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INTEGRATION OF THE AVOIDANCE CYCLE WITH THE SCHEMA  
ENMESHMENT MODEL OF PAIN: RELATIONSHIPS WITH QUALITY OF LIFE  
AND DISABILITY IN CHRONIC, NONMALIGNANT PAIN

By  
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B.A., Ohio University, 2001  
M.A., University of Louisville, 2006

A Dissertation  
Submitted to the Faculty of the  
Graduate School of the University of Louisville  
in Partial Fulfillment of the Requirements  
for the Degree of

Doctor of Philosophy

Department of Psychological and Brain Sciences  
University of Louisville  
Louisville, Kentucky

August 2009

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A Dissertation Approved on

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## DEDICATION

I would like to dedicate this dissertation to my parents, Joseph and Deborah Meyer whose encouragement and support has helped me in ways they will never fully know. Without them I could never have accomplished what I have done. No matter how far away, their presence is felt in every goal I achieve and every lesson I learn.

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## ABSTRACT

### INTEGRATION OF THE AVOIDANCE CYCLE WITH THE SCHEMA ENMESHMENT MODEL OF PAIN: RELATIONSHIPS WITH QUALITY OF LIFE AND DISABILITY IN CHRONIC, NONMALIGNANT PAIN

Jeffrey A. Meyer

March 27, 2009

Persons living with chronic pain encounter a host of physical and psychosocial problems resulting in a loss of quality of life and increased disability. The construct of avoidance has been proposed as a mechanism by which these changes in functioning occur. This study explored the Acceptance and Commitment Therapy (ACT) construct of experiential avoidance and its conceptualization within the ACT model of avoidance, the Cycle of Avoidance. The model is introduced as a framework for integrating an existing model of chronic pain and avoidance, the Schema Enmeshment Model of Pain (SEMP), thus providing a more comprehensive perspective. The study used empirically validated measures to explore constructs integral to the Avoidance Cycle, namely anxiety sensitivity, catastrophizing, experiential avoidance, and their associations with anxiety, depression, quality of life, and disability. The construct of enmeshment, which is a major component of the SEMP, was examined as a conceptualization of the Avoidance Cycle's stage of Entanglement. The study also examined participant's perceptions of the temporal relationships in the Avoidance Cycle. The ACT and SEMP constructs were

examined using multi-method assessment including written questionnaires, brief interview, and chart review. Participants were 139 adults with chronic, nonmalignant pain, recruited from a university pain clinic. Results showed that the components of the Avoidance Cycle of catastrophizing and pain-specific experiential avoidance predicted participants' degree of enmeshment and enmeshment in turn predicted the mental component of quality of life and disability. Pain-specific experiential avoidance was shown to partially mediate the relationship between pain intensity and mental quality of life and disability, but enmeshment was not shown to be mediator between pain intensity and functional status. Regarding the temporal nature of chronic pain and psychological symptoms, rates of participants with self-reported psychological problems increased by 70% after onset of chronic pain. Further those participants who had higher scores on measures of catastrophising, enmeshment, and experiential avoidance were more likely to report their health as worse than one year ago. These results support the utility of using the Avoidance Cycle and SEMP as models of avoidance in chronic pain and explore relationships within the model.



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## INTRODUCTION

### **Study Background, Purpose, and Rationale**

In 1994, the International Association for the Study of Pain (IASP) Subcommittee on Taxonomy defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (p. 210). The IASP reports that chronic pain is persistent, in that pain is ongoing, and that chronic pain can fluctuate with episodic increases and decreases in severity, duration, and the nature of the sensation associated with pain. Often, the qualifier of pain persisting longer than 3 or 6 months is used for an operational definition of chronic pain. Chronic pain is a common medical condition with a worldwide prevalence varying from 10.1-55.2% (IASP, 2003). In the US, a review of American veterans' charts found that out of 300 veterans 50% had some form of chronic pain (Clark, 2002). Approximately 10-15% of the U.S. population suffers from physician-treated or "clinical" chronic pain, and chronic pain has been shown to be more prevalent as one ages (Smith, Hopton, & Chambers, 1999).

Chronic pain is a costly and debilitating problem for both the individual and the community. Sweden, which has some of the highest rates of chronic pain among studied nations, also has the highest rates of sick leave from work at 30% each year, and 14% of the working population is on long-term sick leave (Dahl, Wilson & Nilsson, 2004). In the U.S., it is estimated that the total costs related to the most common chronic pain

condition, lower back pain, may be as high as \$65 billion per year, and estimates of the total cost of chronic pain in the U.S., including cost of healthcare and lost productivity, are between \$75 and \$100 billion (Montrey, 2000; Lee, 1994). Along with the above mentioned costs to the community, many people who live with chronic pain experience decreases in quality of life and increases in disability.

Though it is an important factor in the treatment of chronic pain and other chronic medical conditions, quality of life has been traditionally hard to define and quantify (Fallowfeild, 1990). The World Health Organization formed the WHOQOL group (1995) that defines quality of life as:

An individual's perception of their position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept, affected in a complex way by the person's physical health, psychological state, level of independence, social relationships and their relationship to salient features of their environment.

(p.1403)

Several cognitive-behavioral theories have attempted to explain the processes and mechanisms by which chronic pain affects one's quality of life. The effects of many pain-related psychological variables have been examined and various researchers have created useful models of how psychological characteristics interact in the development and maintenance of chronic pain. Still, it is argued that much work is needed in developing a psychological model of chronic pain that is comprehensive and one that identifies how particular psychological processes are related to changes in the individual's functional well-being (Morley, 2004; Flor & Turk, 1989). In a



comprehensive review of studies examining the psychological factors in the transition from acute to chronic lower back pain, Pincus, Burton, Vogel and Field (2002) found a wide range of variability and noted that many studies demonstrated very poor conceptualization and operationalization of constructs.

This study explored the construct of experiential avoidance and its related psychological constructs and how they interact to affect quality of life in the chronic pain sufferer. The study examined Acceptance and Commitment Therapy (ACT) as applied to chronic pain and special attention was paid to the newly developed ACT model of avoidance called the Avoidance Cycle (Hayes & Smith, 2005). This study used a combination of participant self-report, brief interview, and medical chart review to represent Avoidance Cycle constructs of anxiety sensitivity, catastrophizing, enmeshment, experiential avoidance, depression, anxiety, quality of life and pain-related disability. In this literature review, I will first describe the various stages of the Avoidance Cycle and explore how existing theory and constructs of psychological processes can be integrated into the model. The major goal of this study is examine constructs underlying the Avoidance Cycle using validated measures and to examine their relationships to pain-related disability and quality of life in a sample of adults with chronic pain.

To clarify and operationalize Avoidance Cycle constructs, I will first provide a review of the theory and definition of experiential avoidance, a primary component of the ACT model. Next I will familiarize the reader with both the Acceptance and Avoidance Cycles to provide a framework of the ACT model. Once this framework is established I will then focus specifically on the Avoidance Cycle and its specific application to chronic

pain proposed in this study. Each stage of the Avoidance Cycle will be applied to chronic pain allowing for inclusion of established models of pain avoidance as well as novel models and related constructs.

## **Experiential Avoidance**

### *Definition and Context of Experiential Avoidance*

Avoidance has historically been examined as a contributing factor to a myriad of psychological phenomena. The avoidance of thoughts has been investigated by Wegner and colleagues under the handle of thought suppression (Wegner et al., 1987; Wegner & Zanakos, 1994). The avoidance of negative emotions has also been examined by these researchers (Wegner & Zanakos, 1994) as well as by researchers studying psychological disorders in which emotional avoidance is a regular symptom (e.g. Posttraumatic Stress Disorder; Tull et al., 2004; Major Depressive Disorder; Beck, 1967; Panic Disorder; Barlow, 2000). The avoidance of behaviors and activities is a major criterion for various diagnoses including Agoraphobia, Posttraumatic Stress Disorder, Specific Phobias and various other diagnoses (Diagnostic and statistical manual of mental disorders-IV-TR, 2000). In conjunction with this long history of the study of avoidance, researchers have introduced a recent encompassing construct known as *experiential avoidance*.

Experiential avoidance is a term that encompasses cognitive, emotional, and behavioral avoidance. Experiential avoidance is succinctly defined as:

The phenomena that occurs when a person is unwilling to remain in contact with particular private experiences (e.g., bodily sensations, emotions, thoughts, memories, images, behavioral predispositions) and takes steps to alter the form or

frequency of these experiences and the contexts that occasion them, even when these forms of avoidance cause behavioral harm (Hayes et al., 2004, p.554).

With experiential avoidance, one attempts to suppress not only thoughts, but a multitude of "private experiences".

### *Cognitive Fusion and Experiential Avoidance*

Acceptance and Commitment Therapy theory suggests that the language used to represent the perception of bodily sensations, thoughts, and feelings, acts to propel experiential avoidance (Hayes & Gifford, 1997). For example, sweaty palms, a jittery stomach, flighty thoughts and an awkward feeling can be perceived and labeled as "anxiety". Rules are then set up in one's mind about anxiety, such as "anxiety is bad" or these feelings of anxiety are "more than I can handle". The sensation of anxiety and the subsequent thought of anxiety being bad or unbearable become so strongly related that they become cognitively fused (Hayes & Smith, 2005). When cognitive fusion occurs, a person instantly associates aversive thoughts, such as "this is unbearable or bad," with feelings of anxiety, depression, or pain (Hayes et al., 2004). This experience of a person interacting with an event symbolically (e.g. verbal representation) is bidirectional, meaning that the experience of an event changes a person's verbal symbolism and that verbal symbolism changes the experience of the event (Hayes & Gifford, 1997), thus fueling the cognitive fusion.

### *ACT Models of Acceptance and Avoidance*

This dissertation focuses primarily on the Avoidance component of the ACT model. In order to provide a context for this construct, the major components of the full

ACT model will be briefly described. The two major components, the Acceptance Cycle and the Avoidance Cycle, and their respective stages, are shown in figure 1 on page 152.

### *The Acceptance Cycle*

Proponents of the ACT model pose acceptance and commitment as alternative choices to control and avoidance when one encounters problems. In the book *Get Out of Your Mind and Into Your Life*, Hayes and Smith (2005) propose that when a person encounters a problem or potential problem they will enter either the Cycle of Acceptance and Commitment or the Cycle of Control and Avoidance (see figure 1, page 152). In this model, the Acceptance Cycle begins with “Mindfulness and Defusion” defined as observation of thoughts, feelings and sensations without judgment and separation from these private experiences. Next in the cycle is “Acceptance and Being Present” where a person welcomes his or her experiences in the current context. The next step in the cycle is “Values” in which life actions are chosen according to personal values. The stage of “Commitment and Flexibility” is where one chooses to behave in a way that is in accordance with their values while demonstrating flexibility in thought and lifestyle. The last stage in the cycle, leading back to the choice point of experiencing a problem, is “Growth and Contacted Barriers”. In this stage the person has chosen to live according to personal values and is likely to experience personal growth. According to the model, growth in this stage is also accompanied by the experience of new problems as one encounters situations and experiences that have previously been avoided, resulting in transition to the beginning of the cycle with a new problem. The primary focus of this study will be the Avoidance Cycle, as described below.

### *The Avoidance Cycle*

In the ACT model, the Avoidance Cycle is composed of five stages, each reflecting proposed avoidance-related constructs. Each of these constructs may be seen in figure 1, page 152. The first stage, conceptualized in the Avoidance Cycle, is “Words, Words, Words”. In this stage, one is seen to meticulously evaluate problems and the present moment is lost in attempting to predict what will happen in the future. In the model, catastrophizing, common to this stage, often leads to the stage of “Entanglement” where one’s identity and self are lost amongst disparaging thoughts and feelings. Next, in the “Control and Avoidance” stage one’s thoughts are quelled or avoided, along with other private experiences, as a potential way to reduce discomfort. The short-term decrease in aversion from avoidance can create what has been referred to as a “self-amplifying loop that is resistant to change” (Hayes et al., 2004, p. 555) and is exhibited in the next stage of “Relief and Struggle”, where temporary coping results in long-term dissatisfaction. The last stage is “Life Restriction and Loss” and in which avoidance has now impacted quality of life and those things that are of value to the individual. A central argument of the Avoidance Cycle component of the ACT model is that the cost and negative experience of having a particular disorder (e.g., depression) is not a result of the thoughts, emotions and behaviors that characterize a disorder (e.g., depressing thoughts, anxiety, sleep disturbance) rather, it is a product of trying to avoid and suppress such thoughts, emotions and behaviors that results in the manifestation of the disorder (Hayes et al., 2004).

## **Experiential Avoidance Cycle Applied to Chronic Pain**

Chronic pain and pain in general, can readily be viewed as a private experience that people are often unwilling to experience. Just as the example of sweaty palms, a jittery stomach, flighty thoughts and an awkward feeling are evaluated as "anxiety" and then "anxiety" being evaluated as "bad"; so too nociception of burning, stabbing, tearing, gripping, etc., is most often perceived as "pain" and subsequently "pain" is evaluated and cognitively fused as "bad" or "unbearable". Through the mechanism of experiential avoidance people in pain attempt to alter the form or frequency of situations or environments that evoke pain because they are "bad" or "unbearable". For an acute pain sufferer, avoidance-based coping can allow for rest necessary to regain strength and assure proper healing. For the chronic pain sufferer, avoidance plays a more debilitating role. Because the pain is chronic, it affects many behaviors of great value to the patient and inactivity and restriction manifest into disability.

Along with the private experience of chronic pain comes the private experiences of lowered self-efficacy (because the person may no longer believe they can perform necessary action), role changes (often due to job loss or activity restriction) and a host of psychological phenomena including anxiety, depressive thoughts/mood, hopelessness, etc. Attempts are again made to reduce the frequency of or alter the form of the above private experiences. The chronic pain patient now attempts to avoid nearly any activity because it may produce pain and unwanted private experiences. These attempts may result in a downward spiral, or self-amplifying loop that leads to increased disability and decreased quality of life (Hayes & Smith, 2001).

This general description of the interaction between experiential avoidance and chronic pain will next be broken down by stage, with relevant constructs, and applied to chronic pain. In addition, cognitive-behavioral models, complementary to the ACT model constructs previously reviewed, will be introduced and integrated into the discussion of the construct of avoidance as applied to pain.

### **Stages of the Avoidance Cycle Applied to Chronic Pain**

Hayes and Smith (2005) hypothesize that a choice exists where individuals encounter problems, particularly pain and suffering. In the application to chronic pain, the problems will include various aspects of the experience of chronic pain, including pain sensation, location, frequency, duration and, most commonly, pain intensity. For most chronic pain sufferers all of these dimensions of pain pose themselves as part of “my problems”.

#### *Avoidance Cycle Model Stage of Words, Words, Words: Application to Chronic Pain*

In this first stage in the Avoidance Cycle, (see figure 1, page 152) individuals meticulously evaluate their problems. As described by Hayes it involves “endless predictions and evaluations about my problems; I lose contact with the present moment and start living in my head” (Hayes & Smith, 2005, p. 196). It marks the early beginnings of cognitive fusion where the chronic pain sufferer begins to judge his or her pain as “horrible, bad and unbearable”. This negative judgment has been conceptualized in the literature as the construct of catastrophizing. I will now introduce a model that is specific to pain and complimentary to this conceptualization of the Avoidance Cycle and incorporates the construct of catastrophizing. Focus will be placed on catastrophizing

and its relation to quality of life and disability, which are explored as outcomes in this study.

### *Catastrophizing*

The association between avoidance and catastrophizing has prompted researchers to create models that explain their relationship with functional status variables in those with chronic pain. The Cognitive Behavioral Fear-Avoidance Model of Chronic Pain (figure 2, page 153) was developed by Vlaeyen and Linton (2000) to create a model of how catastrophizing and fear of reinjury can work to decrease quality of life in those with chronic pain. The model suggests that when a person sustains an injury, they have a particular experience of the pain. At this point, the researchers propose that sufferers have two possible routes. In the healthy direction, one has the experience of pain and then does not have high levels of fear and catastrophizing, which allows them to confront issues with their pain and eventually recover. In the maladaptive route, one meets their painful experience with pain catastrophizing, often coupled with negative affect. The catastrophizing leads to pain-related fear which in turn promotes hypervigilance and avoidance. Avoidance leads to disuse, depression and disability which in turn change the person's experience of pain and the cycle starts again. The key determining point in the model is catastrophizing. Though the model is useful theoretically, one criticism of the Fear-Avoidance Model is the difficulty in testing such a complex model of psychological factors in chronic pain (Cook, Brawer, & Vowles, 2006).

Cook, Brawer, and Vowles (2006) addressed this criticism by creating a more simplified model of fear-avoidance in chronic pain as depicted in figure 3, page 154. This model of chronic pain depicts how catastrophizing and fear of reinjury interact and



affect depression, disability and pain severity. The researchers used structural equation modeling to test this model. They found that in the best fit of the model, catastrophizing was directly associated with depression, fear of reinjury, and disability; fear of reinjury was directly associated with depression and disability; and depression and disability were directly associated with pain severity. Though this new model is innovative and supports the mediating roles of catastrophizing and fear, the authors caution the reader about causal inferences due to the lack of temporal precedence; however their portrayal of the model (e.g., directional arrows drawn) does suggest causal relationships. Ward and Thorn (2006) critiqued the Fear-Avoidance Model of Pain stating that pain severity and fear of reinjury could easily exchange places in the model and the changed model would also be valid if tested with structural equation modeling. Such a change in the directionality of this revised model would make the model more biologically-based with a central change mechanism of pain severity rather than fear. To infer causal relationships in mediating constructs, Ward and Thorn (2006) argue that temporal precedence is needed. Temporal precedence means that in a directional model such as this, fear of reinjury would have to occur first, before effects on pain severity, to infer a causal relationship. Temporal precedence stresses a need for longitudinal studies in looking at the psychological variables in developing and maintaining chronic pain.

The longitudinal studies that have been conducted on the Fear-Avoidance Model yield additional support. One longitudinal study by Jensen, Turner and Romano (2001) found that decreases in catastrophizing were associated with decreases in disability, pain intensity, and depression. In another prospective study, Sorbi et al. (2006) used ecological momentary assessment with electronic diaries on palm-top computers to assess

psychological pain responses. Diary data showed that psychological functioning variables accounted for 7-16% of the variance associated with quality of life, as measured by the Medical Outcomes Study-Short Form-36 (SF-36). The researchers also found that pain catastrophizing was worse in individuals who had duration of pain longer than 6 months. A prospective study by Boersma and Linton (2006) also supports the link between fear and catastrophizing in chronic pain disability. They found significant differences in pain patient's levels of self-reported disability and depression depending on the amount of engagement in catastrophic thinking.

Strong cross-sectional support also exists for the concept of pain catastrophizing. A cross-sectional study by Swinkels-Meewisse et al. (2006) found that pain-related fear and catastrophizing were more highly associated with observed and perceived disability than pain intensity. Additionally, a systematic review of studies on psychological predictors of disability and chronicity found catastrophizing to be a reliable predictor of disability (Pincus, Burton, Vogel, & Field, 2002). The construct validity of catastrophizing has also been supported via biophysical research. Seminowicz and Davis (2006) analyzed functional MRIs of healthy individuals and found catastrophizing changed cortical responses in areas of brain associated with attention, when exposed to painful electrical stimulation. Results indicate biophysical changes in attention due to catastrophizing.

More recent cross-sectional studies have examined catastrophizing's relationship to ACT constructs such as acceptance and avoidance and found that participants' level of acceptance mediated the effects of catastrophizing on depression, anxiety, avoidance, and physical/psychosocial functioning (Vowles, McCracken, & Eccleston, 2008). The same

research group found, in a previous study, that catastrophizing accounted for more of the variance in depression, anxiety, and functioning than did pain intensity (Vowles, McCracken, & Eccleston, 2007). Though these studies highlight catastrophizing as an important process in chronic pain, they fail to use or provide a useful model in conceptualizing how these processes interact.

In review, the ideas of “endless predictions and evaluations of my problems” in the Avoidance Cycle Model may be equated with the construct of catastrophizing in the existing literature on chronic pain. This negative appraisal of pain stimuli and related sequelae is conceptualized to lead to a restricted view of one's self. The Avoidance Cycle defines this restriction in the next stage of Entanglement.

*Avoidance Cycle Stage of Entanglement: Application to Chronic Pain*

Entanglement, the second stage of the Avoidance Cycle (see figure 1, page 152), is described by the sufferer as “buying into my thoughts; losing me in the process” (Hayes & Smith, 2005, p. 196). This Avoidance Cycle stage is discussed as it applies to chronic pain using complementary models and related studies. As applied to chronic pain, it is conceptualized that cognitive fusion occurs as the chronic pain sufferer immediately associates those fears and negative evaluations with a multitude of potentially painful stimuli. Some of these painful stimuli may be in conflict with evaluations of other events or values. For example, one might want to enjoy the tranquility of a walk in the forest, but is fearful that the pain experienced would be horrible and too much to deal with. In the context of the concept of avoidance, enmeshment is a construct that has been studied in cognitive conceptualizations of chronic pain. Enmeshment is examined here as a potential construct in the process of the

ACT construct of Entanglement. In this conceptualization of Entanglement, one loses a sense of self due to increased cognitions about pain. To provide a framework for this novel conceptualization of Entanglement, I will introduce the Schema Enmeshment Model of Pain (Pincus & Morley, 2001; figure 4, page 155), a model developed in the cognitive bias literature that serves as a complementary conceptualization to the Avoidance Cycle stage of Entanglement.

### *Schema Enmeshment Model of Pain*

The Schema Enmeshment Model of Pain (Pincus & Morley, 2001; figure 4, page 155) contains the three schemas of pain, illness, and self. A schema represents a person's particular set of cognitions about a specific topic, and the relative connections between these cognitions. Identification of schemas has been successfully used to conceptualize and treat various mental disorders including depression, posttraumatic stress disorder, and borderline personality disorder (Young, Klosko & Weishaar, 2003). In the Schema Enmeshment Model of Pain, the pain schema includes those physical characteristics of pain such as pain intensity, location, and duration. The illness schema contains behavioral or emotional consequences of having pain, including disability, quality of life and plans for the future. Lastly, the self schema is one's view of his or her self and how they operate in the world, including visions of current self, ideal self, and self in the future.

Pincus and Morley (2001) suggest that the components of one schema are connected with components of another schema and that activation of one schema will activate other related schemas. They apply this schema framework to pain-related cognitions. These researchers argue that repeated simultaneous activation of components

of different schemas will result in one schema greatly overlapping with another schema. Enmeshment is seen as the phenomenon in which the three schemas involved are being activated simultaneously, and each schema is absorbed into each other schema. Some overlap in the three schemas is to be expected and is normal and healthy. Persons with pain, who have a healthy amount of schema overlap, or enmeshment, would be classified as active copers by Pincus and Morley (2001), and they propose that these people do not let pain and illness significantly decrease their self-worth. This hypothesis helps to explain how the schema of self relates to the schema of illness and pain, within the model, and how the schema of self then affects changes in functioning, disability, and quality of life. The concept of self and, more importantly, self-worth is integral to the Schema Enmeshment Model of Pain and next I will explain how it has been conceptualized within this model.

Self-worth may be explained further by Turk and Okifuji's (2002) definition of self-efficacy as "a personal conviction that one can perform certain required behaviors in a given situation" (p.680). They link self-efficacy and subsequently self-worth in conceptualizing the impact of managing the physical and cognitive limitations associated with chronic pain. Lackner, Carosella, and Feuerstein (1996) examined the construct of functional self-efficacy in a chronic pain sample. Functional self-efficacy is defined as judgments about one's own ability to perform tasks of physical ability and the level of success expected. They found that functional self-efficacy accounted for a significant proportion of the variability in performance in a weight lifting task. They also found that expectations about reinjury and pain were not predictive of physical functioning when functional self-efficacy was controlled. Results suggest that the self-schema may be

closely related to functional self-efficacy and behavioral performance and subsequently to disability and loss of quality of life. Within the framework of the Schema Enmeshment Model of Pain, this change in functional self-efficacy is conceptualized as the absorption of the self schema into the pain and illness schemas and this phenomenon is indicative of enmeshment.

In the Schema Model of Pain, enmeshment that causes distress, disability, or lowered quality of life occurs when all three schemas are nearly completely overlapping (see part D in figure 4, p.155). For the pain patient in this fully enmeshed condition, activations of the pain schema (e.g., increase in pain from driving in a car) will equally activate the illness schema (e.g., “this pain keeps me from driving places”) and the self schema (e.g., “I am worthless because I can't drive anywhere”). Instances that activate the self or illness schema will also have subsequent activation of the remaining schemas. Enmeshment is hypothesized to result in increased psychological symptoms, loss of quality of life, and increases in disability.

A study by Morley, Davies, and Barton (2005) examined the concept of pain enmeshment by developing a structured interview designed to tap pain-related schemas and the degree of enmeshment in chronic pain patients and measure associations between enmeshment and psychosocial outcomes. The Possible Selves Questionnaire is a brief structured interview that explores participant's schemas related to actual, hoped-for, and feared-for selves. Participants are queried regarding perceived ability to obtain desired personal characteristics, or avoid unwanted characteristics, in the presence of pain. Responses are scored to yield a ratio measure of enmeshment ranging from not at all enmeshed to fully enmeshed. The researchers administered the Possible Selves

Questionnaire to 80 chronic pain patients, along with written measures of depression and acceptance, and found that enmeshment reliably predicted the magnitude of participants' depression and levels of acceptance after controlling for age, gender, and pain characteristics (i.e. intensity, duration). This study generated much interest and other researchers have called for additional studies to examine the relationships between pain enmeshment and pain intensity (MacDonald, 2005). The researchers involved in this study also admit that the Schema Enmeshment Model of Pain is still in need of additional theoretical development (Morley, 2005). The present study further explores the Schema Enmeshment Model of Pain by integrating it into a pain-specific examination of the Avoidance Cycle.

One can see the parallels between enmeshment of the self schema as applied to chronic pain and the loss of sense of self in the Entanglement stage in the Avoidance Cycle conceptualized in ACT. Pincus and Morley (2001) describe enmeshment as developing prior to cognitive bias and offer it as a method of describing how attention bias may occur with the simultaneous activation of schemas. Selective attention to pain stimuli and cognitive interference are seen as precursors of Entanglement and loss of self. This diminishment in self-worth and poor efficacy in behavioral performance could result in the avoidance of potentially painful situations and experiences.

*Avoidance Cycle Stage of Control and Avoidance: Application to Chronic Pain*

In keeping with the ACT Avoidance Cycle model, if one has developed the belief that they cannot handle the experiences of chronic pain, they are likely to use control and avoidance to solve this problem. Hayes and Smith (2005) call this stage of the Avoidance Cycle, Control and Avoidance (see figure 1, page 152). It is where the

chronic pain sufferer begins “acting on ‘solutions’ proposed by my mind, often with the agenda of controlling or avoiding my distressing thoughts, feelings and sensations” (p. 196, Hayes & Smith, 2005). In this stage, experiential avoidance is a regular “solution” to the problem of chronic pain. The difficulty is that chronic pain, by its very nature, is often unavoidable and the tactics of control and avoidance often result in several unwanted consequences such as loss of quality of life and increases in disability. In several empirical studies avoidance behaviors in people with chronic pain have been shown to result in increased sensitivity to subsequent exposures to painful stimuli, generally show no reduction in ongoing pain, and are strong in association with pain chronicity (Philips, 1987; Asmundson, Norton, & Norton, 1999).

In order to highlight key linkages between experiential avoidance and chronic pain, I will review the existing literature and provide information on how the constructs previously described have been operationally defined and quantified in the empirical literature. I will further explore how the factors of willingness to experience pain and the engagement in activity are crucially related to experiential avoidance and control.

#### *Research on Experiential Avoidance and Chronic Pain*

Much of the current research on experiential avoidance and chronic pain has been conducted by Lance McCracken and colleagues. In some of his earlier work, McCracken (1998) administered validated measures of pain acceptance, avoidance and quality of life to patients requesting treatment at a pain management center. He found that patients who had lower experiential avoidance scores on the Chronic Pain Acceptance Questionnaire, a validated pain-specific measure of experiential avoidance, had lower pain intensity, lower pain-related anxiety, and less depression. Acceptance also appeared to predict disability,



as lower experiential avoidance was associated with lowered physical and psychosocial disability, more daily "uptime" (time when one is not resting due to pain), and employment status. Correlation between pain intensity and adjustment variables were low, suggesting that acceptance is not just a result of having low intensity levels of pain.

In another study, McCracken et al. (1999) divided chronic pain patients into one of three groups; dysfunctional, interpersonally distressed, or adaptive copers. The dysfunctional group had greater experiential avoidance and greater pain-related anxiety relative to the other two groups. Using discriminant analysis, pain-related anxiety and acceptance of pain correctly classified 72.5% of the dysfunctional group and 90.9% of active copers, independent of pain intensity and depression. Results indicate that acceptance of pain is a unique dimension of adjustment to chronic pain and that lowering experiential avoidance may help dysfunctional pain patients become active copers.

There have also been several multi-subject studies that have examined the efficacy of interventions used to reduce avoidance in chronic pain patients. John Kabat-Zinn and his fellow researchers (1982) developed the intervention of mindfulness-based stress reduction (MBSR), focusing attention on experiences in the present in a non-judgmental manner. This intervention relied heavily on acceptance and discouraged attempts to reduce or avoid unwanted experiences. MBSR with chronic pain patients has been shown to reduce intensity of pain, improve mood, reduce interference with activities of daily living, reduce medical symptoms, and reduce psychological distress (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985; Kabat-Zinn et al., 1987; Randolph et al., 1999). Mindfulness-based stress reduction has also exhibited indicators of lowered disability and increased quality of life at 12 & 15-month follow-ups (Randolph et al.,

1999; Kabat-Zinn, Lipworth, & Burney, 1985) and in a 4-year review of treatment (Kabat-Zinn et al., 1987) yielding support to maintained benefit from this intervention. Though these studies provide evidence that decreasing avoidance is beneficial to persons living with chronic pain, it is difficult to determine exactly which aspect of the intervention led to the favorable results. Findings may be due to factors such as social support, normalization of illness, or other factors independent of decreases in avoidance.

Another intervention study done in the early stages of the development of the construct of pain-related experiential avoidance was a doctoral dissertation (Geiser, 1992) in which two intervention groups were compared. In one condition, chronic pain patients were asked to accept, rather than attempt to control, their chronic pain and to focus on things that mattered to them such as life-long goals. In the other condition, pain patients were asked to focus on methods to reduce and control pain. Results showed that both interventions were effective in reducing pain interference with life activities and that both interventions increased acceptance of pain as measured by the Chronic Pain Acceptance Questionnaire, a now widely validated measure of pain acceptance. The increase in acceptance predicted more engagement in activities for all subjects at a 3-month follow-up.

More recent intervention studies have used ACT interventions to attempt to reduce avoidance in persons with chronic pain. A randomized clinical trial by Dahl, Wilson, & Nilsson, (2004) in Sweden, placed public health employees with chronic pain in an ACT treatment condition or a control condition of treatment as usual. Participants in the ACT condition received sessions that focused on values, cognitive defusion, exposure, and commitment. Results found that those in the ACT condition used fewer

sick days and medical visits, and had lower ratings of perceived stress than those in the treatment as usual group.

Another relevant and thorough study regarding chronic pain and acceptance interventions is the British study by McCracken, Vowles, & Eccleston (2005). The study was done with a sample of chronic pain patients waiting for treatment at a residential and hospital-based pain treatment center. Researchers compared the participants' pre-treatment/waiting period scores to scores after a three week or four week ACT treatment package designed to decrease experiential avoidance. The treatment was intense, in group format, five days per week, six hours per day and included ACT, exercise sessions, and psychological interventions designed to increase body awareness, reverse habits, and increase relaxation. Results showed that the intervention reduced pain, depression, pain-related anxiety, physical disability, psychosocial disability, and daytime rest due to pain. The intervention was shown to increase walking speed and increase the number of sit-and-stand exercises. Subjects were re-assessed three months following the intervention and showed a 41.2% drop in depression, 25% drop in physical disability, 39% drop in psychosocial disability, and a 61.8% drop in daytime rest hours compared to baseline. Reductions in pain intensity were small compared to increases in functioning, providing evidence that improvements were not simply a result of pain reduction.

