# SELF-EFFICACY, SELF-INITIATED COPING STRATEGIES, AND INDIVIDUAL DIFFERENCES IN PAIN PERCEPTION

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# CHAPTER I

# INTRODUCTION

Pain is defined by the International Association for the Study of Pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage," (Merskey and Bogduk, 1994, ¶11). Merskey and Bogduk (1994) note that pain is a subjective experience determined by an interaction of the following three distinctive components: the sensory-discriminative component, the affective-motivational component, and the cognitive-evaluative component. The sensory-discriminative component refers solely to the tactile sensation and discriminative processes that take place in order for one to distinguish pain from other sensations. Clearly, pain is most always unpleasant and therefore its perception also involves an emotional process. The sentiments that become part of the pain experience, as well as the motivating forces behind these sentiments, constitute the affective-motivational component of pain. The cognitive-evaluative component in the IASP's (Merskey and Bogduk, 1994, ¶11) definition of pain refers to the assessment one makes regarding a painful stimulus as well as how he or she utilizes cognitive processes to directly deal with, manipulate, or attenuate the pain that is experienced. There are inherent difficulties in distinguishing between all three pain components due to their relatively intimate ties to one another. However, pain research meticulously manipulates and measures a number of sensory, cognitive, and affective characteristics in an attempt to isolate each of these components and determine the relative significance of each on an individual's overall perception of pain. In its most basic sense, pain can be understood by its intrinsic division into two categories: chronic and acute pain. Acute pain refers to the sudden onset of painful symptoms due to activation of nociceptors (receptors responsible for the transmission of pain messages) that lead to the temporary, yet nevertheless, very real sensation of sudden pain. Chronic pain, on the other hand, refers to the *incessant* sensation of pain occurring from continuous activation of nociceptors. Chronic pain states vary in intensity and severity between individuals and may or may not be explained by any of the following conditions: 1)neuritis: inflammation of a nerve or nerves, 2) neuropathic pain: pain created by a lesion or abnormality in the nervous system, 3) hyperalgesia: an increased response to a stimulus which is not normally painful as a consequence of troubles in the nociceptive system, 4) peripheral neuropathic pain: pain initiated by a lesion or abnormality in the peripheral nervous system, etc., etc., (Merksey and Bogduk, 1994). Moreover, acute pain, in many ways, may often help facilitate the mechanisms responsible for the development of chronic pain in many individuals. Someone who experiences acute pain may begin to reinterpret sensations that are normally not considered noxious or painful as extremely painful; they become extremely sensitive to all stimuli. "Many people report pain in the absence of tissue damage or any likely pathophysiological cause; usually this happens for psychological reasons," (Merskey and Bogduk, 1994, ¶ 12). Following this description, pain does not necessarily need to be associated with a painful stimulus. Pain may often be associated with or defined as a psychological state. It is because of this that many investigations into acute pain states may be crucial for the prevention and treatment of chronic pain states as well. If we can determine that the pain being experienced is a result of flawed cognitive interpretations and not as a result of real noxious stimulation, it may then be possible to locate the origin of the pain state and focus on eliminating its sensation or perception by the individual. It is for this reason that researchers have been studying the biological, social, and psychological aspects of acute pain perception for a number of decades. If the pain being experienced is psychological, it is possible to modify individual interpretations or thought processes so as to eradicate the pain from any further conscious experiences.

In an experimental setting, there are various ways in which one may induce pain in order to measure it from one person to the next. A relatively common method of pain induction is the cold pressor apparatus, (Hodes et al., 1990; Eccleston, 1995; Williams and Kinney, 1991; Jackson et al. 2002). This relatively simple piece of equipment often consists of a container of ice water kept at an average temperature of 3°C +/- 1.5°. This apparatus is used to determine two measures: pain sensitivity and pain tolerance. Pain tolerance in many experiments (Hodes et al., 1990; Eccleston, 1995; Williams and Kinney, 1991; Jackson et al. 2002) is operationally defined as the amount of time a subject can hold his or her hand in the ice water until the pain is no longer endurable. Pain sensitivity is measured by collecting subjective ratings of the amount of pain the subject is currently experiencing. The subject usually uses a standard Visual Analogue Scale (VAS) to indicate the perceived intensity of his or her pain. The operational definition of pain sensitivity may therefore be understood as the average of all of the subjective ratings an individual assigns to the pain inducing cold water. It has been suggested in a number of studies that tolerance is a measure of the affective-motivational dimension of pain while sensitivity is a measure of the sensory-discriminative component, (Hodes et al., 1990, Zelman et al., 1991). In conjunction with a variety of tools and psychological measurements, the use of the cold pressor apparatus has enabled researchers to delineate the unique role and contribution of various psychological characteristics in pain perception.

In the past, research has focused on individual differences in pain perception that may be due to variables such as gender, affect, attention and/or distraction from pain, expectations, history of pain, etc. Variations in pain measures between genders are most likely due to the interactive effects of social, biological, and psychological components. Unruh (1996) remarks that men are more tolerant of pain, experience pain as less intense, and may be more likely than women to evaluate pain of moderate or mild intensity as a challenge as opposed to a threat. Women, on the other hand, generally do not tolerate pain as long as men, perceive it as more intense, and consider pain as an aspect of health and a sign or symptom of impending injury or illness, (Unruh, 1996).

Regarding affect and pain perception, one emotion that has received considerable attention is anger. Anger has repeatedly been shown to have a significant correlation with both pain sensitivity and pain tolerance. Gelkopf (1997) ascertained a statistically significant positive correlation between anger-in (a term used to describe those people who "stuff" or internalize their anger) and pain sensitivity and a statistically significant negative correlation between anger-in and pain tolerance. Fernandez and Turk (1995) remark, "anger stands out as one of the most salient emotional correlates of pain, even though past research has been largely confined to the study of depression and anxiety," (p. 165). In a more general sense regarding affect and pain perception, positive mood states and experimental manipulations of positive moods appear to enhance pain tolerance while negative mood states and experimental manipulations of negative mood states appear to have the reverse effect on pain tolerance (Zelman et al., 1991; Villemure and Bushnell, 2002)

Although they're ample studies that have investigated the relationship between self-efficacy and pain perception (Dolce 1987; Bandura et al., 1987; Bandura et al., 1988; Williams and Kinney, 1991; Weisenberg et al., 1995; Jackson et al., 2002) comparably less research has been conducted regarding this particular topic. Self-efficacy generally refers to the belief one may hold that when he or she exerts effort for a task, he or she will succeed at that task. This concept was first described by Bandura (1986) and was a crucial theoretical advancement to social cognitive theory. "Perceived self-efficacy is concerned with judgments of how well one can execute courses of action required to deal with prospective situations," (Bandura, 1982, p. 122). Since then, Williams and Kinney (1991) have demonstrated that self-efficacy perceptions predict individual differences in pain tolerance while holding anticipated pain, subjective pain, and attention to pain constant. That is, when controlling for individual expectations of pain, the amount of pain the subject reports experiencing and the amount of attention paid to the painful stimulus, self-efficacy remains a statistically significant predictor of pain tolerance, (Williams and Kinney, 1991). Jackson et al. (2002) were the first researchers to evaluate the relationship between self-efficacy specific to pain and self-efficacy relating to one's overall physical capabilities. Jackson et al. (2002) attempted to illustrate that gender differences in pain perception were mediated by both types of self-efficacy beliefs and that associations between gender and both measures of pain (tolerance and sensitivity) would disappear after controlling for the variance contributed by physical and task-specific self-efficacy.

*Statement of Purpose*

A fair amount of research has been devoted to understanding the relationship between self-efficacy beliefs and pain perception (Dolce 1987; Bandura et al., 1987; Bandura et al., 1988; Williams and Kinney, 1991; Weisenberg et al., 1995; Jackson et al., 2002). There is little consistency, however, in methodology between experiments. The conclusions made from such studies are difficult to meaningfully interpret. Moreover, only one study has attempted to define the relationship between *physical* self-efficacy and pain tolerance and has failed to demonstrate a significant relationship (Jackson et al., 2002). The lack of findings from one particular study should not dictate that other studies do not investigate the same or similar measures. The purpose of this thesis was to investigate the effects of self-efficacy and self-initiated coping strategies on pain perception and to attempt to replicate previous findings of a relationship between self-efficacy and pain tolerance using procedures utilized in Jackson et al. (2002). Specifically, I intended to determine the effects that physical self-efficacy, task-specific self-efficacy relating to pain, task-specific self-efficacy *relating to pain due to cold,* and the use of self-initiated coping strategies have on cold pressor pain tolerance. Physical self-efficacy may be understood as a construct of one's overall self-image and belief in his or her ability to succeed in general physical tasks. Task-specific self-efficacy for pain refers to one's belief regarding his or her capabilities in dealing with a painful situation. Finally, task-specific self-efficacy for *pain due to cold* refers to one's belief regarding ability to deal with pain that occurs due to a cold stimulus. The questions that were being asked included: 1) Do men and women in the current population of interest continue to exhibit the previously demonstrated differences in pain tolerance?, 2) Do men and women differ on measures of physical self-efficacy, task-specific self-efficacy for pain, and task-specific self-efficacy for pain due to cold?, 3) Is there a statistically significant relationship between the physical self-efficacy and both types of task-specific self-efficacy?, 4) Are the measures for physical self-efficacy and task-specific self-efficacy significant predictors of pain tolerance for cold pressor pain?, 5) Do certain self-initiated coping responses enable subjects to tolerate cold pressor pain longer than others? The current study was an attempt to address each of these questions in a manner similar to Jackson et al. (2002) with a few modifications. In particular, I did not use pain sensitivity as a dependent variable as it has been shown in the past to have no relation to self-efficacy (Jackson et al., 2002; Dolce, 1986d), and it interferes with each subjects' potential use of self-initiated coping strategies. If a subject is asked to rate the pain he or she is currently experiencing, he or she will be forced to pay attention to the pain and will not be given a chance to use any type of self-initiated coping strategy in order to more effectively deal with or attenuate his or her pain. In addition, the measure of task-specific self-efficacy has been slightly modified with respect to the scaling and number of options given to each subject. It was determined (through a pilot study) that the majority of responses were negatively skewed towards the "Strongly Agree" end of the spectrum; very few subjects responded by circling "Strongly Disagree." As such, the 6-point Likert scale was changed to a 4-point Likert scale in order to more accurately assess the variations in levels of task-specific self-efficacy for pain between subjects. Both original and modified versions are presented in the appendices (Appendices D and E respectively). Furthermore, I have introduced an additional measure of task-specific self-efficacy: one that refers specifically to *pain due to cold*. The inclusion of the measure of self-efficacy specific to *pain due to cold* was intended to more accurately evaluate the relationship between self-efficacy beliefs and pain tolerance since it is directly applicable to the cold pressor apparatus. It was hoped that by adding a measure that refers specifically to the task at hand (a painful stimulus), more variability in individual differences in pain tolerance could be accounted for.

The following chapter summarizes the research regarding the variables responsible for producing individual differences in pain perception. Because an extensive amount of biological, social, and psychological variables have been implicated in pain processing, I have narrowed down the literature review to reveal variables most closely related to the present topic. In particular, the following chapter will discuss the methods, results, and conclusions of studies investigating the effects of gender, overt cognitive coping strategies and attentional influences on pain perception. In addition, I will briefly describe the principles of social cognitive theory and the methods, results, and conclusions of current studies assessing the relationship between self-efficacy beliefs and pain perception.

