CHRONIC PAIN–RELATED DISTRESS & DISABILITY:
AN EMPIRICAL INVESTIGATION OF A MODERN BEHAVIORAL THEORY OF
ACCEPTANCE OF CHRONIC PAIN

A Dissertation

Presented to

The Graduate Faculty of The University of Akron

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

Elizabeth A. Cascarilla

December, 2009
CHRONIC PAIN–RELATED DISTRESS & DISABILITY:
AN EMPIRICAL INVESTIGATION OF A MODERN BEHAVIORAL THEORY OF
ACCEPTANCE OF CHRONIC PAIN

Elizabeth A. Cascarilla
Dissertation

Approved:  
Accepted:

________________________   ________________________
Advisor      Department Chair
Dr. John E. Queener     Dr. Karin Jordan

________________________   ________________________
Committee Member     Dean of the College
Dr. James R. Rogers     Dr. Mark D. Shermis

________________________   ________________________
Committee Member     Dean of the Graduate School
Dr. David M. Tokar     Dr. George R. Newkome

________________________
Committee Member
Dr. Ingrid Weigold

________________________
Committee Member
Dr. Francis S. Broadway
ABSTRACT

Chronic pain is a pervasive and often intractable health problem that affects approximately one fifth of the population in the United States. Despite the moderate effectiveness of some biomedical and multimodal psychotherapeutic treatments for pain, chronic pain remains highly distressing and disabling for many. A modern behavioral model of chronic pain expands upon earlier operant–behavioral and cognitive–behavioral models of pain (W. E. Fordyce, 1976; D. Turk, D. Meichenbaum, & M. Genest, 1983) by viewing much of the accompanying distress and disability as arising from experiential avoidance (S. C. Hayes, K. D. Strosahl, & K. G. Wilson, 1999) and by asserting the importance of acceptance of pain as a key behavioral process in undermining suffering and promoting adjustment to chronic pain (L. M. McCracken, 2005). Acceptance of chronic pain is conceptualized as the adoption of flexible behavioral response patterns aimed at increasing one’s engagement in meaningful activities and the willingness to experience pain sensations in some circumstances when doing so serves to enhance adaptation and life functioning. Acceptance of chronic pain is emerging as a robust predictor of enhanced psychosocial and physical functioning in patients with chronic pain. Given the prevalence and severity of distress and disability experienced by some treatment-seeking chronic pain patients and the apparent contribution of acceptance to enhanced patient functioning, the current study sought to provide an independent test of
the validity of a modern behavioral theory of acceptance of chronic pain by examining whether greater acceptance of pain predicts enhanced patient adjustment to chronic pain. A total of 117 patients seeking treatment at a chronic pain rehabilitation program responded to questionnaires assessing acceptance of pain and other indices of emotional distress, pain intensity, and pain-related disability. Results indicated that greater chronic pain acceptance is related to less emotional distress and pain-related disability independent of pain intensity. Acceptance of chronic pain accounted for incremental variance in measures of depression, anxiety, and pain-related disability above and beyond pain intensity. Implications for the treatment of chronic pain, future research directions, and strengths and limitations of the current study are discussed.
DEDICATION

This dissertation is dedicated to my sister-in-law and best friend, Dr. Leigh Grieco Cascarilla. For your love and support, I am so grateful. Your strength and empathy continue to teach and inspire me. I will miss you forever.
ACKNOWLEDGEMENTS

I would like to acknowledge several individuals who contributed to the completion of this project. First and foremost, I would like to thank my advisor and committee chairperson, Dr. John E. Queener, who has supported me at every stage of the dissertation process. The successful completion of this project would not have been possible without his insight, guidance, and commitment. I also wish to acknowledge my committee members, Dr. James R. Rogers, Dr. David M. Tokar, Dr. Ingrid Weigold, and Dr. Francis S. Broadway, whose suggestions and feedback have been invaluable.

Additionally, I thank the patients and staff of the Cleveland Clinic Foundation Chronic Pain Rehabilitation Program, particularly Dr. Judith Scheman. I would also like to express my gratitude to Lisa Ferguson, MA, for her assistance with data collection and entry. I also acknowledge Beth Ciha; her editing expertise is greatly appreciated.

