>
<td>39.9</td>
<td>18.1</td>
<td>29.8</td>
</tr>
<tr>
<td><em>F (2,42) = 4.13</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>54.0</td>
<td>43.1</td>
<td>31.1</td>
</tr>
<tr>
<td>SD</td>
<td>16.9</td>
<td>9.5</td>
<td>7.7</td>
</tr>
<tr>
<td><em>F (2,42) = 13.51</em>*</td>
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<tr>
<td><strong>Difficulty</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>54.1</td>
<td>39.8</td>
<td>45.3</td>
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<tr>
<td>SD</td>
<td>17.4</td>
<td>9.3</td>
<td>15.1</td>
</tr>
<tr>
<td><em>F (2,42) = 3.78</em></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Assistance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>11.2</td>
<td>5.3</td>
<td>20.9</td>
</tr>
<tr>
<td>SD</td>
<td>10.8</td>
<td>6.6</td>
<td>11.9</td>
</tr>
<tr>
<td><em>F (2,42) = 8.90</em>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05

** p < .001
possible on each subscale is 100 and the maximum total score is 300. The results showed significant differences among the three groups on the Total Score as well as significant differences on each of the three subscales: (1) Pain; (2) Difficulty and (3) Assistance (Table 12).

Post-hoc comparisons (Tukey-HSD, p < .05) on the total of the Jette Index revealed that the chronic pain group scored significantly higher than the acute pain group, but the chronic pain group did not differ significantly from the control group. In addition, post-hoc comparisons (Tukey-HSD, p < .05) revealed that the chronic pain group scored significantly higher on the Pain subscale when compared to both the acute pain and control groups. Furthermore, the acute pain group scores were significantly different from the control group on this same subscale.

On the Difficulty subscale, the chronic pain group’s score differed significantly only from the acute pain group. On the Assistance subscale, the control group score differed significantly from the acute pain group but did not differ significantly from the chronic pain group.

ii) Cognitive Style

The chronic pain, acute pain and control groups were collapsed across their predominant cognitive style during the acute pain-induction procedure. Cochran tests revealed that the group variances, on each subscale and/or the total score, were homogeneous for the following tests: MPQ, CSQ, STAI and Ways of Coping.
**McGill Pain Questionnaire**

A one-way analysis of variance was performed on the Total McGill score ($F(1,43) = 0.31$) and the Present Pain Intensity ($F(1,43) = 0.48$). These analyses revealed no significant differences between the non-catastrophizers and the catastrophizers.

**Coping Strategy Questionnaire Factors**

One-way analyses of variance were performed on the factors of the CSQ. These analyses are summarized in Table 13 and revealed no significant differences between the catastrophizers and non-catastrophizers.

**State Anxiety**

One-way ANOVAs revealed no significant differences between the catastrophizers and non-catastrophizers ($F(1,43) = .043$) on a measure of state anxiety.

**Jette Functional Activity Scale**

The possibility of non-homogeneity of cell variances was tested using Cochran tests. The degree of heterogeneity was not significant for each of the subscales: 1) Pain ($C(22,2) = 0.70$, $p = 0.06$); 2) Difficulty ($C(22,2) = 0.69$, $p = 0.07$) and 3) Assistance ($C(22,2) = 0.55$, $p = 0.63$). The degree of heterogeneity
Table 13

Factors of CSQ by Cognitive Style:

Means and Univariate Analyses

<table>
<thead>
<tr>
<th>Factor</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Coping &amp; Suppression</td>
<td>Helplessness</td>
<td>Diverting Attention</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
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</thead>
<tbody>
<tr>
<td>Non- Catastrophizers</td>
<td>2.3</td>
<td>2.9</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2.4</td>
<td>2.6</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>0.7</td>
<td>0.8</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>F (1,43)</td>
<td>0.21</td>
<td>1.68</td>
<td>1.97</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0.65</td>
<td>0.20</td>
<td>0.17</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Factor A</th>
<th>Factor B</th>
<th>Factor C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coping</td>
<td>Control</td>
<td>Catastrophizing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non- Catastrophizers</td>
<td>2.1</td>
<td>3.3</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2.5</td>
<td>3.0</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>0.7</td>
<td>1.3</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>F (1,43)</td>
<td>2.42</td>
<td>0.70</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0.13</td>
<td>0.41</td>
<td>0.71</td>
<td></td>
</tr>
</tbody>
</table>

Note: Factors 1, 2 & 3 are derived from Rosenstiel & Keefe (1983). Factors A, B & C are derived from Reeser (1986).
however, was significant for the Total Jette Score ($F(22,2) = 0.81, p = 0.002$). One-way analyses of variance revealed no significant difference between the non-catastrophizers and the catastrophizers on each of the subscales: (1) Pain ($F(1,43) = 0.82$); (2) Difficulty ($F(1,43) = 0.15$) and (3) Assistance ($F(1,43) = 1.33$).