## CHAPTER II

## REVIEW OF LITERATURE

### *Gender Influences*

Gender is a variable inherent to pain research. Robinson et al. (2003) note a review of experimental pain stimuli led to the conclusion that almost 75% of the published pain research has detected a sex difference on at least one of the two dependent measures of pain perception (tolerance and sensitivity). The mechanisms by which these sex differences in pain perception are produced, however, are not fully understood. Frequently, investigations into the pain experience include gender as a demographic variable and not as an active variable or a main focus of the study. Thus, the estimations as to how gender may contribute to variations in pain perception are inconsistent and erratic. In a particular attempt to segregate the unique contribution of gender as well as attentional influences on pain perception, Keogh et al. (2000) investigated the effects of two different attentional strategies on how males and females respond to the cold pressor apparatus (p.3). Manipulation of subjects' attention occurred by the specific instructions for cold pressor participation. Each subject was assigned to one of two groups: focused vs. avoidance attention. The experimenters instructed each of the subjects to either "concentrate on the sensations they experienced from the cold water [attention]...or to avoid all sensations that the cold water produced, to try to block all thoughts and feeling about this sensation from their minds," (Keogh et al., 2000, p. 227). The authors hypothesized that females, in addition to being less tolerant, reporting more pain, and having lower thresholds relative to males, would have more pronounced negative responses to pain when under the instruction to ignore the painful sensations that the cold water produced. No specific hypotheses were made regarding the responses men would have regarding the cold pressor apparatus other than their reactions relative to that of females. Keogh et al. (2000) found that the perception of intensity of cold pressor pain (pain sensitivity) was significantly reduced in males when they attended to the pain in that the pain ratings decreased when males received specific instructions to focus on the pain. The effect of focused attention on pain ratings that occurred in men was not demonstrated in women. That is, pain focusing was found to be beneficial for males and not females. Pain tolerance, as measured by the amount of time a subject could keep his or her hand in the water, was not affected by the differential attentional strategies for either gender. These results suggest that women may not benefit from attention focusing strategies that may be especially effective for men. It is likely that variables other than the simple manipulation of attention through cold pressor instruction had an effect on subject pain tolerance and sensitivity. In addition, Keogh et al. (2000) were able to replicate previous findings that females had a lower tolerance for pain than males. This consistently produced finding of lower tolerance for pain in females relative to males may be due in part to an overall reporting-bias. The probable reporting bias was assessed in Robinson et al.'s (2001) development of the GREP. Robinson et al. (2001) investigated a new author generated measure titled, the Gender Role Expectations of Pain Questionnaire. This measurement was specifically designed to assess how each gender is perceived (by members of their own gender and members of the opposite gender) to report, endure, and subjectively experience pain. The GREP was shown to have test-retest reliability between first and second administrations of the test ($r = .53$ through $r = .93$ for individual items) as a measure of sex-related stereotypic attributes of pain sensitivity, endurance, and willingness to report pain (Robinson et al., 2001). An important note to make regarding this particular study is the uncommon operational definitions of the dependent measures. In particular, sensitivity was defined as how much time passes following an injury before a person experiences pain. That is, if a person cut his or her hand, sensitivity would be the amount of time that passes between the cut and the behaviors or actions that signal the person is now experiencing pain. Furthermore, endurance was defined as "the amount of time that passes before a person experiencing pain will seek relief from the symptoms," (Robinson et al., 2001, p. 257). Pain tolerance, when utilizing the cold pressor apparatus, refers to the amount of time that passes before the subject removes his or her hand from the water. Therefore, this measure of endurance (operationalized in Robinson et al. (2001)) could be comparable to the measure of pain tolerance normally utilized throughout experimental pain studies because both variables assess the amount of time that passes before the subject seeks relief from the painful stimulus. The third measure of the Robinson et al.'s (2001) study was designed to assess the reluctance of an individual to report that he or she is actually experiencing pain. Of the 391 subjects sampled, the authors found that both men and women rated men as far less willing to report pain than women. In addition, both men and women rated women as more sensitive and less enduring of pain than men. Robinson et al. (2001) note that these results "lend support to the gender role theories that suggest that men and women are socialized to respond differently and have different expectations relative to pain perception," (p. 255). That is, there is a greater *social risk* for men (that of potential embarrassment and anxiety) to report pain than there is for women. Both women and men expect women to be more sensitive and less tolerant of pain, and both women and men expect men to refrain from reporting pain. Clearly, in experimental pain procedures these pain responding expectations could influence the way a subject reacts to a specific stimulus. This may demonstrate a confounding variable of many laboratory pain studies. The observed differences in the majority of pain studies could possibly be due to the confounding influence of the gender stereotypes regarding pain responding. An individual's actual reporting of pain may not be representative of the pain he or she is actually experiencing. Specifically, men may be more reluctant to report that they are experiencing pain because of the social risk; the reverse may be true for women. Furthermore, this reporting bias could create an interaction effect if the sex of the subject is different from that of the experimenter. For example, when under the supervision of a male experimenter, the female subject may respond or report pain much sooner than she actually experiences pain due to a social expectation she may hold that women are generally more sensitive to pain than men. On the other hand, the female may report pain much later than she actually experiences it in an attempt to break the gender stereotypes that women are more sensitive than men. The reverse reactions may be observed when a female experimenter is recording pain measures for a male. The male may feel pressure to exaggerate his abilities to deal or cope with the pain. Therefore men may be hesitant to report pain in order to avoid negative emotional and/or social consequences associated with decreased pain tolerance and increased pain sensitivity.

In another study *Sex Differences in Common Pain Events: Expectations and Anchors,* Robinson et al. (2003) attempted to evaluate 1) the association between gender stereotypes and reactions to common painful events, and 2) the differences in what men and women may believe to represent the *worst pain sensation imaginable* for the average woman and average man. Objectives such as these are crucial in determining if men and women actually do have varying assessments of the pain experience. If men and women use "different painful events for the maximal end point of a rating scale," the use of Visual Analogue Scales and other standardized measurements of assessing pain fail to take into account these perceptual gender differences, (Robinson et al., 2003, p. 41). When using common measurements of pain intensity (VAS), it is *assumed* that both male and female subjects will choose individual pain anchors. However, the VAS as a measurement of pain sensitivity fails to consider that, although subjects' pain anchors may be unique, they are diverse enough to produce variations in pain intensity perception. Robinson et al. (2001) incorporated the variable pain anchoring into the objectives of their study to facilitate an understanding of these prospective gender differences in pain assessment. Pain anchors are defined as events that represent the *worst possible sensation imaginable* for men and women. This rating, which the individual gives to a specific event, is used as a contrasting point so that any differences in idiosyncratic cognitive representations of pain will result in logical differences in the final judgments of pain. "Men and women, to a large extent, choose different types of pain events for *worst pain imaginable,*" (Robinson et al., 2003, p. 43). It is reasonable to assume that a subject's pain tolerance for a specific stimulus will be largely dependent on what he or she normally considers to be painful. To estimate each individual's use of pain anchors, Robinson et al. (2003) asked each individual to describe an event they associated with the *worst pain sensation imaginable* for a female, and to describe an event they associated with the worst pain sensation imaginable for a male. Judges categorized responses so that they could be adequately placed into one of the following eight categories: 1) giving birth, 2) menstrual, 3) injury, 4) illness, 5) dental, 6) surgery, 7) emotional, and 8) specific anatomic site (Robinson et al., 2003). The categories were later reduced to giving birth, menstrual, injury, and other because of the low number of responses labeled as belonging to the remaining five categories. The authors found that *regarding women*, male and female participants found that childbirth and menstrual pain to be the *worst pain imaginable*. Obviously the events that women and men list as most painful for women (menstrual pain and child birth) cannot be experienced by men and are therefore unlikely to be used by men as a pain anchor. Moreover, these categories of pain anchors for females are not necessarily universal. Many women have not experienced childbirth and/or do not experience intense menstrual pain. "If we consider the possibility that women use a higher intensity of pain event as their anchor for the worst pain imaginable compared to men…then reported sex differences may be influenced by systematic differences in the types of pain events and hence anchors used by subjects," (Robinson et al, 2003, p. 43). Thus, one could conclude that women would be less sensitive to experimental pain since the pain anchors they use are inherently of higher pain intensity. This, however, would contradict all previous findings. Women have repeatedly been shown to be highly sensitive to experimental pain relative to males. Nevertheless, Robinson et al. (2003) demonstrated that there may be more to the individual differences in pain perception than the average pain study may be empirically investigating.

It is impossible to reduce all differences in perception to a handful of measurable variables. However, identifying as many factors as possible that may contribute to these differences enables a more concise and thorough investigation of acute pain perception and, eventually, a more logical applicability of these results to everyday acute and chronic pain situations. However, what we can infer from the literature regarding gender differences in pain perception is that women, overall, are more sensitive and less tolerant of experimental pain. Furthermore, the use of particular coping strategies (i.e. attentional manipulation Keogh et al. 2000) may not be equally effective for both men and women. Finally, the observed differences between genders may be due to potential reporting and/or experimenter bias. Further research that intends to assess gender differences should focus on reconciling the erratic results of past research employing an experimental methodology that accounts for these probable reporting biases.

*Cognitive Influences*

In addition to investigations involving gender as an active variable in experimental pain studies, a number of researchers have focused increasingly on the effects of direct experimental manipulation of cognitive coping styles on pain perception. This investigations often focus on ways of directly modifying subject allocation of attention to alter the perception of pain by methods such as instructed attentional avoidance of pain stimuli (Keogh et al. 2000, Keogh and Hardenfeldt, 2002), engagement in various distraction tasks (Hodes et al., 1990, McCaul et al., 1992), and instructions to attend to stimuli related to another sensory modality (Zelman et al., 1991, Wied and Verbaten, 2001). This idea was illustrated previously (p.15) by Keogh et al. (2002). Likewise, Hodes et al. (1990) measured the effects of distraction on responses to cold-pressor pain. Contrary to the experimental manipulation of Keogh et al. (2002), the authors of this study chose to manipulate attention to pain using an affectively neutral arithmetic task. Each subject was instructed to listen to a series of 1 digits integers and either A) tap their pen when the sum of the last two digits was greater than 12 or less than 6 or B) tap their pen when the last two digits heard "fit the pattern of odd followed by even," (Hodes et al., 1990, p. 111). Those that were in group A were categorized as being in the high difficulty distraction group while those in group B were categorized as being in the low difficulty distraction group. A third group, the control, did not listen to the taped integers at all. The authors were partially able to demonstrate that pain sensitivity was a function of increasing distraction. Sensitivity ratings in distraction conditions were reduced at the first minute rating interval but were not reduced for control conditions. No statistically significant difference in pain tolerance due to varying levels of distraction was demonstrated. These results, the authors note, suggest that non-emotional distraction strategies alter the sensory component of pain (as measured by pain sensitivity) but not the affective-motivational component (as measured by pain tolerance). However, it is important to note that Hodes et al. (1990) only found differences in sensitivity ratings at the first minute rating interval but not at any other rating interval after that. It is difficult to establish a distinct relationship between distraction conditions and pain sensitivity given that the observed differences were limited to the first minute pain rating interval.

Other studies have examined the effects of similar overt modification of attention techniques of an affectively neutral nature and have produced results dissimilar to that of

Hodes et al. (1990). McCaul et al. (1992) compared the effects of varying levels of an attention-demanding task on heart rate and self-report measures of pain using the cold pressor apparatus. Despite the successful distraction manipulation, no statistically significant differences in heart rate and self-report measures of distress, pain tolerance, or pain sensitivity were found between groups. Not only were there no differences in pain measures between distraction conditions, dependent measures of those in the distraction conditions were statistically indistinguishable from those in no-task control condition. All of the series of four experiments conducted by McCaul et al. (1992) failed to produce any differences in pain measures. Clearly, in this case, neither the sensory component of pain nor the affective-motivational components were altered by the distraction strategy despite its effectiveness as a distraction strategy. This result could very well be due to systematic discrepancies in the choice of attention-demanding task utilized in an experiment.

De Wied and Verbaten (2001) likewise attempted to investigate the effects of overt modification of cognitive faculties on pain perception. The authors specifically sought to directly examine the effects of *affective* distraction tasks upon the subjective experience of pain by using a standardized set of emotional stimuli selected from the International Affective Picture System. Subjects were assigned to one of three conditions: negative, positive, and neutral mood. In each condition, sets of 24 different pictures were presented to each subject. The positive mood condition presented subjects with sports pictures and erotic scenes; the negative mood condition presented subjects with pictures of burn victims, accidents, etc.; the neutral mood condition presented subjects with pictures of household objects, nature, and people. Each subject participated in the cold pressor technique while simultaneously being presented with pre-selected pictures that varied in emotional valence depending on their randomly assigned condition. The authors were able to establish that distraction tasks successfully evoked positive, neutral, and negative emotional states. Furthermore, the data revealed a significant linear trend for pain tolerance scores; highest pain tolerance scores were obtained in the positive mood condition, and lowest pain tolerance scores were obtained in the negative mood condition. That is, subjects who were in the positive mood manipulation condition held their hands in the water significantly more than those in both the neutral and negative mood manipulation condition. No significant differences in pain sensitivity ratings were found between conditions in this experiment. Thus, this study suggests that cognitive coping strategies (which have been overtly modified in an experimental pain setting) that incorporate an *affective* component may enable subjects to more effectively attenuate pain than do those cognitive strategies that are affectively neutral, i.e. Hodes et al. (1990) and McCaul et al. (1992). The mood manipulation strategy used in this experiment may be considered a taught cognitive coping strategy in that the attention of each subject during the cold pressor test was deliberately directed away from the stimulus rather than by the subjects choosing to employ a self-initiated coping strategy. Zelman et al. (1991) obtained results similar to De Wied and Verbaten (2001) in an investigation of the effects of cold pressor pain on individuals in one of three conditions: depressive, neutral, or elative manipulated moods. Again, a linear relationship was observed. Subjects in the depressive mood condition were less tolerant than those in the neutral mood condition. In addition, subjects in the neutral mood condition were less tolerant than those in the elated mood condition. Pain tolerance was affected but pain sensitivity was not. This is consistent with previous ideas that the sensory-discriminative response to pain is not a function of induced mood. Zelman et al. (1991) remark,

> "Changes in mood can be thought of as having global effects on the organism, affecting what might be thought of as a behavioral set to respond. Thus, the mood induction "exerts more influence over behavioral set and consequently the reactive/affective pain system than on the sensory discriminatory pain system," (pp. 109-110).