Additionally, I am grateful for the help of my classmates, Sara, Jen, Tim, and Mariza.

I would like to acknowledge my parents, Ralph and Virginia Cascarilla, whose love, support, and innumerable sacrifices have enabled me to achieve my goals. I would like to thank my brother, Chad, who always challenges me to be better both personally and professionally. The support provided by my sister Grace is also greatly appreciated. I especially want to thank my fiancé, John van der Oord, for believing in me and for providing constant support and comic relief through the entire course of this project.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>LIST OF TABLES</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

## CHAPTER

### I. STATEMENT OF THE PROBLEM

- Chronic Pain: More Than a Biomedical Problem ......................................................... 6
- Chronic Pain: A Biopsychosocial Problem ................................................................. 10
- A Modern Behavioral Model of Chronic Pain ............................................................. 13
  
  - Purpose .................................................................................................................. 16
  
  - Definitions and Operational Terms ........................................................................ 18

### II. REVIEW OF THE LITERATURE

- Conventional Psychological Approaches to Chronic Pain ........................................ 22
- A Modern Behavioral Approach to Chronic Pain ....................................................... 27
- A Modern Behavioral Theory of Experiential Avoidance of Chronic Pain ............... 29
- A Modern Behavioral Theory of Acceptance of Chronic Pain .................................. 31
  
  - Empirical Support for a Modern Behavioral Theory of Acceptance of Chronic Pain .......................................................................................................................... 36
  
  - Experimental Studies of Acceptance of Pain ......................................................... 36
  
  - Clinical Studies of Acceptance of Chronic Pain and Patient Functioning .......... 39
  
  - Outcome Studies of Acceptance-Based Treatment for Chronic Pain ................. 46
Limitations of the Chronic Pain Acceptance Literature ........................................48
Summary................................................................................................................53
General Research Questions ..................................................................................53

III. RESEARCH METHOD..............................................................................................55
Participants.............................................................................................................55
Measures ................................................................................................................57
  Chronic Pain Acceptance Questionnaire ..........................................................57
  Depression Anxiety Stress Scales.......................................................................64
  Numerical Rating Scale-11 ..............................................................................67
  Pain Disability Index..........................................................................................70
Procedures..............................................................................................................72
Hypotheses.............................................................................................................73
Data Analysis.........................................................................................................74

IV. RESULTS...................................................................................................................77
Descriptive Statistics..............................................................................................77
Hypothesis Testing...................................................................................................79
  General Hypothesis 1 (GH1) ............................................................................79
  Specific Hypotheses 1–3 (SH1–SH3)..................................................................79
  General Hypothesis 2 (GH2) ............................................................................83
  Specific Hypotheses 4–7 (SH4–SH7).................................................................83
Summary of Results...............................................................................................87
V. DISCUSSION ..............................................................................................................90

Summary................................................................................................................90

Conclusions............................................................................................................92

Implications for Research ......................................................................................98

Implications for Practice......................................................................................104

Strengths and Limitations ....................................................................................108

REFERENCES ................................................................................................................112

APPENDICES .................................................................................................................132

APPENDIX A. CHRONIC PAIN ACCEPTANCE QUESTIONNAIRE (CPAQ) .................133

APPENDIX B. DEPRESSION ANXIETY STRESS SCALES (DASS) ..................134

APPENDIX C. PAIN DISABILITY INDEX (PDI)......................................................137

APPENDIX D. CHRONIC PAIN REHABILITATION PROGRAM PERMISSIO...139

APPENDIX E. CLEVELAND CLINIC FOUNDATION INSTITUTIONAL REVIEW BOARD APPROVAL LETTERS .............140

APPENDIX F. UNIVERSITY OF AKRON INSTITUTIONAL REVIEW BOARD LETTER.................................................................142
LIST OF TABLES

Table                                                                                       Page

1. Means, Standard Deviations, and Internal Reliability of Study Measures
   \((N = 117)\)........................................................................................................78

2. Correlations (Pearson’s \(r\)) Between Study Measures: Specific Hypotheses 1–3
   \((N = 117)\)........................................................................................................80