McCracken and his colleagues conducted an interesting outcome study in 2007 that compared 53 highly disabled persons with chronic pain to 234 less disabled pain patients (McCracken, MacKichan, & Eccleston, 2007). Both groups went through a three week treatment program aimed at decreasing avoidance and cognitive fusion, while increasing mindfulness and values-based actions. Results showed significant

improvements in measures of psychological distress, disability, and impairment for both groups with the largest effect sizes found in the highly disabled group. These differences were detected at three month follow up as evidence of the long term effectiveness of the intervention.

Other outcome studies based in ACT have shown effective changes in adolescents (Wicksell, Melin, & Olsson, 2007). Soon to be published outcome and RCT studies have further examined the effects of acceptance and exposure based intervention in various samples of participants with chronic pain, including adolescents with abdominal pain (Greco, Blomquist, Acra, & Moulton, Under review), adults with whiplash (Wicksell, Ahlqvist, Bring, Melin, & Olsson, 2008) and adults with musculoskeletal pain (Vowles & McCracken, 2008).

The results of the preceding studies highlight the role of acceptance of pain and reduced experiential avoidance in bettering quality of life, decreasing disability and improving psychological and social functioning. ACT interventions reported as case studies (Kleen, & Jaspers, 2007; Wicksell, Dahl, Magnusson, & Olsson, 2005; Luciano, Visdómine, Gutiérrez, & Montesinos, 2001) have also shown improvements in functioning that are consistent with previous findings. To better quantify measured dimensions of pain avoidance and to design more effective and precise interventions, experiential avoidance as a construct may be further dismantled into subcomponents of activity engagement and pain willingness.

#### *Activity Engagement and Pain Willingness*

Activity engagement and pain willingness are currently conceptualized as the most important constructs of pain-specific experiential avoidance and they make up the

two subscales of the Chronic Pain Acceptance Questionnaire. Operationally defined, activity engagement is the level which one involves his or herself in life's events in the presence of pain, and pain willingness is a person's realization that control and avoidance may not work and the idea that some pain must be endured to carry out desired activities (McCracken, 1999). McCracken, Vowles, and Eccleston (2004) found that the Activity Engagement and Pain Willingness subscales were the strongest predictors of pain-related disability and distress. The researchers found that patients who engaged in normal life activities had lower pain intensity, reported less need to control their pain, lower usage of medication and healthcare, better work status, better physical functioning and less emotional distress. Willingness to experience pain was associated with lowered physical disability, less time spent sleeping to recover from pain, less depression, lower anxiety, as well as fewer numbers of medications and less doctor visits. This evidence suggests that these two dimensions of pain acceptance are related to improving quality of life and decreasing disability, but it is hard to infer causality as no direct manipulations were made and results are purely associative.

The British intervention study by McCracken, Vowles, and Eccleston (2005) previously described, provides some support of a causal relationship of activity engagement and pain willingness. The intervention, designed to reduce experiential avoidance, did so through interventions focused on increasing activity engagement and pain willingness. Results showed that along with the desired outcomes of improved functioning and lowered depression scores, scores on the Activity Engagement and Pain Willingness subscales improved as well. Other researchers have confirmed that greater acceptance of pain, measured by the Chronic Pain Acceptance Questionnaire, is related to

better over all well-being (Viane et al., 2004) and is prospectively associated with better patient functioning (McCracken & Vowles, 2008; McCracken & Eccleston, 2005).

It is clear that more research is needed on the specific ways experiential avoidance, along with its subcomponents of activity engagement and pain willingness, interact to impact quality of life and disability in those with chronic pain. Some of the existing research on thought suppression and the subsequent rebound effect, combined with the negative effects of social reward, may shed light on how avoidance and control specifically increase disability and decrease quality of life.

#### *Avoidance Cycle stage of Relief and Struggle: Application to Chronic Pain*

In the Relief and Struggle stage of the Avoidance Cycle (see Figure 1, page 152), the chronic pain sufferer begins to battle with some of the negative consequences of the “solutions” of control and avoidance. Hayes and Smith (2005) describe this stage as a point where “temporary relief and the illusion that control and avoidance may work soon gives way to ‘this isn’t working’ and struggle” (p.196). In this stage, the chronic pain patient may experience some relief from avoiding painful thoughts, feelings, and sensations. I will examine the internal avoidance of thought, emotional, and sensation suppression and examine how the rebound effect can quickly turn temporary relief from unwanted thoughts, feelings, and sensations into amplification of anxiety, depression, pain and suffering.

#### *The Rebound Effect in Chronic Pain*

Studies in thought suppression (an experimental paradigm used to manipulate internal avoidance) have found that suppressing a certain thought often caused an individual to be preoccupied by the very thought they were trying to suppress (Wegner et

al., 1987). When subjects were asked in a laboratory setting not to think about an image of a white bear, they found it difficult to suppress the thought. In fact, the thought of a white bear came into their minds more often than if they were not instructed to suppress it, a phenomenon called the rebound effect (Wegner et al., 1987). But how can thought suppression lead to effects on quality of life or disability? When people attempt to suppress thoughts that are emotionally loaded, or attempt to suppress the emotion itself, they are likely to experience a magnification of the related emotional response. In fact, chronic thought suppression of depressive thoughts and anxious thoughts can lead to clinical depression and anxiety (Wegner & Zanakos, 1994). The White Bear Suppression Inventory, developed by Wegner and Zanakos (1994) as a measure of thought suppression, has been shown to reliably predict clinical obsession in people prone to obsessive thinking and predict depression in people who dislike negative thoughts (Wegner & Zanakos, 1994).

Research has also demonstrated that thought suppression can facilitate the development of avoidance-based coping when persisting stressors are present (Tacon, Caldera & Bell, 2001). Among persons suffering from posttraumatic stress disorder (PTSD) thought suppression has been shown to be associated with increases in severity of symptoms (Tull et al., 2004). In cancer research, patients' suppression of thoughts, feelings and behaviors have been found to be related to decreases in immune system functioning (Fang et al., 2003), depressive symptoms, lower well-being (Cordova et al., 2001), and lowered physical and mental quality of life (Kershaw et al., 2004). It has also been shown that HIV-infected persons are more likely to show chronic dysregulation in

immune system functioning if suppression is used to deal with chronic stressors (Antoni, 2003).

The pain literature shows that suppression of negative sensations, emotions and thoughts can have detrimental psychological and physical repercussions. A study by Cioffi and Holloway (1993) attempted to find out if suppressed pain sensations demonstrated the rebound effect. They asked generally healthy students to place their hands in a bucket of ice-cold water for as long as they could bear (limit 240 seconds). Students were randomly assigned to three groups. The distraction group was asked to vividly imagine their room at home during the cold-pressor task. The monitoring group was asked to focus as hard as they could on the sensations in their hand. The suppression group was asked to not think about the sensations in their hand and to "empty their minds of all awareness of their hand sensations" (p. 276). During, and for several minutes after, this cold-pressor task, skin conductance levels (SCL) and heart rate were measured. Participants in all three conditions rated their pain about the same immediately after removal from the ice-water, but subjects in the suppressor condition showed greater physiological arousal and SCL during the cold-pressor task. Participants in the suppression group showed significantly slower recovery times in the seven 20-second pain ratings after removing the hand from the ice-water. When subjects were told that they would have to place their hands in the ice-water for a second time, those participants in the suppressor condition showed a significantly greater increase in heart rate than the other groups. After approximately one hour, participants in the suppressor group were more likely to rate an ambiguous vibration on the neck as unpleasant and experienced



greater physiological arousal during the vibration, results that support the previously mentioned interpretation bias.

Sullivan et al. (1997) also asked participants to suppress thoughts during a cold-pressor task, and found that they experienced more intrusions of unwanted thoughts during the task and experienced more pain. Zettle et al. (2005) divided healthy college students into two groups of high and low experiential avoiders based on their scores on the Acceptance and Action Questionnaire. Participants were subjected to a cold-pressor task and were asked to report when the experience first became painful and then to remove their hands at their own will. Researchers found that high avoiders were quicker in removing their hands from the ice-water and reported using poor coping strategies, such as catastrophizing, when performing the task. Curiously, high experiential avoiders did not differ from low avoiders in their ratings of the pain intensity, though results did approach significance with high avoiders reporting greater pain intensity.

Evidence from these studies suggests that the rebound effect is applicable to the acute experience of pain, and may be more closely linked to the psychological aspects of pain (e.g. tolerance, expectations, coping) than the physiological factors (e.g. intensity). Though these laboratory studies on healthy subjects are methodologically sound, it is hard to determine if the findings generalize to patients experiencing *chronic* pain. The persistent, recurring, intense pain of a chronic sufferer is surely different from a short dip of the hand in ice-water. With chronic pain patients the rebound effect is likely to be double-headed in that pain patients both experience the rebound effect regarding pain characteristics as well as with emotional characteristics such as anxiety and depression. In chronic pain patients, the suppression and subsequent rebound may be more closely

linked to negative consequences of chronic avoidance, such as depression and anxiety, than to immediate rebound from suppression of physiological pain. Next, I will explore how chronic avoidance can give way to increased disability and decreased quality of life.

*Avoidance Cycle of Life Restriction and Loss: Application to Chronic Pain*

This last stage of the Avoidance Cycle is Life Restriction and Loss (see Figure 1, page 152). Hayes and Smith (2005) report from the perspective of the sufferer in this stage, “My life shrinks; I lose vitality and contact with my values and become more preoccupied with...” (p. 196). The pain patient experiences the consequences from fear and catastrophizing from the Words, Words, Words stage; they experience the life restriction from cognitive bias and schema enmeshment in the Entanglement stage; the stage of Control and Avoidance has left them coping using experiential avoidance, unwilling to experience pain or even engage in activities that may lead to increased pain; and they experience the suppression of pain and its subsequent rebound effect, combined with increases in depression and anxiety in the Relief and Struggle stage. All of these have now combined to drastically shrink the sufferer’s cognitive experiences to a bias towards pain and catastrophizing, leaving little room for healthy adaptive cognitions. They have lost a sense of who they truly are as their lives have been limited by the avoidance of pain, situations that could cause pain, and painful stimuli. Now, they encounter the new problems that come with avoidance. In their review of the consequences of avoidance, Vlaeyen and Linton (2000) report that chronic avoidance leads to poor behavioral performance, hypervigilance, increased muscular reactivity, deconditioning, and guarded movement due to physical disuse.

Several studies have demonstrated that chronic pain leads to decreased physical and mental well-being. For example, in a study of 88 pain patients and 105 healthy individuals, participants in the pain group scored significantly lower than controls in all levels of quality of life measured, including day-to-day functioning, self-esteem, health status, and energy level (Fanciullo et al., 2003). Chronic pain also leads to decreases in mental health, an important aspect of quality of life. In their review, Romano & Turner (1985) found that depressive symptoms are higher in chronic pain patients than in the general population and rates of depressive symptoms in chronic pain sufferers are higher than in many other medical populations. The review found that about half of the patients with both chronic pain and depression developed them simultaneously, and 40% developed the depression after the onset of chronic pain. Such data suggest that it is the chronic pain that causes depressive symptoms and not vice versa. Still other research has found that the presence of Major Depressive Disorder greatly increases the risk of developing future chronic pain (Currie & Wang, 2005). The prevalence Major Depressive Disorder in patients with chronic pain can be very high, ranging from 30% to 54% (Banks & Kerns, 1996). Elliot, Renier and Palcher (2003) assessed Major Depressive Disorder and minor depression in 242 participants and compared diagnosis with quality of life, as measured by the SF-36. The researchers found the prevalence of Major Depressive Disorder to be 52% in their sample and that the type of depression was highly correlated with the participant's score on the measure of quality of life (SF-36). Consistent with previous findings, they saw that chronic pain patients were significantly more depressed when compared to norms in the U.S. Research using structural equation modeling found anxiety and depression to directly and indirectly affect patient function

(Tan, Jensen, Thornby, & Sloan, 2008). Still this study was cross-sectional and is limited in the causal paths that can be drawn.

A study by Luo et al. (2004) showed that disability due to neck pain was predicted by higher levels of pain intensity, high levels of stress, high anxiety and greater depression. Other work by Dozois et al. (1995) looked at 117 recently injured men and predicted employment status at a 9-month follow-up. The researchers found that a variety of psychological factors (e.g. depressive symptoms, stress) as well as physical factors (e.g. physical status) significantly predicted work status in 9-months. The results of these studies, along with findings discussed earlier, highlight the impact of chronic pain on quality of life, including mental health and functional and perceived disability. Clearly more information is needed about how mechanisms of anxiety, depression and chronic pain are related. These problems of depression, anxiety, disability and decreased quality of life, place the pain patient back at the start of the Avoidance Cycle resulting in a self-perpetuating spiral of more avoidance.

### **Predisposing Factors towards the Avoidance Cycle**

One of the most interesting questions, and possibly the most clinically relevant, is why do some pain sufferers use avoidance as a coping mechanism while others do not. Several studies have shown discreet clusters of impaired and less impaired patients with chronic pain. A study by Geisser, Perna, Kirsch, and Bauman (1998) used cluster analysis of scores on the Brief Symptom Inventory (a measure of physical and psychological symptoms) to classify 1,489 patients with chronic pain. The results yielded two distinct groups: one with high Brief Symptom Inventory scores and one with lower Brief Symptom Inventory scores. Those with high Brief Symptom Inventory

scores showed greater pain intensity, more disability, reported pain having a greater impact on social relationships and had less satisfaction with medical care. Other studies using cluster analysis of the Multidimensional Pain Inventory (MPI; a measure of pain symptoms and coping) have placed chronic pain patients into groups of patients in control of pain, depressed and disabled patients, and active coping patients (Strong, Ashton, & Stewart, 1994) as well as groups of dysfunctional, interpersonally distressed, and adaptive copers (Vollenbroek-Hutten et al., 2004; McCracken et al., 1999). Still other studies have used fear avoidance beliefs, catastrophizing, and depression scores to classify patients into low risk, medium symptoms, and combined symptoms subgroup clusters (Boersma & Linton, 2006). Regardless of the method of classification, each study yielded a cluster of patients who reported better psychological functioning and a group or groups that reported distress and poor psychological functioning.

This review argues that the method by which patients experience this distress is through the Avoidance Cycle. One might ask if there are predisposing factors that increase one's likelihood of entering the Avoidance Cycle. The diathesis-stress model is proposed as a framework for conceptualizing predisposing factors and anxiety sensitivity is offered as a predisposing factor.

*Anxiety Sensitivity within the Diathesis-Stress Framework: Application to the Avoidance Cycle in Chronic Pain*

Within the diathesis-stress framework, a diathesis is defined as "any characteristic of a person (biological or psychological) that increases his or her chances of having a disorder," (Banks & Kerns, 1996, p.104) where a stressor is defined as "an environmental or life event perceived by the individual as threatening to his or her well-being and

exceeding his or her capacities to cope" (Banks & Kerns, 1996, p.104). The framework proposes that a person with a diathesis for chronic pain is more likely to develop this syndrome if the diathesis is met with a stressor. Pain sensitivity poses as a logical diathesis for the development of pain impairment. If one is more likely to experience particular sensations as painful then that person may be more likely to avoid situations or activities that produce those sensations and thus begin to participate in mechanisms of the Avoidance Cycle. Yet the subjective nature of one's experience of pain has makes it hard to measure pain sensitivity in clinical samples without use subjective ratings of pain (i.e. a 1-10 rating of pain intensity). One might imagine that this variability in pain experience is due to various psychological processes that impact the interpretation of negative stimuli. The construct of anxiety sensitivity might be one of the psychological processes that is a predisposing factor, or a diathesis, for avoidance behaviors in those with chronic pain.

Anxiety sensitivity is defined as one's sensitivity to, or fear of, sensations in the body associated with anxiety (e.g., sweaty palms, heart rate increases, nausea, dizziness), which is developed from a belief that these sensations will create problems for the sufferer physically, socially, or psychologically (e.g., heart attack, isolation from friends, insanity; Reiss, 1991). For this study anxiety sensitivity was chosen as a possible proxy diathesis to pain sensitivity because of its heavy reliance on the interpretation of internal sensation. Typically it is generally thought of as a more stable, trait-like characteristic. Asmundson and Taylor (1996) have tested a model in which anxiety sensitivity and pain severity have effects on one's fear of pain which, in turn, results in pain-related escape and avoidance. The researchers tested the model on 259 chronic pain patients and found

that the proposed path diagram was supported and the predicted relationships existed between the constructs. In a later study, Norton and Asmundson (2004) found that structural equation modeling in patients with chronic headache pain supported the model and highlighted the direct and indirect effects of anxiety sensitivity on pain avoidance behaviors. Still, due to the cross-sectional design of these studies, causality can not be directly inferred. Other models of the effect of anxiety sensitivity have done so in looking at the high comorbidity rate of chronic pain and PTSD (Otis, Keane, & Kerns, 2003).

Exposure to trauma is common in patients with chronic pain and has been examined as a factor affecting quality of life. In a prospective study, Koleck et al. (2006) followed patients with acute lower back pain and found that functional non-adjustment (a factor comprised of scores on quality of life measures, length of sick leave from work, and number of medical visits) was predicted by the presence of a traumatic experience. Traumatic experience has also been linked to experiential avoidance. Polusny et al. (2004) examined the effect of experiential avoidance in participants who had been sexually abused as adolescents and found that adolescent sexual victimization is linked with increases in experiential avoidance which, in turn, is related to adulthood problems such as problem drinking, psychological distress, and PTSD-related symptoms. Other studies have found that experiential avoidance has a detrimental effect on psychological outcomes and PTSD in survivors of rape, but that the effect is small (Boeschel et al., 2001). Findings such as these have led researchers to develop models that attempt to explain the relationship of chronic pain and PTSD through the common predisposing factor of anxiety sensitivity.

In a review of the theoretical models of chronic pain and PTSD, Otis, Keane, and Kerns (2003) report anxiety sensitivity as a common construct to all comorbidity models. The reviewers write about Sharp and Harvey's (2001) mutual maintenance model, Asmundson et al.'s (2002) shared vulnerability model, Norton and Asmundson's (2003) fear-avoidance model, and lastly apply the triple vulnerability model of anxiety and PTSD (Barlow, 2000) in chronic pain patients. In each of these models, anxiety sensitivity is viewed as a trait or learned vulnerability toward the development of PTSD and chronic pain. Such a vulnerability would easily be classified as a diathesis in the diathesis-stress model, and traumatic experience or pain may be the stressor that leads to development of PTSD or chronic pain. Though these models are comprehensive and empirically derived, they have not yet been tested (Otis, Keane, & Kerns, 2003) and should only be viewed as plausible theories of comorbidity. Much interest lies in future research involved in testing these models, their constructs, and the processes involved in the development of PTSD and chronic pain and subsequent effects on disability and quality of life.

Though much research can be conceptualized as supporting anxiety sensitivity as a predisposing factor, a diathesis, or a vulnerability for avoidance, less agreement has been obtained on its correct placement in models of avoidance. The mutual maintenance model (Sharp & Harvey, 2001) argues that anxiety sensitivity is a vulnerability for catastrophizing, placing it in the first stage of the Avoidance Cycle. Asmundson, Kuperos, and Norton (1997) found that anxiety sensitivity had the largest effect on attention bias to pain related information, implying more importance in the Entanglement stage. Still other fear-avoidance based models have shown anxiety sensitivity as having



direct and indirect effects on fear of pain and avoidance of pain-related stimuli (Norton & Asmundson, 2003; 2004), placing anxiety sensitivity in stages one and three of the Avoidance Cycle, respectively. Though the proper placement in the model and clear relationships of anxiety sensitivity and avoidance are as yet unclear, it does yield much promise as an important psychological factor in determining one's likelihood of avoidance versus acceptance, and thus vitally important in examining the mediating effects of experiential avoidance on chronic pain and increased disability and decreased quality of life.

In summary, the Avoidance Cycle has been proposed as a conceptual framework to examine ACT constructs and how they relate to psychological distress, such as anxiety and depression; and functional outcomes, such as quality of life and disability. Anxiety sensitivity is offered as a possible predisposing factor, or diathesis, in the development of impairing and debilitating chronic pain.

## STUDY PURPOSE AND GENERAL OUTLINE

### **Importance of this Study**

Chronic pain is a costly and debilitating condition in the US and worldwide. Millions each year seek treatment and relief for chronic pain with varied success. Many commonly used treatments for chronic pain often involve medications wrought with complications and side effects, or invasive and expensive medical procedures. Still, for many patients, pain remains despite medical treatment. This failure has fueled a line of treatments that focus on coping with pain rather than the medical elimination of pain. Health psychologists, practitioners of behavioral medicine, and pain management counselors have identified patient's response to pain as a viable target of intervention, rather than the more difficult target of reducing actual pain or pain intensity.

Given this trend, it becomes exceedingly important to identify key psychological constructs related to the mechanisms of coping with pain. Some of the reoccurring constructs demonstrating utility in the clinical literature include catastrophizing, enmeshment, experiential avoidance, and anxiety sensitivity. Gaining a solid understanding of which of these constructs is most important, most amenable to change, and how they relate to each other is crucial to psychological intervention and pain management. Several models, reviewed in the introduction section of this proposal, have been conceptualized by researchers to operationally define and to integrate these constructs in a way that is both clinically relevant and testable, but recent criticism has

argued that existing models are not comprehensive and do not fully define constructs and explore construct relationships.

Developed by pioneers in the “Third Wave of Behavior Therapy” (Batten & Santanello, 2007), the Avoidance Cycle provides a framework for integrating constructs from existing models of chronic pain in a comprehensive manner. The model focuses on experiential avoidance as a major mediator between life problems (such as chronic pain) and decreases in quality of life. A few ACT-based interventions have been designed to actively reduce experiential avoidance in chronic pain populations, and studies testing these interventions have been somewhat supportive. Still many of these interventions ignore important stages operationalized as a part of the avoidance cycle such as Entanglement. Recent research in cognitive bias has created the very similar construct of enmeshment and the Schema Enmeshment Model of Pain has been formulated and a measure developed. Utilizing the Schema Enmeshment Model of Pain construct of enmeshment, the stage of Entanglement can now be measured within the framework of the Avoidance Cycle, thus integrating the two models to provide a comprehensive model of avoidance in patients with chronic pain.

The present study integrated well-established constructs of coping (Catastrophizing), predisposing factors of avoidance (anxiety sensitivity), and schema based theory of chronic pain (Schema Enmeshment Model of Pain) into a comprehensive model of avoidance (the Avoidance Cycle). Exploring this integrated model and its impact on quality of life and disability provided information to further clarify how these psychological constructs relate to each other in persons coping with chronic pain. Such data may help clinicians to identify useful targets for intervention when treating chronic

pain patients. Ultimately the prospective goal of research, as with this study, is to provide health intervention to the chronic pain sufferer that will increase quality of life and lower disability.

### **Specific Aims**

Aim #1: A primary aim of this study was to explore relationships between chronic pain intensity and quality of life (including depression and disability) utilizing the constructs of the Avoidance Cycle (Hayes & Smith, 2005) applied to chronic pain. Of particular importance is exploration of how constructs integral to the Avoidance Cycle, including anxiety sensitivity, catastrophizing, enmeshment and experiential avoidance, predict anxiety, depression, quality of life and disability. These constructs will be measured by validated questionnaires designed to measure the constructs of interest. For this study, the construct of enmeshment, which is a major component of the Schema Enmeshment Model of Pain (Pincus & Morley, 2001), is examined as a conceptualization of the Avoidance Cycle's stage of Entanglement, thus integrating the two models. There is no current measure developed to assess Entanglement, so this study used the Possible Selves Questionnaire as a measure of Entanglement and compared scores on this measure to validated measures of mental and physical functioning. Mediation and moderation effects between pain intensity and functioning were examined using novel mediators (experiential avoidance, enmeshment) and a novel moderator (anxiety sensitivity).

Aim #2: A second aim of this study was to examine participants' perceptions of the temporal relationships in the Avoidance Cycle. In order to fully explore potential mediation/moderation relationships it would be desirable to establish temporal precedence (i.e. was the person anxious, depressed, or having psychological problems

before the onset of pain or were these symptoms subsequent to pain onset). Since this is not a longitudinal study, establishing temporal precedence for all constructs is not plausible. Further, the Avoidance Cycle model of avoidance is cyclical and conceptualized as a downward spiral and thus does not lend itself well to linear temporality desired in mediation studies. A more realistic goal for this study was to examine participant's *perceptions* of the temporal nature of basic pain-related variables. For example, does the participant believe that psychological distress (i.e. anxiety, depression) developed before, after or simultaneously with onset of chronic pain? These perceptions can be accessed, to some extent, by self-report of symptom occurrence, self-reported psychological history, and report of psychological treatment history. A question from the SF-36 helped to examine the conceptualization of the model as a downward spiral, as it asks participants to rate whether their health is better or worse than one year ago. Participants who score high on Avoidance Cycle measures (i.e. high anxiety sensitivity, high catastrophizing, high avoidance) should be more likely to report worse health status now relative to a year ago, thus lending support to the conceptualization of the model as a declining spiral.

### **Hypotheses**

The constructs in this quasi-experimental study can be categorized in the typical fashion of the scientific method of identifying independent and outcome variables. Independent variables will be pain intensity, anxiety sensitivity, catastrophizing, enmeshment, and experiential avoidance. Dependent variables in this study will be depression, anxiety, quality of life and disability. Given this study's sample size of 139, it is sufficiently powered to use individual predictor variables to predict outcome

variables. Specific hypotheses are listed under each aim. The data analytic plan, including power analysis and analyses proposed for hypothesis testing, begins on page 57. Relationships between independent variables and quality of life and disability, including hypothesized directionality of associations, are provided in figures 7 (page 157) and 8 (page 158) respectively.

*Aim #1*

H1 (Hypothesis #1): Model constructs of pain intensity, anxiety sensitivity, catastrophizing, and experiential avoidance will individually be related to enmeshment.

H2: Enmeshment will be related to functional status (disability and quality of life), as well as psychological distress (depression and anxiety).

H3: Experiential avoidance will mediate the relationship between pain intensity and functional status outcomes (disability and quality of life).

H4: Enmeshment will mediate the relationship between pain intensity and functional status outcomes (disability and quality of life).

H5: Anxiety Sensitivity will moderate the relationship between pain intensity and functional status outcomes (disability and quality of life).

*Aim #2*

H6: The majority of participants with a history of psychological problems will report onset of chronic pain prior to, or at the same time as, onset of psychological problems.

H7: Participants with high levels of avoidance, catastrophizing, and enmeshment, will report current health as being worse than one year ago.

## METHODS

### **Participants**

#### *Description of Participants*

All participants in this study were adults, age twenty-one or older, who suffer from chronic musculoskeletal pain. Chronic pain, for this study will mean pain that has lasted longer than three months. Participants were men and women who are patients in a pain management clinic or center.

Inclusion criteria for this study were; (1) participant is at least twenty-one-years-old, (2) participant has experienced some pain over the past week or would have experienced pain without the aid of medication, a recent anesthetic procedure (e.g. epidural or trigger point injections), or a medical device (e.g. spinal cord stimulator, pain medication pump), (3) this pain must be present more days than not over the past three months or more, and (4) the participant primarily experiences musculoskeletal pain. Patients with orofacial pain were excluded from this study due to confounding related constructs such as physical appearance, dental pain, and other factors that may affect avoidance and other variables in such a sample. Patients with malignant pain were also excluded to avoid confounds related to living with cancer.

#### *Study Sites*

The solitary site for participant recruitment and participation was the University of Louisville Hospital's Pain Management Center located in the Ambulatory Care

Building on the Health Sciences Campus in downtown Louisville, KY. The Pain Management Center (PMC) is an anesthesiology-based multidisciplinary pain treatment center that largely serves uninsured and indigent patients. The PMC primarily focuses on anesthetic procedures designed to reduce the sensation of pain such as epidural and trigger-point injections, and implantable devices such as a pain medication pump or a spinal cord stimulator. The PMC typically treats approximately 30 patients per day.

### **Procedure**

#### *Initial Participant Contact*

Visits to a medical provider may involve significant periods of waiting. This study was designed to utilize this period of time the patient is waiting with little to do, by asking them to participate in this study while waiting for pain clinic appointments. Initial contact was made while the patient was in the waiting area of the Pain Management Center. They were invited to participate in a study, informed consent was gained, and they were then offered a questionnaire packet to fill out and an interview to complete during their visit. Participants were given the option of completing the interview on the telephone if that was more convenient for them.

#### *Informed Consent*

Human Studies Protection Committee approved a partial waiver of informed consent allowing participants to be recruited from Pain Management Center rosters. All recruitment activity and informed consent was done by either this Investigator or a trained Research Assistant. Once recruited, participants provided signed informed consent before participating in this study. Participants were provided a written copy of an informed consent form that provided details of the study. Participants were informed



of their rights to confidentiality and how researchers in this study maintain confidential records. Each participant was informed about what was required of them to participate in this study, mainly, filling out a brief questionnaire and completing a brief interview. Risks and benefits of participation, as well as study personnel and contact information were also reviewed verbally and presented in a written copy. Participants were also informed that their pain center medical chart would be reviewed to extract information related to their pain and to ascertain the reason for their current visit. Participants were given a copy of the informed consent form for their personal records. Privacy related issues pertaining to HIPAA were reviewed at this time. Self-report questionnaire, structured interview procedures, and chart review approach are outlined below. These procedures were pilot-tested. A description of the pilot testing follows beginning on page 46.

#### *Questionnaire Administration*

The brief questionnaire packet (see APPENDIX A, page 176), along with a pen and clipboard, was given to the eligible participant after informed consent was obtained by this Investigator, or the Research Assistant. Participants were encouraged to fill out this packet while waiting to be triaged for medical care, for their exam or for a procedure in an examination room. All efforts were made to ensure patient privacy and to ensure data collection complied with HIPAA standards. The questionnaire portion of this study took approximately 15-20 minutes to complete. Once participants completed the questionnaire the packet was collected and participants were asked to complete the interview portion of the study. All interviews were conducted by this Investigator only. If the participant had not completed the questionnaire by the time their pain clinic

appointment was over they were provided two options. The first, and preferred, option offered was to allow them to complete the packet in the waiting area after their visit. The second option was to allow them to complete the questionnaire at home. If they choose the second option of completing the study at home they were asked to return it to the Pain Management Center on their next visit. If they chose this method an envelope bearing the study name was provided (the participant were instructed not to put their name on the outside of the packet) and they were invited to place the packet in the envelope and return the envelope to the PMC where it was placed in a locked file room. Completed packets were collected by study personnel only, after a maximum time of one week post – PMC visit.

#### *Brief Interview*

Once the questionnaire portion of the study was complete the participant was invited to participate in a structured interview using the Possible Selves Questionnaire (see APPENDIX B, page 191). The interview was conducted in a private area of the PMC where other patients were less likely to hear participant responses. If the participant had not yet been triaged then the interviewer asked the participant to briefly join them for a short interview in an available exam room upon checking availability with pain center staff. If no room was available, the interviewer waited until the participant had been triaged and then conducted the interview in the exam room while the participant was waiting for their physician or for their pain management procedure. Particular care was given so that staff and physician duties were not interrupted or disturbed by administration of the questionnaire or interview. If a physician arrived or if the patient

was needed by staff, study personnel excused themselves and resumed administration at the next convenient time or after the appointment.