Hence, studies involving investigations into acute pain perception have produced mixed results regarding the relationship between overt cognitive coping strategies and both measures of pain tolerance and pain sensitivity. Bearing in mind the abundant amount of literature regarding pain perception and the cognitive component in particular, it is quite remarkable that very little research has attempted to evaluate the use of cognitive coping strategies that subjects *themselves* may inherently employ to deal with an experimental pain stimulus. Most studies (Hodes et al., 1991; Zelman et al., 1991; McCaul et al., 1992; De Wied and Verbaten, 2001) have investigated the effects of various manipulations of cognitive faculties on pain perception. Fernandez (1986) notes, "the cognitive strategy of pain control is a covert one and it may be self-initiated," (p.142). That is to say, subjects may be utilizing other thought processes and cognitive strategies that experimental manipulations may not be taking into consideration. Furthermore, in the case of experimental manipulation, control is in the hands of the experimenter. When subjects are left to learn to attenuate the pain associated with an experimental stimulus on their own, the perceived controllability is in the hands of the subject and he or she may experience a greater degree of independent self-control (Fernandez, 1986). A greater degree of self-control of cognitive faculties may represent a greater degree of self-control over attenuation of experimental/acute pain. Another major limitation of these investigations into overt cognitive manipulations of pain perception, Eccleston (1995) remarks, "…is that there exists a problem of terminological inconsistency in deciding exactly what constitutes a particular strategy within the 'coping with pain' literature," (p. 6). "Within one category of supposedly identical coping strategies, there are large differences in content," (Eccleston, 1995, p. 7). It is imperative that experimenter definitions of distraction strategies, for example, are equivalent throughout the literature. Fernandez (1986) notes that an evaluation of the relative effectiveness of various strategies depends on a classification system that is standardized and is consistently used throughout the research. In an attempt to eliminate the terminological unreliability of this research, Fernandez (1986) devised a hierarchical classification scheme that divided the various cognitive coping strategies into three broad divisions. Each of these strategies was devised with the intention of applying the classification scheme to both overtly modified cognitive coping strategies and self-initiated cognitive coping strategies. These broad divisions include imagery, self-statements, and attention diversion; each division may then be further divided into subcategories which are not of interest in the current thesis. "Imagery strategies," Fernandez remarks, "revolve around the production of particular images with pain-attenuating potential," (1986, p. 143). Examples include imagining oneself in the tropics or engaging in some unrelated task while participating in the cold pressor apparatus. Coping self-statements are the next major class of cognitive strategies proposed by Fernandez and involve "periodic rehearing of key statements to oneself during the pain experience," (1986, p. 146). These 'coping self-statements' often help the individual to endure pain even longer without purposively endeavoring to modify the painful sensations and perceptions of the self. Examples include repeating to one's self that the water in the cold pressor apparatus is tolerable and not painful or telling one's self "I am participating for course credit and I can meet the challenge." The third and final category proposed by Fernandez (1986) is attention-diversion. This category "deals with the directing of attention to a non-noxious event or stimulus in the immediate environment in order to achieve distraction from concurrent pain and ranges on a continuum from a passive redirecting of attention to active attention-diversion," (Fernandez, 1986, p. 146). Examples of this type of cognitive strategy are illustrated in many of the studies cited previously. Passive attention-diversion is demonstrated by De Wied and Verbaten's (2001) incorporation of a set of emotional stimuli from the International Affective Picture System in which subjects viewed a series of pictures while simultaneously participating in the cold pressor apparatus. Active attention-diversion is demonstrated by Hodes et al.'s (1990) employment of an affectively neutral arithmetic task in which each subject was given instructions on how to respond to a specific series of integers by tapping their pen depending on the condition in which they were randomly assigned. This type of attention-diversion clearly involves a more complex interaction between the subject and the actual distracter. Fernandez's (1986) proposed classification system provides a framework in which investigators may make more meaningful comparisons of the efficacy of specific cognitive coping strategies. Providing a hierarchical classification system such as this one helps ameliorate the terminological inconsistency so that individuals studying said cognitive techniques may actually delineate the strength and worth of each strategy. Furthermore, if the terminological inconsistency is eradicated, a more meaningful and in depth investigation of the type of strategy a subject may innately utilize in a painful setting and the effectiveness of such strategy may be determined. It is possible that only a few studies have attempted to measure the use of self-initiated coping strategies regarding acute/experimental pain due to a lack of any consequential way of evaluating them.

*Social Cognitive Theory*

The use of cognitive coping strategies in pain perception has dominated the discussion thus far. However, attention must be paid to a concept closely connected to that of coping skills: self-efficacy. Self-efficacy may facilitate more precise prediction of individual differences in pain perception because of its' unique association with both belief and behavior. For the most part, self-efficacy determines whether or not a particular behavior will be attempted. "The occurrence of coping behavior is conceptualized as being mediated by individuals' beliefs that situational demands do not exceed coping skills," (Dolce et al., 1987,p. 289). Presumably, if one is self-efficacious, he or she will be more likely to utilize coping strategies that may in turn facilitate a successful completion of the task at hand. To further understand the nature self-efficacy, it is necessary to briefly extrapolate on its origin, social cognitive theory. Social cognitive theory was developed by Albert Bandura as an expansion of the principles of social learning theory. Social learning theory, which itself surfaced from the principles of operant conditioning, basically asserts that all behavior is determined by the consequences it produces (Bandura, 1986). According to this theory, two substantial contributors of behavior "are the value individuals place on a specific outcome and the expectancy that the behavior in question will produce that outcome," (DeVillis & DeVillis, 2001, p. 236). Although congruent with the principles of social learning theory, Bandura's inclusion of cognitive processes, motivation, action, and affect into the theory was substantially important and ultimately enabled social *learning* theory to be renamed social *cognitive* theory. Generally speaking, social cognitive theory explains human functioning in terms of a model of reciprocity, more specifically, a triadic reciprocity (Bandura, 1986). "In this model of reciprocal determinism…behavior, cognitive and other personal factors, and environmental influences all operate interactively as determinants of each other," (Bandura, 1986, p. 23). Human nature, Bandura expressed, may be defined within the following perspectives: 1) Symbolizing capability, 2) Forethought capability, 3) Vicarious capability, 4) Self-regulatory capability, and 5) Self-reflective capability (1986). In essence, he sought to explain that all humans are capable of forming a symbolic representation of all of their experiences. Through this symbolism, one is capable of engaging in forethought that may motivate any current and future actions. A particularly fascinating facet of this theory is the idea of human self-regulatory functions and self-reflective capabilities. "Much of [human] behavior is motivated and regulated by internal standards and self-evaluative reactions to their own actions," (Bandura, 1986, p.20). People are capable of reflecting upon past actions and engaging in regulations that are consistent with personal internal standards. "Among the types of thoughts that affect action, none is more central or pervasive than people's judgments of their capabilities to deal effectively with different realities," (Bandura, 1986, p. 21). This fundamental idea led enabled the introduction of the concept of self-efficacy. It provided a crucial modification of the original principles of social learning theory in that Bandura provided a distinction between previous mentions of outcome expectancy and the new term self-efficacy. Perceived self-efficacy can be explained by people's judgments of their abilities to prepare to act, and to act in a certain way to achieve goals relevant to the task at hand. "It [self-efficacy] is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses," (Bandura, 1986, p. 391). Outcome expectancy, on the other hand, simply refers to the expectation that a behavior will or will not result in a certain outcome. For example, if I believe that I have excellent algebraic skills, I am efficacious in my academic and mathematic potential. The outcome expectation in said situation would be by performing well on a math exam, I will receive an "A" and proper peer and professor recognition. Outcome expectations don't necessarily determine the use of effective coping skills. High outcome expectations will not inevitably motivate one to engage in activities in situations where their self-efficacy may already be very low. Self-efficacy however directly influences one behavior, cognitions, and emotional reactions. An individual with a low level of self-efficacy may inadequately assess their ability to deal with a certain situation thereby erroneously creating false perceptions of incompetence and limiting their activities. "Individuals with weak efficacy expectancies are viewed as less likely than individuals with strong expectancies to emit a coping response and less likely to persist in such responding in the presence of obstacles and aversive experiences," (Dolce, 1987, p. 289). On the other hand, individuals that are highly self-efficacious, by definition, have no doubt in areas of performance and competence and appear to approach areas that are unfamiliar and intimidating with confidence and conviction. It may be assumed that these individuals who are generally more self-efficacious believe that their coping skills and ability to deal with the situation at hand outweigh any complexities that the situation may involve. Furthermore, Bandura (1982) notes that, "judgments of self-efficacy also determine how much effort people will expend and how long they will persist in the face of obstacles or aversive experiences," (p. 123). Clearly self-efficacy beliefs have definitive applicability towards experimental investigations into pain perception.

*Self-efficacy and Pain Perception*

It seems reasonable to assume that one who has an overall high level of self-efficacy would be able to not only tolerate pain for longer periods of time, but to also subjectively rate the pain as less intense. In addition, varying levels may help explain observed gender differences in pain perception. Weisenberg et al. (1995) sought to investigate the use of humor as technique for increasing one's pain tolerance. In an exploratory analysis, the researchers also investigated differences in self-efficacy levels and pain tolerance between males and females. Self-efficacy was assessed with a 14-item perceived self-efficacy of pain control scale. Particularly, self-efficacy, in this study, "referred to the subject's perceived ability to control pain associated with cold water," (Weisenberg, et al., 1995, p. 209). Relevant to the objectives regarding self-efficacy, the authors were able to demonstrate that "men had lower anxiety ratings...greater pain tolerance...higher self-efficacy scores, greater perceived ability to control pain, and greater motivation to succeed," (Weisenberg et al., 1995, p. 210). The authors argue that sex differences in motivation and self-efficacy could be due to the fact that a clinical situation is normally likely to yield a higher level of motivation for women as well as for men (Weisenberg, 1995). However, although both genders would have been motivated to perform because of the clinical setting, males continued to exhibit greater levels of motivation, performance, and self-efficacy beliefs. It could be argued that males performed better, in this sample, because of overall increased levels of self-confidence contributing to higher levels of self-efficacy. These superior self-efficacy levels may be argued to have originated from more adaptive socialization practices. As mentioned previously (p. 17-18), Robinson et al. (2001) described certain social influences (child rearing practices, media portrayals, etc.) as possibly cultivating expectations of competency and self-efficacy for dealing with stressful situations and physical tasks. Thus, males are socialized to develop more adequate representations of themselves as adaptive and competent relative to females. As a result, they are able to perform better in the face of obstacles such as experimental pain.