3. Correlations (Pearson’s \(r\)) Between Study Variables \((N = 117)\)........................83

4. Multiple Regression Analysis for Pain Willingness and Activity Engagement
   Predicting Depression, Controlling for Pain Intensity (NRS-11): Specific
   Hypothesis 4 \((N = 117)\)................................................................................84

5. Multiple Regression Analysis for Pain Willingness and Activity Engagement
   Predicting Anxiety, Controlling for Pain Intensity (NRS-11): Specific
   Hypothesis 5 \((N = 117)\)................................................................................85

6. Multiple Regression Analysis for Pain Willingness and Activity Engagement
   Predicting Pain-Related Disability, Controlling for Pain Intensity (NRS-11):
   Specific Hypothesis 6 \((N = 117)\)........................................................................86

7. Multiple Regression Analysis for Pain Willingness and Activity Engagement
   Predicting Hours of Daily Rest, Controlling for Pain Intensity (NRS-11):
   Specific Hypothesis 7 \((N = 117)\)........................................................................87

8. Results of Hypothesis Testing ...................................................................................89
CHAPTER I
STATEMENT OF THE PROBLEM

*Pain* is defined by the International Association for the Study of Pain (2009, “Pain”) as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage … It is unquestionably a sensation in a part of the body but also always an unpleasant and therefore also an emotional experience.” Pain is generally described as either malignant or nonmalignant in origin. The most common classification of pain, as acute or chronic, is temporal and is based on the duration of symptoms. Cancer pain is considered distinct from acute and chronic pain and includes pain associated with the progression, treatment, and comorbid conditions of the disease. It is clinically useful to distinguish acute from chronic nonmalignant pain, as they differ greatly in definition and treatment (Kandel, Schwartz, & Jessell, 2000). Acute pain generally results from disease, inflammation, or tissue injury. It is usually associated with a noxious event, and its severity is generally proportionate to the degree of tissue damage. The source of acute pain can usually be diagnosed and effectively treated. The duration is finite in that it typically remits with time and treatment. Acute pain is considered an ordinary and adaptive experience, as it functions to signal harm and danger in the environment and stimulates behavior to evade or avoid this danger (Melzack & Wall, 1982; Woolf, 2004).
The vast majority of individuals suffering from acute pain recover; however, a relative few do not recover and experience continuing pain (Geisser, Robinson, & Riley, 1999; Melzack, 1993). Chronic nonmalignant pain by definition is characterized as some type of persistent (e.g., low back pain) or recurrent (e.g., migraine) acute pain, the duration of which exceeds 3 months or is beyond the expected period of healing for the original injury (Bonica & Loeser, 2001). The underlying cause of chronic pain is often not readily apparent; even when tissue pathology is discernable, reports of pain severity are often disproportionate to the physical damage (Turk & Okifuji, 2002). The distinction between acute and chronic pain is clinically useful because chronic pain often involves the dynamic interaction of highly integrated and entrenched physiological, psychological, and sociocultural factors over a prolonged period, which makes the diagnosis and modification of these components increasingly complex and difficult (Flor, Birbaumer, & Turk, 1990).

Despite significant advancements in medical and psychotherapeutic treatments of disease and illness, chronic nonmalignant pain remains a pervasive and often intractable health condition, affecting 15% to 46% of the adult population worldwide (Elliott, Smith, Penny, Smith, & Chambers, 1999; Harstall & Ospina, 2003; Verhaak, Kerssens, Dekker, Sorbi, & Bensing, 1998). At any given time, an estimated 90 million Americans suffer from chronic pain (Willis, 1992, as cited in S. E. Taylor, 1999). Prevalence rate estimates for chronic pain vary according to the population and pain site. In a study of American veterans seeking medical care, almost half reported at least one chronic pain complaint (Clark, 2002). Second only to headache, low back pain is the most pervasive neurological
condition in the United States according to the National Institute of Neurological Disorders and Stroke (2009). In a literature review, LeResche and Von Korff (1999) reported prevalence rates for persistent low back pain at approximately 11% to 45%. A survey by Freburger (2009) showed that the prevalence of chronic low back pain among adults living in North Carolina rose significantly from 3.9% ($N = 4,437$) in 1992 to 10.2% ($N = 5,357$) in 2006, with increases observed across age, race/ethnicity, and gender.