**Ways of Coping**

One-way analyses of variance and Dunn's multiple comparison procedure revealed no significant difference between the catastrophizers and non-catastrophizers on all of the scales (Table 14) with the exception of the escape-avoidance scale where the catastrophizers scored significantly higher than the non-catastrophizers.
Table 14

Ways of Coping Scale:
Means and Univariate Analyses by Cognitive Style

<table>
<thead>
<tr>
<th></th>
<th>Non-Catastrophizers</th>
<th></th>
<th>Catastrophizers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Confrontive Coping</td>
<td>5.5</td>
<td>3.6</td>
<td>5.5</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>F (1,43)</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distancing</td>
<td>4.9</td>
<td>3.1</td>
<td>6.1</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>F (1,43)</td>
<td>1.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Controlling</td>
<td>8.5</td>
<td>4.4</td>
<td>7.9</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>F (1,43)</td>
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<td></td>
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</tr>
<tr>
<td>Seeking Social-support</td>
<td>7.5</td>
<td>4.0</td>
<td>8.3</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>F (1,43)</td>
<td>0.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accepting Responsibility</td>
<td>2.8</td>
<td>2.6</td>
<td>3.1</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>F (1,43)</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Escape-Avoidance</td>
<td>4.5</td>
<td>3.5</td>
<td>7.2</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>F (1,43)</td>
<td>4.52 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planful Problem-Solving</td>
<td>8.2</td>
<td>4.1</td>
<td>8.6</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>F (1,43)</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Re-Appraisal</td>
<td>4.9</td>
<td>3.4</td>
<td>5.9</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>F (1,43)</td>
<td>0.77</td>
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</table>

* p < .05
Discussion

The goals of the present study were to determine if chronic pain patients employed different cognitive coping strategies, when compared to an acute pain group and/or a pain-free disabled control group, in three different areas: 1) clinical pain; 2) acute experimental pain and 3) non-pain stressors. Also investigated was the consistency of cognitive style, and the effect of cognitive style on pain tolerance and pain ratings.

Coping with Clinical Pain

In this study, significant differences between the chronic pain, acute pain and control groups were restricted to the ways in which the chronic pain group coped with clinical pain. The CSQ results revealed that the chronic pain group scored significantly higher than the control group on a subscale measuring catastrophizing strategies. However, the acute pain and chronic pain groups did not differ in their use of this strategy in dealing with their clinical pain.

Furthermore, when this same questionnaire was broken down into its factors, it was evident that the chronic pain group had more "maladaptive" or "negative" thoughts about their pain, when compared to the acute pain and/or control
groups. The chronic pain group scored higher than both the acute pain and control groups on factors measuring Helplessness and Catastrophizing. These data appear to support the contention that chronic pain patients tend to use "maladaptive" and/or "negative" means in dealing with their pain, to a greater extent than acute pain patients and/or a relatively pain-free control group. This conclusion however, may not be warranted, for a number of hypotheses may account for these data.

First, the performance of the chronic pain group may simply be indicative of the extent of pain that they were experiencing. The chronic pain group scored significantly higher on all scales of the McGill Pain Questionnaire and overall, they were in more pain, as indicated by the PPI score, than both the acute pain and control groups. When the PPI was entered as a covariate in the analysis of the CSQ, there were no longer any significant differences among the three groups on the catastrophizing factor. The level of clinical pain may therefore explain the performance of the chronic pain group, on the aforementioned subscales.

An alternative explanation may be the differences in subject source. It has been suggested (McGrath, Cappelli, Rosser & Bernstein, 1985; Roskies & Lazarus, 1980) that patients who cope competently with their chronic pain, are seldom referred by their family physicians to speciality pain clinics. In the present investigation the chronic pain and acute pain subjects came from two different
centres. The chronic pain group was comprised mainly of people who were referred to The Rehabilitation Centre, which has a reputation for treating these patients. Only one chronic pain patient came from the Sports Injury Clinic. In contrast, the majority (67%) of the acute pain group was obtained from a Sports Injury Clinic. This clinic provides physician care and physiotherapy, often without the need for a referral from a family physician. Thus, the differences found in the investigation may, to some extent, reflect the type of patient seen in each of these settings. The Rehabilitation Centre treating a higher percentage of people who seek professional help to cope with their pain, be it chronic or acute, while the Sports Injury Clinic would likely treat those who are seeking short-term help to cope with their chronic or acute pain.

A final possible explanation, the role of self-efficacy in coping with clinical pain, will be presented following the discussion of some other findings.

**Coping with Acute Pain**

Differences among the three groups, with respect to cognitive style, pain tolerance and pain ratings during the acute pain-induction procedure, were investigated. With respect to the predominant cognitive style, no significant differences were found among the chronic pain, acute pain
and control groups during the acute pain-induction procedure. Comparable numbers of chronic pain patients, acute pain patients and controls were catastrophizers or non-catastrophizers.

Second, this investigation did not support either hypervigilence theory or adaptation level theory. There were no significant differences in pain tolerance and pain ratings across the three groups. Members of each kept their fingers in the pressure pain apparatus for similar lengths of time and rated the sensations equally. A number of explanations may explain why neither theory was supported.

Different types of acute experimental pain-induction procedures have been employed in different studies. This may account for the varying results. Naliboff and colleagues (1981) employed radiant heat while Schmidt and Brands (1987) employed a cold pressor task. The present study used a pressure pain device. The pain experienced with radiant heat and the cold-pressor task intensifies at a rapid rate and a ceiling is typically reached within 90 to 120 seconds.

In contrast, pressure pain produces a continually building, aching pain. The four-minute maximum time limit employed in the present study, may not have been enough time for the maximum tolerable pain level to have been reached, for fifty-one percent of the subjects kept their finger in the apparatus for the full four minutes.
The only study to use a similar pressure pain apparatus (Malow et al., 1980) employed myofascial pain dysfunction (MPD) patients, as opposed to the chronic pain subjects in the present study. Clinically, these pain populations differ in how they deal with their chronic pain. Keefe & Dolan (1986) compared MPD patients and low back pain patients and found that pain behaviours and coping strategies employed to deal with clinical pain differed greatly. The low back pain patients reported using a wider variety of strategies to control clinical pain.