There have been several attempts to distinguish the individual significance of self-efficacy in pain perception from the interactive effects of self-efficacy in conjunction with gender, outcome expectations, and attention to pain (Dolce et al., 1986d, Williams and Kinney, 1991, and Jackson et al. 2002). Dolce et al. (1986d) reported associations between self-efficacy and cold pressor tolerance. "Changes in self-efficacy ratings across phases [baseline trials, treatment trials, and post-treatment trials] were observed to parallel changes in tolerance across phases. Higher self-efficacy expectancies for tolerance were consistently associated with greater pain tolerance at each phase of the experiment," (Dolce et al., 1986d, cited in Dolce, 1987, p. 291). Williams and Kinney (1991) investigated self-efficacy perceptions, outcome expectations, and attention to pain as cognitive mediators of pain tolerance. Specifically the authors wanted to know "whether intolerance of a painful stimulus is influenced more by anticipations of experiencing pain than by perceptions of self-efficacy," (Williams and Kinney, 1991, p.3). A sample consisting of 64 subjects, 32 men and 32 women, were introduced to the cold pressor stimulus in order to familiarize themselves with the pain inducing apparatus. Each subject was then instructed to rate their self-efficacy for keeping their hand in the cold water of the cold pressor test. Ratings for 24 time periods at 15-second intervals on a scale ranging from 0 (cannot do) to 100 (certain) were collected from each subject. The authors note, "this measurement format and scoring procedure are identical with Bandura's (1984) recommended single-response format for assessing self-efficacy level," (Williams and Kinney, 1991, p. 5). Subjects were also instructed to rate each of the 24 time periods for how painful they believed the cold water may be, a measurement intended to assess anticipated pain. Following the measurement ratings, each subject participated in the cold pressor apparatus. Cold pressor pain tolerance measures were recorded as well as subjective pain ratings which were collected every fifteen seconds throughout the cold pressor test. After each subject removed his or her hand from the cold water, a measure of attention to pain was taken and consisted of the subjects' "estimation of the percent of immersion time they had thought about pain by circling a number on a scale from 0% to 100%," (Williams and Kinney, 1991, p. 7). Finally, subjects completed the self-efficacy and anticipated pain-rating scales a second time. The analysis revealed a significant main effect for sex with males being more tolerant of cold pressor pain and having higher levels of self-efficacy relative to the females. In addition, Williams and Kinney (1991) ran correlational analyses for mediators of pain tolerance with self-efficacy, anticipated pain, and attention to pain as the variables of interest. Consistent with the initial hypothesis, "self-efficacy strongly predicted tolerance when anticipated pain was held constant both at pretest and at posttest. In contrast, anticipated pain lost its capacity to significantly predict tolerance when self-efficacy was held constant…Self-efficacy and attention to pain each remained significantly predictive of tolerance when the other was eliminated," (Williams and Kinney, 1991, p.15). This suggests that self-efficacy beliefs "..are not derived from, or reducible to, outcome expectancies, but to the contrary, anticipated negative outcomes owe their capacity to predict coping behavior to their correlation with perceived self-efficacy," (Williams and Kinney, 1991, p.16).

Jackson et al. (2002) also sought to investigate the effects of gender differences in regards to cold pressor pain but with self-efficacy as a mediating variable. The authors wanted to identify the gender differences in pain perception that may be due to either physical self-efficacy or task-specific self-efficacy. The authors hypothesized that "associations between 1) gender and pain tolerance and 2) gender and pain intensity would vanish after controlling for the impact of physical and task-specific self-efficacy," (Jackson et al., 2002, p. 563). A sample of 69 women and 43 men were recruited to participate. The Physical Self-efficacy Scale (PSE) served as the measure of individual beliefs regarding his or her overall physical capabilities and self-image. This scale was developed by Ryckman (1982) who comments,

> "[This] scale could be sued for diagnostic and assessment purposes in a variety of settings…[specifically] the PSE scale could be used in medical settings to identify those patients who have experienced a significant loss of perceived physical efficacy…and to assess subsequent changes in their perceived efficacy orientation as a result of special therapeutic treatments…Finally, the scale also has potential clinical applicability in conjunction with biofeedback, dance, and other movement therapies…[it] could be used not only for the initial diagnostic purposes but also to assess the success of therapeutic interventions,"(p. 898-899).

Given that the physical self-efficacy scale is an adequate measurement of one's belief in his or her physical capabilities and given its potential use in medical settings, it is reasonable to assume that incorporation of the PSE in an experimental pain investigation may help explain valuable, otherwise unidentified, experimental variance. In addition to the incorporation of the PSE, Jackson et al. (2002) developed a new measure, the Task-specific Self-efficacy Questionnaire, intended to examine expectations about coping with the standard cold pressor test. The items assess each subject's belief that they could control their cold pressor associated pain and perform the task effectively. The task-specific self-efficacy items were administered prior to subject participation in the cold pressor apparatus; other measures were administered in a counterbalanced fashion before or after the pain induction technique. Through path analyses, the authors demonstrated that gender differences in pain perception are *partially mediated* by self-efficacy beliefs. Increases in tolerance and decreases in pain sensitivity were predicted by higher task-specific self-efficacy ratings. The more self-efficacy one has that he or she can successfully complete the cold pressor test (in this case the males were more self-efficacious regarding both the task-specific and physical self-efficacy measures), the higher the pain tolerance and lower the pain sensitivity ratings. It is important to note, however, that the authors did *not* find any significant associations between physical self-efficacy and pain tolerance and physical self-efficacy and pain sensitivity. However, there was a significant association between physical self-efficacy and task-specific self-efficacy (after controlling for gender). This suggests that the inclusion of both measures of self-efficacy into one distinct variable of general self-efficacy may account for more of the observed differences in pain tolerance and pain sensitivity. Although men were clearly higher in both types of self-efficacy and men have repeatedly been shown to have higher pain tolerance and lower decreased sensitivity relative to females, any observed differences between genders regarding pain tolerance or sensitivity were eliminated in

Jackson et al. (2002) after controlling for self-efficacy. The authors' remark "together, differences in perceptions of physical capabilities and expectations specifically related to coping with pain accounted for gender differences in sensitivity to and tolerance for cold pressor pain," (Jackson et al., 2002, p. 566). In addition to its focus on self-efficacy, Jackson et al. (2002) also attempted to assess individual cognitive coping strategies and pain perception. After completion of the questionnaires and cold pressor apparatus, each participant was asked what he or she thought about or did to cope with the pain inducing apparatus. Responses were coded on the basis of their consistency with the Coping Strategies Questionnaire subscales (Rosenstiel and Keef, 1983, cited in Jackson et al., 2002) which include: 1) diverting attention away from the stimulus, 2) catastrophizing, 3) pain focusing, 4) ignoring pain sensations, and 5) reinterpreting pain sensations. Although 63.7% of all subjects reported using more than one strategy, two statistically significant gender differences in coping strategies were demonstrated: 81.6% of men and 63.8% of women reported diverting attention at least once, while 26.1% of women and 7.0% of men reported reinterpreting painful sensations. That is, in this sample, men and women were more likely to divert their attention elsewhere than they were to engage in pain catastrophizing, pain focusing, and ignoring pain sensations. "Given that diverting attention away from pain was associated with increased pain tolerance, the differential use of distraction might also have contributed to gender differences in pain perception," (Jackson et al., 2002, p.567). This suggests attention-diversion sensory-avoidance coping may be an effective coping strategy for males while emotion-focused attention-diversion may be a more effective strategy for females. These results are inconsistent with those of Keogh et al. (2000) that found that attention focusing may be an especially effective coping mechanism for men. Jackson et al. (2002) demonstrated that 81.6% of males benefited from diverting attention away from the pain. These opposing results illustrate the need for further clarification of the use of self-initiated coping strategies in an experimental pain setting. It is possible that the percentage of men and women that utilize a particular coping strategy depends heavily on which categorization/classification system the experimenter choose to employ. The Coping Strategies Questionnaire (Rosenstiel and Keefe, 1983, cited in Jackson et al. 2002) is typically used in investigations regarding chronic pain, not acute. Clearly, a questionnaire that is typically used in chronic pain situations should not be used in an experimental pain setting. Furthermore, simply asking the subject what he or she did to cope with the cold pressor apparatus might influence subject responses simply by using the word "cope." It is also possible that the subject may have done nothing at all to cope with the pain. Jackson et al. (2002) did not leave room for a response in which a person may have utilized no coping strategy at all. Future investigations into the use of self-initiated coping strategies should provide a different way for classifying responses regarding coping and should eliminate the potential influence that the experimenter may have on the subject simply by asking what he or she did to "cope" with the cold pressor.

Gender, pain anchoring, overt attention-modification coping strategies, self-initiated coping strategies, outcome expectations, and self-efficacy all unmistakably contribute to the observed individual differences in pain perception. Considering the discrepancies in the results and conclusions which have been presented, further investigation is needed in order to understand the variance each and everyone of these variables may have alone, and in conjunction with one another. However, an experiment designed to assess all the incongruities of past research regarding these variables would be enormously complicated in scope, design, and analysis. It is for this reason that I have simplified, to an extent, by investigating the effects of self-efficacy and self-initiated coping strategies on pain perception. Specifically, the purpose of the current study was to determine the effects that gender, physical self-efficacy, task-specific self-efficacy relating to pain, task-specific self-efficacy relating to *pain due to cold*, and the use of self-initiated coping strategies have on cold pressor pain tolerance. The original procedures used in Jackson et al. (2002) have been modified for several reasons. In particular, I did not use pain sensitivity as a dependent variable as it has been shown in the past to have no relation to self-efficacy (Jackson et al., 2002; Dolce, 1986d). Furthermore, its inclusion would have created an experimental confound in that interrupting a subject at specific intervals is intuitively interfering with the subjects capability to initiate any type of coping strategy (see Eccleston, 1995, p.6). In addition, the measure of task-specific self-efficacy has been slightly modified with respect to the scaling and number of options given to each subject. As mentioned previously (p. 13) it was determined in a pilot study that the majority of responses were negatively skewed towards the "Strongly Agree" end of the spectrum; very few subjects responded by circling "Strongly Disagree." As such, the 6-point Likert scale was changed to a 4-point Likert scale in order to more accurately assess the variations in levels of task-specific self-efficacy for pain between subjects. I have also chosen to create an additional measure of task-specific self-efficacy: one which refers specifically to pain due to cold. It was hoped that inclusion of this new questionnaire would more adequately assess task-specific self-efficacy because it would refer to the specific type of pain that was being induced in the experimental manipulation.

*Hypotheses*

First of all, I hypothesized that there would be an apparent gender difference in pain tolerance with men being more tolerant of pain than females. It was also hypothesized that each of the three measures of self-efficacy would be positively correlated with one another. Finally, it was hypothesized that physical self-efficacy, task-specific self-efficacy for pain, and task-specific self-efficacy for pain due to cold would all be significant predictors of pain tolerance for both males and females. In addition to investigating each of the above hypotheses, supplementary exploratory analyses were deemed necessary in order to inspect areas in which specific hypotheses were not formulated. To begin with, I intended to evaluate whether or not men and women would differ significantly on all three measures of self-efficacy or use of self-initiated coping strategies. It seems relatively reasonable to assume that males will demonstrate higher scores on all three measures of self-efficacy. Moreover, although I had hypothesized that each measure of self-efficacy would be a significant predictor of pain tolerance, I also wished to ascertain the measure that would be most predictive of pain tolerance. Finally, an analysis regarding the use of self-initiated coping strategies was believed to be essential. I wished to establish the existence of any gender differences in the use of coping strategies and also determine if a particular coping strategy enables one to tolerate cold pressor pain longer than other coping strategies.

# CHAPTER III

# METHOD

*Participants*

Sixty-two undergraduates from Texas State University-San Marcos (26 males and 36 females) were recruited to participate in the current study for course extra credit. The students were recruited from three different classes: two introductory psychology classes and an upper level undergraduate psychology course. Participants' ages ranged from 18 to 29 (M = 20.90, SD = 3.07). Participation was emphasized as voluntary. Individuals who suffered from Raynaud's syndrome were excluded from the study as well as those that suffered from any other sort of circulatory disease. Individuals that were excluded from participation were given an alternate opportunity to receive course extra credit. Informed consent was obtained from each subject simultaneous to his/her signing up to participate in the experiment (See Appendix A). Each subject was told that the experiment involved exposure to a "mildly uncomfortable stimulus" and were thus given the right to withdraw from the study at any time. Furthermore, it was emphasized that confidentiality would be maintained throughout the study.

*Materials*

**The Physical Self-efficacy Scale** (PSE; Ryckman, et al., 1982) is a 22-item measure that was used to determine perceived physical self-efficacy. The PSE contains statements such as "my physique is rather strong" which measure underlying perceived physical ability (See Appendix C). Responses are rated on a six-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree". Reliability for the PSE was determined in a pilot study for the current experiment with a Chronbach's alpha coefficient of .854.