Chronic pain can be a debilitating health condition that in some cases is accompanied by immense suffering and disability that significantly impacts quality of life. The experience of chronic pain can impact functioning in multiple life domains, including the physiological, emotional, social, vocational, avocational, financial, and legal (Schatman, 2006). Emotional distress is a common concomitant of chronic pain, as evidenced by studies demonstrating an increased prevalence of mood and anxiety disorders in persons with chronic pain conditions (Tsang et al., 2008). Among chronic pain patients, prevalence rates of comorbid depression are estimated at approximately 50% (Banks & Kerns, 1996; Romano & Turner, 1985; Tunks, Crook, & Weir, 2008). Substance-induced mood disorders also co-occur in patients with chronic pain and may be partly attributable to pharmacological interventions that often include medications (e.g., opioid analgesics) known to exacerbate negative affective states (Boothby, Kuhajda, & Thorn, 2003). There is also an increased association between disability and chronic pain conditions, where disability refers to the extent to which chronic pain interferes with a person’s ability to participate in daily life activities (Pollard, 1984).
Alterations in major life areas due to disability can, in turn, lead to increased emotional
distress, interpersonal relationship conflict, physical impairment, medical visits and costs,
and altered work status (Boothby et al., 2003).

Suffering from chronic pain can involve emotional and economic costs that extend from individuals to their families, communities, workplaces, the health care system, and society as a whole (Haythornthwaite & Benrud-Larson, 2001). An estimated 10% to 15% of American adults experience back pain–related work disability annually (Edwards, Doleys, Fillingim, & Lowery, 2001). Stewart, Ricci, Chee, Morganstein, and Lipton (2003) conducted a study examining the annual cost of lost time and productivity associated with chronic pain conditions in the United States. Excluding the monetary costs associated with disability compensation, sick leave, and workplace disruption, the annual lost productivity costs were estimated at $61.2 billion. This estimate also excluded the indirect costs associated with the lost productivity of the caretakers of chronic pain sufferers. After the common cold and the flu, chronic nonmalignant pain is the most frequently cited reason why individuals visit their primary care physicians, accounting for more than 35 million medical visits annually (Fishman, Von Korff, Lozano, & Hecht, 1997). In 1999, the annual monetary costs of medical and other treatment for chronic pain patients were estimated at $125 billion (Okifuji, Turk, & Kalauoklani, 1999). In a study of a health maintenance organization, C. C. Engel, Von Korff, and Katon (1996) reported that nearly 70% of the total annual costs were associated with health care utilization by approximately 1 in 5 people with chronic pain.
Despite the prevalence of chronic pain, not all people invariably experience it as highly distressing and disabling, nor do they chronically utilize the health care system (Risdon, Eccleston, Crombez, & McCracken, 2003). Conservative estimates indicate that, of the 1 in 5 Americans reportedly afflicted with chronic pain, the vast majority either seek treatment from their primary care provider or do not seek help at all. Of the estimated 20% of Americans with chronic pain, only a small fraction (5.5%) seek specialty care for that pain at a pain treatment facility (e.g., modality-oriented pain clinic, multidisciplinary pain clinic; Turk & Okifuji, 1998). Research has repeatedly shown reliable and significant differences between people who seek and utilize specialty pain treatment and those who do not. The differentiating and predictive factors of specialty pain care utilization identified in the literature include pain duration, severity of disability, diagnosis of depression and anxiety disorders, and medication intake (Crook, Weir, & Tunks, 1989; Reitsma & Meijler, 1997; Zitman, Linssen, & Van, 1992). Additionally, estimates of substance abuse problems in treatment-seeking chronic pain patients range from 3% to 18% (Fishbain, Rosomoff, & Rosomoff, 1992).