A brief comment is warranted on the significant difference in pain ratings, across the three groups, from Trial #1 to Trial #2. As the reader will recall, prior to Trial #2, each subject was instructed to "Do anything you can to reduce the pain". The mean pain ratings were significantly lower on Trial #2 than on Trial #1. These findings replicate previous research which concluded that "the expectation that pain will be reduced is sufficient to produce a reduction of pain" (Chaves & Barber, 1974, p.361). It underscores the importance of giving subjects the permission to use spontaneous strategies in trying to cope with experimental pain.

It was predicted that the cognitive coping style exhibited during the acute pain-induction procedure would influence pain tolerance and pain ratings. When the data were collapsed across the three groups on the predominant
cognitive style (i.e. non-catastrophizers and catastrophizers) during the acute experimental pain-induction procedure, the prediction was supported in the expected direction. During the experimental pain condition, the non-catastrophizers kept their finger in the pain apparatus 1.7 times longer and rated the sensations as less painful than the catastrophizers. As an aside, the percentage of catastrophizers in the present study mirrored the results of Spanos and colleagues (1979) who found a similar percentage of catastrophizers (33%) and non-catastrophizers (66%).

The results of the present investigation corroborate two previous studies (Chaves & Brown, 1987; Spanos et al., 1979) which found that individuals who were able to control pain did so not because they used any particular strategy, but because they successfully avoided catastrophizing. The cognitive strategies appear to be effective in redirecting the subject’s attention to events other than the painful stimulation. Clinically, these results are significant, for they reinforce the value of teaching patients how to cope with their clinical pain by avoiding catastrophizing cognitions.

**Coping with Stressors**

Overall, on a measure of how people cope with stressful, non-pain events, the three groups did not
perform significantly different. These results suggest that the chronic pain group does not inherently appraise and/or deal with stressful events any differently than acute pain subjects and/or disabled controls. Thus, this finding does not support the hypothesis that chronic pain subjects suffer from chronic pain because they are generally "bad copers", dealing with stressful life events differently from others. The chronic pain group has the capacity to cope with stressful events, but there appear to be other influences at work when they are coping with their clinical pain. The role of cognitive appraisal and self-efficacy may explain this phenomenon and are discussed in the following section.

The hypothesis that one's coping style is flexible, changing with the demands of the situation, was supported. The results indicated that those who catastrophized during the acute pain-induction procedure, employed both catastrophizing and non-catastrophizing strategies in dealing with their clinical pain.

Theoretically, the works of Roskies and Lazarus (1980) and Bandura (1977) relate to the issues of coping with stressors and, in particular, coping with pain. Roskies and Lazarus state that how a person psychologically copes with stress depends upon his/her cognitive view of the situation.
Cognitive appraisal has been shown to be a key factor in coping processes. It is a dynamic process which changes according to three variables: the person's perceived anticipated consequences of an event; its importance to his/her well being and the perceived resources he/she has available to cope with the threat.

Applying this theory to the present investigation, acute experimental pain and clinical pain were appraised differently by the subjects. Experimental pain is time limited, whereas chronic pain is often described as constant. The chronic pain patients catastrophized about their clinical pain, possibly perceiving the anticipated consequences of the event as different from coping with the acute pain stimulus. In fact, the employment of non-catastrophizing strategies is more feasible when one has to cope with short-term pain as opposed to chronic pain where the use of such a self-control strategy may not be effective.

Along a similar vein, Bandura (1977) notes that it is an individual's perception of efficacy which mediates coping efforts, not necessarily an individual's actual ability to cope. Bandura has noted that self-efficacy expectancies are related to both the prediction and maintenance of behavior. A self-efficacy expectancy is defined as a personal conviction or belief that one can successfully perform a required behavior in a given situation.
Self-efficacy theory therefore suggests that pain coping behavior is mediated by self-efficacy expectancies. These self-efficacy expectancies are, in turn, a function of past successes and failures at coping with pain which are attributed to personal abilities.

Self-efficacy expectancies have been shown to be associated with coping with acute clinical and experimental pain. Dolce and colleagues (1986) have conducted clinical research investigating the role of self-efficacy in the perception of experimental pain. They observed that higher self-efficacy was consistently associated with greater pain tolerance, during a cold pressor test. They concluded that even high levels of pain and discomfort may be managed effectively, as long as the individual anticipates being able to cope successfully.

In a clinical setting, Manning and Wright (1983) reported that self-efficacy ratings predicted the percentage of time spent in labor without analgesic medication and were negatively related to the use of analgesics. Weisenberg (1984) has stated that coping strategies are not sufficient for successful coping. A person must believe that they have the skills to cope and that their attempt to cope will have some effect on their pain.
Looking at the characteristics of the subjects in the present study, the chronic pain group had lived with their pain for an average of four years and had often sought many different means to alleviate their pain. In contrast, the acute pain and control groups viewed their pain as being short-lived. Thus, following Bandura’s theory, it is not surprising that the chronic pain group engaged in more catastrophizing thoughts in dealing with their clinical pain, such as "I feel it will never get better" or "It overwhelms me", for indeed their doctors have likely told them that their pain may never get better. The chronic pain group may no longer believe that they have some control over their pain, for it has lasted for a number of years and past attempts to control it have likely been unsuccessful.

**Future Directions**

Overall, the results of this study indicated that catastrophizing cognitions reduced pain tolerance and increased pain ratings in an acute experimental pain condition. In addition, chronic pain patients were not different from acute pain and pain-free controls with respect to how they cope with stressors other than clinical pain. In dealing with clinical pain however, chronic pain subjects tended to employ more “maladaptive” cognitive strategies when compared to the other two groups. The
precise reasons for these differences however, were not clear and may be elucidated by future research.

Specifically, future research is needed in three areas. Self-efficacy appears to play a role in successfully employing cognitive coping strategies. Clinically, Tan (1982) has suggested more direct tests of the applicability of self-efficacy theory to account for changes in pain behavior. This would require the assessment of self-efficacy expectations.