If there was insufficient time to conduct the interview during the participant's pain center appointment they were offered two options. One possible, and preferred, option was for the participant to complete the interview after their appointment. If this option was not feasible then the participant was given the opportunity to complete the interview over the telephone at a later date, not to exceed 6 weeks post-questionnaire completion. Contact information was collected along with participant availability to ensure that the phone interview was minimally invasive. Once the interview section of the study was completed participants were thanked and informed that all needed information had been gathered and no further action was needed on their part. Any papers or forms bearing patients phone numbers or availability were then shredded or placed in an appropriate locked container of material to be shredded.

#### *Chart Review*

On the same day as the participant's visit to the pain center, their medical chart was reviewed to obtain the following information: reason for their current PMC visit; their self-rated pain location and intensity, and the most recent pain-related diagnosis. This information was chosen, in part, due to its ready availability in each patient's chart. Physician and staff usage of the medical chart took precedence over use by study personnel, and personnel attempted to reduce any possible inconvenience to staff or disturbance of clinic flow.

### *Pilot Study*

To test the feasibility of study procedures as well as to anticipate potential problems that may come up in participant accrual, a small pilot study was conducted. Fifteen participants, who were patients in the University of Louisville Pain Management Center, were asked to participate in a brief pilot study and none refused to participate (though one pilot subject did not complete the majority of the questionnaire packet). A total of 9 pilot participants were administered both the questionnaire and the structured interview and three of the six who could not complete the interview at that time agreed to be called later. Each participant was roughly timed to calculate a total administration time for each component of this study. Participants took an average of 20 minutes to complete the written questionnaire and 15 minutes to complete the brief interview. Only a few items were missing from participants who did complete the questionnaire and no one questionnaire consistently had missing items.

Other important information was gained about the feasibility of this study during pilot testing. The administrative specialist at the pain center reported a total of 442 patients actually seen during the month of May, and 130 cancellations or missed appointments. The pain center conducted 54 intakes in the month of May and 57 intakes in each of the months of February, March, and April. Given this information about clinic flow, it was determined that collecting the required number of participants for this study projected by power analysis was feasible.

### *Participant Accrual*

This study necessitated approximately 140 participants for a moderate effect size; this number accommodates for approximately 20 participants with incomplete data.

Power analysis for the projected sample size is presented on page 59. Data was collected approximately 3 days per week and with an average of 3-4 participants per day, yielding approximately 9-12 participants accrued each week.

Participants in this study did not receive any gift or monetary incentives and were not reimbursed in any way for their involvement. Due to this lack of financial incentive and reimbursement, study personnel emphasized that the participant was aiding in the research and understanding of chronic pain by their participation in this study. To stimulate PMC staff interest in the project and facilitate participant recruitment and participation, staff at the pain management center (e.g. nursing and clerical staff) were provided with education about the study rationale, background and procedures.

#### *Data Collection*

The collection of data for this study was done at one time point for questionnaire completion and one time point for structured interview for each participant. No follow-up or re-test data was collected. The period of data collection did not exceed six-months, thus reducing the variability in extraneous variables such as effects due to time of sampling.

### **Measures**

#### Questionnaire Measures

For a brief overview of the measures in this study along with psychometric information and references see Table 1, on pages 122-123. Figure 5, on page 156, lists which measure is assessing each stage of the Avoidance Cycle.

### *Sociodemographic and Health Questionnaire*

This part of the questionnaire packet was placed first in the packet and was designed to acquire specific sociodemographic variables of interest. Those variables included age, gender, height, weight, ethnicity, marital status, level of schooling completed, yearly household income, and current employment status.

In addition to these sociodemographic variables several descriptive questions were asked specific to chronic pain. These questions asked about the participant's bodily location of pain, how long they have had chronic pain, any treatment they had received and whether or not the treatment was successful in reducing pain intensity, and any relevant diagnosis regarding pain. Other questions were asked in the demographic section regarding psychological history. Participants were asked if they had psychological problems or treatment before the onset of their chronic pain and if any problems or treatment had occurred since chronic pain onset. They were also asked if they had any current psychiatric diagnoses.

### *Visual Analogue Scales*

Visual Analogue Scales are a commonly used method of assessing pain intensity and discomfort. Visual Analogue Scales are commonly used in research as well as in clinical practice as a means of communicating a person's level of pain. Typically Visual Analogue Scales are ratings of pain intensity/severity on an 11-point scale where a rating of 0 equals no pain and a rating of 10 equals worst possible or unbearable pain. This approach was taken to ask each participant to rate their pain. Four different Visual Analogue Scales were used to assess current pain level, highest pain level over past week, lowest pain level over past week, and average pain level over past week. Visual

Analogue Scales have been used with success in the West Haven-Yale Multidimensional Pain Inventory (WHYMPI; Kerns, Turk & Rudy, 1985) and in the McGill Pain Questionnaire (MPQ; Melzack, 1975) and have shown to have strong reliability and validity (Jacob & Kerns, 2001).

### *Pain Catastrophizing Scale*

The Pain Catastrophizing Scale is a 13-item self report measure developed to measure thoughts and feelings participants experience when they are in pain (Sullivan, Bishop, & Pivik, 1995). The instrument offers the prompt “When I’m in pain...” and then provides 13 statements such as “...I feel I can’t go on,” or “...I keep thinking about how much it hurts.” The measure asks participants to rate the frequency of such cognition on a 5-point Likert scale that ranges from 0=not at all to 4=all the time. The Pain Catastrophizing Scale has been validated on numerous samples including adults with postoperative pain (Granot & Ferber, 2005), lower-back pain (Moseley, Nicolas & Hodges, 2004), and neuropathic pain (Sullivan, Lynch & Clark, 2005). A study by Chinball and Tait (2005) used this measure with a sample of heterogeneous ethnicity and included an analysis of the factor structure, yielding the three factors of Rumination, Magnification, and Helplessness, all of which are conceptualized as components of catastrophizing. The Pain Catastrophizing Scale was also found to have stable validity across gender (D’Eon, Harris & Ellis, 2004) and was found to have good criterion-related, discriminant and concurrent validity in a community sample (Osman et al., 2000). The total measure demonstrated good internal consistency in this study’s sample (Cronbach’s alpha = .945) as well as for the subscales of Rumination ( $\alpha = .886$ ), Magnification ( $\alpha = .762$ ), and Helplessness ( $\alpha = .908$ ).

### *The Acceptance and Action Questionnaire- version II*

The original Acceptance and Action Questionnaire was developed by Hayes et al. (2004) to measure experiential avoidance. The Acceptance and Action Questionnaire was developed out of 32 statements "designed to assess a high need for emotional and cognitive control, avoidance of negative private events, inability to take needed action in the face of private events, and forms of cognitive entanglement, such as excessively negative evaluations of private experiences or negative self-references" (Hayes et al., 2004). Structural equation modeling was used to factor analyze the 32-item version and the researchers found that a 9-item version is highly correlated with the previous, longer version (Hayes et al., 2004). The 9-item Acceptance and Action Questionnaire was then validated on samples including HMO clients, college students, agoraphobics, women with Borderline Personality Disorder and United Kingdom government civil servants, with other measures of related constructs such as anxiety, depression, well-being, quality of life, dissociation, thought suppression and coping. In total, the scale was validated on a sample of 2,415 participants. The Acceptance and Action Questionnaire showed divergent validity from related constructs such as thought suppression, dissociation, and coping ( $r < .40$ ) and was correlated with quality of life measure ( $r = -.40$ ), and well-being ( $r = -.38$ ) implying a significant relationship exists between experiential avoidance and quality of life (Hayes et al., 2004).

Due to some complaints that the original 9-item Acceptance and Action Questionnaire was sometimes confusing to participants a second abbreviated version, aptly named the Acceptance and Action Questionnaire-II, has been recently developed (Bond et al., 2009). The Acceptance and Action Questionnaire-II asks participants to rate



the truth of the ten statements on a 7 point likert-scale ranging from 1=never true to 4=sometimes true to 7=always true. Items are quite similar to those of the Acceptance and Action Questionnaire and include such statements as "My thoughts and feelings do not get in the way of how I want to live my life", "I am afraid of my feelings", and "I am in control of my life". Appropriate items are reversed scored so a higher score indicates a lower level of experiential avoidance and higher acceptance. Though the article examining the psychometrics of the Acceptance and Action Questionnaire-II is currently being written, information posted by the author on the ACT internet-based listserv has reported that the Acceptance and Action Questionnaire-II has been piloted on 6 different samples with a total of 3,058 participants. Results from these studies have shown strong divergent and convergent validity with measures of health, depression, and anxiety. The Acceptance and Action Questionnaire-II was not correlated with social desirability. The Acceptance and Action Questionnaire-II was used in the present study in an effort to remain current with up-to-date assessment measures. Also there is limited available data on the Acceptance and Action Questionnaire-II with chronic pain populations, thus this study provided normative data for use in chronic pain populations. The AAQ-II demonstrated good reliability in this sample (Cronbach's alpha = .865). Results are compared with the Chronic Pain Acceptance Questionnaire as it is a commonly used and well regarded measurement of avoidance in chronic pain populations.

#### *The Chronic Pain Acceptance Questionnaire*

The Chronic Pain Acceptance Questionnaire (Geiser, 1992) was developed from the early versions of the Acceptance and Action Questionnaire as a measure of one's acceptance of pain. Originally 34-items, the self-administered questionnaire asks the

participant to rate the truth of each statement on a seven point likert scale ranging from 0=never true to 6=always true. Items included such statements as "It's OK to experience pain", "it's not necessary for me to control my pain in order to handle my life well", and "My worries and fears about what pain will do to me are true". Appropriate items were reversed scored so that a higher score indicates higher acceptance. Factor analysis of the Chronic Pain Acceptance Questionnaire revealed four factors titled "(1) activity engagement (pursuit of life activities regardless of pain); (2) pain willingness (recognition that avoidance and control are often unworkable methods of adapting to chronic pain); (3) thought control (belief that pain can be controlled or changed by altering one's thoughts); and (4) chronicity (recognizing that pain may not change; McCracken, 1999). McCracken, Vowles, & Eccleston (2004) performed a component analysis of the 34-item version and found that the two factors of activity engagement and pain willingness were significant predictors of pain-related disability and distress. Using items from these two factors, the researchers recommend use of a 20-item version that has strong inter-item correlation, internal consistency, and predictive validity. The 20-item version of the Chronic Pain Acceptance Questionnaire was used in this study. The CPAQ showed good internal reliability for the total score (Cronbach's alpha = .887) and for the subscales of Activity Engagement ( $\alpha = .884$ ), and Pain Willingness ( $\alpha = .780$ ) in this study's sample.

*Center for Epidemiological Studies Depression Scale Short Form (CES-D-10)*

The Center for Epidemiological Studies Depression Scale Short Form (CES-D-10; Andresen et al., 1994) is a 10-item scale used to measure depressive symptomology in this study. The CES-D-10 was developed from the CES-D which was a longer 20-item

version of the measure (Radloff, 1977), and has been shown to be strongly correlated with the longer 20-item version and other measures of depression (Zauszeniewski, 2004). Though this instrument does not diagnose depression on its own, it has been shown as a valid and reliable measure of depressive symptoms and has been used extensively on populations dealing with quality of life issues and disability such as patients with diabetes (Rubin et al., 2004), multiple sclerosis (Harrison & Stuifbergen, 2001), and rheumatoid arthritis (Ward, 1994). The CES-D-10 has also been used with patients experiencing chronic pain from various conditions such as lumbago and phantom limb pain, and pain has been shown to be a risk factor for depression indicated by severe scores on the CES-D-10 (Darnall et al, 2005). In this sample the CES-D-10 demonstrated fair internal consistency (Cronbach's alpha = .655)

#### *Beck Anxiety Inventory (BAI)*

The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown & Steer, 1988) is a 21-item self-report questionnaire that asks to what extent the participant was bothered by several symptoms of anxiety such as “wobbliness in legs” or “hands trembling”. The resulting score is then compared to cut scores for normal/minimal, mild to moderate, moderate to severe, and severe anxiety. The BAI has been shown to have strong reliability, and strong concurrent, construct, and discriminant validity (Beck & Steer, 1990). Factor analysis of the BAI yielded for factors including Neurophysiological, Subjective, Panic and Autonomic subscales (Beck & Steer, 1990). The BAI has been used with chronic pain populations with little complication (Hadjistavropoulos & LaChapelle, 2000). The BAI asks about symptoms over the past week and was used as a

measure of current anxiety symptoms for this study. It had good internal reliability in the current sample (Cronbach's alpha = .929).

*Medical Outcomes Study: Short-Form 12-Item Health Survey (SF-12)*

The Medical Outcomes Study was a large scale study developed to assess variation of patient health-related outcomes in the United States, and was conducted at several sites over the course of several years. The SF-36 was developed from the Medical Outcome Study as a 36-item measure of quality of life, consisting of eight subscales loaded onto the two components of Physical Health and Mental Health (Kosinski, 1997). When additional studies on the SF-36 found that more than 80% of the variance in the eight subscales is accounted for by the physical and mental health components (Ware et al., 1995), a twelve item version of the SF-36 was designed to focus specifically on these two components. The SF-12 is a commonly used 12-item measure that assesses quality of life and loads onto the two components of physical health and mental health. The SF-12 has been shown to be reliable and valid and has been used on a wide variety of various health populations (Ware, Kosinski, & Keller, 1996). The SF-12 was shown to be internally reliable in this sample (Cronbach's alpha = .849). The SF-12 was used in this study along with one question about change in health from the SF-36. The SF-36 item "Compared to one year ago, how would you rate your health in general now?" includes response options on a 5-point scale ranging from "Much better than one year ago," to "Much worse than one year ago." This item is valid and reliable as it stands alone and does not load on any subscale or component score on the SF-36. This item was used to test the secondary aim that the Cycle of Avoidance can be conceptualized as a downward progressing spiral.

### *Pain Disability Index*

The Pain Disability Index is a 7-item measure that assesses disability by asking the participant to rate how much pain interferes with their lives in the seven domains of Family/Home Responsibilities, Recreation, Social Activity, Occupation, Sexual Behavior, Self-Care, and Life Support Activities (Pollard, 1981). Participants rate their disability in each of these domains on an 11-point Likert scale where 0 equals no disability and 10 equals total or worst disability. The Pain Disability Index has been normed on large samples of chronic pain patients (Chinball & Tait, 1994) and analysis of the factor structure of the Pain Disability Index reveals two factors, discretionary activities and obligatory activities, for this measure (Jerome & Gross, 1991). In a study by Gronbald et al (1993), the Pain Disability Index was found to be correlated with other longer measures of disability, have good test-retest reliability, and to measure a broader level of disability than just that directly related to pain intensity. Several other studies have supported the construct validity, reliability, and two-factor structure of the Pain Disability Index in a clinical sample of chronic pain patients (Tait, Chinball & Krause, 1990; Tait et al., 1987). It had good reliability in the current sample (Cronbach's alpha = .861).

### *Anxiety Sensitivity Index*

The Anxiety Sensitivity Index (Reis et al., 1986) is a 16-item self-report questionnaire where participants rate on a five-point Likert scale how concerned they are about the possible negative effects of anxiety-related symptoms. The scale is then scored by summing participant's answers, and the resulting score serves as an indicator of one's anxiety sensitivity ranging from 0 to 64, where a larger number equals greater anxiety

sensitivity. The Anxiety Sensitivity Index has been used to study a number of anxiety disorders including Panic Disorder, PTSD and Generalized Anxiety Disorder (Schmidt, Zvolensky, & Maner, 2006; Rubin et al., 2000; Bernstein et al., 2005; Rector, Szacun-Shimizu, & Leybman, 2006). The Anxiety Sensitivity Index has also been used in studying patients with chronic pain and has been used in predicting pain-related fear and anxiety (Zvolensky et al., 2001; Greenberg & Burns, 2003). Studies have shown the Anxiety Sensitivity Index to possess high internal consistency and show good test-retest reliability (Peterson & Reiss, 1992). The structure of the Anxiety Sensitivity Index is conceptualized in such a way that the three first-order factors of Physical Concerns, Cognitive Concerns, and Social Concerns all load onto the higher-order factor of Global Anxiety Sensitivity (Zinbarg et al., 1997). Only the total score on the ASI was used in this study and was shown to have good internal consistency (Cronbach's alpha = .930).

#### Interview Measure

##### *Possible Selves Questionnaire*

The Possible Selves Questionnaire (Morley, Davies & Barton, 2005) is a brief measure designed to be administered in a structured interview format (see Appendix B, page 193). The interview asks the participant to generate up to 10 characteristics that describe the three possible selves of the actual self, the hoped-for self, and the feared for self. The interview then asks the participant to answer yes or no to whether they could achieve any of these characteristics in the future if they were still in pain. This question is designed to measure pain enmeshment, i.e. how much are future schemas dependant upon the presence or absence of pain. Scores on these questions are achieved by taking the ratio of enmeshed responses (e.g. I cannot be happy in the future with pain) over the

number of total responses. These ratios are created for the hoped-for self (Hoped-for Enmeshment subscale) and for the feared-for self (Feared-for Enmeshment). An average of the two ratios makes up the Total Enmeshment score.

Following participant generation of characteristics and rating of projected achievement if in pain, participants are then asked to rate on 7-point Likert scales how capable they are of achieving the characteristics listed for the hoped-for self and how capable they are of avoiding the characteristics listed for the feared-for self. These questions are designed to measure the participant's *efficacy* regarding the future. Participants are also asked to rate on a 7-point Likert scale the likelihood that those characteristics mentioned will describe them in the future, a question designed to measure the participant's *expectancy* for the future. These questions designed to find discrepancies in possible selves is modeled after established methods developed by personality researchers (Higgins, Bond, Klein, & Strauman, 1986; Hooker & Kaus, 1994).

The Possible Selves Questionnaire was chosen for this study for several reasons. One reason was to reduce measurement error inherent in only using one type of measurement (e.g., self-report questionnaires) to assess participant's characteristics. By including a brief interview, the shared method variance is lowered and it is more likely to gain accurate responses on measures. A second important reason the Possible Selves Questionnaire was chosen is because it is currently the only published measure available that is designed to assess pain enmeshment. Though this measure is novel, further study of the Possible Selves Questionnaire has demonstrated some reliability and divergent validity (Morley, Davies & Barton, 2005). For instance, enmeshment, as assessed by this

measure, was reliably associated with acceptance and depression across a replication study, while enmeshment was not shown to be accounted for by generalized hopelessness or biased by verbal fluency (Sutherland & Morley, 2008).

#### Information from Chart Review

In addition to information obtained from self-report questionnaires and from brief interview, three variables in this study were gained from medical chart review. Each participant's clinical chart was used to determine the reason for the patient's current PMC visit, verification of primary chronic pain intensity and location at intake, and current diagnoses. The reason for the patient's visit to the pain clinic is important due to potential effects on dependent variables in this study such as avoidance, anxiety and depression. The University of Louisville Pain Management Center performs several different operations of varying degrees of invasiveness including assessment procedures; treatment procedures such as epidural injections and trigger-point injections; behavioral medicine; follow-up examinations; and medication-related appointments. Depending on the reason for the participant's visit, anxiety and avoidance attitudes may be high relatively in anticipation of a procedure they will undergo. Gaining the type of visit information from the chart allowed this study to examine differences in anxiety and avoidance by type of visit.

Using the patient chart to obtain pain location and diagnosis served as a check of self-report accuracy from the participants' answers reported in the demographic section of the questionnaire packet. Pain location was used to ensure that the pain the participant is reporting about in this study's questionnaire packet is the same pain being treated by



the Pain Management Center. Chart information was also useful in roughly gauging how knowledgeable the patient is of his or her own diagnoses.

## **Data Analysis**

### *Sample Size Calculation*

Sample size was calculated to perform analyses of (1) individual linear relationships, (2) potential mediation relationships, and (3) potential moderation relationships. A Bonferroni correction was made based on an alpha level of .05 divided by the number of tests per comparison. For example, there were four individual linear analyses in Hypothesis 1 (enmeshment predicted by [1] pain intensity, [2] anxiety sensitivity, [3] catastrophizing, and [4] experiential avoidance) so an adjusted alpha of .0125 (.05/4) was used to test for significance in H1. In Hypothesis 2 five tests were ran (enmeshment predicting [1] physical quality of life, [2] mental quality of life, [3] disability, [4] depression, and [5] anger) so an adjusted alpha of .01 (.05/5) was used to test for significance in H2. If significance was found with total scores on construct measures then subscale scores on that measure were examined using an unadjusted alpha (.05). In tests of mediation and moderation three primary analyses were run in each of Hypotheses 3, 4, and 5, thus an adjusted alpha of .017 (.05/3) was used. These Bonferroni corrections were used to help to maintain a family wise error rate of .05 while not radically sacrificing power. Power analysis was done based on an estimated moderate effect size, which was .30 for individual comparisons, and .36 for tests of mediation and moderation. G\*Power (Buchner, Erdfelder, & Faul, 1997) estimates a needed sample size of N=132 for individual comparisons, N=117 for mediation analyses,

and  $N=99$  for moderation analyses. Based on these calculations, the sample size of 139 for this study is adequate to yield enough power to detect differences.

### *Descriptive Statistics*

Descriptive statistics were provided based on both self-report and chart review. This study utilized a chronically underserved sample, namely persons in chronic pain without private insurance. Due to the heterogeneity that exists in such a sample, several demographic characteristics were assessed to paint a descriptive picture of the collected sample. Demographics such as age, body mass index, and pain duration were examined by calculating means, standard deviations and ranges. Other categorical descriptors such as marital status, level of education, occupation, and pain location were examined by calculating frequencies for each category. This information was provided as a way to describe the collected sample with hopes to increase the generalizability of this study to other similar populations.

### *Analyses for Hypothesis Testing*

Hypotheses 1 and 2 were tested using linear regression to test if independent variables predicted dependent variables. Hypotheses 3 and 4 were tested using conditions for mediation outlined by Fritz and MacKinnon (2007) which utilizes the four-step process for finding partial mediation developed by Baron and Kenny (1986). The method for testing these conditions in this study was prescribed by Frazier, Tix, & Barron (2004). The moderation effect in Hypothesis 5 was tested by examining the interaction effect between anxiety sensitivity and pain intensity (Holmbeck, 1997) using the method of Frazier, Tix, & Barron (2004). Examination of Hypothesis 6 was done with descriptive statistics and post hoc t-tests. Lastly, Hypothesis 7 was analyzed by

employing discriminant analysis and independent samples t-tests to examine post hoc differences between groups of participants.

## RESULTS

### **Participant Characteristics**

#### *Response Rates*

A total of 345 patients at the University of Louisville Pain Management Center were invited to participate in this study. 272 patients consented to participate in the study (78.8%), 175 completed at least the written questionnaire (50.4%), and 139 participants completed both the questionnaire and interview (40.3%). Only three participants withdrew consent during the study; all three cited participation burden as their reason for withdrawal.

#### *Characteristics of Completers versus Non-Completers*

Within this study *completers* are operationalized as those participants who completed all parts of the study, namely written questionnaire, chart data, and interview. *Non-Completers* are operationalized as those participants who completed the written questionnaire, have chart data, but who did not complete the interview portion of the study. There are several factors which may have resulted in a particular participant not completing the interview portion of the study. These factors include not leaving contact information for interview follow-up, providing a phone number that was disconnected or temporarily out of service when contact calls were attempted, and not being able to be reached to complete the interview within the six week limit following receipt of written questionnaire. In this study 139 participants were classified as completers, while 36

participants were classified as non-completers. Completers and non-completers did not differ significantly on demographic continuous variables such as age, body mass index, and pain characteristics. Regarding categorical variables non-completers were more likely to be men (50% non-completers vs. 38.8% completers), were more likely to be Caucasian (83.3% non-completers vs. 77.7% completers), were less likely to be African-American (16.7% non-completers vs. 20.1% completers), were more likely to have never been married (27.8% non-completers vs. 18.7% completers), and were more likely to live alone (27.8% non-completers vs. 21.7% completers). Other demographic categorical variables did not differ significantly between completers and non-completers. On written questionnaire scores (ASI, AAQ-II, CPAQ, CES-D-10, BAI, SF-12, PDI) there were no significant differences between completers and non completers. Caution should be taken when interpreting differences or lack of differences between these two groups because of unequal sample sizes. For all subsequent analyses reported for this dissertation, only completer responses will be reported, including demographics, correlations, and hypothesis testing. From this point on the term *participants* will only refer to those 139 participants defined here as completers.

#### *Completion Rates for Study Measures*

The number of participants who answered every item on a given questionnaire and the relative percentage compared to the entire sample is listed in Table 6, page 133. Subscale completion rates are also listed in this table. Completion rates ranged from 78.4% to 100%. With the exception of one measure, the CPAQ and its two subscales, no measure had less than an 89.2% completion rate. No values were imputed for items with

missing data, thus the reported rates are true rates of completed measures. All data was manually entered, cleaned, and examined for any outliers.

### *Participant Demographics*

The demographic variable results presented below are broken up into three distinct categories: general demographics (gender, ethnicity, marital status, income, occupation, etc.), pain characteristics (duration, intensity, location, etc.), and psychological characteristics (psychological problems before pain onset, psychological problems after pain onset, psychological treatment, etc.). For descriptive purposes these characteristics will be examined separately in the following sections.

### *General Demographics*

General demographics were self-reported from study participants and are summarized in Table 2 (page 124). The following statement lists the means or frequencies of the most endorsed characteristic for each demographic variable. Participants were largely middle aged ( $M$  age=45.43,  $SD$ =10.68), overweight ( $M$  BMI=32.16,  $SD$ =8.21), female (61.2%), Caucasian (77.7%), divorced (41.0%), living with a partner or spouse (22.3%), had a highest level of education of a high school diploma or GED (41.0%), had an annual household income of less than \$10,000 (54.0%), and were disabled (59.7%).

Table 3 (page 127) compares demographics from this study's sample with those from the recruitment city, state, and nation (US Census Bureau, <http://quickfacts.census.gov/qfd/states/21000.html>). Overall, women are over represented in this study's sample compared to city, county, state, and national population estimates. With regard to ethnicity in this sample, Caucasians are

representative of city and county estimates and under representative of state and national estimates. African-Americans are under represented in this study compared to city census data, representative of county data, and over representative of state and national data. With regard to education, the percentage of high school graduates is representative of city, county, state, and national data. Lastly, compared to city, county, state and national estimates our sample had a much lower median income. These characteristics, coupled with those listed previously, highlight a largely understudied and underserved sample particularly with regard to education, socioeconomic status, and disability.

#### *Pain-related Characteristics*

Table 4 (page 128) outlines the pain-related variables examined in this study. With regard to pain intensity, participants rated their current pain intensity as high on a 0 to 10 scale where 10 equals worst possible pain ( $M=6.60$ ,  $SD=2.17$ ). Ratings of lowest, highest, and average pain in past week roughly centered on current pain ratings. Ratings taken from the participants' chart at time of intake were slightly higher ( $M=7.05$ ,  $SD=1.65$ ) than current ratings of pain intensity at the time of study questionnaire completion. Participants reported experiencing pain for an average of nearly seven years ( $M=6.94$  years,  $SD=6.77$ ), and had pain in multiple pain sites ( $M=2.35$  sites,  $SD=1.52$ ). The most common pain site was the lower back (76.3%), and the most common diagnosis was degenerative disc disease (48.2%) according to patient self-report, and lumbago (61.2%) according to physician diagnosis from chart. The number of pain diagnoses also differed between patient self-report ( $M=1.60$ ,  $SD=1.11$ ) and chart information ( $M=2.30$ ,  $SD=1.10$ ). The most common treatment for pain was medication (89.2%), followed by anesthetic injection (61.2%), then chiropractics (30.2%). Of those who had a specific

treatment provided, the highest endorsed treatment success rate was for medication (74.2% satisfied), followed by anesthetic injection (59.3%), and then counseling or therapy (34.3%). At the time of consent for study participation, most patients were present for an initial appointment (43.2%), followed by coming to the clinic for a procedure (29.5%), and lastly coming to clinic for a follow-up appointment (27.3%).

### *Psychological Characteristics*

Table 5 (page 131) lists the psychological characteristics of the study sample. Of the sample, just over a quarter (25.2%) of participants reported that they had tried counseling or therapy to help treat their chronic pain. Of those participants 34.3% reported that they felt that this treatment was successful in treating their pain. Rates of psychological problems prior to onset of chronic pain appear to be much higher in this sample compared to epidemiological data of adults in the US. For example, 30.2% of the sample reported that they have had problems with depression, the most commonly endorsed problem, prior to onset of pain, while approximately 9.5% of adults suffer from depression in a given year (Regier, Narrow, & Rae, 1993) and lifetime prevalence rates range from 4.9-17.1% (Ingram, Scott, & Siegle, 1999). The percent of participants reporting no psychological problems prior to onset of chronic pain was 49.6%. Just over one-fifth of the sample (21.6%) reported psychological treatment prior to onset of chronic pain, with an average of 37.67 (51.37) sessions. Following onset of chronic pain, participants reported a much higher rate of psychological problems. For example, 64% reported problems with depression (post pain onset), nearly double the prior to pain prevalence. Nearly all other psychological problems showed a doubling in rate after chronic pain. Similarly, the number of reported psychological problems showed a



twofold increase. Only 14.5% of participants reported no psychological problems after pain onset. Approximately 37.4% of participants reported psychological treatment after onset of chronic pain with an average of 21.44 (31.85) sessions. 28.1% of participants reported having a current psychological diagnosis.

#### *Descriptives of Study Measures and Subscales*

The means and standard deviations for each study measure total score and subscale are listed on Table 6, page 133.

### **Associations between Avoidance Cycle Constructs**

#### *Demographic Differences*

##### *Gender, Ethnicity, and Age Differences on Avoidance Cycle Constructs*

Independent sample t-tests were run to detect any differences that might exist between men and women on measures of study constructs. These t-tests were performed for both total scores and subscale scores for the constructs of pain intensity, anxiety sensitivity, catastrophizing, enmeshment, experiential avoidance, depression, anxiety, quality of life, and disability. No significant differences were found between men and women when compared at the .05 alpha level. Independent sample t-tests were also conducted for the same constructs to test for significant differences between Caucasians and African Americans on measures' total scores and subscale scores. No significant differences were found between Caucasians and African Americans. Bivariate correlations were run using Pearson's  $r$  to test for significant correlations between participants' age and measures total and subscale scores. Age was not found to be significantly correlated with measure or subscale scores. Because no significant

differences were found between gender, ethnic groups, and age on measures of study constructs no attempts to control for these variables were made on subsequent analyses.

#### *Socioeconomic Differences on Avoidance Cycle Constructs*

Independent samples t-tests were run to detect differences based on participants' household annual income and level of education. Participants who had an annual household income of less than \$10,000 had higher levels of pain-related experiential avoidance,  $t(106) = -2.043$ ,  $p = .044$  (2-tailed), less willingness to experience pain,  $t(119) = -2.509$ ,  $p = .013$  (2-tailed), more frequent occurrence of depressive symptoms,  $t(126) = 2.328$ ,  $p = .022$  (2-tailed), more severe symptoms of anxiety,  $t(124) = 2.799$ ,  $p = .006$  (2-tailed), lower quality of life related to physical components,  $t(95.388) = -2.250$ ,  $p = .027$  (2-tailed), and greater disability,  $t(123) = 2.314$ ,  $p = .022$  (2-tailed) compared to those with income greater than \$10,000. No significant differences on study measures and subscales were found between participants with a high school diploma or less education and participants with greater than a high school education.

#### *Associations between Avoidance Cycle Constructs*

Correlations among constructs within this study are listed in table 9 (page 137).