Patients who participate in specialty treatments for chronic pain have a worse overall prognosis relative to those who do not utilize specialty care (Crook et al., 1989). This is not surprising considering that those in specialty care report the highest levels of emotional distress and have the lowest rates of recovered physical functioning (S. E. Taylor, 1999). Thus, it is readily apparent that patients who seek out and participate in specialty treatment for chronic pain suffer most, pass on significant costs to society (McCracken, 2005), and, therefore, merit the most study.
Chronic Pain: More Than a Biomedical Problem

Most people who seek specialty care for chronic pain are treated in anesthesia-based clinics that adhere to a biomedical treatment model. The primary objective of this treatment approach is the identification of the pathophysiology of the presenting complaint and the alleviation or significant reduction of pain (L. Jacobson & Mariano, 2001). The biomedical model presumes that the reported level of pain and the extent to which pain interferes with patient functioning can be directly attributed to identifiable tissue pathology or injury, yet this assumption has repeatedly been shown to be faulty (Risdon et al., 2003; Sharp, 2001).

Although medical opinion may support the seemingly logical assumption linking identifiable physical pathology with reports of pain and patient functioning, findings for this association are limited at best (e.g., Sharp, 2001). For example, Boos et al. (1995) found the incidence of disc herniation, as measured using magnetic resonance imaging, to be equivalent among patients with and without chronic back pain. This pattern was repeatedly demonstrated throughout the pain literature. Jensen, Turner, Romano, and Lawler (1994) reported that many patients with magnetic resonance imaging findings indicating physical abnormalities (e.g., disk bulge) do not complain of back pain. Likewise, Spitzer, LeBlanc, and Dupuis (1987) showed that many patients complain of pain in the absence of any objective findings of identifiable tissue damage. In a study conducted by Bigos et al. (1991), reports of back pain failed to correlate with objective measures of back function and general physical fitness such as muscle strength, oxygen uptake, weight, height, or body mass index.
Although physical pathology in and of itself fails to predict reports of pain and patient functioning (Turk & Okifuji, 2002), a vast body of research has demonstrated support for the profound contribution of psychosocial variables to explaining this relation (e.g., Boothby, Thorn, Stroud, & Jensen, 1999; Johansson & Lindberg, 2000; Pfingsten, Hildebrandt, Leibing, Franz, & Saur, 1997). Turk and Okifuji (2002) conducted a literature review of studies investigating predictors of pain chronicity and long-term disability. Notably, physical factors, such as injury severity and job physicality, were not the dominant contributors to the prediction of chronicity and long-term disability. Rather, psychosocial factors such as compensation status, prevalence of pain behaviors (overt actions indicating the experience of pain), job dissatisfaction, affective reactivity, maladaptive attitudes and beliefs, inadequate social support, substance abuse, and psychiatric diagnoses (e.g., depression) were the strongest predictors of transition from acute injury to chronic disability. In a study of predictors of long-term disability associated with chronic pain, Burton, Tillotson, Main, and Hollis (1995) found that psychosocial factors accounted for 59% of the variance in chronic pain–related disability. Psychosocial factors also significantly predict post-surgical outcomes (Schofferman, Anderson, Hines, Smith, & White, 1992). The psychological variable perceived life control appears to mediate the relation between subjective reports of pain, depression, and disability (Fordyce, 1995; Lackner, Carosella, & Feuerstein, 1996; Romano et al., 1995; Rudy, Kerns, & Turk, 1988; Waddell, Newton, Henderson, Somerville, & Main, 1993). Evidence also suggests that negative affective responses in the presence of chronic pain can significantly contribute to increased disability (Riley & Robinson, 1998).
patients diagnosed with pain syndromes, psychological variables predict perceived pain severity, emotional distress, treatment seeking, and long-term disability (e.g., Boothby et al., 1999; Johansson & Lindberg, 2000; Pfingsten et al., 1997).