Studies investigating treatments which strengthen self-efficacy expectancies may have considerable clinical significance. Manipulation of self-efficacy may be a critical factor in altering a chronic pain patient's self-perceptions about being able to cope with his/her pain. This is especially relevant for chronic pain patients. If they are taught to perceive that they can control and contain the influence of pain on their lives, it may help them to cope with their pain even when medical science cannot eliminate the sensations of pain itself completely.

Finally, a study following a group of acute pain patients over the course of one year may shed some light on how chronic pain patients develop "maladaptive" coping strategies and/or changes in self-efficacy expectancies. Are these cognitions and expectancies a result of
unsuccessful attempts at controlling their pain, as Bandura
has suggested, or are they the inherent ways in which
chronic pain patients deal with their pain? The
development of negative self-efficacy expectancies could be
chronicled, thus elucidating how these cognitions develop
in chronic and acute pain patients.
References


Appendix A

Forgie & Barber Pain Apparatus
Appendix B

Acute Pain Subject Recruitment Form

AREN YOU IN PAIN?

GRADUATE STUDENT IN NEED OF PEOPLE FOR RESEARCH STUDY ON
HOW PEOPLE DEAL WITH PAIN

STUDY WOULD INVOLVE 1 TO 2 HOURS OF YOUR TIME
INTERVIEW AND QUESTIONAIRES

DO YOU QUALIFY?

HAVE YOU BEEN IN PAIN FOR LESS THAN SIX MONTHS?

IS YOUR PAIN MILD TO SEVERE; CONSTANT OR PERIODIC?

IS YOUR PAIN IN ANY REGION OF YOUR BODY: BACK, NECK,
KNEE, FOOT, LEG, BUTTOCK ETC...

IF YOU ARE INTERESTED IN PARTICIPATING IN THIS WORTHWHILE
STUDY PLEASE FILL IN THE INFORMATION BELOW AND RETURN THIS
SHEET TO THE RECEPTIONIST.

NAME__________________________________________________________

PHONE NUMBER______________________________________________

LOCATION OF PAIN____________________________________________

HOW LONG HAVE YOU BEEN IN PAIN?___________________________

OR CALL

828-1524 BRENSDA

FOR MORE INFORMATION

(Please leave message on answering machine
 if I am not available)
Appendix C

Research Consent Form

Title of Project: Coping with Pain
Principal Investigator: Brenda L. Ferguson
Name of Volunteer: ____________ Date: ____________

I understand that I have been asked to participate in a research study that will last 45 to 90 minutes. It will involve a number of questions, questionnaires and an experimental procedure which may involve some discomfort. During each trial of the experiment, one of my index fingers will be placed in a pressure apparatus. Every 20 seconds I will be asked to rate the intensity of the sensations that I experience on a 0 to 10 scale. I will try to keep my finger in the pressure apparatus for at least one minute, and for as long after one minute as I can. However, if my finger becomes too uncomfortable, I may withdraw it from the apparatus AT ANY TIME. The experiment consists of two trials. After each trial I will be asked to describe the sensations, thoughts and feelings that occurred.

I understand that I have the freedom to withdraw from the experiment at any time. My agreement or refusal to consent to participation in the study will, in no way, affect my treatment at The Rehabilitation Centre.
I understand that some of my verbal responses will be tape recorded. These audio tapes will be kept confidential and used only for research purposes. My privacy will be protected. All research data obtained about me during the course of this study will be kept confidential and accessible only to the principal investigator and assistants on the project. In addition, should the study results be published, my identity will not be released.

I understand the procedures involved and agree to participate. I also understand that I have the freedom to withdraw from the experiment at any time.

Volunteer Signature

Brenda L. Ferguson
Principal Investigator
Appendix D

Procedural Flowchart

(1) Interview: Demographic and descriptive data

(2) Assessment Battery #1:
  - McGill Pain Questionnaire (Appendix F)
  - Coping Strategy Questionnaire (Appendix G)
  - State-Trait Anxiety Questionnaire - (State-Anxiety) (Appendix H)

(3) Acute Pain-induction Procedure: Trial #1 (Appendix I)

(4) Cognitive Style Interview (Appendix K)

(5) Acute Pain-induction Procedure: Trial #2

(6) Cognitive Style Interview (Appendix K)

(7) Assessment Battery #2:
  - Jette Functional Status Index (Appendix L)
  - Ways of Coping Scale (Appendix M)
Appendix E

Structured Interview Form

Name
DOB

Marital Status
Occupation

Education
Diagnosis

How long have you had current pain? Location?

Medication: Dosage, How often, How long?

Surgery for current pain problem.

Any other surgery? Any other physical ailments?

Involved in accident prior to pain?

Previous experiences with pain:

When - Describe

Same as this one?

What makes it better?

What makes it worse?

Previous treatments: Medication, nerve block, acupuncture,

hypnosis, heat packs, cold packs, immobilization,

traction, swimming, exercises, physiotherapy, TNS,
laser, chiropractor

Relief?

Pain and Work: Part-time Due to pain?

Full-time Cannot work

Litigation Disability Pension
Appendix F

McGill Pain Questionnaire

The MPQ (Melzack 1975) consists of 78 adjectives arranged into 20 groups reflecting three pain dimensions: sensory, affective and evaluative. The MPQ provides three types of pain data. These are the (a) Present Pain Intensity (PPI), a numerical estimate ranging from 0 (no pain) to 5 (excruciating pain), of the subject’s present level of pain; (b) Number of Words Chosen (NWC) from among the 20 subclasses of pain descriptors and; (c) Pain Rating Index (PRI) which is the sum of the rank values of the descriptors chosen in each adjective group. In the present study, the MPQ was administered orally by the investigator.