**The Task-specific Self-efficacy Questionnaire for Pain** is a 7-item measure that was originally developed by Jackson et al. (2002) which seeks to examine expectations regarding dealing with pain. Responses in the pilot study and were rated on 6-point Likert scale assessing degree of agreement ranging from "Strongly Disagree" to "Strongly Agree." The measure specifically assesses one's degree of certainty that he/she can control pain in general (See Appendix D). Reliability for the TSSE in the pilot study was determined with a Cronbach's alpha coefficient of .9143. Prior to issuing this questionnaire to subjects in the true experiment, the wording of items were slightly modified and responses were changed to be rated on a 4-point Likert scale assessing degree of agreement ranging from "Not at All" to "A Lot" (See Appendix E). Items of the original Task-specific Self-efficacy Questionnaire were modified after analyzing descriptive statistics obtained during the pilot study. It was found that very few of the forty subjects in the pilot study responded to any of the items by circling "Strongly Disagree." Responses were all negatively skewed towards the "Strongly Agree" spectrum of the scale. As a result, the items of this specific measure were modified to be measured on the 4-point Likert scale mentioned above. Furthermore, certain statements of the Task-specific Self-efficacy Questionnaire that utilized words such as "sure" and "confident" were modified to contain the word "certain." This modification took place so that all items of the measure would be semantically equivalent.

**The Task-specific Self-efficacy Questionnaire for Pain Due to Cold** is a 7-item measure that I designed as an extension of Jackson et al.'s (2002) Task-specific Self-efficacy Questionnaire. This scale seeks to examine assess the degree of certainty one has that he/she can control pain that is due specifically to cold. Responses are rated on a 4-point Likert scale ranging from "Not at All" to "A lot," (See Appendix F). This item was not utilized in the pilot study and as a result, reliability coefficients were only determined for the true experiment.

*Apparatus*

The cold pressor test was used to induce experimental pain. This apparatus was constructed by anchoring blue ice™ to the bottom of an ice chest with an aquarium pump running through the water to keep the temperature at an even 3 +/- 1.5 °C. Careful monitoring of a digital thermometer ensured proper water temperature. A stopwatch was used to record pain tolerance, operationalized here as the amount of time that the subject can keep his/her hand immersed in the water. Pain sensitivity was not used as a dependent measure because of its interference in each subjects' potential use of self-initiated coping strategies.

*Design and Procedure*

Each participant gave informed consent by reading the recruitment statement and then choosing to sign up for a specific date and time. Furthermore, each subject participated in the entire experiment as an individual and was not in contact with any of the other participants throughout the duration of the experiment. Three separate female experimenters, each of whom was present on separate days that the experiment was conducted, conducted the experiment. Subjects were randomly assigned to experimenters as a result of signing up for their specified date and time to participate. As each subject arrived, he or she was placed in one room, told that the experiment involved exposure to a 'mildly uncomfortable stimulus,' and informed that he or she had the right to withdraw without consequence at any time. Furthermore, each subject was told that the experiment would take approximately fifteen to twenty minutes and reminded to refrain from writing his or her name on any of the questionnaires so that confidentiality could be maintained throughout the duration of the experiment. Each subject was then given the Physical Self-Efficacy Questionnaire and Task-Specific Self-Efficacy Due to Pain Questionnaire and the experimenter left the room. Upon completion of these first questionnaires, the experimenter led the subject into a different room, gave the subject the Task-Specific Self-Efficacy Due to Pain Due to Cold Questionnaire, and then left the room once again. After completion of this final questionnaire, the experimenter re-entered the room to begin cold pressor pain induction. The experimenter instructed the subject to "place your non-dominant hand up to your wrist in the water and hold it there until you feel that it is no longer tolerable." In addition, each subject was told not to talk throughout the duration that his or her hand was immersed in the freezing water. The experimenter stood quietly behind each subject in order to record the subjects' pain tolerance. Subjects who had not removed their hands prior to four minutes were instructed to remove their hands when the time limit was reached.

Next, the experimenter asked the subject *"What did you do or think while your hand was immersed in the cold water?"* This question was intended to assess any possible use of self-initiated coping strategies that may have taken place in order to deal with the pain induced by the cold pressor apparatus. This question differs from the question used by Jackson et al. (2002) in that the word "cope" was not introduced in the question so that any influence this word might have had on the subject could be eliminated. The experimenter recorded the subject responses that were later coded based on their consistency with Fernandez's (1986) proposed classification system. Originally, this proposed classification system of cognitive coping strategies for pain was rather extensive; there were four major categories with at least two subdivisions in each category. In order to eliminate categories that would most likely not be used by participants during pain induction, and, in order to eliminate any of the potential confusion that may be caused in distinguishing between these categories by experimenters, the categories were reduced to three major divisions. These categories included: 1) attention-diversion, 2) mental imagery, and 3) coping self-statements. Attention-diversion, according to Fernandez (1986) "deals with the directing of attention to a non-noxious event or stimulus in the immediate environment in order to achieve distraction from concurrent pain," (p. 146). Mental imagery is a general reference to the coping strategy in which subjects create or produce particular images in their minds in order to attenuate the discomfort and pain being experienced by the cold pressor apparatus. Finally, individuals who utilize coping self-statements can be understood to be "rehearsing...key statements to oneself during the pain experience…aimed at negating the unpleasant aspects of nociceptive stimulation," (Fernandez, 1986, p. 146). Subject responses could also be classified into the additional two categories of "none" or "other." These categories were included in order to account for subjects who claimed to not utilize any self-initiated coping strategy at all and to account for subjects who utilized responses that could not be categorized in either attention-diversion, mental imagery, or coping self-statements. After each subject was asked the coping question, the experimenter wrote down the response and placed it in a manila envelope with all of the other questionnaires. The participant was then debriefed and given contact information for any subsequent questions or concerns that he or she might have. Each subject was asked to keep the details of the experiment to him or herself until completion of the study. The subjects were told that they would receive the results of the study within several weeks after all data collection had ceased.

After every subject had participated in the experiment, the three female experimenters evaluated the coping responses. Each manila envelope was opened one by and one and all three experimenters determined the category in which to place the response: 1) attention-diversion, 2) mental imagery, 3) coping self-statements, 4) none, or 5) other. A response could only be placed in *one* category; all three experimenters had to agree on the category in which the response was placed. After all responses had been coded, it was determined that a large number of responses had been categorized in the "other" category. In order to make the most use out of this data, the experimenters decided to further categorize each of these "other" responses into one of two subdivisions: pain-focusing and non-pain-focusing. Those responses coded as pain-focusing responses included comments such as "I was just thinking about how bad my hand hurt," and "I was thinking how cold and painful the water was." Any responses that did not indicate the subject had been focusing on the pain induced by the cold pressor apparatus were categorized as "other: non-pain-focusing." After all responses were classified, scores from every measure and from the dependent variable were recorded on individual scantrons for each and every participant.

# CHAPTER IV

# RESULTS

Reliability coefficients for all three self-efficacy measures were computed using Cronbach's Alpha. Analysis of items of physical self-efficacy revealed a negative correlation between item 17 and the remaining items of the questionnaire. The initial reliability coefficient was .7923. As a result, item 17 was removed from any further analyses involving the PSE and an alpha of .8069 was obtained. The measure for task-specific self-efficacy for pain (TSSE 1) was found to have reliability of .8374 and the measure for task-specific self-efficacy for *pain due to cold* (TSSE 2) was found to have reliability of .9195.

Descriptive statistics for the entire sample of participants on all three self-efficacy questionnaires (PSE, TSSE 1, and TSSE 2) and for the dependent variable pain tolerance were obtained and can be seen in Table 1. The scores for the Physical Self-efficacy Questionnaire can range from 22 to 132 with a higher score indicating a higher level of physical self-efficacy. The scores for both Task-specific Self-efficacy Questionnaires can range from 7 to 28 with a higher score indicating a higher level of task-specific self-efficacy. Pain tolerance scores are measured in seconds and can range from 1 second to

240 seconds. A score of 240 indicates the subject kept his or her hand in for the maximum time limit of four minutes.

Table 1
Descriptive Statistics for All Subjects

| | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|
| **Age** | 18.00 | 29.00 | 20.90 | 3.07 |
| **PSE** | 56.00 | 113.00 | 89.35 | 12.54 |
| **TSSE 1** | 10.00 | 27.00 | 20.27 | 4.17 |
| **TSSE 2** | 7.00 | 28.00 | 20.03 | 4.61 |
| **Pain Tolerance** | 1 | 240.00 | 135.35 | 94.26 |

Prior to investigating any of the relationships between all three self-efficacy measures and the relationship between self-efficacy measures and pain tolerance, the normality of each of the self-efficacy measures (PSE, TSSE 1, and TSSE 2) and the dependent variable pain tolerance was evaluated. A histogram was created for each variable for both genders. All variables demonstrated a normal distribution for both genders with the exception of task-specific self-efficacy for *pain due to cold* and pain tolerance for males (see Appendices G and H). The distributions for males regarding these two variables were both negatively skewed. The negatively skewed distribution of pain tolerance scores for males indicated a ceiling effect. Appendix I presents a frequency distribution of pain tolerance scores for males. As can be seen, 61.5% of individual pain tolerance scores are at the maximum limit of 240 seconds. Furthermore, 80.8% of the pain tolerance scores ranged from 123 seconds to 240 seconds. The remaining individual pain tolerance scores ranged from 27 to 45 seconds and are representative of outliers.

In order to determine any differences in measures between genders, independent samples t-tests were conducted with all the independent variables (except self-initiated coping strategies) and the dependent variable (pain tolerance). Consistent with my hypothesis, a statistically significant difference between genders was found with regards to pain tolerance $t(1, 60) = 5.007$, $p < .001$. On average, males tolerated pain for 195.08 seconds, approximately 102.86 seconds more than females who tolerated pain, on average, for 92.22 seconds. Levene's test demonstrated equal variances and an $Eta^2$ of .295 was obtained indicating that approximately 29.5% of the variance in pain tolerance could be explained by gender differences. However, the outliers in male tolerance scores (depicted in Appendix I) made the distribution of male pain tolerance scores appear to have equal variance with that of the females even though the distribution of male responses demonstrated a ceiling effect. These results must be interpreted with caution. Furthermore, regarding the measure of physical self-efficacy, a statistically significant difference was found between genders $t(1, 60) = 4.84$, $p < .001$). On average, males scored 13.36 points higher on the Physical Self-efficacy Questionnaire than females. Levene's test demonstrated that equal variances could be assumed and an $Eta^2$ of .28 was obtained indicating that 28% of the variance in physical self-efficacy could be explained by gender differences. A statistically significant difference was also found between genders with regards to the Task-specific Self-efficacy Questionnaire $t(1, 55.56) = 4.267$, $p < .001$) with Levene's test demonstrating equal variances could *not* be assumed. On average, males scored 3.76 points higher than females on TSSE 1. An $Eta^2$ of .246 was obtained indicating that 24.6% of the variance in task-specific self-efficacy for pain could be explained by gender differences. A statistically significant difference was also found between genders regarding Task-specific Self-efficacy for *Pain Due to Cold* $t(1,60) = 2.513$, $p < .02$. On average, males scored 3.86 points higher than females on TSSE 2. Levene's test demonstrated that equal variances could be assumed and an $\text{Eta}^2$ of .095 was obtained indicating that only 9.5% of the variance in task-specific self-efficacy for pain due to cold could be explained by gender differences. Because the gender differences were so pronounced with all self-efficacy measures and the dependent measure of pain tolerance, all further analyses were conducted with the male and female genders separated. It was believed that analyzing the data on split-file would enable more accurate detection of statistically significant differences in pain tolerance than had the sample been analyzed as a whole not separated by gender. Moreover, although the assumption of normality for males with regards to task-specific self-efficacy for pain *due to cold* was violated (as depicted in Appendix G), Levene's test for homogeneity of variances failed to detect unequal variances for this variable. Therefore, it is imperative that the gender differences in pain tolerance are interpreted with caution. In addition, pain tolerance cannot be meaningfully used in a regression analysis for the male gender.

With the purpose of identifying any differences in pain tolerance that might be due to class from which the participant was recruited from, an independent samples t-test was conducted. No statistically significant differences in pain tolerance were found to be due to class from which the participant was recruited. Furthermore, in order to determine if there were any differences in pain tolerance due to experimenter, a one-way between-groups ANOVA was conducted with experimenter as the independent variable. Results illustrated that there were significant differences in pain tolerance due to experimenter $F(2, 59) = 5.895$, $p < .005$). Upon further examination, it was determined that the statistically significant difference in pain tolerance due to experimenter most likely occurred because of an unequal distribution of male and female subjects between experimenters. A Bonferonni post-hoc test determined that differences were between the first and second female experimenters. A frequency distribution illustrated that the second female experimenter ran 11 subjects (3 female, 8 male) while the first experimenter ran 22 subjects (11 female, 22 male). Males had demonstrated a ceiling effect with regards to the dependent variable pain tolerance. As a result, it was determined that the differences in pain tolerance due to experimenter most likely occurred because of the relatively high number of male subjects that were run by the same female experimenter.