#### *Associations between Avoidance Cycle Constructs and Outcome Variables*

##### *Quality of Life*

This study's measure of quality of life, the SF-12, is divided into two component scores, the Physical Component Summary (SF-12 PCS) and the Mental Component Summary (SF-12 MCS). Pearson's  $r$  statistic was used to examine the significance of correlations between study measures' total and subscale scores, and these two summary scores of the SF-12. Table 7 (page 135) summarizes these relationships and

corresponding levels of significance using alpha values of .05 and .0125. The strength of the correlations was rated based on the Pearson's  $r$  value (either positive or negative) on the following scale: Low = .11 to .30; Moderate = .31 to .50; High .51 and larger. With regard to the SF-12 PCS, significant low correlations were found with scores of current and average pain intensity (VAS), catastrophizing (PCS total score), Helplessness (PCS subscale), Feared-for Enmeshment (PSQ), Activity Engagement (CPAQ subscale), depression (CES-D-10), and anxiety (BAI). Significant moderate correlations were found between the SF-12 PCS and scores of pain-specific experiential avoidance (CPAQ total), Pain Willingness (CPAQ subscale), and disability (PDI).

With regard to the SF-12 MCS, significant low correlations were found with scores of current and average pain intensity (VAS). Significant moderate correlations were found between the SF-12 MCS and anxiety sensitivity (ASI), Magnification (PCS subscale), Hoped-for Enmeshment (PSQ), Pain Willingness (CPAQ), depression (CES-D-10), and disability (PDI). High correlations were found between the SF-12 MCS and catastrophizing (PCS), Rumination (PCS subscale), Helplessness (PCS subscale), global experiential avoidance (AAQ-II), pain-specific experiential avoidance (CPAQ total), Activity Engagement (CPAQ subscale), and anxiety (BAI).

### *Disability*

Pearson's  $r$  statistic was used to examine the significance of correlations between study measures' total and subscale scores, and the total score on the Pain Disability Index (PDI) this study's measure of disability. Table 8 (page 136) summarizes these relationships and corresponding levels of significance using alpha values of .05 and .0125. All measure and subscale scores were found to be statistically significantly

correlated with the PDI. The strength of the correlations was rated based on the Pearson's  $r$  value (either positive or negative), again, on the following scale: Low = .11 to .30; Moderate = .31 to .50; High .51 and larger. Significant low correlations were found between the PDI and scores of Hoped-for Enmeshment (PSQ) and Feared-for Enmeshment (PSQ). Significant moderate correlations were found between the PDI and scores of current and average pain intensity (VAS), anxiety sensitivity (ASI), Rumination (PCS subscale), Magnification (PCS subscale), global experiential avoidance (AAQ-II), depression (CES-D-10), physical components of quality of life (SF-12 PCS), and mental components of quality of life (SF-12 MCS). High correlations were found between PDI and catastrophizing (PCS total), helplessness (PCS subscale), pain-specific experiential avoidance (CPAQ total), Activity Engagement (CPAQ subscale), Pain Willingness (CPAQ subscale), and anxiety (BAI).

### **Hypotheses Testing**

*Aim 1: Exploring the Relationships between Chronic Pain and Avoidance Cycle*

#### *Constructs*

*Hypothesis 1 (H1): Model constructs of pain intensity, anxiety sensitivity, catastrophizing, and experiential avoidance will individually be related to enmeshment.*

This hypothesis was tested using four primary tests of linear regression. The four tests were participants' scores on the visual analogue scale (VAS) current pain intensity scale, the total score on the Anxiety Sensitivity Index (ASI), the total score on the Pain Catastrophizing Scale (PCS), and the total score on the Chronic Pain Avoidance Questionnaire (CPAQ) used in four separate regression equations to predict the participants' total score on the Possible Selves Questionnaire (PSQ), the measure of

enmeshment. Each comparison was tested against an alpha value of .0125 to control family wise error rate. When significant results were found using the adjusted alpha for any of these four comparisons, further analyses at the unadjusted alpha level ( $\alpha = .05$ ) were conducted to examine relationships between related predictor constructs (e.g. average pain intensity over past week), measure subscale scores (e.g. PCS subscale scores, CPAQ subscale scores) and predicted variable subscales (e.g. PSQ subscale scores).

#### *Current Pain Intensity Predicting Enmeshment*

Participants' rating of current pain intensity (VAS) did not predict Total Enmeshment (PSQ total) using linear regression,  $F(1, 137) = .890, p = .347$ . No further analyses of related pain intensity variables or PSQ subscales (e.g. Hoped-for Enmeshment, Feared-for Enmeshment) were conducted.

#### *Anxiety Sensitivity Predicting Enmeshment*

Participants' score on the measure of anxiety sensitivity (ASI) did not predict Total Enmeshment (PSQ total) using linear regression,  $F(1, 126) = .968, p = .327$ . No further analyses of anxiety sensitivity and PSQ subscales were conducted.

#### *Pain Catastrophizing Predicting Enmeshment*

Participants' score on the measure of pain catastrophizing (PCS) significantly statistically predicted Total Enmeshment (PSQ total),  $F(1, 131) = 24.550, p < .001$ . These two variables were found to be moderately correlated ( $r = .397, p < .001$ ). Further analyses found that the total score on the PCS statistically predicted scores on the PSQ subscale of Hoped-for Enmeshment,  $F(1, 131) = 19.997, p < .001$ , and found a moderate correlation between the two variables ( $r = .364$ ). Participants' total score on the PCS also

predicted scores on the PSQ subscale of Feared-for Enmeshment, but not as strongly,  $F(1, 129) = 10.778, p = .001$ , as a low correlation was found ( $r = .278, p = .001$ ). Based on these findings further analyses were conducted to examine the relationship between PCS subscales (Rumination, Magnification, Helplessness) and enmeshment.

The Rumination subscale of the PCS was found to statistically predict participants' total score on the measure of enmeshment,  $F(1, 134) = 23.698, p < .001$ , representing a moderate correlation ( $r = .388, p < .001$ ). When looking at prediction of PSQ subscale scores, the Rumination subscale statistically predicted scores on the PSQ subscale Hoped-for Enmeshment,  $F(1, 134) = 15.315, p < .001$ , and had a moderate correlation between the two variables ( $r = .320, p < .001$ ). To a lesser extent, the Rumination subscale predicted Feared-for Enmeshment,  $F(1, 132) = 13.300, p < .001$ , and was moderately correlated ( $r = .303, p < .001$ ).

The Magnification subscale of the PCS was also found to statistically predict participants' total score on the measure of enmeshment,  $F(1, 136) = 14.541, p < .001$ , representing a moderate correlation ( $r = .311, p < .001$ ). The Magnification subscale was a poorer predictor of PSQ subscales, but still yielded significant results when predicting Hoped-for Enmeshment,  $F(1, 136) = 12.712, p = .001$  (low correlation,  $r = .292, p < .001$ ), and Feared-for Enmeshment,  $F(1, 134) = 6.707, p = .011$  (low correlation,  $r = .218, p = .005$ ).

Lastly, the Helplessness subscale of the PCS was found to be the best predictor of participants' total score on the measure of Total Enmeshment,  $F(1, 133) = 26.009, p < .001$ , which yielded a moderate correlation ( $r = .404, p < .001$ ). The Helplessness subscale also statistically predicted Hoped-for Enmeshment,  $F(1, 133) = 22.286, p < .001$

(moderate correlation,  $r = .379$ ,  $p < .001$ ), and Feared-for Enmeshment,  $F(1, 131) = 10.798$ ,  $p = .001$  (low correlation,  $r = .276$ ,  $p = .001$ ).

#### *Pain-Specific Experiential Avoidance Predicting Enmeshment*

Of all the predictor variables in Hypothesis 1, pain-specific experiential avoidance, as measured by the total score on the Chronic Pain Acceptance Questionnaire (CPAQ), was the best predictor of total score on the measure of enmeshment,  $F(1, 107) = 30.068$ ,  $p < .001$ , with a high-moderate correlation ( $r = .468$ ,  $p < .001$ ). The total score on the CPAQ also reliably predicted the Hoped-for Enmeshment subscale,  $F(1, 107) = 22.796$ ,  $p < .001$  (moderate correlation,  $r = -.419$ ,  $p < .001$ ), as well as the Feared-for Enmeshment subscale,  $F(1, 107) = 14.563$ ,  $p < .001$  (moderate correlation,  $r = -.346$ ,  $p < .001$ ).

The CPAQ subscale of Activity Engagement was a slightly better predictor of enmeshment than the total CPAQ score and reliably predicted Total Enmeshment,  $F(1, 117) = 32.223$ ,  $p < .001$  (moderate correlation,  $r = -.464$ ,  $p < .001$ ), Hoped-for Enmeshment,  $F(1, 117) = 24.740$ ,  $p < .001$  (moderate correlation,  $r = -.418$ ,  $p < .001$ ), and Feared-for Enmeshment,  $F(1, 116) = 13.294$ ,  $p < .001$  (moderate correlation,  $r = -.321$ ,  $p < .001$ ).

The CPAQ subscale of Pain Willingness also reliably predicted Total Enmeshment,  $F(1, 120) = 20.140$ ,  $p < .001$  (moderate correlation,  $r = -.379$ ,  $p < .001$ ), Hoped-for Enmeshment,  $F(1, 120) = 16.334$ ,  $p < .001$  (moderate correlation,  $r = -.346$ ,  $p < .001$ ), and Feared-for Enmeshment,  $F(1, 119) = 9.739$ ,  $p = .002$  (low correlation,  $r = -.275$ ,  $p = .001$ ).

The related measure of global, non pain-specific, experiential avoidance, the Acceptance and Action Questionnaire (AAQ-II) was also tested for prediction of

enmeshment. Though not as strong as its pain-specific version, the CPAQ, the AAQ-II did statistically predict Total Enmeshment,  $F(1, 125) = 12.336, p = .001$  (moderate correlation,  $r = -.300, p < .001$ ), and Hoped-for Enmeshment,  $F(1, 125) = 14.265, p < .001$  (moderate correlation,  $r = -.320, p < .001$ ), but not Feared-for Enmeshment,  $F(1, 123) = 3.546, p = .062$  (low correlation,  $r = -.167, p = .031$ ).

*H2: Enmeshment will be related to functional status (disability and quality of life), as well as psychological distress (depression and anxiety).*

This hypothesis was tested using five linear regressions. The five tests used participants' scores on the Possible Selves Questionnaire to individually predict scores on outcome measures of functional status (SF-12 Physical Component Summary, SF-12 Mental Component Summary, Pain Disability Scale,) and psychological distress (CES-D-10, Beck Anxiety Inventory), in five separate regression equations. Each comparison was tested against an alpha value of .01 to control family wise error rate. The primary relationships hypothesized in Hypotheses 1 and 2 are represented in figure 7 (page 157). When significant results were found using the adjusted alpha for any of these five primary comparisons, further analyses using the unadjusted alpha level ( $\alpha = .05$ ) were conducted to examine relationships between predictor subscales (Hoped-for Enmeshment and Feared-for Enmeshment) and predicted variables.

#### *Enmeshment Predicting Disability*

Participants' total score on this study's measure of Total Enmeshment (PSQ total) was a significant predictor of the total score on the Pain Disability Index (PDI),  $F(1, 124) = 10.664, p = .001$  (low correlation,  $r = .281, p = .001$ ). Additional analyses showed that Hoped-for Enmeshment (PSQ subscale) was a significant predictor of disability,  $F(1,$



124) = 6.239,  $p = .014$  (low correlation,  $r = .219$ ,  $p = .007$ ). Feared-for Enmeshment (PSQ subscale) was also a significant predictor of pain disability,  $F(1, 122) = 6.733$ ,  $p = .011$  (low correlation,  $r = .229$ ,  $p = .005$ ).

#### *Enmeshment Predicting Quality of Life*

Enmeshment was not a significant predictor of the physical component of quality of life (SF-12 PCS),  $F(1, 122) = 6.074$ ,  $p = .015$ , though the correlation between the two factors was significant (low correlation,  $r = -.218$ ,  $p = .008$ ).

Enmeshment was a significant predictor of the mental component of quality of life (SF-12 MCS),  $F(1, 122) = 13.336$ ,  $p < .001$ , and the two factors were moderately correlated ( $r = -.314$ ,  $p < .001$ ). This finding prompted analysis of the two subscales of the Possible Selves Questionnaire (PSQ) and their prediction of the SF-12 Mental Component Summary. The Hoped-for Enmeshment subscale was a better predictor of the mental component of quality of life than the Total Enmeshment score,  $F(1, 122) = 16.240$ ,  $p < .001$  (moderate correlation,  $r = -.343$ ,  $p < .001$ ), while the Feared-for Enmeshment subscale was a poor and non-significant predictor of the Mental Component Summary,  $F(1, 120) = 3.380$ ,  $p = .068$  (low correlation,  $r = -.166$ ,  $p = .034$ ).

#### *Enmeshment Predicting Depressive Symptomology*

Total Enmeshment (PSQ total) was not a significant predictor of participants' score on the study's measure of depressive symptoms (CES-D-10),  $F(1, 127) = 6.408$ ,  $p = .013$ , though a significant but low correlation between the two factors was detected ( $r = .219$ ,  $p = .006$ ). No further analyses were conducted regarding enmeshment subscales predicting depressive symptomology.

### *Enmeshment Predicting Anxiety*

Total Enmeshment (PSQ total) was not a significant predictor of participants' score on the study's measure of anxious symptoms (BAI),  $F(1, 125) = 2.227, p = .138$ . No further analyses were conducted regarding enmeshment subscales predicting anxiety symptoms.

*H3: Experiential avoidance will mediate the relationship between pain intensity and functional status outcomes (quality of life and disability).*

The mediation in this hypothesis was tested using a test of related steps recommended by Fritz and MacKinnon (2007) which utilizes the four-step process for testing partial mediation developed by Baron and Kenny (1986). In testing whether or not pain-specific experiential avoidance mediates the relationship between pain intensity and quality of life, if the following four steps are satisfied experiential avoidance will be considered a mediator (see Figure 9, page 159):

1. A significant relationship exists between pain intensity (Visual Analog Scale; VAS ratings) and quality of life (SF-12). Path c (Figure 9, 1.)
2. A significant relationship exists between pain intensity (VAS ratings) and pain-specific experiential avoidance (Chronic Pain Acceptance Questionnaire; CPAQ). Path a (Figure 9, 2.)
3. A significant relationship exists between pain-specific experiential avoidance (CPAQ) and quality of life (SF-12) exists when controlling for pain intensity (VAS). Path b (Figure 9, 2.)

4. The relationship between pain intensity (VAS) and quality of life (SF-12) is reduced when controlling for pain-specific experiential avoidance (CPAQ).

Path c' (Figure 9, 2.)

Multiple regression was used to test these four conditions using a process outlined by Frazier, Tix, & Barron (2004). These authors recommend testing the four conditions using three separate regression equations. The first regression equation used the predictor variable (pain intensity) to predict the outcome variable (quality of life) and tests path c. The second equation uses the predictor variable (pain intensity) to predict the mediator variable (experiential avoidance) and tests path a. The last regression equation entered both the Predictor variable (pain intensity) and the mediator variable (experiential avoidance) to predict the outcome variable (quality of life) thus testing both path b and path c'. To test if the change between path c and path c' is significant the method recommended by Frazier, Tix, & Barron (2004) was used. Since the difference between c and c' is equal to the product of paths a and b, they recommend testing the significance of the product of paths a and b. This test is done by dividing the product of the unstandardized regression coefficients of path a (*a*) and path b (*b*) by the standard error term thus producing a z-score which can be compared to criterion z-score set at the level of alpha. The standard error term recommended by these authors is the square root of  $b^2sa^2 + a^2sb^2 + sa^2sb^2$ , where *a* and *b* are unstandardized regression coefficients and *sa* and *sb* are their standard errors.

To test if experiential avoidance is a mediator of pain intensity and disability the same process was used with disability (measured with the Pain Disability Index; PDI) replacing quality of life. Comparisons were tested against an alpha value of .017 to

control family wise error rate and against a corresponding z-score of 2.39 (2-tailed). If significant results were found at this level for total measure scores than further analyses were done to test for mediation of related (AAQ-II scores) or subscale scores (CPAQ subscales of Activity Engagement or Pain Willingness)

*Experiential Avoidance Mediating Pain Intensity and Quality of Life*

The first model of mediation tested was participants' ratings of current pain intensity (VAS) and the Physical Component Summary of the SF-12 (SF-12 PCS) mediated by the total score on the CPAQ. Because significant differences existed on the CPAQ and SF-12 PCS between participants who made more or less than \$10,000 of annual household income, dichotomized household income was controlled for in this mediation analysis. Pain-specific experiential avoidance did show partial mediation but that mediation was not significant at the .017 alpha level,  $z = -1.823$ ,  $p = .069$  (see Table 10, page 139). Because the total CPAQ score did not mediate current pain intensity and the physical component of quality of life the subscales of Activity Engagement and Pain Willingness were not investigated.

Next, the relationship was tested between current pain intensity and the Mental Component Summary MCS of the SF-12 (SF-12 MCS) mediated by pain-specific experiential avoidance (CPAQ total score). Again, this analysis controlled for annual household income. The total CPAQ score did significantly mediate the relationship between pain intensity VAS and SF-12 MCS,  $z = -2.804$ ,  $p = .005$  (see Table 11, 140). Since the total CPAQ score was significant for mediation, CPAQ subscales of Activity Engagement and Pain Willingness were investigated at the .05 alpha level ( $z = 1.96$ ).

When investigating Activity Engagement as a mediator between current pain intensity and MCS quality of life, annual household income was not controlled for because it was not significantly associated with any of the examined variables. Activity Engagement was a significant mediator between current pain intensity and the Mental Component Summary,  $z = -2.281$ ,  $p = .023$  (see Table 12, page 141).

In examining the CPAQ subscale of Pain Willingness as a mediator of current pain intensity and the mental component of quality of life (SF-12 MCS), annual household income was again controlled for due to its significant relationship with Pain Willingness. Pain Willingness did prove to be a significant mediator between current pain intensity and SF-12 MCS, even after controlling for annual household income,  $z = -2.720$ ,  $p = .007$  (see Table 13, 142).

#### *Experiential Avoidance Mediating Pain Intensity and Disability*

A second part of testing this hypothesis is examining pain-specific experiential avoidance (CPAQ total) mediating current pain intensity (VAS) and disability (PDI). The analysis again controlled for annual household income due to its correlation with both total CPAQ score and PDI total score. Participants' total score on the measure of pain-specific experiential avoidance was a significant mediator of current pain intensity and disability after controlling for annual household income,  $z = 2.794$ ,  $p = .007$  (see Table 14, page 143). Since the total CPAQ score was significant for mediation, CPAQ subscales of Activity Engagement and Pain Willingness were investigated at the .05 alpha level ( $z = 1.96$ ).

The Activity Engagement subscale of the CPAQ was tested for mediation between current pain intensity (VAS) and disability (PDI) controlling for annual

household income. Analysis showed that Activity Engagement was a significant mediator of current pain intensity and the PDI total after controlling for annual household income,  $z = 2.035$ ,  $p = .042$  (see Table 15, page 144).

Lastly, the Pain Willingness subscale of the CPAQ was tested for mediation between current pain intensity (VAS) and disability (PDI) controlling for annual household income. Analysis showed that Pain Willingness was a significant mediator of current pain intensity and the PDI total after controlling for annual household income,  $z = 3.116$ ,  $p = .003$  (see Table 16, 145).

*H4: Enmeshment will mediate the relationship between pain intensity and functional status outcomes (quality of life and disability).*

To test if enmeshment (Possible Selves Questionnaire; PSQ) was a mediator of current pain intensity and functional status, the same four criteria of mediation (Baron & Kenny, 1986), as in Hypothesis 3, were tested, again using three multiple regression equations, to explore enmeshment in the role of mediator. Comparisons were tested against an alpha value of .017 to control family wise error rate. If the total score on the measure of enmeshment (PSQ) is a significant mediator then the PSQ subscales of Hoped-for Enmeshment and Feared-for Enmeshment will be tested for mediation using the same process and an alpha value of .05.

#### *Enmeshment Mediating Pain Intensity and Quality of Life*

The model of mediation tested was participants' ratings of current pain intensity (VAS) and the Physical Component Summary (SF-12 PCS) being mediated by the total score on the Possible Selves Questionnaire (PSQ). Significant differences existed on the PCS of the SF-12 between participants who made more or less than \$10,000 of annual

household income. The dichotomized household income was controlled for in this mediation analysis. Participants' total score of enmeshment as a mediator was not significant at the .017 alpha level,  $z = -1.003$ ,  $p = .317$  (see Table 17, page 146). Because the total enmeshment score did not mediate current pain intensity and the physical component of quality of life the subscales of Hoped-for Enmeshment and Feared-for Enmeshment were not investigated.

Next, the participants' ratings of current pain intensity (VAS) and the Mental Component Summary (SF-12 MCS) was tested for mediation by the total score on the Possible Selves Questionnaire (PSQ). Household income was not controlled for in this mediation analysis because it was not significantly associated with variables in this model. Participants' total score of enmeshment did not significantly mediate current pain intensity and SF-12 MCS at the .017 alpha level,  $z = -.856$ ,  $p = .395$  (see Table 18, page 147). Because the total enmeshment score did not mediate current pain intensity and the mental component of quality of life the subscales of Hoped-for Enmeshment and Feared-for Enmeshment were not investigated.

#### *Enmeshment Mediating Pain Intensity and Disability*

The second outcome measure tested was disability as measured by the Pain Disability Index (PDI). The analysis again controlled for annual household income due to its correlation with the PDI total score. Participants' total score on the measure of enmeshment (PSQ) was not a significant mediator of current pain intensity and disability after controlling for annual household income,  $z = 1.058$ ,  $p = .293$  (see Table 19, page 148). Since the total enmeshment score did not mediate current pain intensity and

disability the PSQ subscales of Hoped-for Enmeshment and Feared-for Enmeshment were not investigated.

*H5: Anxiety Sensitivity will moderate the relationship between pain intensity and functional status outcomes (quality of life and disability).*

The moderation effect in this hypothesis was tested by examining the interaction effect between anxiety sensitivity and pain intensity (Holmbeck, 1997). The statistical testing of this hypothesis involved three separate sets of analyses: one for each dependent variable (SF-12 Physical Component Summary, SF-12 Mental Component Summary, and Pain Disability Index total). Analyses involving the outcome measures of SF-12 PCS and disability controlled for annual household income due to the significant relationship between these variables in this sample. As recommended by Frazier, Tix, and Barron (2004) the continuous variables in each analysis were standardized by subtracting the sample mean from the individual score and dividing by the sample standard deviation. This standardization helps to control for multicollinearity and increases the ease of interpretation. Multiple hierarchical regression was then utilized to test for the conditional effects of anxiety sensitivity (Anxiety Sensitivity Index; ASI), the conditional effects of current pain intensity (VAS), and the interaction effect (anxiety sensitivity X pain intensity) on the dependent variables of functional status (Frazier, Tix, & Barron, 2004). The control variable was entered into the first block (when appropriate), followed by the conditional variables (current pain intensity and functional status outcome), and lastly the interaction term. The significance of the moderation effect was evaluated by testing the change in variance ( $R^2$ ) after adding the interaction term to the regression model. Comparisons were tested against an alpha value of .017 to control familywise



error rate. Significant models of moderation were plotted to examine the form of the moderation according to Frazier, Tix, and Barron (2004). Because the variables in the interaction term are continuous variables their values at one standard deviation above and below the mean were entered into the regression equation to predict the scores on the outcome measures. The slopes of these plotted lines, one standard deviation above and below the mean of the moderator, were tested using multiple regression to see if they were significantly different from zero. This final step in probing the interaction was performed as recommended by Aiken and West (1991) for continuous variables.

#### *Anxiety Sensitivity Moderating Pain Intensity and Quality of Life*

The first analysis completed was a three block hierarchical regression model predicting SF-12 Physical Component Summary (SF-12 PCS) with annual household income in block 1, anxiety sensitivity (ASI) and current pain intensity added in block 2, and the ASI multiplied by current pain intensity (interaction product term) added in block 3. Anxiety sensitivity was not a significant moderator of current pain intensity and the physical component of quality of life,  $F$  Change (1, 111) = .861,  $p$  = .355 (see Table 20, page 149).

The next analysis was a two block hierarchical regression model predicting SF-12 Mental Component Summary (MCS) with anxiety sensitivity (ASI) and current pain intensity in block 1, and the ASI multiplied by current pain intensity (interaction product term) added in block 2. Anxiety sensitivity was not a significant moderator of current pain intensity and the mental component of quality of life,  $F$  Change (1, 113) = .004,  $p$  = .947 (see Table 21, page 150).

### *Anxiety Sensitivity Moderating Pain Intensity and Disability*

The last analysis completed was a three block hierarchical regression model predicting disability (PDI) with the control variable of annual household income in block 1, anxiety sensitivity (ASI) and current pain intensity added in block 2, and then ASI multiplied by current pain intensity (interaction product term) added in block 3. Anxiety sensitivity was a significant moderator of current pain intensity and the disability,  $F(1, 112) = 6.308, p = .013$  (see Table 22, page 151). To examine the form of this moderation the unstandardized results are plotted in Figure 10, page 160. Both the slope of the high level of anxiety sensitivity (one standard deviation above the mean) and the slope of the low level of anxiety sensitivity (one standard deviation below the mean) were significantly different from zero (high ASI,  $B = 4.254, p < .001$ ; low ASI,  $B = 2.264, p < .001$ ).

#### *Aim 2: Examining Participants' perceptions of the temporal nature of their pain and Avoidance Cycle constructs*

*H6: Majority of participants with history of psychological problems will report onset of chronic pain prior to, or at the same time as, onset of psychological problems.*

This hypothesis was examined by using descriptive statistics and post hoc t-tests. Several comparisons provided valuable information regarding this chronic pain sample and its perceptions of the temporal nature of their psychological impairment due to pain. In this sample, 50.4% percent of the participants reported some psychological problem or problems (e.g. depression, anxiety, panic attacks, and excessive worry) prior to the onset of their pain. Following the onset of pain, the number reporting psychological problems increased to 85.5%. This number reflects a 69.6% increase in the number of individuals

reporting psychological problems following the onset of chronic pain relative to before pain onset. Regarding specific psychological problems, excessive worry showed a 118.6% increase in participants; depression showed a 111.9% increase; anxiety had a 99.6% increase; and participants reporting panic attacks increased by 52.3%. Post-hoc comparisons were performed on study measures between participants who reported psychological problems before pain and those who did not. The results revealed significant differences between groups on only three measures: the Anxiety Sensitivity Index, the Beck Anxiety Inventory, and the Possible Selves Questionnaire (enmeshment). On these measures, participants reporting psychological problems prior to their pain reported higher anxiety sensitivity ( $t = 2.146, p = .034$ ), higher anxiety ( $t = 2.010, p = .047$ ), and lower enmeshment ( $t = -2.331, p = .021$ ).

*H7: Participants with high levels of avoidance, catastrophizing, and enmeshment, will report current health as being worse than one year ago.*

To test this hypothesis discriminant analysis was employed. Specifically the participant's scores on the Pain Catastrophizing Scale (PCS), Possible Selves Questionnaire (PSQ), and the Chronic Pain Acceptance Questionnaire (CPAQ), were used to statistically predict membership in one of two groups. Group one included participants who rated their overall health as the same or better than one year ago, and group two included participants who rated their health as worse than the past year. These ratings are based on one item from the SF-36 on how their health is compared to one year ago and were compared to total scores on measures of catastrophizing (PCS), enmeshment (PSQ), pain-specific avoidance (CPAQ). A total of 66.9% of participants reported their health as being worse than one year ago. The discriminant analysis was

able to correctly classify 65.4% of cases, Wilk's lambda ( $df\ 3$ ) = .884,  $p = .005$ .

Participants who reported their pain as worse than one year ago had significantly higher levels of catastrophizing ( $t = -3.525$ ,  $p = .001$ ), and greater experiential avoidance ( $t = 2.140$ ,  $p = .035$ ).

## DISCUSSION

### **Summary of Results**

This study sought to explore the relationships between constructs included in the Avoidance Cycle (Hayes & Smith, 2005) as it is applied to chronic pain. The constructs examined were pain intensity, anxiety sensitivity, catastrophizing, entanglement, and experiential avoidance, as they relate to depression, anxiety, quality of life and disability. The Schema Enmeshment Model of Pain (Pincus & Morley, 2001) was integrated into the Avoidance Cycle by using enmeshment as a measurable conceptualization of entanglement. The constructs of the model were measured using empirically validated questionnaires given to participants in either written or interview format. The study is cross-sectional and examined participants' responses at one time point as estimates of the relationships between the constructs within the model. Multiple regression was largely used to examine the study's conceptualized independent variables and their ability to predict, mediate, or moderate dependent variables. The temporal nature of the Avoidance Cycle was explored using participants' perceptions of the onset of psychological symptoms relative to chronic pain.

The participants in this clinical sample were patients at a university hospital anesthesiology-based pain management center in a mid-sized Midwestern city. The pain management center serves patients who are largely uninsured or underinsured and draws patients from a large area in the state including metropolitan areas and rural communities.

Persons in the study participated voluntarily and were not compensated. Information gathered was multimodal and was collected by written questionnaire, in-person or over-the-phone interview, and reviewed medical chart information. Nearly 90 percent of study questionnaires were filled out completely. The CPAQ had a slightly lower completion rate (78.4%) and it was one of the longer measures in this study and had the most response options, seven, which may have contributed towards its lower completion rate. Most of the participants in this study were middle-aged adults and many were Caucasian (77.7%), women (61.2%), divorced (41.0%), high school educated or less (66.1%), and disabled (59.7%). Overall the sample had a very low household income as 54% made less than \$10,000 per year and only 10.8% made more than \$40,000 per year.

*Aim 1: Exploring the Relationships between Chronic Pain and Avoidance Cycle*

#### *Constructs*

*Hypothesis 1 (H1): Model constructs of pain intensity, anxiety sensitivity, catastrophizing, and experiential avoidance will individually statistically predict enmeshment.*

For this study, Pincus and Morley's (2001) concept of enmeshment was used as a proxy for the Avoidance Cycle's stage of Entanglement (Hayes & Smith, 2005). Enmeshment was measured using the Possible Selves Questionnaire (PSQ) which has been shown to be associated with pain-specific experiential avoidance (Morley, Davies, and Barton, 2005). This hypothesis explored the relationship of enmeshment and the other independent, process variables of pain intensity, anxiety sensitivity, catastrophizing, and pain-specific experiential avoidance. No significant relationship was found between either pain intensity and enmeshment, or anxiety sensitivity and enmeshment.

Enmeshment was predicted by catastrophizing (Pain Catastrophizing Scale; PCS) and pain-specific experiential avoidance (Chronic Pain Acceptance Questionnaire; CPAQ). Further analysis showed that all subscales of the measure of catastrophizing (Rumination, Magnification, and Helplessness) significantly predicted enmeshment and its two components (Hoped-for Enmeshment and Feared-for Enmeshment). The Helplessness subscale was the strongest predictor of Total Enmeshment and was a better predictor of Hoped-for Enmeshment than Feared-for Enmeshment.

Pain-specific experiential avoidance was found to be a better predictor of enmeshment and its components than was catastrophizing. Both subscales of the CPAQ (Activity Engagement and Pain Willingness) were significant predictors of Total Enmeshment and its components, and Activity Engagement was a better predictor than both the total score on the CPAQ as well as the subscale of Pain Willingness. Interestingly, this study's measure of global experiential avoidance (the Acceptance and Action Questionnaire – Version Two; AAQ-II) also predicted total enmeshment and one of its components (Hoped-for Enmeshment), though it was not as strong a predictor as pain-specific experiential avoidance.