The MPQ has become a frequently reported dependent measure in both clinical evaluations (Reading & Newton 1977; Hunter & Philips 1980) and treatment trials (Fox & Melzack 1976; Rybstein-Blinchik, 1979). It has also been used with both chronic pain (Kremer & Atkinson 1981; McCrea, Turner & Dawson, 1981) and acute pain subjects (Reading, 1982; Reading, 1984). A comparison of MPQ profiles of women experiencing chronic pelvic pain and post-episiotomy pain showed that acute pain patients displayed greater use of
sensory word groups while chronic pain patients used affective and evaluative subgroups with greater frequency (Reading, 1982).

A recent study by Zarkowska and Philips (1986) however, compared three pain groups: 1) recent onset (1 day to 4 months); 2) low chronic (1 to 4 months) and; 3) high chronic (7 to 31 years) and found no significant differences on the MPQ PRI or on any of the subscales.
Appendix B

Coping Strategy Questionnaire

The CSQ was developed by Rosenstiel and Keefe (1983) and consists of 44 items which assess cognitive and behavioral pain coping strategies. The subject rates each item on a 7-point scale (0=never do that, 3=sometimes and 6=always). The cognitive coping scales are: (1) diverting attention; (2) reinterpreting pain sensations; (3) catastrophizing; (4) ignoring pain sensations; (5) praying and hoping and; (6) coping self-statements. The one behavioral scale is increasing activity level. Each scale consists of six items. At the end of the questionnaire, subjects make two separate ratings of the overall effectiveness of coping strategies. Using a 7-point scale, each subject rates: (a) how much control they have over pain (0=no control, 3=some control, and 6=complete control) and (b) how much they are able to decrease pain (0=can’t decrease it at all, 3=can decrease it somewhat, and 6=can decrease it completely).

The reliability of the CSQ subscales has been supported (Gross, 1986; Rosenstiel & Keefe, 1983; Turner & Clancy, 1986). Rosenstiel and Keefe conducted a principal component analyses of the scales, which produced three factors accounting for 68% of the variance in questionnaire
responses. The component measures are listed below:

1. Cognitive coping and suppression:
   - Reinterpreting pain sensations
   - Coping self-statements
   - Ignoring pain sensations

2. Helplessness:
   - Catastrophizing
   - Increasing activity Level
   - Control over pain
   - Ability to decrease pain

3. Diverting attention and praying:
   - Diverting attention
   - Praying or hoping

Reesor (1986) performed a similar principal component analyses but produced three different factors accounting for 69.5% of the variance. These component measures are listed below:

A. Active coping strategy:
   - Ignoring pain sensations
   - Coping self-statements
   - Reinterpreting sensations
   - Diverting attention
   - Increasing activity level

B. Control or self-efficacy:
   - Ability to decrease pain
   - Control over pain
C. Catastrophizing:

Catastrophizing

Praying or hoping

The CSQ has been used with chronic low back pain patients (Gross, 1986; Reesor, 1986; Rosenstiel & Keefe, 1983; Turner & Clancy, 1986), myofascial pain dysfunction (Keefe & Dolan, 1986) and osteoarthritis patients (Keefe, Caldwell, Queen et al., 1987).
Coping Strategy Questionnaire for Pain Patients

Individuals who experience pain have developed a number of ways to cope, or deal with, their pain. These include saying things to themselves when they experience pain, or engaging in different activities. Below are a list of things that patients have reported doing when they feel pain. For each activity, I want you to indicate, using the scale below, how much you engage in that activity when you feel pain, where a 0 indicates you never do that when you are experiencing pain, a 3 indicates you sometimes do that when you are experiencing pain, and a 6 indicates you always do it when you are experiencing pain. Remember, you can use any point along the scale.

When I feel pain...

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<tr>
<td>0</td>
<td>1</td>
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1. I try to feel distant from the pain, almost as if the pain was in somebody else's body.
2. I leave the house and do something, such as going to the movies or shopping.
3. I try to think of something pleasant.
4. I don't think of it as pain but rather as a dull or warm feeling.
5. It's terrible and I feel it's never going to get any better.
6. I tell myself to be brave and carry on despite the pain.
7. I read.
8. I tell myself that I can overcome the pain.
9. I take my medication.
10. I count numbers in my head or run a song through my mind.
11. I just think of it as some other sensation, such as numbness.
12. It's awful and I feel that it overwhelms me.
13. I play mental games with myself to keep my mind off the pain.
15. I know someday someone will be here to help me and it will go away for awhile.
16. I walk a lot.
17. I pray to God it won't last long.
18. I try not to think of it as my body, but rather as something separate from me.
19. I relax.
20. I don't think about the pain.
21. I try to think years ahead, what everything will be like after I've gotten rid of the pain.
22. I tell myself it doesn't hurt.
23. I tell myself I can't let the pain stand in the way of what I have to do.
24. I don't pay any attention to it.
25. I have faith in doctors that someday there will be a cure for my pain.
26. No matter how bad it gets, I know I can handle it.
27. I pretend it's not there.
28. I worry all the time about whether it will end.
29. I lie down.