With the aim of determining direction and strength of the relationships between all of the self-efficacy measures, a correlation matrix was created for each gender group separately (See Table 2).

Table 2
Correlation Matrix of All
Measures For Males and Females

| | Measure | Pearson Correlation | Tolerance | PSE | TSSE 1 | TSSE 2 |
|---|---|---|---|---|---|---|
| **Males** | **Tolerance** | r = | 1.00 | -.212 | -.150 | -.220 |
| | **PSE** | r = | -.212 | 1.00 | .255 | .169 |
| | **TSSE 1** | r = | -.150 | .255 | 1.00 | .421 (*) |
| | **TSSE2** | r = | -.220 | .169 | .421 (*) | 1.00 |
| **Females** | **Tolerance** | r = | 1.00 | -.077 | .485 (**) | .568 (**) |
| | **PSE** | r = | -.077 | 1.00 | .020 | -.205 |
| | **TSSE 1** | r = | .485 (**) | .020 | 1.00 | .664 (**) |
| | **TSSE 2** | r = | .568 | -.205 | .664 (**) | 1.00 |

* Correlation is significant at $p < 0.05$ (2-tailed)
** Correlation is significant at $p < 0.05$ (2-tailed)

For males, the only statistically significant correlation was the positive correlation between the Task-specific Self-efficacy for Pain Questionnaire and the Task-specific Self-efficacy for *Pain Due to Cold* Questionnaire ($r = .421$, $p < .05$). No statistically significant positive correlation was demonstrated between either TSSE 1 physical self-efficacy or TSSE 2 and physical self-efficacy. Similarly for females, Table 2 illustrates a statistically significant positive correlation between TSSE 1 and TSSE 2 ($r = .664$, $p < .01$). However, no statistically significant positive correlation between task-specific self-efficacy for pain and physical self-efficacy was observed and no statistically significant positive correlation was observed between task-specific self-efficacy for *pain due to cold* and physical self-efficacy. On the contrary, there was a trend of a negative correlation between TSSE 2 and PSE ($r = -.205$) although it was not statistically significant at $p < .05$.

In order to determine which self-efficacy measures were statistically significant predictors of pain tolerance, separate multiple regression analyses were conducted on pain tolerance for males and females. Contrary to my hypothesis, none of the independent measures (PSE, TSSE 1, and TSSE 2) were found to be statistically significant predictors of pain tolerance for males. This is not surprising because of the ceiling effect of male pain tolerance scores mentioned previously (p.51). For females, Table 2 revealed statistically significant correlations between TSSE 1 and pain tolerance ($r = .485$, $p < .01$) and between TSSE 2 and pain tolerance ($r = .568$, $p < .01$). However, once again contrary to my hypothesis, no statistically significant positive correlation was revealed between PSE and pain tolerance for females. As a result, only TSSE 1 and

TSSE 2 were entered as predictor variables of pain tolerance for the female gender in a multiple regression analysis.

For females, the Task-specific Self-efficacy Questionnaire for *Pain Due to Cold* was found to have a larger simple correlation with pain tolerance than the Task-specific Self-efficacy Questionnaire for Pain (TSSE 1 $r = .485$; TSSE 2 $r = .568$). Because of this larger simple correlation with pain tolerance, TSSE 2 was brought into the equation first, followed by TSSE 1. TSSE 1 was not found to be a statistically significant predictor of pain tolerance for females as it did not contribute to a statistically significant change in F ($p < .312$) (see Table 3).

Table 3
Summary of Regression Equation
With TSSE 1 and TSSE 2
Entered as Predictor Variables for Females

| | **R** | **$R^2$** | **$R^2$ Change** | **F Change** | **df1** | **df2** | **Sig. F Change** |
|---|---|---|---|---|---|---|---|
| **TSSE 2** | .568 | .322 | .322 | 16.16 | 1 | 34 | .000 |
| **TSSE 2, TSSE 1** | .586 | .343 | .021 | 1.05 | 1 | 33 | .312 |

Since it was determined that TSSE 1 was not a statistically significant predictor of pain tolerance for females, a simple linear regression was then conducted with only TSSE 2 as a predictor variable. The results of this analysis indicated that task-specific self-efficacy for *pain due to cold* accounted for a significant amount of the variance in pain tolerance, $R^2 = .322$, $F(1,34) = 16.16$, $p < .001$ (see Table 4). This indicates that, contrary to the hypothesis, only task-specific self-efficacy for *pain due to cold* was a statistically significant predictor of pain tolerance for the female gender.

Table 4
ANOVA Summary Table for
Females TSSE 1 as a Predictor Variable

| | Sum of Squares | df | Mean Square | F | Significance |
|---|---|---|---|---|---|
| **Regression** | 76946.76 | 1 | 76946.76 | 16.16 | .000 |
| **Residual** | 161895.45 | 34 | 4761.63 | | |
| **Total** | 238842.22 | 35 | | | |

In order to determine if there were any differences in pain tolerance due to use of self-initiated coping strategies, a frequency distribution of coping responses was first created for all participants *(both male and female genders)* indicating that 14.5% of subjects utilized mental imagery, 24.2% of subjects utilized attention-diversion, 1.6% utilized coping self-statements, 14.5% of subjects utilized no coping strategy, and 45.16% of subjects used some other self-initiated coping strategy not specified by the current study's classification system (e.g. pain-focusing, comparing the experience to prior experiences with ice baths). A separate one-way between-groups ANOVA was then conducted *for each gender* in order to determine if pain tolerance time was dependent on the type of self-initiated coping strategy utilized. Category 3 (coping self-statements) was eliminated from the analysis since only one subject was categorized as using this coping strategy. Thus, the categories included in the analysis included: 1) attention-diversion, 2) mental imagery, 4) none, and 5) other. According to the one-way between-groups ANOVA for *males only*, there was no statistically significant difference in pain tolerance scores for males due to type of self-initiated coping strategy utilized. Once again, it was believed that this effect (or lack of effect) was observed because of the ceiling effect of male pain tolerance scores mentioned previously (p.47). With equal variances assumed, *females*, on the other hand, demonstrated a statistically significant difference in pain tolerance due to type of self-initiated coping strategy utilized, $F(3, 31) = 7.841$, $p < .001$. Tukey post-hoc tests demonstrated that differences in pain tolerance scores for females occurred between: 1) mental imagery vs. the "none" category and 2) mental imagery vs. strategies categorized as "other." On average, those females that utilized mental imagery tolerated pain 140.47 seconds longer than those that claimed to utilize no coping strategy and 121.04 seconds longer than those that utilized a coping strategy categorized as "other."

Because there were a relatively large number of responses categorized as "other," these responses were broken down into two subdivisions: 1) pain-focusing and 2) other non-pain-focusing (as described on page 47). A supplementary, exploratory analysis was conducted in order to determine differences in pain tolerance that may be due to coping style with the "other" category divided as described. Category 3 was once more dropped from the analysis since only one subject responded by utilizing coping self-statements. Therefore, the categories analyzed included: 1) attention-diversion, 2) mental imagery, 4) none, 5) other non-pain-focusing, and 6) pain-focusing. Men were excluded from the analysis since it was determined that there were no statistically significant differences in pain tolerance due to the original categories of self-initiated coping strategy utilized. A frequency distribution of female responses indicated that 14.3% of females utilized attention-diversion, 25.7% utilized mental imagery, 14.3% utilized strategies categorized as "none," 20% utilized strategies categorized as "other non-pain-focusing," and 25.7% utilized pain-focusing. Once again, according to the one-way between-groups ANOVA, there was a statistically significant difference in pain tolerance due to type of self-initiated coping style utilized, F (4, 30) = 5.734, p < .001. Tukey's post hoc test determined that the significant differences occurred between mental imagery and all of the other coping strategy categories. Table 5 presents the mean differences in pain tolerance time of each category compared with that of mental imagery.

Table 5
Tukey Post-Hoc
Differences in Pain Tolerance
Due to Coping for Females

| | **Coping Category of Comparison** | **Mean Difference In Pain Tolerance (seconds)** | **Significance Level** |
|---|---|---|---|
| **Mental Imagery** | Attention-Diversion | 66.267 | .409 |
| | None | 140.467 (*) | .006 |
| | Other, Non-Pain-Focusing | 115.095 (*) | .015 |
| | Pain-Focusing | 125.667 (*) | .004 |

* The mean difference is significant at p < .05.

As can be seen, those individuals that utilized pain-focusing were 125.67 seconds *less tolerant*, on average, than those that utilized mental imagery. In addition, pain-focusing individuals were 59.40 seconds *less tolerant*, on average, than those that utilized attention-diversion. Although there was not a statistically significant difference demonstrated between individuals that utilized pain-focusing and those that utilized attention-diversion (p < .517), a mean difference of approximately one minute in pain tolerance is suggestive of the potentially harmful effects of pain-focusing as a self-initiated coping strategy.

# CHAPTER V

# DISCUSSION

The current thesis demonstrates a number of relationships that exist between psychological variables and pain perception and provides further insight and direction for future experimental manipulations. Previous studies regarding individual differences in pain perception have repeatedly demonstrated the important contribution of gender (Keogh et al., 2000; Unruh, 1996; Robinson et al., 2001; Jackson et al., 2002; Robinson et al., 2003). The current study is no exception. Replication of findings such as these should be viewed as supplementary confirmation of our current understanding of pain processing.

*Hypotheses and Research Findings*

Normality of each of the independent variables as well as the dependent variable was inspected with histograms. Normality was not demonstrated for males with regards to both the task-specific self-efficacy for *pain due to cold* and pain tolerance (see Appendices G and H). The distribution of responses for TSSE 2 was negatively skewed because most males demonstrated relatively high levels of task-specific self-efficacy for *pain due to cold.* Concerning pain tolerance scores, this distribution was also negatively skewed because of a ceiling effect produced in male pain tolerance times. 61.5% of males held their hands in the cold water for the maximum time limit of four minutes.

This ceiling effect made the results of any statistical tests involving the male gender and pain tolerance unreliable. However, the pattern of results obtained in this study seems to be consistent with previous research on pain tolerance for cold pressor pain. Hodes et al. (1990) found that 24 of 45 subjects in their sample maintained their arm in the cold pressor apparatus for the full four minutes. The authors did not specify if the majority of the subjects were male or female. Nevertheless, Hodes et al. (1990) were forced perform supplementary analyses with the pain tolerance scores of those subjects that did not reach the four minute time limit. A similar analysis was not conducted in the current study since the majority of the subjects that reached the four minute time limit were men; nothing could be done to reverse this observed effect. It seems questionable to me that more studies have not reported ceiling effects for pain tolerance. I believe that it is highly probable that a ceiling effect is produced nearly every time the cold pressor apparatus is used as a method of pain induction. A four minute time limit is necessary when using the cold pressor apparatus. This time limit serves as a protection for the subject should he or she choose to hold his or her hand in the freezing water for an excessive amount of time. All the same, more interpretable results for males would have been produced had a different method of pain induction been utilized in the methodology of the current experiment. Eccleston (1995) notes that the results of an experiment may be greatly affected by the choice of procedure and the measures taken in any given experiment. Other methods of pain induction include (but are not limited to) electrical nerve stimulation, capsaicin, finger pressure pain, and heat stimulation. However, because of a restriction of available resources and ethical concerns, the cold pressor apparatus was the most convenient and practical piece of equipment for the current experiment.

The initial hypotheses that men would exhibit higher pain tolerance relative to males was supported. Males, on average, tolerated pain for 195 seconds longer than females. However, the gender differences in pain tolerance must be interpreted with caution because of the prominent ceiling effect of male pain tolerance scores. Although the ceiling effect makes interpreting results difficult, it is highly likely that the gender differences in pain tolerance would still exist regardless of the four minute time limit. If anything, the gender differences in pain tolerance may have been more pronounced because males would have been given the opportunity to hold their hand in the water longer than four minutes. With this in mind, one may continue to speculate, why this statistically significant gender difference is repeatedly demonstrated in an experimental pain setting. First of all, although there may be inherent differences regarding pain processing at the biological level, the differences illustrated here may be due in part to an overall reporting bias as mentioned previously (pp. 17-18). Robinson et al. (2001) noted two important points: 1) both men and women rated men as far less willing to report pain than women and 2) both genders rated women as more sensitive and less tolerant of pain relative to men. This indicates that, most likely, there is a greater *social risk* for men to report pain than there is for women. An individual's pain report may be most representative of what he or she *expects* other members of his or her gender to report, not what he or she is actually experiencing. The subjects, in the current study, may have endured the pain of the freezing water for the amount of time that he or she *thinks* other males or females endured the pain. Furthermore, Levine and De Simone (1991) have shown that the gender of the experimenter influences pain report with men reporting less pain to a female experimenter. All three experimenters of this study were female. Men may have exaggerated their abilities to cope with the cold pressor pain in order to avoid potential negative emotional and/or social consequences. Unruh (1996) notes "embarrassment may cause men to minimize pain unless pain increases in severity or intensity interferes with work…this may be consistent with social norms that accept insensitivity to pain and pain endurance as measures of virility," (p.158). Many of these young men (average age = 20 yrs. old) may also have exaggerated their abilities not to avoid embarrassment but, on the contrary, to impress the female experimenter. The male participants may have held the false beliefs that by enduring pain longer, the female experimenter would be astounded by their pain-tolerating abilities.