These results provide mixed support for Hypothesis 1. Two out of the four constructs tested in this hypothesis were found to be significant predictors of enmeshment while the other two were not. Similar to this study's findings, previous research using the same measure of enmeshment, the Possible Selves Questionnaire, also failed to find a significant relationship between pain intensity and enmeshment (Morley, Davies, and Barton, 2005). The same study did find a relationship between pain-specific experiential avoidance and enmeshment, just as in this study's sample. Compared to the Morley,

Davies, and Barton (2005) sample, the current study's sample had lower scores on the CPAQ,  $M = 45.39$  (21.26) versus  $M = 61.00$  (19.62), but scores on the measure of enmeshment were quite similar. For Hoped-for Enmeshment the current study's mean was .42 (.37) compared to .44 (.31) in the Morley, Davies, and Barton (2005) study, and for Feared for Enmeshment the current sample's mean was .61 (.40) compared to .56 (.35). The earlier study did not give a score for combined Hoped-for and Feared-for enmeshment or Total Enmeshment.

The replication of these results highlights the link between pain-specific experiential avoidance and enmeshment. The relationship between global experiential avoidance and enmeshment had not been previously explored and the relationship found in this study suggests that it too may play a role in the reduction of independent self, illness, and pain schemas in persons with chronic pain. The findings suggest that pain patients who are more likely to avoid pain, and unpleasant internal experiences in general, will be less likely to view themselves as independent from their pain. Negative thoughts and internal dialogue, such as catastrophizing, may only further the fusion between peoples' views of themselves and their views of their inability to achieve ideal personality characteristics. Also, findings support the notion that the more experiential avoidance and catastrophizing one does, the stronger the idea becomes that if they did not have pain, they would not possess those characteristics they fear describing them. Analysis of construct components suggest that behavioral avoidance, as measured by the Activity Engagement subscale, may play a larger role in enmeshment than does cognitive avoidance, thus fostering the feeling of helplessness and associated thoughts.



*H2: Enmeshment will statistically predict functional status (disability and quality of life), as well as psychological distress (depression and anxiety).*

Hypothesis 2 tests the idea that enmeshment acts to maintain or increase distress in persons with chronic pain (Pincus and Morley, 2001). Where Hypothesis 1 examined enmeshment as a dependent variable, Hypothesis 2 explored enmeshment as an independent variable used to predict scores on the outcome measures of disability (Pain Disability Index; PDI), quality of life (SF-12), depression (CES-D-10), and anxiety (Beck Anxiety Inventory; BAI). The results showed that enmeshment did not significantly predict scores on the Physical Component Summary of the SF-12 (SF-12 PCS), but it was a moderately strong predictor of scores on the Mental Component Summary of the SF-12 (SF-12 MCS). Further analysis showed that Hoped-for Enmeshment was a slightly better predictor of the mental components of quality of life than total enmeshment, and Feared-for enmeshment was not a significant predictor of scores on the SF-12 MCS. These results suggest that enmeshment, and specifically Hoped-for Enmeshment, plays a role in mental health and well-being. Essentially, one's belief that their pain prohibits them from becoming who they hope to be is related to mental health and quality of life. Though no results were found between enmeshment and physical well being, as measured by the SF-12, the relationship between enmeshment and disability may shed some light on how this construct impacts physical functional status.

Enmeshment did significantly predict participants' scores on the PDI, the measure of disability, though the relationship was low compared to the Mental Component Summary. Both Hoped-for Enmeshment and Feared-for Enmeshment significantly predicted disability, with Feared-for Enmeshment showing a slightly stronger association

than Hoped-for Enmeshment. This finding suggests that enmeshment does play a role in the extent that physical pain interferes with participants' personal, social, and occupational activities. The study done by Morley, Davies, and Barton (2005) also used the PDI to examine the relationship between enmeshment and disability. They also found a significant relationship between both Hoped-for and Feared-for Enmeshment and disability. The replication of these findings in the current sample support the hypothesis that enmeshment does play a role in pain-related disability.

The Morley, Davies, and Barton (2005) study also examined the construct of depression though they used a different measure to approximate this construct. Where the current study used the CES-D-10 to measure depressive symptoms, the previous study used the Beck Depression Inventory. The CES-D-10 demonstrated a low correlation between depression and Total Enmeshment. The Morley, Davies, and Barton (2005) study found that scores on the BDI were *highly* correlated with scores of Hoped-for Enmeshment and lowly correlated with Feared-for Enmeshment. Still, when hierarchical regression was used to control for factors such as gender, age, and pain demographics the relationship between Feared-for Enmeshment and depression became non-significant. The relationship between the current study's other measure of psychological distress, the Beck Anxiety Inventory, likewise did not reliably predict enmeshment.

These findings combined with data from previous research provide mixed support for Hypothesis 2. Based on the findings from the present study, enmeshment appears to have some relationship to functional status including quality of life and disability, but no conclusions can be made at this time regarding enmeshment and its relationship with

anxiety and depression. One would expect that given the finding that enmeshment significantly predicted the mental component of quality of life, it would have also predicted other elements of mental health such as depression and anxiety.

In summary, Hypotheses 1 and 2 both looked at the relationship of enmeshment and Avoidance Cycle constructs. Only one published study to date has examined a measure of enmeshment and explored relationships to relevant constructs in chronic pain such as pain intensity, avoidance, disability, and depression (Morley, Davies, and Barton, 2005). The current study sought to expand upon the existing literature while simultaneously examining other constructs related to the Avoidance Cycle such as catastrophizing and anxiety. This study replicated previous findings of associations of enmeshment with pain-specific avoidance and disability. It also explored previously unexamined relationships between enmeshment and catastrophizing as well as global experiential avoidance. Still this study did not replicate previous results linking enmeshment and depression. These findings highlight the need for additional research regarding the associations of enmeshment and psychological distress and functional status. Lastly, additional studies are needed to further validate the Possible Selves Questionnaire as a reliable and accurate measure of enmeshment.

*H3: Experiential avoidance will mediate the relationship between pain intensity and functional status outcomes (quality of life and disability).*

Hypothesis 3 examines the mediating relationship experiential avoidance has on a participants' current report of pain intensity and how they perceive their functional status, namely quality of life and disability. Based on established definitions of mediation (Baron and Kenny, 1986; Holmbeck, 1997) this hypothesis proposes that

experiential avoidance explains, in part, *how* a person's pain intensity influences their functional status. Functional status was broken into the two domains of quality of life and disability. Quality of life was broken into two components of physical and mental health and well being, represented by the SF-12 subscales of the Physical Component Summary (SF-12 PCS) and the Mental Component Summary (SF-12 MCS), respectively. Based on the tests of Hypothesis 3, no conclusions can be made regarding pain-specific experiential avoidance (total score on the CPAQ) as a mediator of current pain intensity (pain rating on a visual analogue scale) and physical quality of life (score on SF-12 PCS), as this study failed to reject the null hypothesis that no mediation occurs as stated in this model.

It can be concluded that pain-specific experiential avoidance partially mediates the relationship between current pain intensity and mental quality of life (SF-12 MCS) even after controlling for income level. When the mediator of pain-specific experiential avoidance is entered into the regression equation the relationship between current pain intensity and mental quality of life became non-significant (significance drops from  $p = .036$  to  $p = .273$ ) and the mediating result was highly significant ( $p = .005$ ). Analysis of CPAQ subscales showed that both Activity Engagement and Pain Willingness also served as partial mediators between pain intensity and mental quality of life. Though Pain Willingness was the stronger mediator of the two subscales it was still not as strong as the total score on this measure of pain-specific experiential avoidance. These results suggest that a person with chronic pain who continues to engage in physical activity and is willing to experience pain during such activities is more likely to experience better mental health and well-being.

Review of recent research appears to support this idea. A study done by Wicksell, Renofalt, Olsson, Bond, & Melin (2008) found that pain-specific avoidance was significantly correlated with the mental component of the SF-12 in a clinical sample of Swedish patients with chronic pain. Similar to the present study, they also found the relationship between pain avoidance to be more strongly associated with mental quality of life than physical quality of life. A recent British study found that people with chronic pain who exhibited less experiential avoidance and increased activity toward valued life directions experienced fewer mental health-related problems, as evidenced by lower scores on measures of depression and pain-related anxiety (McCracken and Vowles, 2007). This strategy of less avoidance and increased valued activity was found, in the same study, to be more successful than traditional coping methods, such as activity pacing, relaxation, self-instructional training, in managing chronic pain. One recent study, done in the United States, found significant moderator effects for pain-specific experiential avoidance, as measured by the CPAQ, between pain intensity and negative affect in a sample of women with arthritis and fibromyalgia (Kratz, Davis, & Zautra, 2007). These supporting studies show international support for the relationship of pain-specific experiential avoidance and psychological aspects of health and well-being. The present study findings contribute to the relatively consistent findings in this emerging body of literature.

With regard to physical disability, the current study found that pain-specific experiential avoidance partially mediates the relationship between current pain intensity and disability, as measured by the Pain Disability Index (PDI). The significance of this result was nearly as high as the mediation of the other functional status outcome, mental

quality of life. Interestingly, the relationship between pain intensity and disability remained stronger than the relationship between pain intensity and mental quality of life after accounting for the mediator of pain-specific experiential avoidance. Just as with SF-12 MCS scores, additional analyses of the CPAQ subscales found that both Activity Engagement and Pain Willingness significantly mediated participants' current levels of pain intensity and their perceived disability. In fact, Pain Willingness was the best mediator as compared to Activity Engagement and the total score on the CPAQ. These results suggest that a person living with pain who is less avoidant of their pain and actions that might increase pain is less likely to view their pain as restricting functioning in their daily life.

Similar results, linking pain-specific experiential avoidance and disability, have been found in recent empirical literature. Much of the current literature surrounding the use of pain-specific avoidance has come from Sweden and Great Britain. In a study of 611 Swedes, participants' scores on the measure of pain-specific experiential avoidance (CPAQ) explained more of the variance associated with scores on the Pain Disability Index than another well accepted measure of avoidance of pain, the Tampa Scale of Kinesiophobia (Wicksell, Olsson, & Melin, in press). These researchers conducted a randomized controlled trial that found that 21 Swedish patients with chronic pain and whiplash pain had lower scores on the PDI after a 10-week intervention aimed at decreasing experiential avoidance of pain and pain-related private experiences (Wicksell, Ahlqvist, Bring, Melin, & Olsson, 2008). Some of these same authors, in a different correlational study, found that pain-related avoidance was strongly associated ( $r = .75$ ) with interference of pain in daily activities (Wicksell, Renofalt, Olsson, Bond, & Melin,

2008). One other previously mentioned study found mild to moderate associations between pain-specific avoidance and physical and psychosocial disability (McCracken and Vowles, 2007).

In summary, Hypothesis 3 was largely supported by analyses. Pain-specific experiential avoidance, as measured by the Chronic Pain Acceptance Questionnaire (CPAQ), was shown to explain some of the relationship between pain intensity and functional status. Review of the recent literature, also supports this hypothesis and places this study in the context of current international research on pain-related avoidance and physical and psychological functioning. Based on the findings in this study, existing research may be generalizable to a low socioeconomic sample in the Midwestern United States. Some question remains as to why the present study analyses did not find that CPAQ scores mediated pain intensity and scores on the Physical Component Summary of the SF-12, while the CPAQ was a mediator between the constructs of pain intensity and physical disability. This discrepancy evokes the question of the difference between physical quality of life and physical disability. Though the measures reflecting these two constructs are worded differently, they both seem to approximate the level of interference caused by pain in daily social, occupational, and personal activities. Further research and theoretical development is needed to clarify and further define these constructs.

*H4: Enmeshment will mediate the relationship between pain intensity and functional status outcomes (quality of life and disability).*

Hypotheses 1 and 2 examined the associations between enmeshment and independent and dependent variables within the Avoidance Cycle as applied to chronic pain. Hypothesis 4 further explores the construct of enmeshment and its potential role as

mediator of participants' current pain intensity and functional outcomes such as quality of life and disability. Though one study has looked at enmeshment as a predictor of emotional distress (Morley, Davies, & Barton, 2005), no studies to date have examined enmeshment in this role of mediator. Hypothesis 4 proposes that enmeshment can help explain *how* pain intensity impacts functional status in persons with chronic pain. Primary analyses included enmeshment as a mediator of three separate constructs representing functional status; physical health and well-being (SF-12 PCS); mental health and well-being (SF-12 MCS); and pain-related disability (PDI).

This study failed to reject the null hypothesis that enmeshment does not mediate participants' current pain intensity and functional status. Tests of mediation failed to find significant results in all three tests of the aforementioned measures of functional status and no conclusions can be made at this time. These findings were expected given the method used to test mediation in the study. For mediation to exist, the predictor variable must be associated with the mediator variable, as mentioned in condition number 2 of the four conditions of mediation (Baron & Kenny, 1986). In this case, current pain intensity must be associated with enmeshment. The information found in the first analysis of Hypothesis 1 showed that current pain intensity was not a significant predictor of enmeshment in this study's sample. Thus, the second condition for enmeshment as a mediator between pain intensity and functional status was not met. In order for a construct to be recognized as a mediator all four conditions need to be met.

This information may give a clue to the specific nature of pain and functional status. Though enmeshment did not mediate this relationship, enmeshment may explain how other variables in the Avoidance Cycle influence functional status. For instance, in



this study both pain catastrophizing and pain-specific experiential avoidance did predict enmeshment and enmeshment subsequently predicted mental quality of life and disability. Future research could explore enmeshment as a potential mediator or moderator of catastrophizing and functional status (such as mental quality of life and disability) or enmeshment as a mediator or moderator between pain-specific experiential avoidance and functional status. These revised hypotheses would still be consistent with the Avoidance Cycle model as the relationship would propose, for example, that pain intensity would influence catastrophizing which would influence functional status as mediated by enmeshment.

*H5: Anxiety Sensitivity will moderate the relationship between pain intensity and functional status outcomes (quality of life and disability).*

This hypothesis examines the construct of anxiety sensitivity as a condition under which pain intensity affects functional status. For example, it is suggested that pain intensity will more strongly influence functional status when a participant is highly sensitive to anxiety. In testing Hypothesis 5 the interaction of pain intensity and anxiety sensitivity, as measured by the Anxiety Sensitivity Index (ASI), was examined with the three variables of functional status: physical quality of life, mental quality of life, and disability. Testing the interaction term was recommended by Holmbeck (1997) and this term was tested using the steps recommended by Frasier, Tix, and Barron (2004).

Neither component summaries (SF-12 PCS, SF-12 MCS) of the measure of quality of life (SF-12) were found to be significantly moderated by participants' anxiety sensitivity. These analyses failed to reject the hypothesis that anxiety sensitivity was not a significant moderator of pain intensity and quality of life, therefore no conclusions can

be made. Anxiety sensitivity was found to be a statistically significant moderator of current pain intensity (VAS) and disability (PDI). Though this result was statistically significant, it is not certain that it is clinically significant as the moderator effect was very slight. Examination of the plotted effect of the moderation (see Figure 10, p. 160) shows that the lines representing 1 standard deviation above and below the mean, for participants scores on the ASI, are nearly parallel indicating a very slight moderating effect. In fact, upon entering the interaction term of anxiety sensitivity and pain intensity only accounts for an additional 3.7% of the variance in disability. Still the slopes of both the high and the low regression lines were significantly different from zero indicating that those with high or low anxiety sensitivity experience more disability with higher pain. Though the moderation effect is small, the combined equation of anxiety sensitivity, pain intensity, and the interaction accounts for approximately 34.5% of the variance in participants' scores on the measure of disability (PDI).

Anxiety sensitivity has been conceptualized in the literature as a diathesis for anxiety disorders, such as panic disorder and PTSD, and some research has supported this theory (Schmidt, Zvolensky, & Maner, 2006). Anxiety sensitivity has also been conceptualized as a common predisposing factor in several explanations of the high comorbidity between PTSD and chronic pain (Otis, Keane, & Kerns, 2003). In the current study anxiety sensitivity was examined as a diathesis for decreased functional status in those with chronic pain, and weak, mixed support was found for this hypothesis. These results suggest anxiety sensitivity provides some mild moderation between pain intensity and disability but invite the hypothesis that other process variables are involved. For example, some empirical support suggests that anxiety sensitivity predicts pain-

related avoidance (Asmundson, & Taylor, 1996; Norton, & Asmundson, 2004) while other research identifies anxiety sensitivity as a strong predictor of pain-related anxiety (Zvolensky, Goodie, McNeil, Sperry, & Sorrell, 2001). Still other research suggests that anxiety sensitivity plays a crucial role in a person in pain's bias to pain related information, a process crucial in the formation of enmeshment (Asmundson, Kuperos, & Norton, 1997). Based on the findings of the present study combined with previous research, anxiety sensitivity seems to play a moderating role between chronic pain and process variables in the Avoidance Cycle such as anxiety, experiential avoidance, and enmeshment which in turn have a more direct effect on functional status. Future research can examine the moderating effects of anxiety sensitivity between chronic pain and process variables within the Avoidance Cycle.

*Aim 2: Examining Participants' perceptions of the temporal nature of their pain and Avoidance Cycle constructs*

Examination of the temporal nature of chronic pain and constructs such as psychological distress and quality of life is important for two reasons relevant to this study. The first is related to the statistical limitations of analyses that perform tests of prediction, mediation, and moderation. Each of these tasks implies a temporal linear relationship. For example, if it is said that chronic pain intensity predicts experiential avoidance, it is supposed that *first* an increase in pain intensity occurs, and *then* experiential avoidance increases. Similar implications exist with mediation and moderation if causality is to be implied. Though these relationships have been tested in the present study, the cross-sectional nature of the study limits any inferences towards causality or the temporal occurrence of pain and related sequelae. Thus, inquiring about

the study participants' perceptions of the temporal nature of their pain onset and occurrence of psychological symptoms helps, in part, to strengthen analyses of prediction, mediation, and moderation in this cross-sectional study.

The second reason that participants were questioned related to their perception of the temporal nature of their pain and Avoidance Cycle constructs is related to the theoretical temporal nature of the model. Hayes and Smith (2005) report that the Avoidance Cycle begins with the occurrence of some problem. As it is applied to chronic pain, this problem is conceptualized as chronic pain and its related characteristics. The Avoidance Cycle implies that after the problem has occurred one then passes through, in a roughly linear fashion, the various stages of the cycle. Further, Hayes and Smith (2005) state that the Avoidance Cycle can be thought of as a downward spiral resulting in increased life restriction and loss. This downward spiral continues to support time-related elements to the model, for instance the idea that the longer a person engages in avoidance behaviors the more their life is restricted. Again, due to the cross-sectional nature of this study, these theoretical considerations cannot be tested directly. Still, participants' perceptions of how their pain has temporally affected avoidance cycle constructs can provide some support for the time aspects of the model while setting the stage for future longitudinal research.

*H6: Majority of participants with history of psychological problems will report onset of chronic pain prior to, or at the same time as, onset of psychological problems.*

Mixed support was found for Hypothesis 6. Examination of this hypothesis was complicated by the high rate of psychological problems premorbid to participants' chronic pain. In this sample, over half of participants reported some psychological

problem prior to their onset of chronic pain, with over one fifth of the sample who indicated that they have had clinical treatment for a psychological problem. This finding complicates support of the hypothesis, as stated, because a majority of the participants already had some psychological problems prior to the onset of their chronic pain. An underlying assumption of hypothesis 6 is that participants' mental health gets worse after chronic pain onset. Further examination of the participant demographics showed this assumption to be supported as rates of reported psychological problems increased by nearly 70% after pain onset. Similarly, large increases were also found in individual psychological problems, ranging from a 52.3% increase for panic attacks to a 118.6% increase for excessive worry.

The high rate of psychological distress reported prior to pain onset combined with the sharp increases in mental health problems revisits a common question in the literature: Did psychological distress cause chronic pain or did the chronic pain cause psychological distress? The more commonly held perception is that chronic pain is a diathesis for psychological disturbance, though little longitudinal evidence exists to support this conclusion (Banks, & Kerns, 1996). In a study of persons with chronic pain and depression only 12% reported that their depression preceded their chronic pain while the other 78% reported that their depression occurred simultaneously with or after the onset of chronic pain (Lindsay, & Wyckoff, 1981). In comparison, 41.6% of the participants, in the current study, who said they had problems with depression at the time of questionnaire administration, said that they have had problems with depression prior to their chronic pain. Overall, of the 118 participants in this study who reported current psychological problems, 56.8% reported some psychological problems prior to chronic

pain. This finding fails to support the hypothesis that most participants would report psychological problems as occurring after chronic pain onset.

The baseline reports of psychological problems in this study are much higher than in the U.S. population. Recent research found that approximately 26.2% of adults in the U.S. suffer from mental illness in a given year, compared to 51.4% reporting psychological problems prior to pain in the current sample (Kessler, Chiu, Demler, & Walters, 2005). With regard to specific psychological problems, the current study found similarly high rates of psychological distress. For example, the rate of participants reporting problems with depression prior to pain onset is roughly two to three times higher than published prevalence rates for depression (Regier, Narrow, & Rae, 1993; Ingram, Scott, & Siegle, 1999). Those participants who reported having some mental health treatment (21.6%) is more than twice as high as previous research on Americans and the rate of acquiring mental health treatment (8.8%; Katz, Kessler, Frank, Leaf, & Lin, 1997). Caution should be used when interpreting this information as the prevalence for psychological problems in this study is based on participant self-report rather than diagnostic criteria. Though the numbers generated in this study are simply participants' retrospective reports of psychological problems, it would still appear that the current sample had unusually high rates of premorbid psychological distress. Several characteristics of this particular sample may help to explain these high rates.

One possible explanation is the low economic status of the study's participants. With 54% of participants earning a household income of less than \$10,000 the study sample is heavily representative of those with very low income. This overrepresentation of those in low economic status is further supported by the fact that this sample was

collected from an ambulatory care center geared at treating uninsured patients and those insured on government social welfare programs. Inadequate access to healthcare due to lack of insurance may also contribute to high rates of mental health problems (Katz, Kessler, Frank, Leaf, & Lin, 1997). Recent research on census data and mental health treatment has supported a long held assumption of the inverse relationship between socioeconomic status and mental health and found support of a causal relationship between low socioeconomic status and mental illness (Hudson, 2005). The same study also found that familial fragmentation was highly correlated with mental illness, which could be a competing explanation of this study's high rate of premorbid psychological problems since 41% of the present sample was divorced. These findings should continue to be interpreted cautiously as the correlational nature of the study limits temporal statements. For instance, the sample could have low economic status at the time of questionnaire administration due to longstanding financial problems or the low economic status could be directly due to pain related disability. Again with divorce rates it was not determined whether the familial disruption occurred prior to or as a result of chronic pain.

In summary, the findings of this study provided mixed support for Hypothesis 6. The majority of participants did not report that all psychological problems began after the onset of their chronic pain. Still, a sharp increase in psychological distress was reported after the onset of chronic pain. This increase in reported distress post pain-onset lends support to the temporal suggestions of the Avoidance Cycle that avoidant reactions to pain cause increased psychological distress. One must also consider the limitation in assuming linear causality to a cyclical process. It could also be conceptualized, within the framework of the model that existing psychological distress encouraged avoidant

behaviors when encountering a new problem and thus resulted in increased chronic pain. This conceptualization theorizes psychological problems as a diathesis for chronic pain as well as chronic pain being a diathesis for increased psychological problems. Both views are valid interpretations based on the findings of this study and the data of existing empirical research. These competing views regarding symptom course is further complicated by reliability issues related to retrospective recall. To control biases related to retrospective recall and to determine course of symptoms, prospective longitudinal approaches are required to distinguish the relative impact of chronic pain on mental health and vice versa.

*H7: Participants with high levels of avoidance, catastrophizing, and enmeshment, will report current health as being worse than one year ago.*

This study rejected the null hypothesis that participants' scores on measures of avoidance, catastrophizing, and enmeshment, would not correctly categorize participants' ratings of their health as either better or the same as one year ago; or worse than one year ago. Thus, Hypothesis 7 was supported as the measures of pain-specific experiential avoidance (CPAQ), catastrophizing (PCS), and enmeshment (PSQ), correctly classified 65.4% of participants who rated their health as worse than one year ago and those who rated it as the same or better than one year ago. Further, the discriminant analysis correctly classified 70.7% of those who reported their health as worse than one year ago. Post hoc analyses showed that those who rated their health as worse than one year ago had greater levels of experiential avoidance and catastrophizing than those who rated their health as the same or better than a year ago.



Support of Hypothesis 7 provides some insight into the temporal nature of the Avoidance Cycle as applied to chronic pain. Hayes and Smith (2005) conceptualize the Avoidance Cycle as a downward spiral toward a narrow, struggle-based, and inflexible life. This study examined the impact that constructs in the model have on physical and mental health and found that those who were engaging in the Avoidance Cycle as applied to chronic pain were more likely to experience poorer mental and physical health. In Hypothesis 7 the study examined participants' own perceptions of their overall health. It supported the notion that the Avoidance Cycle is a downward spiral by the finding that those who engaged in Avoidance Cycle constructs found their health to be worsening. Catastrophizing and experiential avoidance seemed to be major factors in predicting the decline in health while enmeshment was less important.

Some caution should be taken here in interpreting these results as participants' rating of their health as worse than one year ago may be a function of their catastrophizing rather than a true measure of deteriorating health. Future studies could examine the truth of these perceptions with corroborating reports from family members or health care providers, or by comparing ratings of health with objective measures of health such as frequency of medical visits, medical assessments, or other indicators of medical pathology. Prospective pain ratings or information from a pain diary could also provide additional clarification on the relationship between Avoidance Cycle constructs and worsening health.

#### **Utility of the Avoidance Cycle Model as Applied to Chronic Pain**

Cognitive Behavioral Therapy (CBT) has been the predominant method of the past few decades for treating chronic pain with psychological intervention and has been

shown to be effective in recent meta-analyses (Hoffman, Papas, Chatkoff, & Kerns, 2007; Morley, Eccleston, & Williams, 1999). Still, the specific process and manner in which behavioral and psychological phenomena affect one's experience of pain remains unclear (Morley, 2004). Recently, Acceptance and Commitment Therapy (ACT) has emerged as a strong source of theory explaining the complex relationship between chronic physical pain and psychological distress and physical functioning. Utilizing the theoretical framework provided by ACT, recent research has examined chronic pain using outcome studies (Greco, Blomquist, Acra, & Moulton, under review; Wicksell, Ahlqvist, Bring, Melin, & Olsson, 2008; Vowles, & McCracken, 2008; McCracken, MacKichan, & Eccleston, 2007; Wicksell, Melin, & Olsson, 2007; McCracken, Vowles, & Eccleston, 2005; Dahl, Wilson, & Nilsson, 2004), correlational studies (McCracken, & Vowles, 2008; Vowles, McCracken, & Eccleston, 2008; Wicksell, Renofalt, Olsson, Bond, & Melin, 2008; McCracken, Gauntlett-Gilbert, & Vowles, 2007; McCracken, & Vowles, 2007; McCracken, Vowles, & Gauntlett-Gilbert, 2007; Vowles, McCracken, & Eccleston, 2007), and case studies (Kleen, & Jaspers, 2007; Wicksell, Dahl, Magnusson, & Olsson, 2005; Luciano, Visdómine, Gutiérrez, & Montesinos, 2001). Though a fair amount of empirical literature exists on ACT and chronic pain no empirical studies have examined chronic pain specifically utilizing the Avoidance Cycle as a framework for examining ACT construct relationships.

The current study uses the conceptual framework of the Avoidance Cycle and applies the cycle to chronic pain. Based on the study's results, the Avoidance Cycle is useful as a model of the processes involved in cognitive and behavioral avoidance as it results in decreases in mental and physical aspects of health. In agreement with existing

literature, pain-specific experiential avoidance (CPAQ) emerged as the key construct affecting quality of life and functional status in persons with chronic pain (McCracken & Eccleston, 2005; McCracken, Vowles, & Gauntlett-Gilbert, 2007). Within the Avoidance Cycle, pain-specific experiential avoidance would fall within the Avoidance and Control stage of the cycle. Partial mediation was shown for pain-specific experiential avoidance, between pain intensity and both mental quality of life and disability. In addition to pain-specific experiential avoidance, global experiential avoidance (AAQ-II) was a significant factor predicting quality of life and disability. No published studies have examined the impact of global experiential avoidance on processes and outcomes in chronic pain. As in existing literature, catastrophizing was found as the second strongest construct impacting outcome measures of health (Vowles, McCracken, & Eccleston, 2008; Vowles, McCracken, & Eccleston, 2007), and is represented by the Word, Words, Words stage of the Avoidance Cycle. Enmeshment was an additional construct examined by this study and one that is much less well-represented in the existing empirical literature.

### **The Role of Enmeshment**

Within the Avoidance Cycle as applied to chronic pain, the construct of enmeshment was conceptualized within the Entanglement stage where the chronic pain sufferer buys completely into their thoughts and loses themselves in the process (Hayes & Smith, 2005). With regard to pain, the construct of enmeshment is explained in the Schema Enmeshment Model of Pain (SEMP) as a fusion of one's schema of themselves with their beliefs about their pain and illness (Pincus & Morley, 2001). Given these two definitions enmeshment seems to be a relevant proxy for the Entanglement stage. This stage is listed in the model between the Words, Words, Words stage and the Control and

Avoidance stage, which suggests that enmeshment would be closely associated with catastrophizing and experiential avoidance. Results from the current study supported these relationships as both catastrophizing and experiential avoidance statistically predicted enmeshment. Though very little research has been done examining enmeshment, one previous study also found significant associations between enmeshment and these constructs (Morley, Davies, and Barton, 2005).

What is less clear is how enmeshment relates to characteristics of chronic pain such as pain intensity and to relevant measures of health outcomes such as quality of life, disability, depression and anxiety. In the current study, enmeshment was not significantly associated with pain intensity, depression, or anxiety, and only showed low to moderate association with measures of quality of life and disability. As would be expected given these results, enmeshment was not a significant mediator of pain intensity and measures of functional status. Other research has had similar difficulty in testing the SEMP and its impact on mental health outcomes (Read & Pincus, 2004). Results indicate some utility of measuring enmeshment in persons with chronic pain and support its linkages to constructs such as experiential avoidance and catastrophizing. Yet, enmeshment's associations within ACT and the Avoidance Cycle are still murky and require further exploration. It is still unclear at this time whether enmeshment, as measured by the Possible Selves Questionnaire, is an appropriate proxy for the Avoidance Cycle's stage of Entanglement. Developments in the recent ACT literature have continued to explore the Entanglement process of losing ones self into ones thoughts and have created new constructs in attempt to operationalize this process with constructs such as cognitive fusion and psychological inflexibility.

## **Cognitive Fusion and Psychological Inflexibility**

Six core processes are theorized in ACT; namely Acceptance, Cognitive Defusion, Present Moment Contact, Self as Context, Values, and Committed Action (Hayes, Strosahl, & Wilson, 1999). These processes are thought of as positive psychological skills. Conversely each process has a negative counterpart; namely Experiential Avoidance, Cognitive Fusion, Past or Future Focus, Self as Content/Process, Weak or Absent Values, and Inaction/Impulsivity. Of these negative counterparts cognitive fusion is most closely associated with Hayes and Smith's (2005) stage of Entanglement. They define cognitive fusion as "the tendency to allow thought to dominate other sources of behavioral regulation because of the failure to pay attention to the process of relating over and above the process of relating...in less abstract terms, cognitive fusion involves treating our thoughts as if they are what they say they are" (Hayes & Smith, 2005, p.57). This process of buying in to one's thoughts and subsequent behavioral restriction and avoidance, fuels psychological inflexibility a construct that involves the interaction of the negative counterparts of the six core processes. Psychological inflexibility is the persistence in avoidant behaviors, due to related cognitions, even when such avoidance causes life restriction and disability, or failure to persist in healthy behaviors due to unwanted internal experiences such as pain and worry (McCracken & Vowles, 2007). Clearly cognitive fusion and psychological inflexibility play significant roles in the Avoidance Cycle and cognitive fusion could serve as an operationalized definition of the Entanglement stage. Still measurement of these constructs is in its infancy.