30. I replay in my mind pleasant experiences in the past.

31. I think of people I enjoy doing things with.

32. I pray for the pain to stop.

33. I take a shower or bath.

34. I imagine that the pain is outside of my body.

35. I just go on as if nothing happened.

36. I see it as a challenge and don't let it bother me.

37. Although it hurts, I just keep on going.

38. I feel I can't stand it anymore.

39. I try to be around other people.

40. I ignore it.

41. I rely on my faith in God.

42. I feel like I can't go on.

43. I think of things I enjoy doing.

44. I do anything to get my mind off the pain.

45. I do something I enjoy, such as watching TV or listening to music.

46. I pretend it's not a part of me.

47. I do something active, like household chores or projects.

48. I use a heating pad.
Based on all the things you do to cope, or deal with your pain, on an average day, how much control do you feel you have over it? Please circle the appropriate number.
Remember, you can circle any number along the scale.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 |

Based on all the things you do to cope, or deal with your pain, on an average day, how much are you able to decrease it? Please circle the appropriate number.
Remember, you can circle any number along the scale.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
Appendix H

State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI) (Speilberger, Gorsuch & Lushene, 1970) is a self-report measure of both state and trait anxiety. In this study, only the State-anxiety scale (S-anxiety), form X-1, was administered. The S-anxiety scale consists of 20 statements that evaluate how a respondent feels "right now, at this moment". The respondent reads each statement and indicates which response best describes the intensity of their feelings: where: 1=not at all; 2=somewhat; 3=moderately so; and 4=very much so. The essential qualities measured by the S-anxiety scale are feelings of apprehension, tension, nervousness and worry. The norms used in this study were those based upon general medical and surgical patients.

The STAI has been proven to be a reliable and valid anxiety measure (Speilberger et al., 1970). In fact, it is the most extensively used anxiety measure in psychological research (Buros, 1978). Speilberger (1983) has compiled a bibliography of research on the STAI and has cited over 2,000 studies since 1970. Scores on the S-anxiety scale have been shown to increase in response to physical danger and psychological distress (e.g., Miller, 1979) and to
decrease as a result of relaxation training (e.g.,
Speilberger, 1983). The scale has also been used to assess
the level of state anxiety induced by stressful
experimental procedures (Auerbach, 1973; Shipley, Butt,
Horwitz & Fabry, 1978).
Appendix I

Acute Pain-Induction Procedure:

Instructions to Subjects

Following the completion of Assessment Battery #1, the investigator states:

This experiment consists of two trials. One index finger will be placed in the apparatus on Trial #1 and the other index finger will be used for the second trial. Please try to keep your finger in the apparatus for at least one minute, and for as long after one minute as possible. If however, the pain becomes too intense, you may stop the procedure at any time. There is a four minute time limit on each trial.

While your finger is in the apparatus, I am going to ask you to rate the intensity of the sensations you may be feeling.

Each subject is then given a letter size sheet of paper which has on it the pain scale. This sheet of paper is placed in front of the subject and the investigator explains the procedure for rating the pain sensations.

On this painscale, 0 represents “no pain”, 1 represents “just recognizable as pain”; 5 is “moderate pain” and 10 is “excruciating pain”, which is defined
as the point at which you would like to stop the experiment. Every 20 seconds, I am going to say the word "rate" and at that time, I would like you to quickly give me a number from the 0 to 10 scale, which best corresponds to the intensity of pain that you are experiencing.

Do you have any questions?

**Trial #1.**

The investigator then places the second phalanx of the subject's index finger in the apparatus. A stop watch is started as soon as the apparatus arm is lowered. Every twenty seconds, the investigator states the word "rate" and records on a sheet of paper, the subject's response. The trial continues until the subject wishes to stop or the 480 seconds have elapsed. At this time, the apparatus arm is lifted and the subject's finger is removed from the apparatus.

Immediately following the removal of the subject's finger, on both Trial #1 and Trial #2, the investigator follows the Cognitive Style Interview Protocol (Appendix K).
Trial #2.

The preceding instructions are followed for Trial #2, with the following exceptions. First, the subject's other index finger is placed in the apparatus. Second, before the investigator places the subject's finger in the apparatus, the investigator states:

Other than removing your finger from the apparatus, this time I would like you to do anything you can, to reduce the pain.

The investigator then answers any questions that the subject may have, but is careful not to interpret the above statement to the subject.
Appendix J

Pain Scale

0 1 2 3 4 5 6 7 8 9 10

no pain just recognizable as pain moderate pain excruciating pain
Appendix K

Cognitive Style Interview Protocol

After the removal of the subject's finger from the apparatus, on both Trial #1 and Trial #2, the investigator states:

One of the things that I am interested in in this study is what you were feeling and thinking while your finger was in the apparatus. I am going to ask you a few questions about any thoughts, feelings or anything that occurred to you while your finger was in the apparatus and I would like you to answer in as much detail as you can.

Try to imagine yourself back during the few moments just before you placed your finger in the apparatus. Tell me everything you can remember about what you were thinking and feeling at that time, even if your thoughts were brief or random and even if they seemed trivial.

If the patient reports being unable to recall anything when the question is posed, the investigator prompts with a question such as: "What were you thinking about?" or "How were you feeling?"

When the subject has provided more than three items, the investigator asks:
Is there anything else?

This question is repeated until the subject reports no new cognitions that occurred before placing their finger in the apparatus. The investigator then asks:

Once you placed your finger in the apparatus, what kind of feelings and thoughts did you have?

The investigator prompts if necessary and repeats the following statement until no further responses are evoked:

After that, what can you remember?

The investigator continues to ask "Is there anything else?", until no further cognitions are reported.

When the subject recalls no further information, the investigator states:

As you were sitting there, with your finger in the apparatus, giving reports from time to time, what else do you recall experiencing, any thoughts, feelings, images -- even fleeting or random?

Finally, the investigator asks:

What do you remember thinking about or feeling just before you took your finger out of the apparatus?