Despite extensive support for the significant contribution of psychosocial factors to the prediction of pain chronicity, distress, and disability, and the lack of evidence supporting the idea of chronic pain as a purely biomedical problem, the most frequently utilized treatments for patients with chronic pain are biomedically based (i.e., surgery, physical therapy, spinal manipulation, analgesic pharmacotherapy, epidural-steroid injections, etc.; Schatman, 2006). Biomedical treatments may have intuitive appeal in part because of their effectiveness in treating acute pain; however, there is limited empirical support for these methods in terms of producing significant or sustained pain reduction or improved functioning (Bigos et al., 1991; Dahl, Wilson, Luciano, & Hayes, 2005). For example, Kemler et al. (2000) found that patients denied having improved functioning despite reporting decreased pain intensity subsequent to undergoing spinal cord stimulator implantation. In a follow-up survey conducted by Crook et al. (1989), 82% of patients treated in a specialty pain clinic reported experiencing persistent pain 2 years post-discharge. A meta-analysis conducted by van Tulder, Goossens, and Hoving (2000) revealed strikingly little evidence for the effectiveness of the most common medical treatments for the treatment of chronic pain in terms of their influence on pain intensity, global functioning, and work status.

In some cases, biomedical treatments, such as surgical and pharmacological pain control techniques, may maintain or even exacerbate pain (Waddell, 1996). For example,
surgical techniques are often completely ineffective or produce only temporary reductions in pain while incurring substantial costs (Melzack & Wall, 1982). Research has implicated the regenerative nature of the nervous system and the proliferation of new neural pathways in the short-lived benefits of many surgical interventions (e.g., epidural-steroid injections; Zimmerman, 1979, as cited in S. E. Taylor, 1999). In addition, many pain patients often undergo multiple operations to reduce pain; paradoxically, even a single surgery can exacerbate pain by causing changes in the nervous system that can themselves be a major source of chronic pain (Waddell, 1996). A wide variety of pharmacological agents (e.g., narcotic analgesics) are used to treat chronic pain; however, many of the frequently prescribed medications for pain control have significant risks and limitations in terms of long-term pain reduction. For example, chronic use of opioid analgesics increases risk for tolerance, addiction, and exacerbation of any existing mood disorders (Melzack & Wall, 1982). Moreover, researchers have found that the long-term administration of opioid analgesics does not significantly reduce pain or improve functional status (Zenz, Strumpf, & Tryba, 1992), may actually contribute to pain-related disability (Merskey & Moulin, 1999, as cited in Boothby et al., 2003), and, in the absence of psychosocial intervention, can adversely impact global rehabilitation and restoration of functioning (Turk & Meichenbaum, 1994, as cited in Boothby et al., 2003).

As the vast majority of specialty programs for chronic pain are biomedically based, the psychosocial aspects of pain are often unappreciated and, consequently, go unaddressed (McCracken, 2005). Although biomedical treatments do produce significant improvement in some patients, it remains clear that biomedical care aimed at pain
reduction does not resolve the multidimensional problem of chronic pain for many
sufferers (McCracken, 2005; Waddell, 1996).

Chronic Pain: A Biopsychosocial Problem

In response to the apparent limitations of the narrow focus on pathophysiology
and pain reduction underlying the biomedical model, the biopsychosocial model evolved.
This model provides a more comprehensive account of the multidimensional nature of
chronic pain (G. Engel, 1977a, 1977b; International Association for the Study of Pain,
1993; L. Jacobson & Mariano, 2001; Loeser & Turk, 2001; Melzack & Wall, 1982; Turk
& Okifuji, 1998). Whereas the biomedical approach is concerned primarily with
discerning disease processes and managing pain symptomatology, the biopsychosocial
approach offers a holistic and integrated framework for understanding the multiple
factors (i.e., genetic, physiological, psychological, sociocultural, intraindividual, and
environmental barriers and resources) that contribute to an individual’s experience of
pain and his or her transition to, and maintenance of, chronicity and related distress and
disability (Loeser & Turk, 2001; Turk & Okifuji, 1998). The past 40 years has seen an
accumulation of evidence for the biopsychosocial model of pain and, in particular, the
contribution of psychosocial factors to the development and maintenance of chronic
pain–related distress and disability. This has led to the increased role of psychologists in
pain management and the concomitant development and proliferation of integrated
multidisciplinary and interdisciplinary pain rehabilitation programs (Boothby et al., 2003;
Turk & Okifuji, 2002). In contrast to biomedical-based treatments that often fail to “cure”
or significantly reduce intractable pain, multimodal biopsychosocial-based treatments (i.e., those that are multidisciplinary or interdisciplinary) provide patients with the best opportunity for effective and comprehensive care (Schatman, 2006; S. E. Taylor, 1999).