Beyond the SEMP's Possible Selves Questionnaire, as used in the current study as a measure of enmeshment, there are few instruments that could tap into the process outlined in the Avoidance Cycle's stage of Entanglement. Only two very recently developed measures aim to measure cognitive fusion or psychological inflexibility with regard to chronic pain. One such measure is the Psychological Inflexibility in Pain Scale (PIPS) developed by Wicksell, Renofalt, Olsson, Bond, and Melin (2008). These researchers comprised 38 items meant to assess avoidance, acceptance, cognitive fusion, and values orientation. Validation on a sample of 203 Swedes allowed for factor analysis and a reduction in test items to 16 items with two subscales of Avoidance and Cognitive Fusion. Initial data on the newly formed PIPS shows internal consistency, criterion validity and associations with important outcomes in pain such as pain severity, affective distress, disability, and quality of life. The other promising measure is the second version of the Brief Pain Coping Inventory (BPCI-2). This measure was redesigned by McCracken and Vowles (2007) to include the assessment of psychological flexibility. The Psychological Flexibility subscale was meant to incorporate the measurement of acceptance, mindfulness, values orientation and cognitive defusion. The BPCI-2 was tested on 260 English participants and results supported two subscales of Pain Management Strategies and Psychological Flexibility. The subscale of Psychological Flexibility accounted for a significant amount of the variance associated with psychosocial disability and physical functioning. The recent creation of these two measures highlight the continued importance of measuring the process described in the stage of Entanglement and provide future options for the validation or improvement of

the Possible Selves Questionnaire, which was the current study's tool for measuring enmeshment as a proxy for Entanglement.

### **Strengths and Limitations**

#### *Strengths of the Current Study*

This study has several unique dimensions that expand the existing literature on chronic pain. One strength of this study is its use of a process-oriented model as a framework for analyzing constructs in the ACT literature. Previous studies have examined pain-related constructs such as intensity, catastrophizing, avoidance, depression, anxiety, quality of life and disability as they relate to ACT, but none have done so using the Avoidance Cycle as a conceptual framework for these constructs. The Avoidance Cycle as applied to chronic pain is a useful model for several reasons. One such reason is that the model lends itself to examination of some of the constructs as process variables and others as outcome variables. Constructs that are presented in the early stages of the model such as catastrophizing, enmeshment, and experiential avoidance are easily conceptualized as process variables, while constructs that appear in later stages of the model such as depression, anxiety, quality of life, and disability can be conceptualized as outcome variables. Due to the cyclical nature of the model, outcomes could also be conceptualized as processes and vice versa, but the arguably arbitrary distinction used in the current study is in accordance with previous pain research and lends itself to the necessity of determining independent and dependent variables in a research experiment.

Another useful aspect of the Avoidance Cycle as applied to chronic pain is its suggestion of temporal progression through a cycle. The progressive nature of the model

implies that one first encounters chronic pain, and then catastrophizes, and then becomes entangled, and then experientially avoids, etc. Though the order of these stages is by no means solidified and it appears that a person in pain could easily skip stages or move backwards in the cycle, the semi-linear nature of the model is starting point to understanding how chronic pain affects people over time. This starting point provides a platform to discuss the course of avoidance in chronic pain and could help to explain the development of problems such as depression, anxiety, low quality of life and disability.

Though this study was cross-sectional, one strong point was the assessment of participants' perceptions about the temporal nature of their pain and related impairment. Retrospective recall about psychological problems before and after pain onset can estimate the course of psychological impairment. Few studies have used this method to assess the temporality of pain impairment and no studies have done so within an ACT model. In this study, striking increases in reported psychological problems after onset of chronic pain supports the idea of pain as a catalyst for problems in mental health. The course of these problems and their development continue to be a topic of study in pain research literature (Tan, Jensen, Thornby, & Sloan, 2008). Participants' comparisons of their health to one year ago continue to expand upon the process of health decline in the presence of pain. Using catastrophizing, enmeshment and avoidance to predict this decline highlights the utility of the Avoidance Cycle in explaining this decline in health and draws comparison to the Avoidance Cycle's conceptualization as a downward spiral.

Integration of the Schema Enmeshment Model of Pain (SEMP) into the Avoidance Cycle as an operationalization of Entanglement was a novel addition to ACT in chronic pain. The most recent work with the SEMP's construct of enmeshment has



been in relation to constructs and measures (experiential avoidance, CPAQ) developed by ACT researchers (Morley, Davies, and Barton, 2005)., but have not been as explicitly integrated with an ACT model as this dissertation study has done. This integration used the solid theoretical backbone of the SEMP to enhance the definition of Entanglement and its utility in current research. The use of the SEMP's measure of enmeshment, the Possible Selves Questionnaire, establishes new psychometric options in the study and measurement of Entanglement and, more broadly, cognitive fusion.

Lastly, one additional strength of this study was the demographic characteristics of the clinical sample. To date the large majority of research with ACT constructs in adult chronic pain populations has been done with English and Swedish participants and very few have been done with American participants (Kratz, Davis, & Zautra, 2007). Several critical differences, such as access, cost, and availability of healthcare, exist between healthcare in America and Europe that may reduce the generalizability of European results to patients in the United States (Dahl, Wilson, & Nilsson, 2004). The Midwestern United States sample of the current study increases the generalizability of results to Americans with chronic pain. Further comparisons between this study's sample and existing research done internationally can help to estimate similarities and differences in the experience of chronic pain and subsequent medical care across nations.

The low socioeconomic status of this study's sample is an additional demographic strength with implications in the generalizability and utility of this study. The low household income of the participants coupled with this study's recruitment from a pain management center that specializes in serving uninsured and underinsured patients highlights the study's attempt to examine an underserved and understudied population.

The results from the study and implications for future research and treatment are more generalizable to low income and disabled patients. Improvements in the functioning of persons with the above mentioned demographics may have the greatest impact in reducing the cost and societal burden of chronic pain in the United States.

#### *Limitations of the Current Study*

With a large number of constructs, the Avoidance Cycle is complex and proposes many possible mediating and moderating relationships between cycle constructs. The cross-sectional design of the current study makes it hard to support causal relationships. For instance, arguments have been made that experiential avoidance is a major mediator between chronic pain and loss of quality of life, but establishing mediation is a debated and complex process. Baron and Kenny (1986) define a mediator as the "mechanism through which the focal independent variable is able to influence the dependent variable of interest" (p.1173). Operationalized, they propose that four, previously described, conditions must be met to consider a variable to be a mediator. These conditions are based upon correlational data and do not rely on temporal findings to qualify mediation. In effect experiential avoidance was found to statistically partially mediate pain intensity and quality of life but this finding may not translate into a real time mediating process in the proposed temporal direction.

Baron and Kenny's (1986) methodology behind their definition and testing of a mediator has been criticized. More recent studies on mediating variables call for temporal precedence to infer mediation (Ward & Thorn, 2006) rather than simple statistical mediation. This criticism could be addressed by future *longitudinal* research that follows patients in the transition from acute to chronic pain while intermittently

assessing for constructs mentioned in this model (Grotle, Vollestad, Veierod, & Brox, 2004). Studies of this nature would yield stronger more valid causal relationships between chronic pain and the psychological mechanisms and processes (i.e. catastrophizing, enmeshment, experiential avoidance, etc.) that affect quality of life in the chronic pain patient.

Though several elements of this study attempt to explore temporal precedence through self-report and retrospective recall, these methods have been historically criticized regarding validity and reliability. Both self-report and retrospective recall are strongly susceptible to participant bias and errors in memory which may influence recall. This problem is not easily remedied due to the subjective nature of many constructs in this study (i.e. pain intensity, catastrophizing, depression, etc.). Still, some objective measurements of study constructs could strengthen future research. For example, disability could be measured by completion times on tasks of daily living, range of motion measurements, or strength and fitness tests. The bias of retrospective recall could be improved by ecological momentary analysis or by friend and family reporting of observed behaviors.

One additional limitation of this study is the use of the Possible Selves Questionnaire (PSQ) which is a much less well-validated than other measures used in this study. The PSQ only has one published study with any psychometric information on the instrument (Morley, Davies, and Barton, 2005). This lack of validation could be the reason why it was not as strong a predictor of functional outcomes as other study predictors. Some variability may be due to the fact that this measure was the only self-report questionnaire that was verbally administered in an interview format. Future

research may wish to use other proxies for the Entanglement stage than the PSQ score of enmeshment, such as the previously discussed measures of cognitive fusion or psychological flexibility. Still, the use of the PSQ in this study does have implications for its use as an operationalization of Entanglement in future studies.

### **Comments and Implications**

In the Pain Management Center from which this sample was recruited, pain intensity ratings are the principle measure of the “success” of a pain management intervention. The standard used in the center, and in many pain programs like it, is whether the pain intensity rating was reduced by 50%. If this reduction occurred, then the intervention was deemed as a success. Several difficulties exist in this measurement and criterion of pain management including the subjective nature of pain ratings, variability of pain ratings over time and across activities, post procedural pain increases, and placebo effects, to name just a few. Within multidisciplinary pain management approaches pain intensity reduction is only one of the targets of intervention. Equally important are increases in quality of life and physical and psychosocial functioning. This study aimed to look at the processes that are involved in the relationship of pain intensity and constructs of functional status such as quality of life and disability.

Utilizing the framework of the Avoidance Cycle, as applied to chronic pain, this study used well validated measures of processes in chronic pain to explore the SEMP’s construct of enmeshment as novel conceptualization of the Avoidance Cycle stage of Entanglement. Both pain-specific experiential avoidance and catastrophizing predicted enmeshment and enmeshment in turn predicted mental quality of life and disability. When enmeshment was explored as a mediator between pain intensity and functional

status outcomes no significant results were found. It is clear that enmeshment is an integral construct related to key processes in the Avoidance Cycle but it did not hold up as a direct mediator between pain intensity and measures of physical and psychological impairment. The construct of enmeshment may explain more variance as a mediator between intermediate constructs such as catastrophizing and experiential avoidance and outcome measures such as mental quality of life and disability. Future examinations of this proposed mediating relationship could provide evidence of enmeshment as an indirect mediator of pain intensity and functional status rather than a direct mediator as this study proposed.

Pain-specific experiential avoidance did prove to be a strong partial mediator between pain intensity and the mental component of quality of life, as well as between pain intensity and disability. These results highlight the importance of experiential avoidance in the process of reducing quality of life and increasing disability in those with chronic pain. Further, these results point to the utility of interventions designed to decrease experiential avoidance and how this reduction could potentially improve chronic pain patients' functioning and mental health. Intervention-based studies that have sought to reduce experiential avoidance and increase pain willingness and activity engagement have found favorable results in patient functioning and psychological health (Vowles, & McCracken, 2008; Wicksell, Ahlqvist, Bring, Melin, & Olsson, in press; McCracken, MacKichan, & Eccleston, 2007; Wicksell, Melin, & Olsson, 2007; McCracken, Vowles, & Eccleston, 2005; Dahl, Wilson, & Nilsson, 2004). The significant findings of pain-specific experiential avoidance as a mediator between pain intensity and mental quality of life and disability encourage exploration of experiential avoidance as a mediator between

other constructs in the Avoidance Cycle. One recent study has done so by examining experiential avoidance as a mediator between catastrophizing and patient functioning and has found significant results (McCracken, Vowles, & Eccleston, 2008).

The effect of catastrophizing on chronic pain continues to be an area of interest. The current study found catastrophizing to be a strong predictor of enmeshment and catastrophizing was also strongly linked with quality of life and disability. Catastrophizing is largely a verbal phenomenon where pain sensations, behaviors, cognitions, and emotions are labeled and unrealistically applied, exaggerated, or worsened. This use of catastrophizing language leads to belief in these distortions and a loss of self in the process, hence the strong connection with enmeshment of schemas of self, pain, and illness. These findings are consistent with the fundamental tenants of Relational Frame Theory (RFT) which is the theoretical basis of ACT. RFT stresses the importance of language in the development of psychopathology (Hayes, Barnes-Holmes, & Roche, 2001). Interventions that decrease the use of unhelpful language in chronic pain patients may emerge as useful targets in increasing physical and mental health.

With regard to moderators of pain intensity and functioning, anxiety sensitivity was proposed as a diathesis that may increase one's likelihood of using avoidance-based coping. The hypotheses designed to test this in the current study looked at anxiety sensitivity as a moderator between pain intensity and functional status. Though anxiety sensitivity showed moderate correlations with mental quality of life and disability, it was only shown to be a moderator of pain intensity and disability. These results, though significant, were not very strong. Future research may address the suggestion that anxiety sensitivity is a diathesis for avoidance-based coping, for example by examining

anxiety sensitivity as a moderator between pain intensity and pain-specific experiential avoidance. Though some evidence suggests that anxiety sensitivity plays a significant role in the chronic pain process, more research is needed to illuminate the nature of its relationship to other constructs in the model.

Lastly, the assumptions of temporality in this study should be held lightly and are subject to further study. Though participants' self reported rates of psychological problems dramatically increased after onset of chronic pain, the majority of participants reported that they experienced some psychological problems before pain onset. This finding could be interpreted as evidence that psychological distress is a contributing factor in the development of chronic pain. Similarly, the directionality of causal relationships implied in models of mediation and moderation should be held lightly. Future prospective study with longitudinal data is needed to clearly establish causality among these models.

In summary, this study highlighted the utility of using ACT constructs in examining phenomena in chronic pain, and the usefulness of the Avoidance Cycle, as applied to chronic pain, as a framework for conceptualizing processes related to these constructs in chronic pain. Results support the mediating role of experiential avoidance between pain intensity and functional and psychological impairment. Avoidance-based coping is clearly a damaging method of dealing with the numerous challenges that face persons who deal with chronic pain. Future research is needed to further illuminate the key factors in the development and maintenance of chronic pain and to determine the strength and causality of these relationships.

Table 1. Summary of Study Questionnaires

Measure	Number of Items	Construct Assessed	Brief description	Psychometric References	Original Reference
Possible Selves Questionnaire (PSQ)	Interview format	Enmeshment	10-20 min. interview that asks the participant to create a list of attributes for Hoped-for and Feared-for Selves. Yields a ratio that represents Enmeshment and Efficacy and Expectancy ratings.	Tested on a chronic pain population and predicted depression and acceptance (Morley, Davies & Barton, 2005).	-Morley, Davies & Barton, 2005
10-point Visual Analogue Scales (VAS)	4	Pain intensity	Participant gives ratings of pain intensity on a 11 point Likert scale for current pain, and lowest, highest and average pain over the past week.	Shown to have strong reliability and validity (Jacob and Kerns, 2001)	-Kerns, Turk & Rudy, 1985 -Melzack, 1975
The Acceptance and Action Questionnaire-II (AAQ-II)	10	Experiential Avoidance	Participant rates how true various statements about avoidance and emotional problems on a 7-point Likert scale	AAQ-II has been piloted on 6 different samples with a total of 3,058 participants. Results from these studies have shown strong divergent and convergent validity with measures of health, depression, and anxiety. The AAQ-II was not correlated with social desirability. (Bond et al., 2009)	-(original version) Hayes et al., 2004 -(2 <sup>nd</sup> version) Bond et al, 2009
The Chronic Pain Acceptance Questionnaire (CPAQ)	20	Experiential Avoidance specific to chronic pain	Participant rates how true various statements about avoidance of chronic pain on a 7-point Likert scale. CPAQ yields total score and two factors of Activity Engagement and Pain Willingness.	CPAQ has strong item intercorrelation, internal consistency, and predictive validity (McCracken, Vowles, & Eccleston, 2004).	-(original version) Geiser, 1992 -(2 <sup>nd</sup> version) McCracken, Vowles, & Eccleston, 2004
The Anxiety Sensitivity Index (ASI)	16	Anxiety Sensitivity	Participants rate on a 5-point Likert scale how concerned they are about the possible negative effects of anxiety-related symptoms. ASI yields a total score and three factors of Physical, Cognitive and Social Concerns.	ASI possesses high internal consistency and has shown good test-retest reliability (Peterson & Reiss, 1992). ASI has been used to predict fear and avoidance in chronic pain populations (Zvolensky et al., 2001; Greenberg & Burns, 2003).	-Reis et al., 1986
Pain Catastrophizing Scale (PCS)	13	Catastrophizing specific to chronic pain	Participants rate the frequency of catastrophizing cognitions on a 5-point Likert scale. Yields total score and two factors of Rumination and Powerlessness.	The PCS was found to have stable validity across gender (D'Eon, Harris & Ellis, 2004) and was found to have good criterion-related, discriminant and concurrent validity in a community sample (Osman et al., 2000).	-Sullivan, Bishop, & Pivik, 1995



Summary of Study Questionnaires (Continued)

Measure	Number of Items	Construct Assessed	Brief description	Psychometric References	Original Reference
Pain Disability Index (PDI)	7	Pain-related Disability	Participants rate how much pain interferes with their lives in the seven domains of Family/Home Responsibilities, Recreation, Social Activity, Occupation, Sexual Behavior, Self-Care, and Life Support Activities on an 11-point Likert scale. Yields total score and factors of Discretionary items and Obligatory items	The PDI has been normed on a large samples of chronic pain patients (Chinball & Tait, 1994). PDI was shown to be correlated with other longer measures of disability, have good test-retest reliability, strong construct validity, good reliability, and a two-factor structure (Gronbald et al,1993; Tait, Chinball & Krause, 1990; Tait et al., 1987).	-Pollard, 1981
Center for Epidemiological Studies Depression Scale (CES-D-10)	10	Depressive symptoms	Participants rate the frequency of depressive symptoms on a 4-point Likert scale.	The CES-D-10 has been shown to be a valid and reliable measure of depressive symptoms and has been used extensively on diverse populations (Rubin et al., 2004; Harrison & Stuitbergen, 2001; Ward, 1994). The CES-D-10 has also been used with patients experiencing chronic pain (Darnall et al, 2005).	-(original version) Radloff, 1977 -(10-item version) Andresen et al., 1994
Medical Outcomes Study: Short-Form 12-Item Health Survey (SF-12)	12	Quality of Life	Participants answer 12 questions related to general health and how their life has been limited by problems with emotional and physical health. Yields total score and components of Physical and Mental Health.	The SF-12 has been shown to be reliable and valid and has been used on a wide variety of various health populations (Ware, Kosinski, & Keller, 1996).	-Ware et al., 1995

Table 2.

## Demographic Characteristics of Participants Who Completed All Parts of Study (N=139)

Variable	Frequency	Percentage	<i>M</i>	<i>SD</i>
Age			45.43	10.68
Body Mass Index			32.16	8.21
Gender				
Female	85	61.2		
Male	54	38.8		
Ethnicity				
African American	28	20.1		
Caucasian	108	77.7		
Hispanic	1	.7		
Other ethnicities	2	1.4		
Marital Status				
Never married	26	18.7		
Currently married	40	28.8		
Separated	11	7.9		
Divorced	57	41.0		
Widowed	5	3.6		
Current Living Arrangement				
Live alone	30	21.6		
Live with spouse/ partner	31	22.3		

Variable	Frequency	Percentage	<i>M</i>	<i>SD</i>
Live with spouse/ partner and children	29	20.9		
Live with children (no spouse/partner)	20	14.4		
Live with roommate who is not partner	4	2.9		
Live with parents	14	10.1		
Other living arrangement	10	7.2		
<b>Highest Level of School Completed</b>				
9 <sup>th</sup> grade or lower	17	12.2		
Partial high school	18	12.9		
High school/GED	57	41.0		
Partial college	40	28.8		
College graduate	5	3.6		
Graduate school	2	1.4		
<b>Annual Household Income Level</b>				
Less than \$10,000	75	54.0		
\$10,000 – \$19,999	31	22.3		
\$20,000 – \$39,999	17	12.2		
\$40,000 - \$59,999	9	6.5		
\$60,000 - \$100,000	5	3.6		
Over \$100,000	1	.7		

Variable	Frequency	Percentage	<i>M</i>	<i>SD</i>
Current Employment Status				
Working full-time	11	7.9		
Working part-time	10	7.2		
On leave with pay	1	.7		
On leave without pay	9	6.5		
Disabled	83	59.7		
Seeking work	9	6.5		
Retired	6	4.3		
Homemaker	7	5.0		
Student	1	.7		

Table 3.

Comparisons of Study Sample Demographics to City, County, State, and National Demographics from U.S. Census Bureau

Demographic	Study Sample ( <i>n</i> =139)	Census 2006 City of Louisville	Census2006 Jefferson County	Census 2006 Kentucky	Census 2006 United States
Female	61.2%	52.7%	51.9%	51.0%	50.7%
Caucasian	77.7%	62.9%	76.4%	90.2%	80.1%
African-American	20.1%	33.0%	20.2%	7.5%	12.8%
High school graduates	74.8%	76.1%	81.8%	74.1%	80.4%
Household annual income	54%<\$10,000	50%<\$28,843	50%<\$42,239	50%<\$37,046	50%<\$44,334

Table 4.

## Participants' Pain-related Characteristics

Variable	Frequency	Percentage	<i>M</i>	<i>SD</i>
<b>Pain Intensity VAS (0-10)</b>				
Current			6.60	2.17
Average over past week			6.75	1.86
Highest in past week			8.57	1.73
Lowest in past week			5.27	2.20
Intensity at time of intake to clinic			7.05	1.65
Duration of Pain in Years			6.94	6.77
<b>Pain Location</b>				
Number of pain locations			2.35	1.52
Neck	50	36.0		
Upper back/ shoulder blades	41	29.5		
Lower back	106	76.3		
Upper extremities	26	18.7		
Lower extremities	67	48.2		
Head	22	15.8		
Other locations	9	6.5		
<b>Pain Diagnoses</b>				
Number of diagnoses self report			1.60	1.11
Number of diagnoses from chart			2.30	1.10

Variable	Frequency	Percentage	<i>M</i>	<i>SD</i>
<b>Self Reported Diagnoses</b>				
Degenerative Disc disease	67	48.2		
Lumbago	53	38.1		
Bulged disc(s)	65	46.8		
Fibromyalgia	14	10.1		
Reflexive Sympathetic Dystrophy	5	3.6		
Other pain diagnosis	19	13.7		
<b>Diagnoses from Chart</b>				
Degenerative Disc disease	45	32.4		
Lumbago	85	61.2		
Bulged disc(s)	22	15.8		
Chronic neck pain	27	19.4		
Spondylosis	44	31.7		
Arthropathy	21	15.1		
Enthesopathy	7	5.0		
Other diagnosis	64	46.0		
<b>Treatments</b>				
Medication	124	89.2		
Anesthetic injection	86	61.9		
Implantable device	13	9.4		

Variable	Frequency	Percentage	<i>M</i>	<i>SD</i>
Chiropractics	42	30.2		
Surgery	35	25.2		
Counseling/Therapy	35	25.2		
Other treatments	17	12.2		

#### Reported Successful Treatments

(Percent success of those who had that type of treatment)

Medication	92	74.2
Anesthetic injection	51	59.3
Implantable device	3	23.1
Chiropractics	11	26.2
Surgery	10	28.6
Counseling/Therapy	12	34.3
Other treatments	14	82.4

#### Reason for Visit at Time of Consent

Initial appointment	60	43.2
Follow up	38	27.3
Procedure	41	29.5



Table 5.

## Participants' Psychological Characteristics

Variable	Frequency	Percentage	<i>M</i>	<i>SD</i>
<b>Psychological Problems before Onset of Chronic Pain</b>				
Depression	42	30.2		
Anxiety	34	24.5		
Panic attacks	21	15.1		
Excessive worry	33	23.7		
Other psych problems	11	7.9		
No psych problems	69	49.6		
<b>Psychological Problems since Onset of Chronic Pain</b>				
Depression	89	64.0		
Anxiety	68	48.9		
Panic attacks	32	23.0		
Excessive worry	72	51.8		
Other psych problems	14	10.1		
No psych problems	20	14.5		
<b>Psychological Treatment</b>				
Before onset of pain	30	21.6		
Number of sessions before onset of pain			37.67	51.37
Since onset of pain	52	37.4		
Number of sessions since onset of pain			21.44	31.85

Variable	Frequency	Percentage	<i>M</i>	<i>SD</i>
Currently have psych diagnosis	39	28.1		
Number of psych problems before onset of pain			1.01	1.35
Number of psych problems since onset of pain			1.97	1.44

Table 6.

## Participants' Mean Scores and Standard Deviations on Study Questionnaires

Measure/Subscale	<i>n</i>	% of Total	<i>M</i>	<i>SD</i>
Anxiety Sensitivity Index (ASI)	128	92.1	21.50	15.08
Pain Catastrophizing Scale (PCS)	133	95.7	28.23	13.36
PCS Rumination subscale	136	97.8	10.29	4.63
PCS Magnification subscale	138	99.3	5.27	3.21
PCS Helplessness subscale	135	97.1	12.53	6.52
Acceptance and Action				
Questionnaire (AAQ)	127	91.4	45.85	13.30
Chronic Pain Acceptance				
Questionnaire (CPAQ)	109	78.4	45.39	21.26
CPAQ Pain Willingness				
subscale	122	87.8	16.93	9.60
CPAQ Activity Engagement				
subscale	119	85.6	27.93	14.52
Center for Epidemiological Studies –				
Depression Scale (CES-D-10)	129	92.8	15.09	5.05
Beck Anxiety Inventory (BAI)	127	91.4	19.55	12.71

Measure/Subscale	<i>n</i>	% of Total	<i>M</i>	<i>SD</i>
Medical Outcome Studies Short Form				
12-item version (SF-12)				
SF-12 Physical Component				
Summary (PCS)	124	89.2	24.90	7.41
SF-12 Mental Component				
Summary (MCS)	124	89.2	41.23	12.80
SF-12 Subscales				
Physical Functioning (PF)	139	100.0	26.87	7.68
Role Physical (RP)	137	98.6	26.48	7.05
Bodily Pain (BP)	137	98.6	23.89	7.63
General Health (GH)	129	92.8	33.66	10.60
Vitality (VT)	139	100.0	38.12	9.98
Social Functioning (SF)	138	99.3	30.66	10.91
Role Emotional (RE)	136	97.8	33.55	14.23
Mental Health (MH)	139	100.0	39.89	12.79
Pain Disability Index (PDI)	126	90.6	44.90	12.46
Possible Selves Questionnaire				
(PSQ) total	139	100.0	.51	.31
Ratio of Hoped-for Enmeshment	139	100.0	.42	.37
Ratio of Feared-for Enmeshment	137	98.6	.61	.40

Table 7.

## Relationships between Study Constructs and Quality of Life (SF-12)

Constructs	Relationship between	Relationship between
	construct and SF-12 Physical Component Summary (PCS)	construct and SF-12 Mental Component Summary (MCS)
Pain intensity (VAS) current	-.282**	-.204*
Pain intensity (VAS) average	-.257**	-.269**
Anxiety Sensitivity (ASI)	-.035	-.459**
Catastrophizing (PCS)	-.201*	-.567**
Rumination (PCS)	-.129	-.518**
Magnification (PCS)	-.143	-.479**
Helplessness (PCS)	-.223*	-.572**
Enmeshment (PSQ) Hoped-for	-.045	-.343**
Enmeshment (PSQ) Feared-for	-.290**	-.166
Experiential Avoidance (AAQ-II)	-.069	.586**
Pain-specific Experiential Avoidance (CPAQ) Total	.328**	.625**
Activity Engagement (CPAQ)	.215*	.583**
Pain Willingness (CPAQ)	.382**	.463**
Depression (CES-D-10)	-.194*	-.493**
Anxiety (BAI)	-.209*	-.533**
Disability (PDI)	-.477**	-.439**

\*significant at alpha .05 level, \*\*significant at alpha .0125 level

Table 8.

## Relationships between Study Constructs and Disability (PDI)

Constructs	Relationship between construct and Pain Disability Index (PDI)
Pain intensity (VAS) current	.395**
Pain intensity (VAS) average	.393**
Anxiety Sensitivity (ASI)	.458**
Catastrophizing (PCS)	.562**
Rumination (PCS)	.458**
Magnification (PCS)	.492**
Helplessness (PCS)	.586**
Enmeshment (PSQ) Hoped-for	.219*
Enmeshment (PSQ) Feared-for	.229*
Experiential Avoidance (AAQ-II)	-.472**
Pain-specific Experiential Avoidance (CPAQ) Total	-.618**
Activity Engagement (CPAQ)	-.527**
Pain Willingness (CPAQ)	-.539**
Depression (CES-D-10)	.488**
Anxiety (BAI)	.525**
Quality of Life (SF-12) Physical Component Summary	-.477**
Quality of Life (SF-12) Mental Component Summary	-.439**

\*significant at alpha .05 level, \*\*significant at alpha .0125 level

Table 9.

Associations between Study Measure Total Scores and Subscales

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. Pain Intensity (VAS)	-																
2. ASI	.202 *	-															
3. PCS Total	.309 **	.614 **	-							* Significant at the .05 alpha level ** Significant at the .01 alpha level							
4. PCS Rumination	.249 **	.494 **	.915 **	-													
5. PCS Magnification	.305 **	.699 **	.893 **	.762 **	-												
6. PCS Helplessness	.302 **	.559 **	.952 **	.783 **	.790 **	-											
7. Total Enmeshment	.080	.087	.397 **	.388 **	.311 **	.404 **	-										
8. Hoped-for Enmeshment	.059	.068	.364 **	.320 **	.292 **	.379 **	.784 **	-									
9. Feared-for Enmeshment	.071	.066	.278 **	.303 **	.218 *	.276 **	-.815 **	.276 **	-								
10. CPAQ Total	-.303 **	-.437 **	-.674 **	-.663 **	-.538 **	-.645 **	-.468 **	-.419 **	-.346 **	-							

Table 9.

Associations between Study Measure Total Scores and Subscales (continued)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
11. CPAQ Activity Engagement	-.220 *	-.319 **	-.555 **	-.542 **	-.401 **	-.559 **	-.465 **	-.418 **	-.321 **	.919 **	-						
12. CPAQ Pain Willingness	-.337 **	-.479 **	-.649 **	-.643 **	-.574 **	-.590 **	-.379 **	-.346 **	-.275 **	.803 **	.503 **	-					
13. AAQ-II	-.175 *	-.554 **	-.534 **	-.457 **	-.523 **	-.515 **	-.300 **	-.320 **	-.167	.620 **	.577 **	.477 **	-				
14. CES-D-10	.375 **	.499 **	.538 **	-.424 **	.522 **	.553 **	.219 *	.279 **	.083	-.577 **	-.464 **	-.567 **	-.490 **	-			
15. BAI	.332 **	.772 **	.622 **	.466 **	.644 **	.623 **	.132	.142	.068	-.499 **	-.420 **	-.508 **	-.589 **	.625 **	-		
16. SF-12 PCS	-.282 **	-.035	-.201 *	-.129	-.143	-.223 *	-.218 *	-.045	-.290 **	.328 **	.215 *	.382 **	-.069	-.194 *	-.209 *	-	
17. SF-12 MCS	-.204 *	-.459 **	-.567 **	-.518 **	-.479 **	-.572 **	-.314 **	-.343 **	-.166	.625 **	.583 **	.463 **	.586 **	-.493 **	-.533 **	-.209 **	-
18. PDI	.395 **	.562 **	.562 **	.458 **	.492 **	.586 **	.281 **	.219 *	.229 **	-.618 **	-.527 **	-.539 **	-.472 **	.488 **	.525 **	-.477 **	-.439 **



Table 10.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Physical Components of Quality of Life Mediated by Pain-Specific Experiential Avoidance Controlling for Annual Household Income.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: PCS				
Predictor: Current pain intensity	-.848	.292	-.254	.004
Step 2 (path a)				
Dependent: CPAQ				
Predictor: Current pain intensity	-2.710	.876	-.287	.003
Step 3 (paths b & c')				
Dependent: PCS				
Mediator: CPAQ (b)	.083	.035	.241	.018
Predictor: Current pain intensity (c')	-.653	.315	-.204	.041

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = -1.823$ ,  $p = .069$

Table 11.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Mental Components of Quality of Life Mediated by Pain-Specific Experiential Avoidance Controlling for Annual Household Income.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: MCS				
Predictor: Current pain intensity	-1.090	.514	-.191	.036
Step 2 (path a)				
Dependent: CPAQ				
Predictor: Current pain intensity	-2.710	.876	-.287	.003
Step 3 (paths b & c')				
Dependent: MCS				
Mediator: CPAQ (b)	.356	.051	.597	<.001
Predictor: Current pain intensity (c')	-.515	.468	-.093	.273

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = -2.804$ ,  $p = .005$

Table 12.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Mental Components of Quality of Life Mediated by Activity Engagement.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: MCS				
Predictor: Current pain intensity	-1.174	.510	-.204	.023
Step 2 (path a)				
Dependent: Activity Engagement				
Predictor: Current pain intensity	-1.468	.602	-.220	.016
Step 3 (paths b & c')				
Dependent: MCS				
Mediator: Activity Engagement (b)	.481	.069	.556	<.001
Predictor: Current pain intensity (c')	-.657	.458	-.115	.154

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = -2.281$ ,  $p = .023$

Table 13.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Mental Components of Quality of Life Mediated by Pain Willingness Controlling for Annual Household Income.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: MCS				
Predictor: Current pain intensity	-1.090	.514	-.191	.036
Step 2 (path a)				
Dependent: Pain Willingness				
Predictor: Current pain intensity	-1.386	.370	-.322	<.001
Step 3 (paths b & c')				
Dependent: MCS				
Mediator: Pain Willingness (b)	.528	.129	.385	<.001
Predictor: Current pain intensity (c')	-.738	.538	-.126	.173

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = -2.720$ ,  $p = .007$

Table 14.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Disability Mediated by Pain-Specific Experiential Avoidance Controlling for Annual Household Income.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: PDI				
Predictor: Current pain intensity	2.144	.490	.368	<.001
Step 2 (path a)				
Dependent: CPAQ total				
Predictor: Current pain intensity	-2.710	.876	-.287	.003
Step 3 (paths b & c')				
Dependent: PDI				
Mediator: CPAQ total (b)	-.335	.049	-.549	<.001
Predictor: Current pain intensity (c')	1.207	.470	.208	.012

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = 2.794$ ,  $p = .007$

Table 15.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Disability Mediated by Activity Engagement Controlling for Annual Household Income.