Again, until the subject reports no new cognitions, repeat "Is there anything else?"
Appendix L

Jette Functional Status Index

The Functional Status Index (FSI) (Jette, 1980a) consists of 75 items outlining 25 daily activities such as transferring, to or from a car, putting on a sweater or coat, washing dishes, and climbing stairs. Each of the 25 activities is rated in terms of three dimensions: (1) Pain (the degree of discomfort or sensation of hurting experienced when performing the activity); (2) Difficulty (how easy or how hard it is to perform the activity); and (3) Dependence (the degree of help or assistance a person needs to perform a specific activity). The pain and difficulty dimensions are rated along a 4-point scale where 1=none, 2=mild, 3=moderate and 4=severe. The dependence ratings are: 0=no assistance, 1=mechanical assistance, 2=human assistance, 3=mechanical and human assistance and 4=cannot perform. The subject's functional capacity score is computed by summing the three subscales.

The FSI has proven to be a reliable instrument with adults suffering from rheumatoid arthritis and osteoarthritis (Jette, 1980a, 1980b). It has also been used to assess the functional status of chronic pain patients (Rosenstiel & Keefe, 1983) and the spinal cord injured (Rosenstiel & Roth, 1981).
Functional Activity Scale:

Instructions and Sample Items

1. Below is a list of activities. For each activity please indicate, using the scale below, how much pain is involved when you engage in that activity, where a 1 indicates no pain, a 2 indicates mild pain, a 3 indicates moderate pain, and a 4 indicates severe pain. If you do not usually engage in an activity, try to answer the question as to how much pain would be involved if you did engage in it.

1 2 3 4
No pain  Mild pain  Moderate pain  Severe pain

2. Listed below are the same activities. This time for each activity please indicate, using the scale below, how difficult it is for you to engage in each activity, where a 1 indicates no difficulty, a 2 indicates mild difficulty, a 3 indicates moderate difficulty, and a 4 indicates severe difficulty. If you do not usually engage in an activity, try to answer the question as to how difficult it would be if you did engage in it.

1 2 3 4
No Difficulty  Mild Difficulty  Moderate Difficulty  Severe Difficulty
3. Listed below are the same activities. For each activity please indicate, using the scale below, how much assistance you need to do that activity, where a 0 indicates you are independent and use no assistance, a 1 indicates you use mechanical assistance, such as a cane or a brace, a 2 indicates you use human assistance, a 3 indicates you use both mechanical and human assistance, and a 4 indicates you cannot perform the activity. If you never engage in an activity, try to answer the question as to how much assistance you would need if you did engage in it.

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<tr>
<td>No</td>
<td>Mechanical Assistance</td>
<td>Human Assistance</td>
<td>Human &amp; Mechanical Assistance</td>
<td>Cannot Perform</td>
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<tr>
<td>1.</td>
<td>Putting on sweater or coat</td>
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<td>2.</td>
<td>Transferring to or from the car</td>
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<td>3.</td>
<td>Transferring to or from chairs</td>
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<td>4.</td>
<td>Putting on underclothes</td>
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<td>5.</td>
<td>Walking outside</td>
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<td>6.</td>
<td>Working with pots and pans</td>
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<td>7.</td>
<td>Transferring to or from bath</td>
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<td>8.</td>
<td>Washing all areas of body</td>
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<td>9.</td>
<td>Climbing stairs</td>
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<td>10.</td>
<td>Working at the sink</td>
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<td>11.</td>
<td>Putting on and tying shoes</td>
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12. Climbing curbs
13. Doing home repairs
14. Washing windows
15. Doing dishes
16. Transferring to or from bed
17. Working at stove, oven or refrigerator
18. Doing laundry
19. Shopping
20. Putting on shirt or blouse
21. Doing yardwork
22. Bedmaking
23. Walking inside
24. Putting on hosiery or pants
25. Working at your usual job
Appendix M

Ways of Coping

The Ways of Coping (Folkman & Lazarus, 1980) is a 67 item checklist containing a wide range of thoughts and actions that people use to deal with taxing events. It is a process measure, designed to elicit information about the strategies a person uses to deal with a specific stressful encounter. Each respondent verbally describes a specific stressful encounter, describing who was involved, where it took place and what happened. (In the current investigation the subjects are instructed not to choose their pain problem or disability per se, as the specific stressful event). The checklist is then applied to the stressful event. Each item is scored on a 4-point scale where: 0=used somewhat and/or not applicable; 1=used somewhat; 2= used quite a bit; 3=used a great deal.

The internal consistency and factor structure of the scale have been established (Folkman & Lazarus, 1980; Folkman, Lazarus, Dunkel-Schetter, DeLongis & Bruen, 1986). A principal component analysis (Folkman et al., 1986) has accounted for 46.2% of the variance and yielded eight scales. The eight scales are listed below along with representative items:
1. Confrontive coping
   Stood my ground and fought for what I wanted.
   Tried to get the person responsible to change his or her mind.
   Took a big chance and did something very risky.

2. Distancing
   Made light of the situation; refused to get too serious about it.
   Went on as if nothing had happened.
   Tried to forget the whole thing.

3. Self-controlling
   I tried to keep my feelings to myself.
   Kept others from knowing how bad things were.
   I tried not to act too hastily or follow my first hunch.

4. Seeking social support
   Talked to someone to find out more about the situation.
   Talked to someone who could do something concrete about the problem.
   I asked a relative or friend I respected for advice.

5. Accepting responsibility
   Criticized or lectured myself.
   Realized I brought the problem on myself.
   I made a promise to myself that things would be different next time.
6. Escape-avoidance

Wished that the situation would go away or somehow be over.

Hoped a miracle would happen.

Had fantasies about how things might turn out.

Took it out on other people.