Although it was not hypothesized as to whether men or women would demonstrate higher levels of physical self-efficacy or task-specific self-efficacy, an exploratory analysis revealed a statistically significant gender difference on all three self-efficacy measures. Men scored higher than women on measures of physical self-efficacy, task-specific self-efficacy for pain, and task-specific self-efficacy for *pain due to cold.* It is probable that many of the men may perceive themselves to have increased athletic abilities relative to females. Many of the items on the PSE refer to agility and physical strength. As such, the men may be more in tune with their physical capabilities than women in the current sample. In addition, the negatively skewed distribution of responses for males with regards to the measure of task-specific self-efficacy for *pain due to cold* may have been due to the fact that many male subjects are already familiarized with apparatuses very similar to the cold pressor test. That is, many of the male subjects may be accustomed to the pain induced by the cold water because of their involvement in athletics. Ice baths are generally used to as a method of numbing and facilitating healing of athlete-related injuries. In future investigations that may utilize these self-efficacy measures in conjunction with the cold pressor apparatus, it is imperative that the researchers find ways to control for the potentially biasing effects of using a large number of subjects that are athletically involved. One way to control for this would be to form stricter exclusion criteria with regards to subject participation. Future researchers may want to eliminate all subjects who have had been extensively involved in athletics because of the injuries involved and the eminent use of ice baths as a therapeutic tool for these injuries. This may be a more accurate way of ensuring that subjects do not have familiarity with devices which so closely resemble the cold pressor apparatus.

It was also originally hypothesized that there would be an association between all three measures of self-efficacy although the strength of the relationship was not estimated. Because of the non-normal distribution of responses on the TSSE 2 and pain tolerance for males, males are excluded from any interpretations regarding this particular hypothesis. Analysis of the female gender indicated a statistically significant positive correlation between both measures of task-specific self-efficacy but not between task-specific self-efficacy measures and physical self-efficacy. The statistically significant positive correlation between task-specific self-efficacy and task-specific self-efficacy for *pain due to cold* may be explained by the similarity in wording between both of these measures. The strength of the relationship ($r(34) = .668$, $p < .01$) suggests that the two measures of task-specific self-efficacy were, in essence, measuring the same thing. Although one measure referred to one's task-specific self-efficacy for pain and the other to one's task-specific self-efficacy for *pain due to cold*, subjects may have reacted to both measures with similar responses. Some subjects, during the experiment, even made a point to tell the experimenter that they had already answered the questionnaire. In actuality, subjects had not answered the TSSE 2 questionnaire but thought that they had because of the similarity in appearance between TSSE 1 and TSSE 2. It is likely that there was very low discriminative power between the two measures.

Additionally, it was hypothesized that all variables would be significant predictors of pain tolerance. Because of the non-normal distribution for males with regards to the dependent measure, they will once again be excluded from interpretations involving this analysis. For females, TSSE 2 was found to be the only statistically significant predictor of pain tolerance. Neither PSE nor TSSE 1 were found to be statistically significant predictors of pain tolerance for females. These results are consistent with findings of Jackson et al. (2002) where it was discovered that high levels of task-specific self-efficacy were associated with increased pain tolerance for cold pressor pain but physical self-efficacy was not. In the current study, when task-specific self-efficacy for *pain due to cold* was entered as the predictor variable in the regression equation, approximately 32..3% of the variance in female pain tolerance was accounted for. TSSE 1 did not contribute a statistically significant increase in the variance in pain tolerance because both self-efficacy measures exhibited a strong correlation with each other and were extremely redundant. Most of the variance due to task-specific self-efficacy had already been accounted for by TSSE 2. Since the TSSE 2 questionnaire was completed in the presence of the cold pressor apparatus, it is possible that female subjects altered their beliefs because of the knowledge of the specific type of pain that the questionnaire was referring to. A subject may have responded to the first task-specific self-efficacy questionnaire with enhanced confidence because she did not know what type of pain to base her responses on. However, the second self-efficacy questionnaire was completed directly next to the cold pressor. If the female subject knew she normally could not tolerate pain associated with cold water very well, the ice chest could have influenced her responses. This way her responses would be more consistent with her beliefs about how she would perform. Evidently, the more relevant a self-efficacy measure is to the task-at-hand, the higher its predictive value. However, because of the redundancy and low discriminability between the two task-specific self-efficacy measures, it is difficult to meaningfully interpret the significance of each measure as a predictor variable for pain tolerance.

Although no specific hypotheses relating to self-initiated coping strategies were formed, an exploratory analysis of these strategies produced substantially interesting and interpretable results. The majority of the subjects (both male and females) utilized coping strategies categorized as "other" (45.16%). The least utilized coping self-strategy was the category "coping self-statements" with only one subject classified as using this particular strategy. As a result, this category was dropped before any analyses regarding coping strategies were conducted. Males demonstrated no difference in pain tolerance due to coping strategy. This is, once again, most likely due to the ceiling effect produced by male pain tolerances scores and excludes males from any further interpretations. Females, on the other hand, exhibited statistically significant differences in pain tolerance according to the type of self-initiated coping strategy that was used. Those females that utilized mental imagery were found to be the most tolerant of cold pressor pain.

However, because of very small N's in each type of coping strategy category, the results are very difficult to interpret. The small cell N was due to the fact that men were eliminated from the analysis. Use of the men in the analysis would have watered down the results and prevented any demonstration of statistical significant in pain tolerance due to coping strategy utilized for females as well. Regardless of the difficulty in interpretation, this result different from that of Jackson et al. (2002) who found that diverting attention away from pain was associated with the greatest increase in pain tolerance. The results of the current study suggest that females may more effectively attenuate pain if they actively use their imaginations as compared to actively or passively directing their attention towards a non-pain related stimulus. The benefits of using Fernandez's (1986) proposed classification system of cognitive coping strategies for pain for the current study could not be easily construed. Of the 36 females included in the analysis, 5 utilized attention-diversion, and 9 utilized mental imagery. It appears that coping self-statements are rarely used, as evidenced by the sole subject who was classified in this particular category. Fernandez notes that coping self-statements typically incorporate the use of defense mechanisms or rationalization in order to negate the unpleasant aspects of pain (1986). Although it is apparent that females actually did experience pain, as evidenced by their relatively low tolerance times, it is possible that the pain was not intense or emotionally unpleasant enough to cause subjects to enter a state of denial. Likewise, the use of coping self-statements as a way of attenuating pain may be more arduous and cognitively demanding that simply directing one's attention away or imagining a pleasant situation.

It was apparently advantageous that the current study incorporated the categories of "none" and "other" into the classification system. Of the total 36 female subjects analyzed, 4 claimed to have not utilized any type of self-initiated coping strategy while 16 of the female subjects utilized various types of self-initiated coping strategies categorized as "other." Because of the high number of "other" responses, it was determined that subdividing these responses and performing a supplementary analysis would be constructive. The majority of the responses coded as "other" were classified as pain-focusing. This type of self-initiated coping strategy has been investigated previously by Keogh et al. (2000) who found pain-focusing had a beneficial effect for males; males demonstrated a statistically significant decrease in pain report when they were instructed to focus on the pain. The authors were unable to make the same conclusion for females. Contrary to Keogh et al. (2000), pain-focusing, in the current study, was found to be detrimental for females. Those female subjects that utilized pain-focusing were significantly *less tolerant* than those that utilized mental imagery. In addition, pain-focusing females were *less tolerant* than those that utilized attention-diversion (although this relationship was not determined to be statistically significant). This result seems commonsense; the more one pays attention to pain, the less tolerable the pain becomes. Imagery and distraction strategies are purposely beneficial because they intrude on the amount of attention that can be given to the painful stimulus. Distraction and/or mental imagery diminish perceived pain because they displace the processing of nociceptive information (Fernandez and Turk, 1989). Focusing on the pain induced by the cold pressor apparatus is unmistakably, at least for females, a significant way to reduce one's ability to tolerate pain.

Collectively, the results of analyses of self-initiated coping strategies for the female gender suggest 1) the use of mental imagery may increase tolerance for cold pressor pain for females, and 2) the use of pain-focusing as a self-initiated coping strategy may be especially detrimental to a female's tolerance for cold pressor pain.

*Limitations and Future Suggestions*

A very prominent limitation of the current study is the ceiling effect of male pain tolerance scores which has dominated the current discussion. This ceiling effect was produced because of the restriction that the four minute hand time limit placed on pain tolerance scores. Additionally, this ceiling effect was produced because many individuals may have been accustomed to the stimulus or stimuli similar to it. There is, however, no way to control for what type of painful stimuli subjects may or may not be familiarized with other than forming stricter exclusion criteria upon initial subject recruitment. Had the males had a normal distribution of pain tolerance scores, it would have been possible to conduct a regression equation with self-efficacy measures as predictors of pain tolerance. The fact that no regression equation could be conducted is a serious limitation of this study. It is not possible to make any interpretations regarding the predictive value of self-efficacy measures for the males and it is not possible to meaningfully interpret any gender differences. Furthermore, the ceiling effect made it difficult to assess the use of self-initiated coping strategies for the male gender and/or difficult to evaluate the effect that these strategies may or may not have had on pain tolerance for male participants. Future investigations into experimental pain should seriously reconsider using the cold pressor apparatus as a method of pain induction. There are other ways to induce pain if the resources and time are made available.

Another major weakness of the current experiment is the relatively small sample size. If more subjects had been recruited and more subjects had participated, the statistical power would have increased. It is possible that physical self-efficacy might have actually been a significant predictor of pain tolerance had a bigger group of people been sampled. A larger number of subjects would also have obviously contributed to a larger number of responses classified in each coping strategy category and the potentiality of equal cell N's. Had equal cell N's occurred with the current sample of participant responses, the interpretations regarding females and self-initiated coping strategies would be more reliable.

Finally, the current study failed to measure any potential subject reporting bias. It would be of great value had the current study been conducted by both male and female experimenters. Males may have responded more honestly as they may not have felt pressure to be more tolerant of cold pressor pain. It would have been fascinating to look at effects produced by the interaction between subjects and experimenters of a different sex. Nevertheless, it was not possible to evaluate these potential effects because all three experimenters were female. Future investigations in pain perception should make sure to have an equal number of both male and female experimenters so that this subject reporting bias may be assessed.

Any investigation into the gender differences produced in pain perception must be painstakingly developed in a manner so as to avoid or eliminate experimental confounds such as those presented in the past and in the current study. A variety of choices exist when deciding how to induce pain in an experimental setting. The current study exemplifies the problems that can be created because of the complexity of the pain phenomenon and the procedures involved. Nevertheless, this study has replicated previous findings of a significant association between task-specific self-efficacy and pain tolerance and a lack of association between physical self-efficacy and pain tolerance. Furthermore, overwhelmingly apparent gender differences in pain perception were revealed once again and the importance of self-initiated coping strategies in pain perception has been affirmed. Future studies should focus on developing a more complete and clear understanding of the effects of specific self-initiated cognitive coping strategies on pain tolerance for both genders. Furthermore, the mechanisms by which levels of self-efficacy predict individual differences in pain tolerance should be evaluated not only on the psychological and social level, but the biological level as well.

APPENDICES

# APPENDIX A

We are currently recruiting students to participate in a psychology experiment. The experiment will involve exposure to a mildly uncomfortable stimulus. In return for your participation, you will receive the proper course credit stipulated by your instructor. The entire experiment will take approximately thirty minutes.

If you suffer from Raynaud's disease or some other type of circulatory disorder you may not participate. If you are unable to or do not wish to participate in the experiment there is an alternative. We are putting an article by Dr. Stimmel, Carol Crayton, and Tracy Rice on reserve in the library listed under Psych 1300-Stimmel. Please read the article thoughtfully and write a one-page critique/discussion of its contents. This one page **TYPED** paper will substitute for your participation in the experiment and should be turned into Dr. Stimmel in room 310F.