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Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: PDI				
Predictor: Current pain intensity	2.144	.490	.368	<.001
Step 2 (path a)				
Dependent: Activity Engagement				
Predictor: Current pain intensity	-1.348	.605	-.202	.028
Step 3 (paths b & c')				
Dependent: PDI				
Mediator: Activity Engagement (b)	-.394	.072	-.440	<.001
Predictor: Current pain intensity (c')	1.674	.470	.288	.001

---

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = 2.035$ ,  $p = .042$

Table 16.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Disability Mediated by Pain Willingness Controlling for Annual Household Income.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: PDI				
Predictor: Current pain intensity	2.144	.490	.368	<.001
Step 2 (path a)				
Dependent: Pain Willingness				
Predictor: Current pain intensity	-1.386	.370	-.322	<.001
Step 3 (paths b & c')				
Dependent: PDI				
Mediator: Pain Willingness (b)	-.651	.112	-.475	<.001
Predictor: Current pain intensity (c')	1.280	.479	.219	.009

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = 3.116$ ,  $p = .003$

Table 17.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Physical Components of Quality of Life Mediated by Total Enmeshment Controlling for Annual Household Income.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: PCS				
Predictor: Current pain intensity	-.848	.292	-.254	.004
Step 2 (path a)				
Dependent: Total Enmeshment				
Predictor: Current pain intensity	.014	.012	.099	.256
Step 3 (paths b & c')				
Dependent: PCS				
Mediator: Total Enmeshment (b)	-5.247	2.026	-.220	.011
Predictor: Current pain intensity (c')	-.785	.286	-.236	.007

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = -1.003$ ,  $p = .317$



Table 18.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Mental Components of Quality of Life Mediated by Total Enmeshment.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: MCS				
Predictor: Current pain intensity	-1.174	.510	-.204	.023
Step 2 (path a)				
Dependent: Total Enmeshment				
Predictor: Current pain intensity	.011	.012	.080	.347
Step 3 (paths b & c')				
Dependent: MCS				
Mediator: Total Enmeshment (b)	-12.411	3.492	-.302	.001
Predictor: Current pain intensity (c')	-1.059	.489	-.184	.032

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = -.856$ ,  $p = .395$

Table 19.

Analyses of Mediation Using Multiple Regression: Current Pain Intensity and Disability Mediated by Total Enmeshment Controlling for Annual Household Income.

Testing steps	B	Std. Error	$\beta$	p
Step 1 (path c)				
Dependent: PDI				
Predictor: Current pain intensity	2.144	.490	.368	<.001
Step 2 (path a)				
Dependent: Total Enmeshment				
Predictor: Current pain intensity	.014	.012	.099	.256
Step 3 (paths b & c')				
Dependent: PDI				
Mediator: Total Enmeshment (b)	10.848	3.283	.265	.001
Predictor: Current pain intensity (c')	1.950	.475	.335	<.001

B = Unstandardized coefficient, Std. Error = Standard error of B,  $\beta$  = Standardized coefficient

Significance test of  $c - c'$ :  $z = 1.058$ ,  $p = .293$

Table 20.

Analysis of Moderation Using Hierarchical Regression: Current Pain Intensity and Physical Components of Quality of Life  
 Moderated by Anxiety Sensitivity Controlling for Annual Household Income.

Block	Predictor Variable(s)	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF	Sig. of ΔF
1	Annual household income	.038	.038	4.508	.036
2	Annual household income, Current pain intensity, ASI total score	.094	.056	3.442	.035
3	Annual household income, Current pain intensity, ASI total score, Interaction term (pain intensity X ASI)	.101	.007	.861	.355

Outcome variable: SF-12 Physical Component Summary

Table 21.

Analysis of Moderation Using Hierarchical Regression: Current Pain Intensity and Mental Components of Quality of Life Moderated by Anxiety Sensitivity Controlling for Annual Household Income.

Block	Predictor Variable(s)	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF	Sig. of ΔF
1	Current pain intensity, ASI total score	.230	.230	17.054	<.001
2	Current pain intensity, ASI total score, Interaction term (pain intensity X ASI)	.230	<.001	.004	.947

Outcome variable: SF-12 Mental Component Summary

Table 22.

Analysis of Moderation Using Hierarchical Regression: Current Pain Intensity and Disability Moderated by Anxiety

Sensitivity Controlling for Annual Household Income.

Block	Predictor Variable(s)	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF	Sig. of ΔF
1	Annual household income	.041	.041	4.887	.029
2	Annual household income, Current pain intensity, ASI total score	.308	.267	21.829	<.001
3	Annual household income, Current pain intensity, ASI total score, Interaction term (pain intensity X ASI)	.345	.037	6.308	.013

Outcome variable: Pain Disability Index

Figure 1. The Acceptance and Avoidance Cycles.

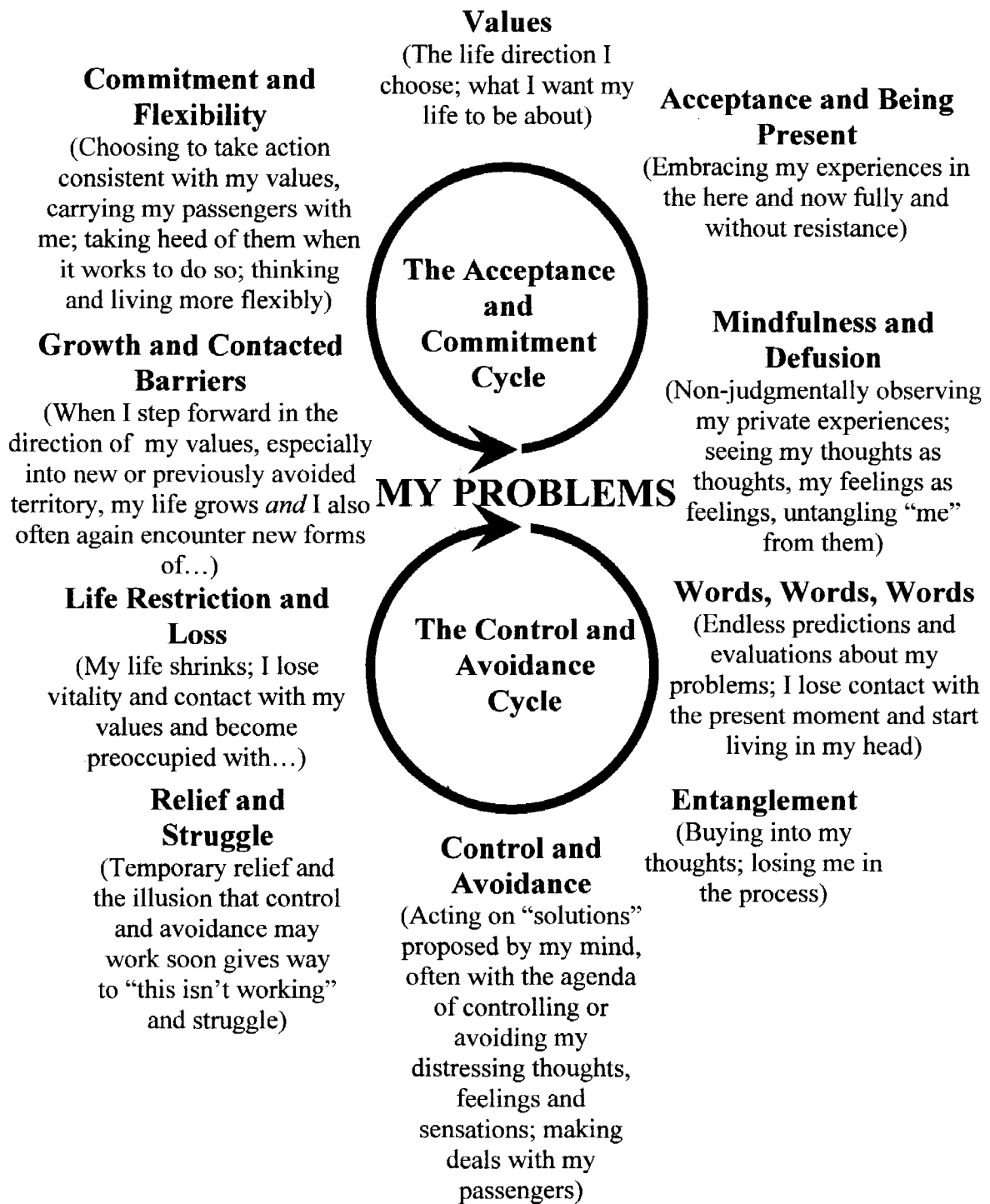


Figure 2. The Cognitive-Behavioral Fear-Avoidance Model of Chronic Pain

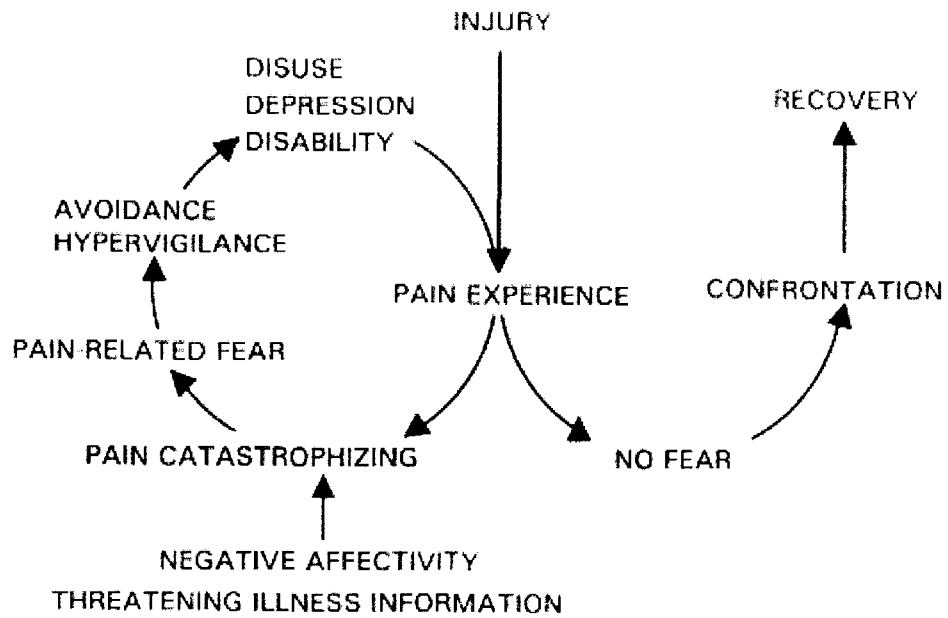


Figure 3. The Fear-Avoidance Model of Chronic Pain

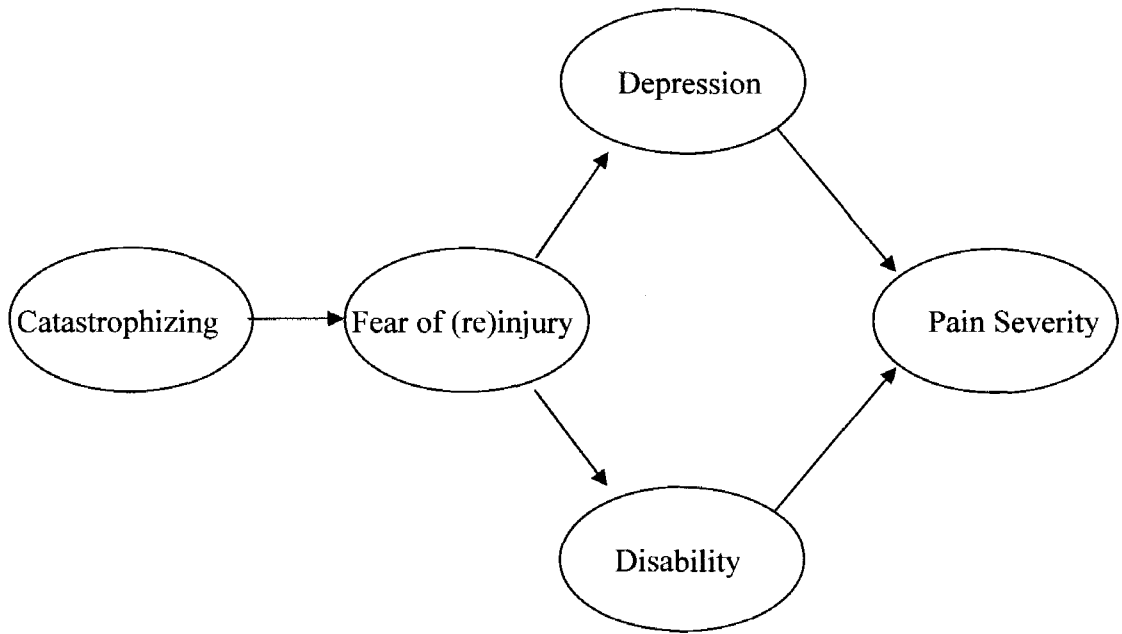
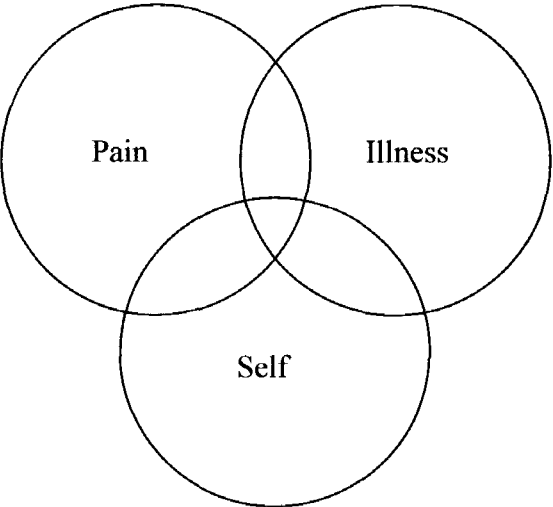
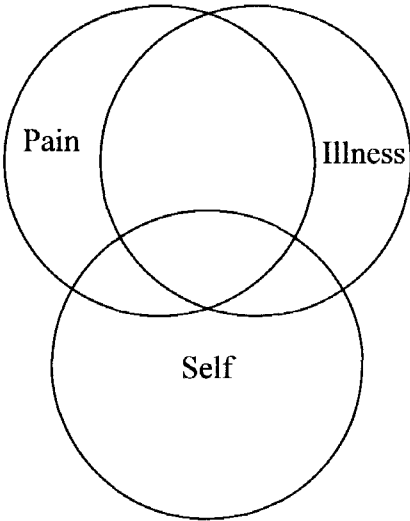




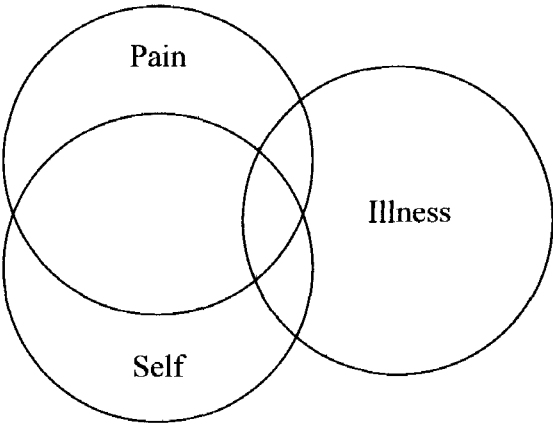
Figure 4. The Schema Enmeshment Model of Chronic Pain



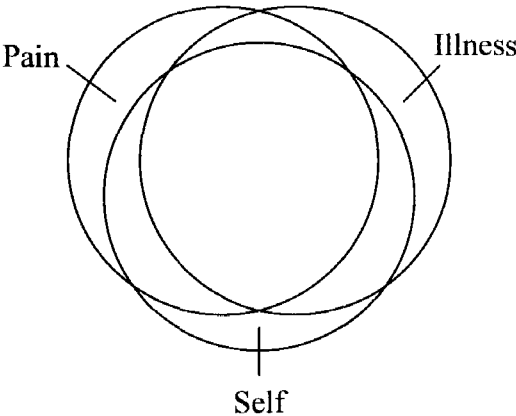
A: Healthy-normal enmeshment



B: Coping with chronic pain



C: Nonproblematic pain enmeshment



D: Enmeshment resulting in distress

Figure 5. Diagram of measures assessing the stages of the Avoidance Cycle

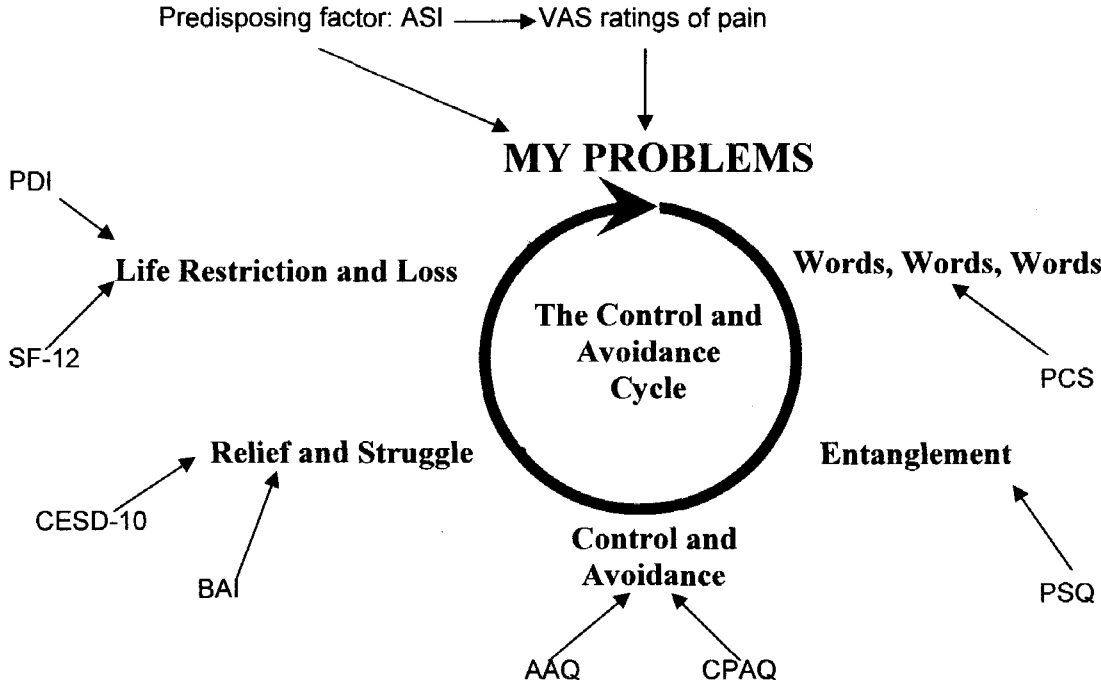


Figure 7. Potential Individual Relationships

*Hypothesis #1*

Pain Intensity → Enmeshment

Catastrophizing → Enmeshment

Experiential Avoidance → Enmeshment

Anxiety Sensitivity → Enmeshment

*Hypothesis #2*

Enmeshment → Quality of Life – Physical Component Summary

Enmeshment → Quality of Life – Mental Component Summary

Enmeshment → Disability

Enmeshment → Depression

Enmeshment → Anxiety

Figure 8. Potential Mediating and Moderating Relationships

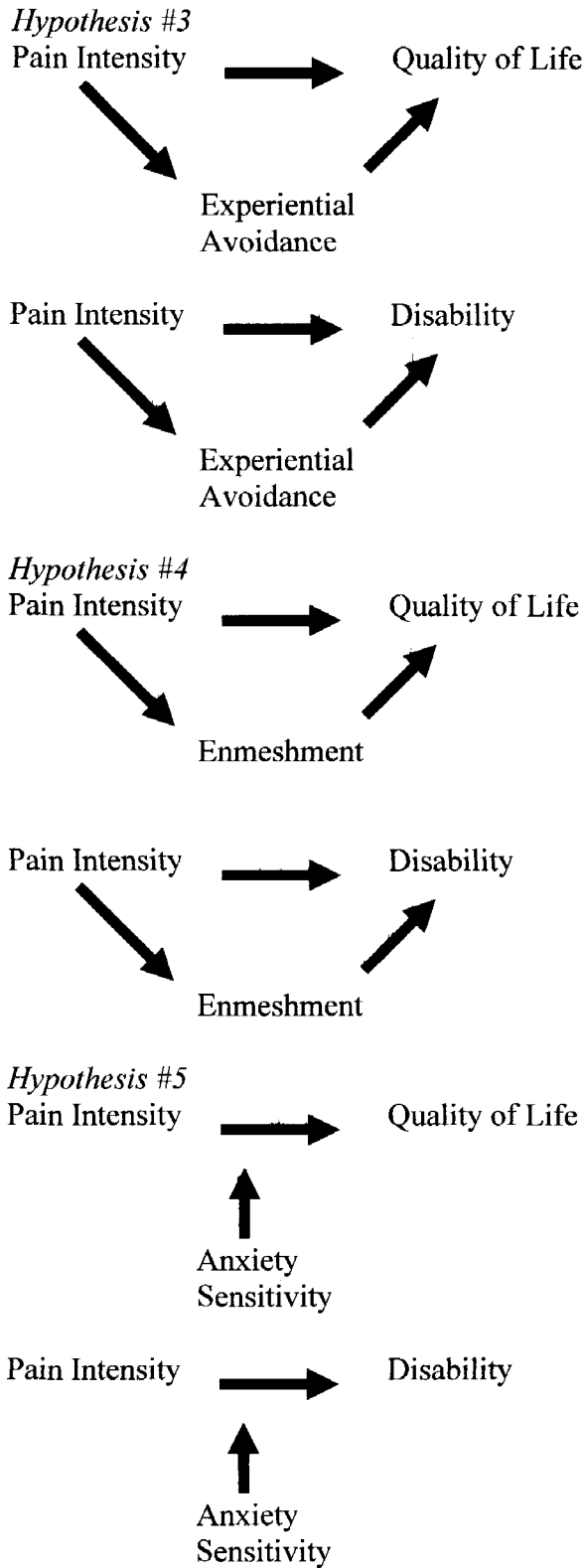
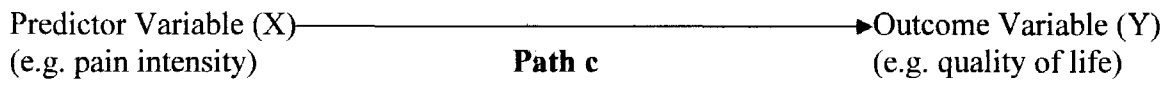


Figure 9. Paths Used in Testing Mediation

1.)



2.)

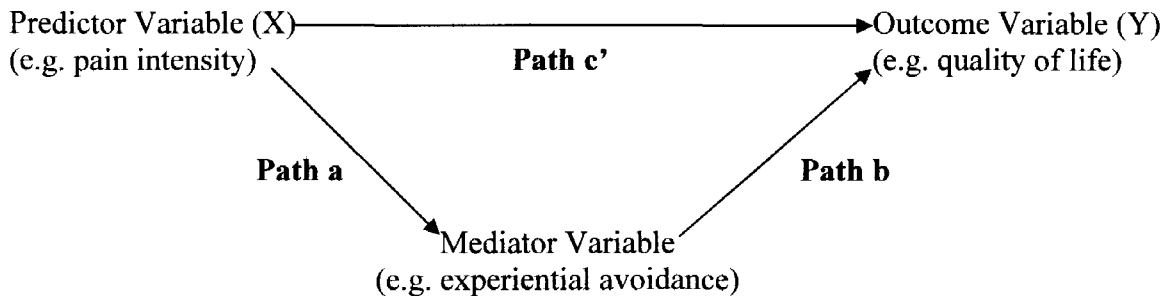
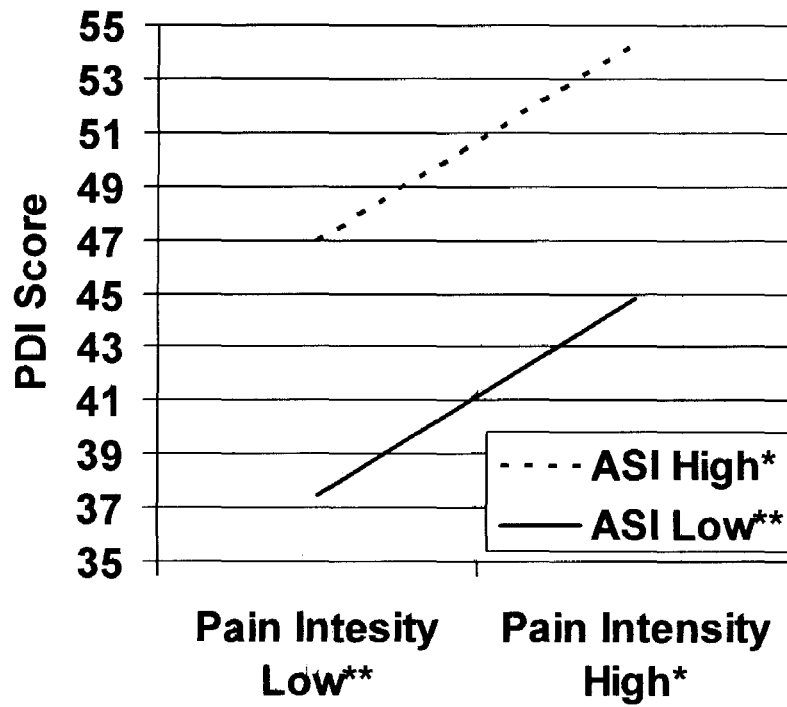


Figure 10. Plot of Anxiety Sensitivity as a Moderator of Pain Intensity and Disability  
Controlling for Annual Household Income



\*High scores were obtained by determining value 1 *SD* above mean. Slope of this line is significantly different from zero ( $B = 4.254, p < .001$ )

\*\*Low scores were obtained by determining value 1 *SD* below mean. Slope of this line is significantly different from zero ( $B = 2.264, p < .001$ )

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APPENDIX A

**Attitudes and Beliefs about Chronic Pain Questionnaire\***

\*(please note that formatting of questionnaire was changed to aid in readability and flow for actual administration to participants. Content was not altered.)

Attitudes and Beliefs about Chronic Pain Questionnaire

Your  
name: \_\_\_\_\_

**GENERAL BACKGROUND INFORMATION**

1. **Today's date:** \_\_\_/\_\_\_/\_\_\_ (month/day/year)
2. **Age:** \_\_\_
3. **Gender**  
 Female     Male
4. **How tall are you?**  
 \_\_\_ feet    \_\_\_ inches
5. **How much do you currently weigh?**  
 \_\_\_ pounds
6. **Ethnic group** (check one box):  
 1 White (non-Hispanic)                       4 Asian  
 2 Black     5 Specify (\_\_\_\_\_)  
 3 Hispanic
7. **Marital status** (check one box):  
 1 Never married                                       4 Divorced  
 2 Currently married                                       5 Widowed  
 3 Separated
8. **Current living arrangement** (check one box):  
 1 Live alone     5 Live with roommate  
 2 Live with spouse/partner                                      who is not partner  
 3 Live with spouse/partner and children                       6 Live with parents  
 4 Live with children (no spouse/partner)                       7 Other (specify)\_\_\_\_\_
9. **Level of school completed** (check one box):  
 1 Less than 7th grade  
 2 Junior High School (7th, 8th, & 9th grade)  
 3 Partial high school (10th or 11th grade)  
 4 High School graduate (Includes G.E.D.)  
 5 Partial college or specialized training (graduate degree)  
 6 College or university graduate  
 7 Graduate professional training

## PAIN-RELATED INFORMATION

1. **Pain Location:** Which area best describes where your worst pain is mainly located?

- 1 Neck
- 2 Upper back or shoulder blades
- 3 Lower back (lumbar region)
- 4 Upper extremities (arms, hands, fingers, shoulders, wrists, elbows)
- 5 Lower extremities (legs, feet, toes, hips, knees, ankles)
- 6 Head (headaches, migraines)
- 7 Face (eyes, ears, nose, jaw, teeth)
- 8 Other (Specify: \_\_\_\_\_)

2. **Pain Duration:** How long have you had consistent pain in the area you identified in the last question?

Please estimate how long, to the best of your ability in months and years.

\_\_\_ months and \_\_\_ years

3. **Pain Intensity:** Please rate how intense your pain is using a scale from 0 to 10 where:

**0=no pain, no discomfort and 10=worst pain, unbearable discomfort.**

- a. How intense is your pain **right now** at this moment (please circle one)?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

no pain      mild pain      moderate pain      severe pain      unbearable pain

- b. What was the **lowest** intensity your pain was at **over the past week** (please circle one)?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

no pain      mild pain      moderate pain      severe pain      unbearable pain

- c. What was the **highest** intensity your pain was at **over the past week** (please circle one)?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

no pain      mild pain      moderate pain      severe pain      unbearable pain



d. What was the **average** intensity your pain was at **over the past week** (please circle one)?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

no pain      mild pain      moderate pain      severe pain      unbearable pain

5. **Pain Treatment:** Please indicate if you have had any of the following treatments and whether or not it was successful in lowering the intensity of your pain.