The most compelling data to date suggest that when treatment options expand beyond unimodal biomedical treatments for pain to include psychological components within an integrated multidisciplinary treatment regimen, patient outcomes improve (Deyo, 1983; Flor, Fydrich, & Turk, 1992; Gatchel & Epker, 1999; Hazard, 1991; Turk, 1990, 1996). Meta-analyses and empirical studies have shown that integrated multidisciplinary pain management programs, which nearly always include psychological components informed by operant–behavioral and cognitive–behavioral principles, provide chronic pain patients with the most effective means of reducing emotional distress and improving global functioning (Flor et al., 1992; Guzman et al., 2001; Okifuji et al., 1999; Turk, 2002; Turk & Okifuji, 1998). Numerous studies have also demonstrated the effectiveness of interdisciplinary approaches in the treatment of chronic pain (Hoffman, Papas, Chatkoff, & Kerns, 2007; Jensen, Chodroff, & Dworkin, 2007; Kitahara, Kojima, & Ohmura, 2006; Lemstra & Olszynski, 2005; Moss-Morris, Humphrey, Johnson, & Petrie, 2007; Osborne, Raichle, & Jensen, 2006; Stanos & Houle, 2006). According to a meta-analysis conducted by Flor et al. (1992), these programs are more effective than no treatment or a wait-list control and are up to twice as effective as monodisciplinary single-component programs in improving physical activity and return-to-work status; resolving compensation claims; and reducing pain levels, affective distress, medication intake, and health care utilization. In terms of pain reduction,
physical functioning, and return-to-work status, Flor et al. (1992) concluded that multidisciplinary chronic pain management programs were more effective than unimodal surgical, pharmacological (i.e., long-term opioid therapy), or sensory (i.e., implantable spinal cord stimulators, intrathecal opioid pumps) interventions. Furthermore, in contrast to integrated multidisciplinary programs, singular biomedical treatments are often associated with iatrogenic outcomes (Schatman, 2006).

Despite data demonstrating integrated multidisciplinary pain rehabilitation programs as the most effective treatment option for chronic pain, few such programs are available in the United States because of decreased funding and concerns about profitability (Schatman, 2006). Moreover, these programs are not successful for all patients, as evidenced by significant patient attrition and relapse rates (Richmond & Carmody, 1999; Turk & Rudy, 1990). Additionally, meta-analyses and empirical studies have shown that few patients report total and sustained alleviation of pain over time (Elliott, Smith, Hannaforf, Smith, & Chambers, 2002), some patients deny any reduction in pain at all (Turk, 1990), and others report adverse effects on functioning and rehabilitation (Aronoff, 1991; Deyo, Nachemson, & Mirza, 2004; Jamison, Anderson, Peters-Asdourian, & Ferrante, 1994; Waddell, 1987). Thus, despite the moderate effectiveness of some biomedical, psychological, and multimodal specialty treatments (Deyo, 1983; Flor et al., 1992; Gatchel & Epker, 1999; Hazard, 1991; Turk, 1990, 1996), chronic pain remains a multidimensional and often intractable problem for sufferers and health care professionals alike (L. Jacobson & Mariano, 2001).
A Modern Behavioral Model of Chronic Pain

Despite significant advancements in medical and psychotherapeutic treatments, chronic pain remains a pervasive and challenging health condition for numerous people (Elliott et al., 1999; Harstall & Ospina, 2003; Verhaak et al., 1998) and is often accompanied by costs that extend from individuals to their families and to society as a whole (Haythornthwaite & Benrud-Larson, 2001). Some patients seeking specialty treatment for chronic pain suffer substantially from persistent pain and pain-related emotional distress and disability. A subset of treatment-seeking chronic pain patients are distinguished by their relentless, varied, and numerous failed attempts to control or alleviate an essentially uncontrollable, and likely irresolvable, health condition (Aldrich, Eccleston, & Crombez, 2000). Accordingly, patients who participate in clinical treatment for chronic pain are defined by their inability to learn to adapt to a life with chronic pain (Reitsma & Meijler, 1997). Therefore, it is imperative that researchers identify and test new theories that may inform more effective psychotherapeutic treatments and empower the lives of those suffering from chronic pain.