7. Planful problem-solving

I knew what had to be done, so I doubled my efforts to make things work.

I made a plan of action and followed it.

Changed something so things would turn out all right.

8. Positive reappraisal

Changed or grew as a person is a good way.

I came out of the experience better than when I went in.

Found new faith.

Rediscovered what is important in life.

I prayed.

The Ways of Coping scale has been applied to university students (Folkman & Lazarus, 1985) and a community sample comprised of middle-aged couples (Folkman & Lazarus, 1980; Folkman et al., 1986).
Appendix N

Training of Raters

Two university graduates, who were blind to the nature of the study, were trained as raters. Each was required to read two articles (Spanos et al., 1979; Turk, Meichenbaum & Genest, 1983 (Chapters 4 & 5)), and the Cognitive Style Scoring Guide (Appendix G). The experimenter then met with each rater independently and discussed the articles.

Each rater was then asked to apply the Cognitive Style Scoring Guide to a series of sample cognitions. Their rating of these sample cognitions was reviewed by the experimenter and the raters were given the taped responses to score, after they had completed this training session to criterion reliability.
Appendix D

Guide for Scoring Cognitive Strategies

The purpose of this guide is to help you to score the verbal testimony of subjects for the presence of specific cognitive strategies. This guide was adapted from the Structured Interview Schedule for Pain Scoring Key developed by Benest (1982). You will be listening to the tape-recorded responses of subjects following two trials in a pressure pain apparatus. The interviews were conducted immediately following the removal of the subject’s finger from the pressure pain apparatus.

For rating purposes, there will be two cognitive strategies: 1) non-catastrophizing and 2) catastrophizing. You will determine which category each of the subject’s major thoughts belongs to. For a subject, one thought could be rated as a non-catastrophizing and another as catastrophizing. After listening to all of the verbal testimony, you must determine each subject’s predominate cognitive strategy using the scale outlined at the end of this guide.

Non-Catastrophizing Cognitive Strategies

For the purposes of research, non-catastrophizing strategies are defined as cognitive strategies which are either neutral or those which the individual employs to
help them cope with the acute pain-induction procedure. There are a variety of non-catastrophizing strategies.

**Distraction**

**Attention-diversion.**

The subject focuses his attention on something other than pain. Some examples are thoughts about a pleasant experience, doing mental arithmetic or focusing their attention on their breathing.

**Examples:** "I was making out my grocery list", "I was reading that poster", "I was tapping my foot", "I started to distract myself", "I moved my other fingers, I thought that would help", "I was singing a song in my head".

**Coping Self-Statements**

The subject says things to themselves to help them cope. The self-statement may be a minimization of the stress or may emphasize the individual's ability to cope with the situation. Coping imagery may also be involved. For example the subject reports imagining a situation that is inconsistent with the feeling of pain.

**Examples:** "Lying on a beach in warm sunny weather", "I can deal with this", "This isn't so bad", "This doesn't bother me that much", "I was thinking, this
isn’t so bad, the pain in my back is much worse", "I just kept saying to myself, you’ve got to keep it on", I knew I would stop whenever I wanted so I just kept going".

Relaxation

Somatization & Dissociation.

The subject describes his experience during the trial in such terms as relaxed, calm, drowsy or reports thinking of "nothing".

Examples: "I felt calm", "I just tried to relax", "I tried not to think".

The subject may also describe feelings of dissassociation where the pain feels separated from their body or they may objectively observe sensations in the painful part with some detachment. (NB: negative affect is not salient).

Examples: "My mind was calm; it was just my finger that was hurting", "I was feeling the sensations, the throbbing and the numbness", "The pain seemed far away".

Catastrophizing Strategies

For the purposes of research, catastrophizing strategies are those which interfere with the subject’s ability to cope with the pain.
**Negative Self-Statements**

The subject reports thoughts which imply an inability to cope with the situation. The subject may indicate that they felt no control over the sensations and/or they may have had thought about termination or not terminating (as in a conflict, not as a resolved decision to stay).

Examples: "All the way through, I was wondering if should stay a little longer", "I was thinking, how long can I stand it", "I wish I could take it out", "I had to keep encouraging myself to stay in", "I really wanted to take it off", "I can't stand this, this is awful", "My attempts to distract myself didn't work, I couldn't concentrate on it".

**Catastrophizing Thoughts and Images**

The subject reports exaggerating the noxious aspects of the situation and thinks of unrealistic or frightening consequences. They may express fear, anxiety or other "worry thoughts" about possible dire outcomes.

Examples: "I thought my finger would never be the same", "I thought the bar was going to cut off my finger", "I thought this is going to hurt", "I hate pain (as a reported cognitive)", "I thought you were going to bang down hard on the bar", "It started to feel like it was crushing the bone in my finger", "my finger was turning blue and I was afraid I might damage
it", "I could feel the hurt all the way up to my shoulder so I started to worry it was pinching a nerve".

Subjects may also report that their attention was focused on the pain or other unpleasant feelings. They may have thought of little other than the pain or could not attend to anything else.

Examples: "Except for the pain I couldn’t think of anything else", "All I could feel was the pain", "I couldn’t concentrate on anything else", "I was thinking I should think of other things...I was trying not to think about it...It was bothering me more".

**Subject Classification**

As stated earlier, you must decide whether the subject’s cognitions were predominantly non-catastrophizing or catastrophizing. If the subject engaged in both non-catastrophizing and catastrophizing strategies, use this 4-point scale to rate the saliency of each category and then determine the subject’s overall category.

1. Vague elements.
2. At least one clear occurrence.
3. Multiple examples that the thoughts were more than an isolated cognitive event.
4. Thought predominated mental activity.