If you would like to participate in the experiment please chose the specific date and time below that will fit your schedule. **Once you sign up to participate you are giving your consent and are obligated to appear in room 312 of the psychology building at that specified time.** If you fail to appear you will not receive the course extra credit. After completing the experiment and analyzing the data we will get back to you with the results. If you have problems or questions with scheduling issues please call Dr. Stimmel at 245-3163 or e-mail Carol at cc48283@txstate.edu. We greatly appreciate your participation and look forward to seeing you!

The dates and times in which people will be able to participate are on the following page. **X's** indicate that that specific time and day is not open for scheduling. Highlighted spaces may be filled up one person per time slot.

# APPENDIX B

Please indicate the following:

AGE: ____________________

GENDER: ________________

APPENDIX C

**DO NOT PUT YOUR NAME ANYWHERE ON THIS PACKET**

Please read the following statements carefully. Indicate your level of agreement or disagreement by circling one of the scale categories to the right of each statement. Circling an A shows you strongly disagree, a B that you disagree, a C is somewhat disagree, a D is somewhat agree, and E is agree, and an F indicates you strongly agree. Please answer honestly; all responses will be kept confidential.

| | Strongly Disagree | Disagree | Disagree Somewhat | Agree Somewhat | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 1. I have excellent reflexes. | A | B | C | D | E | F |
| 2. I am not agile and graceful. | A | B | C | D | E | F |
| 3. I am rarely embarrassed by my voice. | A | B | C | D | E | F |
| 4. My physique is rather strong. | A | B | C | D | E | F |
| 5. Sometimes I don't hold up well under stress. | A | B | C | D | E | F |
| 6. I can't run fast. | A | B | C | D | E | F |
| 7. I have physical defects that sometimes bother me. | A | B | C | D | E | F |
| 8. I don't feel in control when I take tests involving physical dexterity. | A | B | C | D | E | F |
| 9. I am never intimidated by the thought of a sexual encounter. | A | B | C | D | E | F |
| 10. People think negative things about me because of my posture. | A | B | C | D | E | F |
| 11. I am not hesitant about disagreeing with people bigger than me. | A | B | C | D | E | F |

| | Strongly Disagree | Disagree | Disagree Somewhat | Agree Somewhat | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 12. I have poor muscle tone. | A | B | C | D | E | F |
| 13. I take little pride in my ability in sports. | A | B | C | D | E | F |
| 14. Athletic people usually do not receive more attention than me. | A | B | C | D | E | F |
| 15. I am sometimes envious of those better looking than myself. | A | B | C | D | E | F |
| 16. Sometimes my laugh embarrasses me. | A | B | C | D | E | F |
| 17. I am not concerned with the impression my physique makes on others. | A | B | C | D | E | F |
| 18. Sometimes I feel uncomfortable shaking hands because my hands are clammy. | A | B | C | D | E | F |
| 19. My speed has helped me out of some tight spots. | A | B | C | D | E | F |
| 20. I find that I am not accident prone. | A | B | C | D | E | F |
| 21. I have a strong grip. | A | B | C | D | E | F |
| 22. Because of my agility, I have been able to do things that many others could not do. | A | B | C | D | E | F |

APPENDIX D

Please read the following statements carefully. Regarding the scenario you just read, imagine that you are a subject about to participate in an experiment that involves the cold pressor test. Indicate your level of agreement or disagreement with the following statements by circling one of the scale categories to the right of each statement. Circling an A shows you strongly disagree, a B that you disagree, a C is somewhat disagree, a D is somewhat agree, an E is agree, and an F indicates you strongly agree. Please answer honestly; all responses will be kept confidential.

| | Strongly Disagree | Disagree | Disagree Somewhat | Agree Somewhat | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 1. I am certain I can cope successfully during the cold pressor test. | A | B | C | D | E | F |
| 2. I am sure it will be difficult for me to tolerate the pain related to the cold pressor test. | A | B | C | D | E | F |
| 3. I can come to grips with any pain related to the task very well. | A | B | C | D | E | F |
| 4. I am sure that I have control of performing well during the task | A | B | C | D | E | F |
| 5. I am certain I won't be able to manage the pain associated with this task. | A | B | C | D | E | F |
| 6. I am not confident I can endure the pain associated with the cold pressor test. | A | B | C | D | E | F |

| | Strongly Disagree | Disagree | Disagree Somewhat | Agree Somewhat | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 7. In general, I expect to handle the cold pressor test very well. | A | B | C | D | E | F |

APPENDIX E

Please read the following statements carefully and indicate the degree to which you agree with the following statements by circling one of the scale categories to the right of each statement. Circling A indicates that you do not agree at all; circling B indicates that you agree more than A. Circling C indicates that you agree more than B. Circling D indicates that you agree a lot. Please answer honestly; all responses will be kept confidential.

| | NOT AT ALL | | | A LOT |
|---|---|---|---|---|
| | A | B | C | D |
| 1. I am certain I can cope successfully with pain during a painful situation. | A | B | C | D |
| 2. I am certain it will be difficult for me to tolerate the pain related to any type of painful situation. | A | B | C | D |
| 3. I am certain I can come to grips with pain very well. | A | B | C | D |
| 4. I am certain that I have control of performing well during a task that is painful. | A | B | C | D |
| 5. I am certain I won't be able to manage the pain associated with a specific painful task. | A | B | C | D |
| 6. I am not certain I can endure the pain associated with a painful task. | A | B | C | D |

| | NOT AT ALL | | | A LOT |
|---|---|---|---|---|
| | A | B | C | D |
| 7. In general, I am certain that I can handle any situation that may be painful very well. | A | B | C | D |

# APPENDIX F

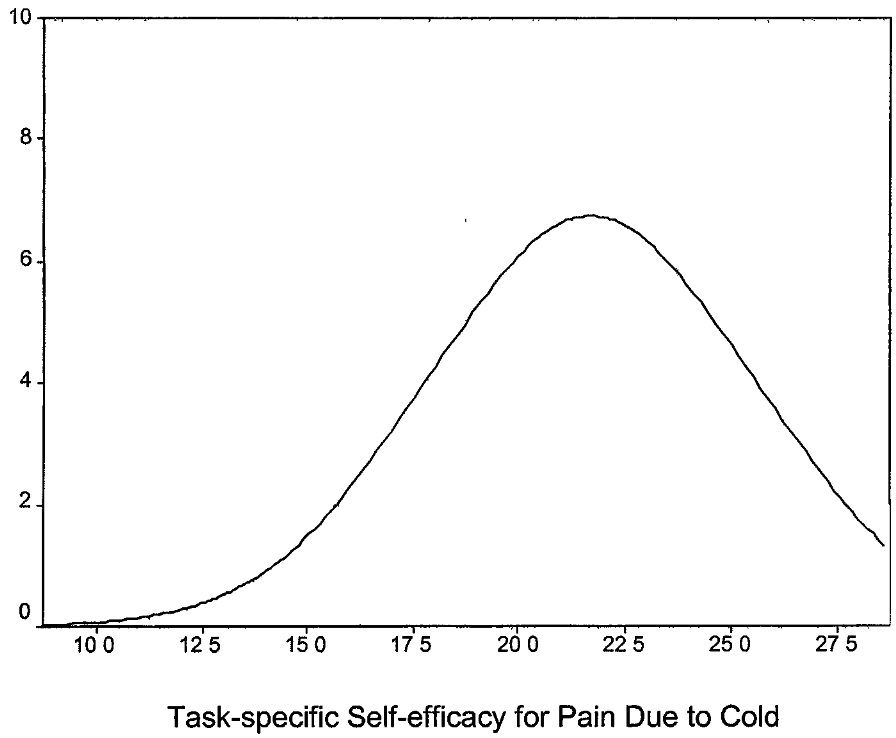
Please read the following statements carefully and indicate the degree to which you agree with the following statements by circling one of the scale categories to the right of each statement. Circling A indicates that you do not agree at all; circling B indicates that you agree more than A. Circling C indicates that you agree more than B. Circling D indicates that you agree a lot. Please answer honestly; all responses will be kept confidential.

| | NOT AT ALL | | | A LOT |
|---|---|---|---|---|
| | A | B | C | D |
| 1. I am certain I can cope successfully during pain due to cold. | A | B | C | D |
| 2. I am certain it will be difficult for me to tolerate pain due to cold. | A | B | C | D |
| 3. I am certain I can come to grips with any pain due to cold very well. | A | B | C | D |
| 4. I am certain that I have control of performing well during a task that involves pain due to cold. | A | B | C | D |
| 5. I am certain I won't be able to manage the pain associated with something cold. | A | B | C | D |

| | NOT AT ALL | | | A LOT |
|---|---|---|---|---|
| | A | B | C | D |
| 6. I am not certain I can endure the pain associated with something that is cold. | A | B | C | D |
| 7. In general, I am certain that I can handle pain due to cold very well. | A | B | C | D |

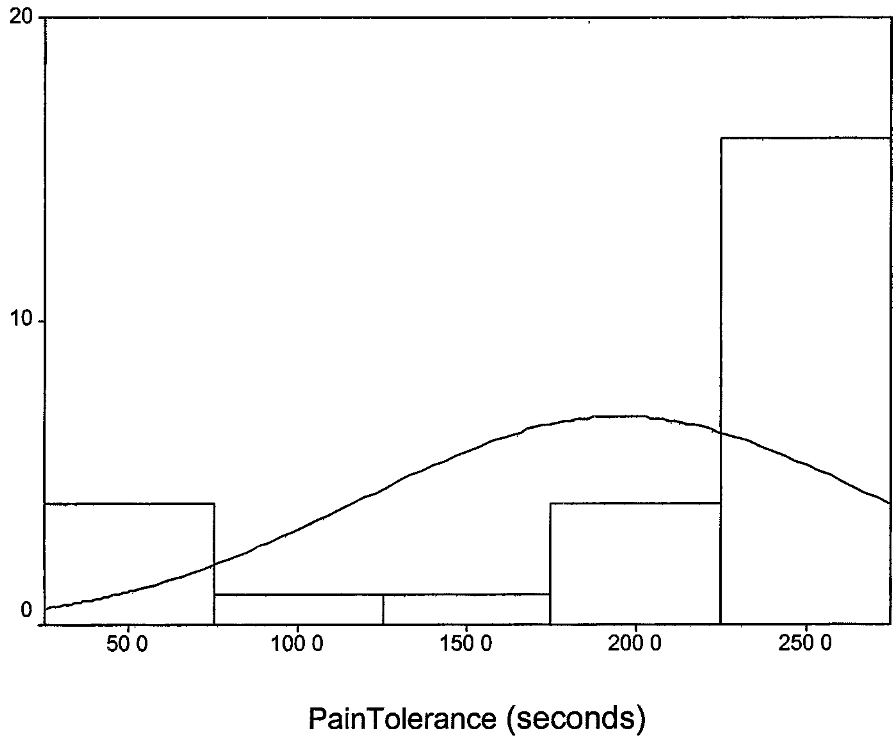
APPENDIX G

Distribution of TSSE 2 Responses for Males



APPENDIX H

Distribution of Pain Tolerance Scores for Males



# APPENDIX I

Frequency Distribution of Pain Tolerance Scores for Males

| **Pain Tolerance (seconds)** | **Frequency** | **Cumulative Percent** |
|---|---|---|
| 27 | 1 | 3.8 |
| 36 | 1 | 7.7 |
| 40 | 1 | 11.5 |
| 45 | 1 | 15.4 |
| 123 | 1 | 19.2 |
| 130 | 1 | 23.1 |
| 186 | 1 | 26.9 |
| 200 | 1 | 30.8 |
| 222 | 1 | 34.6 |
| 223 | 1 | 38.5 |
| 240 | 16 | 100.0 |
| Total | 26 | |

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# VITA

Carol Crayton was born in Carrollton, Texas, on January 31, 1980, the daughter of Philip and Gayla Crayton and sister of Keith Crayton. After completing her schooling at Newman Smith High School, Carrollton, Texas in 1998, she attended Texas State University-San Marcos. She graduated with a Bachelor of Science in Psychology and a minor in Biology in 2002. In 2003, Carol entered the Health Psychology Master of Arts program at Texas State University-San Marcos. During graduate school she worked as a teaching assistant in the psychology department and as a Health Information Management Technician at Austin Regional Clinic. In May 2005, Carol Crayton will receive her Master of Arts in Health Psychology as well as a Certification in Biostatistics from the Health Services Research Department of Texas State.

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