**Successful      Unsuccessful**

a. **Medication** (ex. Hydrocodone, methadone, muscle relaxers etc.)

b. **Anaesthetic injections** (ex. Trigger-point, epidural, nerve block, etc.)

c. **Implantable device** (ex. Spinal cord stimulator, morphine pump, etc.)

d. **Chiropractic therapy**

e. **Surgery** (ex. Fusion of discs, disc removal, rods, screws, etc.)

f. **Counseling or therapy** (ex. Behavioral medicine, sessions with a counselor, psychologist, psychiatrist, etc.)

g. **Other**

(Specify: \_\_\_\_\_ )

6. **Pain Diagnosis:** Please indicate whether or not you have had, or currently have, any of the following Diagnoses (please check all that apply):
- 1 Degenerative Disc Disease
  - 2 Fibromyalgia
  - 3 Reflexive Sympathetic Dystrophy (RSD) or Complex Regional Pain Syndrome
  - 4 Bulging Discs
  - 5 Lumbago (lower back pain)
  - 6 Other (Specify: \_\_\_\_\_)
7. **Before** you had chronic pain, did you have problems with any of the following (check all that apply)?
- 1 Depression
  - 2 Anxiety
  - 3 Panic Attacks
  - 4 Excessive worrying
  - 5 Other psychological problems (Specify: \_\_\_\_\_)
  - 6 None (I had no psychological problems before I had chronic pain)
8. **Before** you had chronic pain did you receive any treatment for psychological problems or stress, such as seeing a counselor, psychologist, or psychiatrist?
- NO
  - YES...If you answered YES please indicate how many sessions or visits you had with this professional:  
 \_\_\_ sessions
9. **Since** you have had chronic pain, have you had problems with any of the following (check all that apply)?
- 1 Depression
  - 2 Anxiety
  - 3 Panic Attacks
  - 4 Excessive worrying
  - 5 Other psychological problems (Specify: \_\_\_\_\_)
  - 6 None (I have had no psychological problems since I have had chronic pain)
10. **Since** you have had chronic pain have you received any treatment for psychological problems or stress, such as seeing a counselor, psychologist, or psychiatrist?
- NO
  - YES...If you answered YES please indicate how many sessions or visits you have had with this professional:  
 \_\_\_ sessions

11. Do you **currently** have any psychiatric diagnoses or disorders that have been diagnosed by a mental health professional?

NO

YES....If you answered YES please list any current diagnoses:  
Specify: \_\_\_\_\_

**AAQ-II**

**Directions:** Below you will find a list of statements. Please rate the truth of each statement as it applies to you. Use the following scale to make your choice.

1-----2-----3-----4-----5-----6-----7  
 never very seldom seldom sometimes frequently almost always always  
 true true true true true true true

	Never True		Sometimes True			Always True	
	1	2	3	4	5	6	7
1. Its OK if I remember something unpleasant.	1	2	3	4	5	6	7
2. My painful experiences and memories make it difficult for me to live a life that I would value.	1	2	3	4	5	6	7
3. I'm afraid of my feelings.	1	2	3	4	5	6	7
4. I worry about not being able to control my worries and feelings.	1	2	3	4	5	6	7
5. My painful memories prevent me from having a fulfilling life.	1	2	3	4	5	6	7
6. I am in control of my life.	1	2	3	4	5	6	7
7. Emotions cause problems in my life.	1	2	3	4	5	6	7
8. It seems like most people are handling their lives better than I am.	1	2	3	4	5	6	7
9. Worries get in the way of my success.	1	2	3	4	5	6	7
10. My thoughts and feelings do not get in the way of how I want to live my life.	1	2	3	4	5	6	7

### CPAQ

**Directions:** below you will find a list of statements. Please rate the truth of each statement as it applies to you. Use the following rating scale to make your choices. For instance, if you believe a statement is 'Always True,' you would circle a 6 in the area next to that statement.

	0-----	1-----	2-----	3-----	4-----	5-----	6
	never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true
				Never True		Sometimes True	Always True
1. I am getting on with the business of living no matter what my level of pain is ...	0	1	2	3	4	5	6
2. My life is going well, even though I have chronic pain...	0	1	2	3	4	5	6
3. It's OK to experience pain ...	0	1	2	3	4	5	6
4. I would gladly sacrifice important things in my life to control this pain better ...	0	1	2	3	4	5	6
5. It's not necessary for me to control my pain in order to handle my life well ...	0	1	2	3	4	5	6
6. Although things have changed, I am living a normal life despite my chronic pain...	0	1	2	3	4	5	6
7. I need to concentrate on getting rid of my pain...	0	1	2	3	4	5	6
8. There are many activities I do when I feel pain..	0	1	2	3	4	5	6
9. I lead a full life even though I have chronic pain...	0	1	2	3	4	5	6
10. Controlling pain is less important than any other goals in my life ...	0	1	2	3	4	5	6
11. My thoughts and feelings about pain must change before I can take important steps in my life ...	0	1	2	3	4	5	6
12. Despite the pain, I am now sticking to a certain course in my life ...	0	1	2	3	4	5	6
13. Keeping my pain level under control takes first priority whenever I'm doing something ...	0	1	2	3	4	5	6
14. Before I can make any serious plans, I have to get some control over my pain ...	0	1	2	3	4	5	6
15. When my pain increases, I can still take care of my responsibilities ...	0	1	2	3	4	5	6

16. I will have better control over my life if I can control my negative thoughts about pain ...	0	1	2	3	4	5	6
17. I avoid putting myself in situations where my pain might increase ...	0	1	2	3	4	5	6
18. My worries and fears about what pain will do to me are true ...	0	1	2	3	4	5	6
19. It's a relief to realize that I don't have to change my pain to get on with my life ...	0	1	2	3	4	5	6
20. I have to struggle to do things when I have pain.....	0	1	2	3	4	5	6

**CES-D-10**

Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way during the **PAST WEEK** by **checking the appropriate box** for each question.

	<b>Rarely or none of the time (less than 1 day)</b>	<b>Some or a little of the time (1-2 days)</b>	<b>Occasionally or a moderate amount of time (3-4 days)</b>	<b>All of the time (5-7 days)</b>
1. Was bothered by things that usually don't bother me				
2. I had trouble keeping my mind on what I was doing				
3. I felt depressed				
4. I felt that everything I did was an effort				
5. I felt hopeful about the future				
6. I felt fearful				
7. My sleep was restless				
8. I was happy				
9. I felt lonely				
10. I could not "get going"				

## BAI

**Directions:** Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by each symptom during the PAST WEEK, INCLUDING TODAY, by placing an X in the corresponding space in the column next to each symptom.

**How much have you been bothered**

<b>by...</b>	<b>NOT AT ALL</b>	<b>MILDLY</b> It did not other me much.	<b>MODERATELY</b> It was very unpleasant but I could stand it	<b>SEVERELY</b> I could barely stand it
1. Numbness or tingling.				
2. Feeling hot.				
3. Wobbliness in legs.				
4. Unable to relax.				
5. Fear of the worst happening.				
6. Dizzy or lightheaded.				
7. Heart pounding or racing.				
8. Unsteady.				
9. Terrified.				
10. Nervous.				
11. Feelings of choking.				
12. Hands trembling.				
13. Shaky.				
14. Fear of losing control.				
15. Difficulty breathing.				
16. Fear of dying.				
17. Scared.				
18. Indigestion or discomfort in abdomen.				
19. Faint.				
20. Face flushed.				
21. Sweating (not due to heat).				

## Health and Well-Being

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. For each of the following questions, please mark an "X" in the one box  that best describes your answer.

1. In general, would you say your health:

Excellent	Very Good	Good	Fair	Poor
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The following questions are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

How much does your health limit you in...	Yes, limited a lot	Yes limited a little	No not limited at all
2. <b>Moderate activities</b> , such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Climbing <b>several</b> flights of stairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

Has your physical health caused you to...	All of the time	Most of the time	Some of the time	A little of the time	None of the times
4. <b>Accomplish less</b> than you would like	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Be limited in the <b>kind</b> of work or other activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

Have emotional problems caused you to...	All of the time	Most of the time	Some of the time	A little of the time	None of the times
6. <b>Accomplished less</b> than you would like	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Do work or other activities <b>less carefully than usual</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

Not at all	A little bit	Moderately	Quite a bit	Extremely
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during **past 4 weeks**...

<b>Over the past 4 weeks...</b>	<b>All of the time</b>	<b>Most of the time</b>	<b>Some of the time</b>	<b>A little of the time</b>	<b>None of the times</b>
---------------------------------	------------------------	-------------------------	-------------------------	-----------------------------	--------------------------

9. Have you felt calm and peaceful?

10. Did you have a lot of energy?

11. Have you felt downhearted and depressed?

12. During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting friends, relatives, etc.)?

- All of the time
- Most of the time
- Some of the time
- A little of the time
- None of the time

13. Compared to one year ago, how would you rate your health in general now?

- Much better now than a year ago
- Somewhat better now than a year ago
- About the same as one year ago
- Somewhat worse now than one year ago
- Much worse now than one year ago



### ASI

**Directions:** Below is a list of beliefs and feelings about various sensations. Please indicate your opinion by checking the box below the best response.

	<b>Very Little</b>	<b>A little</b>	<b>Some</b>	<b>Much</b>	<b>Very Much</b>
1. It is important for me not to appear nervous.					
2. When I cannot keep my mind on a task, I worry that I might be going crazy.					
3. It scares me when I feel "shaky" (trembling).					
4. It scares me when I feel faint.					
5. It is important to me to stay in control of my emotions.					
6. It scares me when my heart beats rapidly.					
7. It embarrasses me when my stomach growls.					
8. It scares me when I am nauseous.					
9. When I notice that my heart is beating rapidly, I worry that I might have had a heart attack.					
10. It scares me when I become short of breath.					
11. When my stomach is upset, I worry that I might be seriously ill.					
12. It scares me when I am unable to keep my mind on a task.					
13. Other people notice when I feel shaky.					
14. Unusual body sensations scare me.					
15. When I am nervous, I worry that I might be mentally ill.					
16. It scares me when I am nervous.					

## PCS

**Instructions:** Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

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

## PDI

**Directions:** Please rate from 0 to 10 the extent to which pain interferes in the following areas. Please circle the number that best describes how much your life has been disabled by pain in the following areas.

**1. Family and home responsibilities:** activities related to home and family

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
No Mild Moderate Severe Total  
Disability Disability Disability Disability Disability

**2. Recreation:** hobbies sports and other leisure time activities

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
No Mild Moderate Severe Total  
Disability Disability Disability Disability Disability

**3. Social activity:** participation with friends and acquaintances other than family members

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
No Mild Moderate Severe Total  
Disability Disability Disability Disability Disability

**4. Occupation:** activities partly or directly related to working including housework or volunteering

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
No Mild Moderate Severe Total  
Disability Disability Disability Disability Disability

**5. Sexual behavior:** frequency and quality of sex life

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
No Mild Moderate Severe Total  
Disability Disability Disability Disability Disability

**6. Self care:** personal maintenance and independent daily living (bathing dressing etc.)

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
No Mild Moderate Severe Total  
Disability Disability Disability Disability Disability

**7. Life-support activity:** basic life-supporting behaviors (eating sleeping breathing etc.)

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
No Mild Moderate Severe Total  
Disability Disability Disability Disability Disability

APPENDIX B

**Possible Selves Questionnaire**  
(Administrator script is written in italics)

**Part 1: Actual Self**

*This part of the study is concerned with how you view yourself at the moment. Please tell me up to 10 characteristics that you think you actually possess. You can include things that you don't like about yourself as well as things that you do like.*

- |          |           |
|----------|-----------|
| 1. _____ | 6. _____  |
| 2. _____ | 7. _____  |
| 3. _____ | 8. _____  |
| 4. _____ | 9. _____  |
| 5. _____ | 10. _____ |

**Part 2: Hoped-for self**

*This section is concerned with how you see yourself in the future. We all think about our future to some extent. When we do this we usually think about the kinds of experiences that are in store for us and the kinds of people we might possibly become. Sometimes we think about what we **hope** we will be like. Psychologists talk about this in terms of 'hoped for possible selves' – the selves we hope to become in the future. Examples of common hoped for selves include becoming a parent or grandparent.*

*Please take a little time to think about all of your hoped for possible selves- you may have just a few or many. Some questions that may help you think are:*

- Is there anything I haven't already become that I would like to become?*
- What are my hopes for the future?*
- Are there any hobbies I would like to be better at?*

*Please tell me any you can think of:*

- |          |           |
|----------|-----------|
| 1. _____ | 6. _____  |
| 2. _____ | 7. _____  |
| 3. _____ | 8. _____  |
| 4. _____ | 9. _____  |
| 5. _____ | 10. _____ |

Now that you have listed some of your hopes for the future, consider the attributes of the type of person you hope to become.

Please tell me up to 10 characteristics you hope you will possess in the future. Some of these may be characteristics that you already possess.

For each one please decide if you could be like this in the future if you were still in pain. Please tell me 'Yes' or 'No' for each characteristic.

Next, think 'Can I make this characteristic come true?' How capable do you feel of achieving this description in the future? Please rate on a 7-point scale, where 1 means that you don't believe you're capable of making it happen and 7 means that you believe that you're definitely capable of making it happen.

Finally consider, 'How likely is it that these characteristics will describe me in the future?' Again please use a 7-point scale where 1=very unlikely and 7=very likely

Please list up to 10 characteristics that you hope you will possess in the future. Some of these may be characteristics you already possess.	Is it possible to be like this with pain?	Can I make this happen? 1=not at all 7=definitely	How likely is it that this will describe me? 1=very unlikely 7=very likely
1)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
2)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
3)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
4)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
5)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
6)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
7)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
8)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
9)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
10)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7

**Part 3: Feared-for self**

In addition to having hoped for possible selves, we may have images of ourselves that we fear, dread, or don't want to happen: Examples of common feared for selves are getting divorced or having financial problems. Some of us may have a large number of feared possible selves in mind, whereas other may have only a few.

Please take a little time to think about all of your feared possible selves. Please tell me as many as you can think of.

1. \_\_\_\_\_

6. \_\_\_\_\_

2. \_\_\_\_\_ 7. \_\_\_\_\_  
 3. \_\_\_\_\_ 8. \_\_\_\_\_  
 4. \_\_\_\_\_ 9. \_\_\_\_\_  
 5. \_\_\_\_\_ 10. \_\_\_\_\_

*Now that you have listed some of your fears for the future, think about the attributes of the type of person you fear becoming.*

*Please tell me up to 10 characteristics you fear you will possess in the future. Some of these may be characteristics that you already possess.*

*For each one please decide if you could be like this in the future if you were no longer in pain. Please tell me 'Yes' or 'No' for each characteristic.*

*Next, think 'Can I stop this description from coming true?' How capable do you feel of preventing this in the future? Please rate on a 7-point scale, where 1 means that you don't believe you're capable of stopping it happen and 7 means that you believe that you're definitely capable of stopping it happen.*

*Finally consider, 'How likely is it that these characteristics will describe me in the future? Again please use a 7-point scale where 1=very unlikely and 7=very likely*

Please list up to 10 characteristics that you fear possessing in the future. Some of these may be characteristics you already possess.	Is it possible to be like this without pain?	Can I stop this happening? 1=not at all 7=definitely	How likely is it that this will describe me? 1=very unlikely 7=very likely
1)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
2)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
3)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
4)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
5)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
6)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
7)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
8)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
9)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7
10)	Yes No	1 2 3 4 5 6 7	1 2 3 4 5 6 7

## CURRICULUM VITAE

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March 27, 2009

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### *Education*

- Expected*      *Ph.D. University of Louisville, Clinical Psychology*  
(Expected Completion Date – July, 2009)  
Barbara Stetson, Ph.D., chair
- 2006              M.A. University of Louisville, Psychology
- 2001              B.A. Ohio University, Psychology  
*Cum Laude*

### *Research and Clinical Interests*

Behavioral Medicine, Health Psychology, Chronic Pain, Exercise Attitudes, Lapse and Relapse, Post-Traumatic Stress Disorder, Substance Abuse and Dependency, Cognitive-Behavioral Therapy, Acceptance and Commitment Therapy

### **Publications**

#### **Poster Presentations at National Conferences**

- 2008    **Meyer, J., Bonner, J., Rothschild, C., Rogers, W., Foster, M., Richardson, K., Robertson, E., Reitz, P., Stetson, B.** Acceptance and Experiential Avoidance: Associations with Quality of Life and Self-Care in Adults with Type 2 Diabetes. Society of Behavioral Medicine, March, 2008, San Diego, CA

- 2006 **Meyer, J.**, Stetson, B., Bonner, J., Rothschild, C., Ulmer, C., & Beacham, A. Demoralization and affective state and associations with exercise characteristics in a sample of community exercisers. Association of Behavioral and Cognitive Therapies, November 2006, Chicago, IL.
- 2005 **Meyer, J.**, Stetson, B., Ulmer, C., & Dubbert, P. Association of tonic processes and exercise relapse in male community exercisers. Association for the Advancement of Behavior Therapy, November 2005, Washington, DC.
- 2005 Stetson, B., Bonner, J., **Meyer, J.**, Ulmer, C., Rothschild, C., Kurian, R., & Mokshagundam, S. P. Home-based physical activity barriers in older men with diabetic neuropathy following cessation of supervised resistance training. Association for the Advancement of Behavior Therapy, November 2005, Washington, DC
- 2005 Bonner, J., Stetson, B., Beacham, A., Ulmer, C., Rothschild, C., & **Meyer, J.** Associations between exercise schema and exercise behavior related to psychological well-being in community dwelling adults. Association for the Advancement of Behavior Therapy, November 2005, Washington, DC.
- 2004 Ulmer, C., Stetson, B., Beacham, A., Salmon, P., & **Meyer, J.** Trait mindfulness in a sample of community exercisers. Association for the Advancement of Behavior Therapy, November 2004, New Orleans, LA.
- 2004 Stetson, B., Beacham, A., **Meyer, J.**, Bonner, J., Ulmer, C., & Rothschild, C. Consistency of physical activity patterns and relationship to mood in community dwelling adults. Association for the Advancement of Behavior Therapy, November 2004, New Orleans, LA.

#### **Abstracts Accepted for Conference Presentation**

- 2008 Rogers, W., **Meyer, J.**, Rothschild, C., Bonner, J., Das, N., Richardson, K., Mokshagundam, S.P., Krisnasamy, S., Kong, M., Stetson, B. (April, 2009). Social isolation is associated with geographic socioeconomic status and quality of life in at-risk, underserved adults with type 2 diabetes. Submitted for presentation at the 30th Annual Meeting of the Society of Behavioral Medicine. Montreal, Canada.
- 2008 Richardson, K., Rogers, W., Bonner, J., Rothschild, C., **Meyer, J.**, Das, N., Mokshagundam, S.P., Krisnasamy, S., Kong, M., Stetson, B. (April, 2009). Geographic socioeconomic status, health literacy and perceived barriers to self-care in at-risk, underserved adults with type 2 diabetes. Submitted for presentation at the 30th Annual Meeting of the Society of Behavioral Medicine. Montreal, Canada.



### **Abstracts Published**

- 2006 Bonner, J., Stetson, B.A., **Meyer, J. A.**, Rothschild, C.L., Ulmer, C.S., & Beacham, A.O. The role of personality and schema in predicting exercise-related guilt. *Annals of Behavioral Medicine*, 31, S156.
- 2005 Stetson, B., Beacham, A., **Meyer, J.**, Ulmer, C., Rothschild, C., & Bonner, J. Exercise cognitions differ by number of exercise relapse occurrences. *Annals of Behavioral Medicine*, 29, p.S160.
- 2005 Stetson, B., Beacham, A., Rothschild, C., **Meyer, J.**, Bonner, J., & Ulmer, C. Combined utility of the Transtheoretical/Stage of change and Relapse Prevention Models in understanding the process of ongoing exercise. *Annals of Behavioral Medicine*, 29, p.S159.
- 2004 Stetson, B. A., Beacham A. O., Dubbert, P., Ulmer, C., & **Meyer, J.** Community Exercisers' Perspectives on Processes of Exercise Lapses and Relapses. *Annals of Behavioral Medicine*, 7, p.S041.

### **Manuscripts in Production**

- 2007 Stetson, B., Ulmer, C., **Meyer, J.**, Beacham, A., Gallagher, K. & Dubbert, P. Intermittent physical activity levels in regular exercisers: Perceived and behavioral patterns and prospective associations in community women. Currently being reviewed for resubmission to the journal *Psychology of Sport and Exercise*.
- 2007 Stetson, B., Beacham, A., & **Meyer, J.** Manuscript in progress on the Transtheoretical Model of behavior change as applied to exercise and mechanisms of change in the relapse prevention model. To be submitted to the journal *Health Education Research*

### ***Conferences and Invited Presentations***

- 2006 Attended 40th annual convention of the Association of Behavioral and Cognitive Therapies, November 2006, Chicago, IL
- 2005 Attended 39th annual convention of the Association of Behavioral and Cognitive Therapies, November 2005, Washington, DC.
- 2005 Attended 26<sup>th</sup> annual meeting of the Society of Behavioral Medicine, March 2005, Boston, MA
- 2004 Attended 38<sup>th</sup> annual convention of the Association for Advancement of Behavior Therapy, November 2004, New Orleans, LA.

- 2004 Attended 25<sup>th</sup> annual meeting of the Society of Behavioral Medicine, March 2004, Baltimore, MD
- 2004 Stetson, Barbara A., Abbie O. Beacham, Patricia Dubbert, Christine Ulmer, and **Jeff A. Meyer**. "Community Exercisers' Perspectives on Processes of Exercise Lapses and Relapses." Citation paper presented as a talk at the 25<sup>th</sup> annual meeting of the Society of Behavioral Medicine, March 2004, Baltimore, MD

### ***Clinical Experience***

- 2008 **Psychology Intern**, Togus VA Medical Center, Augusta, ME  
 Rotation: Integrated Primary Care (IPC)  
 Supervisor: John Agee, Ph.D.  
 -Conducted brief intake and intervention sessions.  
 -Consulted with primary care providers on individual patients.  
 -Facilitated Mindfulness Based Stress Reduction group.  
 -Conducted brief neuropsychological screens.  
 Rotation: PTSD Intensive Outpatient Program (IOP)  
 Supervisor: Jerold Hambright, Ph.D.  
 -Facilitated week long intensive outpatient groups focused on reducing veteran's struggling with suffering and increasing valued living.  
 -Conducted intake interviews and paper and pencil evaluations for admission of veterans into PTSD IOP.  
 -Conducted detailed diagnostic interviews for assessment of PTSD.  
 Rotation: Health Psychology  
 -Facilitated Managing Overweight Veterans Everywhere (MOVE) group.  
 -Performed intake assessments for Pain Management group.  
 -Served as interim member of Pain Management Oversight Committee.  
 -Performed psychosocial assessments for kidney transplants
- 2007- **Clinic Assistant**, University of Louisville Psychological Services Center:  
 2008 Louisville, KY  
 Supervisor: Bernadette Walter, Ph.D.  
 -Performed weekly intake interviews and assessments for incoming clients to the Psychological Services Center and wrote integrative intake summaries based on interview and intake measures.  
 -Assisted in daily clinic procedures such as client scheduling, client account management, receipt of payment, telephone intakes, peer supervision, and other tasks.  
 -Assisted in maintaining home-based primary care clinical team under Dr. Barbara Stetson. Regular duties included student orientation, clerical duties for team, and student support and supervision.  
 -Scheduled, organized, and managed Psychological Services Center Colloquium Series, a monthly presentation from community psychologists on relevant clinical issues.

-Scheduled, organized, and managed Psychological Services Center in-services, a monthly case conference for clinical teams and supervisors on specific areas of team expertise and client case presentation.

2006- **Student Psychologist**, University of Louisville Psychological Services Center:

2007 Serious Mental Illness Team, Louisville, KY

Supervisor: Rich Lewine, Ph.D.

-Lead psychological group therapy for inpatients at University of Louisville hospital's acute inpatient psychiatric unit.

-Utilized empirically based treatment at Psychological Services Center of clients with severe mental illness, and less severe psychological disorders.

2006- **Student Psychologist**, Central State Hospital, Louisville, KY.

2007 General inpatient, forensic unit, and geriatric unit.

Supervisor: Carolyn Jones, Psy.D.

-Conducted all of the hospital's annual psychological evaluations from August 2006 to May 2007. Evaluations were full psychological assessments of functioning, intelligence, and personality

-Regularly attended and provided input on interdisciplinary team meetings including treatment team meetings, forced medication reviews, and Treatment Appropriateness Review Committees.

2004- **Student Psychologist**, University of Louisville Psychological Services Center:

2007 Psychological assessments.

Supervisors: Bernadette Walter, Ph.D., Paul Bock, Ph.D.

-Conducted detailed assessment of gifted and talented placement for middle school

-Conducted detailed assessments of adult Attention Deficit/Hyperactivity Disorder

2005- **Student Psychologist**, University of Louisville Psychological Services Center:

2006 Behavioral Primary Care Team, Louisville, KY.

Supervisor: Amy Buckley, Ph.D.

-On-site treatment and assessment at the University of Louisville Hospital Ambulatory Internal Medicine clinic. Focus on behavioral therapy and brief intervention.

-Regular consultation with health providers about patients and their medical and psychological care.

-Utilized empirically based treatment at Psychological Services Center of clients with chronic illness and health-related problems

- 2004- **Student Psychologist**, University of Louisville Psychological Services Center:  
2006 Women's Trauma/PTSD Team, Louisville, KY.  
Supervisor: Tamara Newton, Ph.D.
- Conducted individual assessment and psychotherapy for trauma survivors.
  - Utilized empirically based treatments for PTSD including imaginal exposure and cognitive-behavioral therapy.
  - Participated in outreach efforts with Legal Aid of Louisville a non-profit organization dedicated to providing legal assistance to community women and families.
- 2003- **Student Psychologist**, University of Louisville Hospital Pain Management  
2005 Center, Louisville, KY.  
Supervisor: Abbie Beacham, Ph.D.
- Conducted assessments for eligibility for implantation of Spinal Cord Stimulator and Medication Infusion System procedures
  - Conducted individual psychotherapy for pain center patients utilizing cognitive-behavioral and Acceptance and Commitment Therapy interventions.
  - Acted as primary personnel for Behavioral Medicine treatment in this anesthesiology based pain clinic.
  - Assisted patients before and during procedures such as trigger-point injections and epidural to reduce anxiety and increase procedure success.
- 2001- **Clinical Service Provider**, Full-time employee, Extended Drug and Alcohol  
2003 Treatment for Men, Talbert House, Cincinnati, OH;  
Supervisor: Thom Bach, M.A., Otis Ray, M.A.
- Facilitated large and small education and treatment groups.
  - Created and implemented a six week (24 day) curriculum for a specialized group on anger management and stress reduction.
  - Conducted intake assessments
  - Developed treatment plans with biopsychosocial interventions for substance abuse
  - Provided individual and family counseling.

#### *Research Experience*

- 2007- **Research for Dissertation**, University of Louisville Pain Management Center  
present Faculty Advisor: Barbara A. Stetson, Ph.D.
- Developed and implemented study Attitudes and Beliefs about Chronic Pain a multi-method assessment, cross-sectional study investigating associations between Acceptance and Commitment Therapy constructs of avoidance and the Schema Enmeshment Model of Pain and their relationship to quality of life and disability.

- 2003- **Research Assistant**, Department of Brain and Psychological Sciences,  
 present University of Louisville  
 Supervisor: Barbara A. Stetson, Ph.D.
- Currently involved in development, data collection, and statistical analysis of a diabetes self management study on a clinical population of diabetics.
  - Currently writing manuscript on exercise slip, lapse and relapse as it relates to the tonic and phasic processes of the Relapse Prevention Model.
  - Assisted in pilot study examining the utility of palm top questionnaires combined with RT3 Accelerometer data to compare recorded and reported variables related to exercise.
  - Data collection, data management, data entry, data cleaning, and statistical analysis in a questionnaire-based study, examining the psychometric qualities of measures of health behaviors and attitudes, mindfulness and physical activity
  - Data collection data management on a study tracking physical activity and exercise in an older population of males with Type-II Diabetes Mellitus and peripheral neuropathy. Components included personal and phone interviews, tracking of adverse events (i.e. a serious fall or injury), psychoeducational newsletters and physical assessments of functional assessment
  - Data entry and management of previously collected data on exercise patterns and physical activity. Evaluated data about exercise patterns and omissions, using the Relapse Prevention Model as an empirical framework.
- 2006- **Research Assistant**, Central State Hospital, Louisville, KY  
 2007 Supervisor: Carolyn Jones, Psy.D.
- Quarterly conducted internal audits on therapist's notes in clinical charts.
  - Presented findings in summaries/graphically to hospital administrators
  - Periodic checks and audits in quality assurance in the areas of competency evaluations, individual therapy, and risk assessments
- 2002- **Research Assistant**, Department of Psychology, University of Cincinnati,  
 2003 Supervisor: John Schafer
- Literature search and literature review on brief measures of alcohol and drug use and dependency to assist in development of a brief version of the Substance Abuse Subtle Screening Inventory (SASSI)
  - Edited, formatted and prepared manuscript on SASSI validity issues for submission into the journal *Addiction*
- 2000- **Research Assistant**, Department of Psychology, Ohio University,  
 2001 Supervisor: Steven Patterson
- Served as research confederate, administering mathematical tasks, in a study examining the effects of hydration levels on stress and

psychophysical indicators of stress, including blood make-up, heart rate, bioimpedence, and blood pressure  
-Monitored heart rate, blood pressure, and bioimpedence in subjects of hydration study, using COP-WIN computer program  
-Collected and analyzed blood, plasma and physiological data using such instruments as a coulter-counter, a bioimpedence machine, a centrifuge and pipettes.

### *Teaching Experience*

- 2008 **Co-presenter** for "ACT Gone Wild" to approximately 80 mental health providers at the Northampton VA, Northampton, MA on November 28, 2008.
- 2008 **Teaching Assistant** for Interventions course (doctoral level) with Dr. Paul Salmon, University of Louisville, Fall and Spring Semester 2007-08.
- 2007 **Presenter** of "Stimulation of the Septal Area of the Brain and Effects on Behavior" to residents in the school of medicine, University of Louisville Hospital, November 16, 2007.
- 2007 **Teaching Assistant** of Interviewing Practicum (doctoral level) with Dr. Janet Woodruff-Borden, University of Louisville, Fall and Spring Semester 2007-08.
- 2007 **Guest Presenter:** "Meditation and mindfulness: An exercise in eating a raisin" in clinical doctoral team on serious mental illness, University of Louisville, Spring Semester 2007.
- 2006 **Guest Presenter:** "Machismo and men's issues in therapy" in clinical doctoral team on serious mental illness, University of Louisville, Fall Semester 2006.
- 2006 **Guest Lecture:** "Orthogonality in contrast comparisons" in Advanced Statistics II doctoral course, University of Louisville, Spring Semester 2006.
- 2006 **Teaching Assistant** of Advanced Statistics II (doctoral level) with Dr. Lora Haynes, University of Louisville, Spring Semester 2006.
- 2005 **Teaching Assistant** of Advanced Statistics I (doctoral level) with Dr. Steven Edgell, University of Louisville, Fall Semester 2005.
- 2005 **Co-presenter** of "Behavioral Medicine and the Chronic Pain Patient" with Dr. Abbie Beacham. Presentation to residents in the school of medicine, University of Louisville Hospital, June 6, 2005

### *Volunteer Experience and Community Service*

- 2007 **Presenter** of “Coping with Chronic Pain: An ACT-based Approach for Older Adults” to community members at the Kling Senior Center, December 7, 2007.
- 2002- **Volunteer**, Compeer Program, Mental Health Association, United Way,  
2003 Cincinnati, OH. Supervisor: Victor Lloyd

### *Awards and Honors*

- 2006 Awarded Graduate School Student Research Funds \$200  
2006 Awarded Grawemeyer Student Research Funds; \$700  
2005 Awarded Grawemeyer Student Research Funds; \$750  
2004 Awarded Grawemeyer Student Research Funds; \$750  
2004 Awarded Graduate Fellowship, University of Louisville  
2003 Awarded Grawemeyer Student Research Funds; \$750  
2003 Awarded Graduate Fellowship, University of Louisville  
2002 Employee Recognition Award for Providing Outstanding Clinical Services,  
Talbert House, Cincinnati, OH

### *Membership in Professional Organizations*

- 2008-present American Psychological Association
- 2004-present Society of Behavioral Medicine
- 2004-present Association for Behavioral and Cognitive Therapies