In a review of the current state of the science, acceptance of pain was identified as a key psychological factor associated with improved adjustment to chronic pain with important clinical implications for pain management (Keefe, Rumble, Scipio, Giordano, & Perri, 2004). Consistent with these theoretical developments, acceptance-based treatment approaches for chronic pain are increasingly acknowledged by pain researchers and clinicians alike as a novel and effective psychological approach for understanding and promoting adjustment to chronic pain (Keefe et al., 2004). Emergent and promising
acceptance-based approaches to chronic pain (i.e., acceptance and commitment therapy [ACT], Dahl et al., 2005; contextual cognitive–behavioral therapy, McCracken, 2005) emphasize the importance of behavioral processes such as experiential avoidance and acceptance of pain. These approaches are referred to in the present study as “modern behavioral” approaches to chronic pain, as their shared theoretical foundation derives from what Hayes has called a “modern behavioral therapy” and its underlying model of human suffering and behavior change, namely, ACT (Hayes, Strosahl, & Wilson, 1999).

The modern behavioral model of human suffering and behavior change underlying ACT includes a number of theoretical processes that are described in depth elsewhere (for reviews, see Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Hayes, Strosahl, et al., 1999). Briefly, experiential avoidance is conceptualized as one of six core theoretical processes that contribute to the development and maintenance of human suffering and psychopathology. In ACT, experiential avoidance is defined as a process whereby “a person is unwilling to remain in contact with particular private experiences (e.g., bodily sensations, emotions, thoughts, memories, behavioral predispositions) and takes steps to alter the form or frequency of these events and the contexts that occasion them” (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996, p. 1154). In contrast, acceptance is conceptualized as one of six core theoretical processes that contribute to the promotion of commitment and behavior change. In ACT, acceptance is considered the opposite of experiential avoidance and is defined as the process of “actively contacting psychological experiences—directly, fully, and without needless defense—while behaving effectively” (Hayes et al., 1996, p. 1154).
Based on the ACT model, a modern behavioral theory of human suffering in the context of chronic pain asserts that, for some people, a primary source of suffering arises from experiential avoidance (Hayes, Strosahl, et al., 1999). A modern behavioral theory of behavior change asserts the importance of acceptance of chronic pain, which has been defined as “an active willingness to engage in meaningful activities in life regardless of the experience of pain-related sensations, thoughts, and related feelings that might otherwise hinder such engagement” (McCracken, Carson, Eccleston, & Keefe, 2004, p. 6). From a modern behavioral perspective, acceptance of chronic pain is an important process that contributes to undermining suffering, improving functioning, and promoting adjustment to chronic pain (McCracken, 2005).

Consistent with this theoretical framework, a growing body of empirical research has shown acceptance of pain to be a robust correlate of enhanced adjustment based on established measures of emotional and physical functioning in chronic pain populations (Esteve, Ramírez-Maestre, & López-Martínez, 2007; Kratz, Davis, & Zautra, 2007; Mason, Mathias, & Skevington, 2008; McCracken, 1998; McCracken & Eccleston, 2003, 2005, 2006; McCracken, Spertus, Janeck, Sinclair, & Wetzel, 1999; McCracken, Vowles, & Eccleston, 2004; Vowles, McCracken, McLeod, & Eccleston, 2008; Wicksell, Olsson, & Melin, in press). Moreover, acceptance of pain reliably contributes to the prediction of functioning in patients seeking treatment for chronic pain beyond the contribution of pain intensity, a variable known to influence adjustment to pain (Mason et al., 2008; McCracken, 1998; McCracken et al., 1999; McCracken, Vowles, et al., 2004).
McCracken and colleagues have been instrumental in the systematic study of acceptance of pain, in part because of the empirical validation and publication of the only measure of acceptance designed specifically for use in chronic pain populations: the Chronic Pain Acceptance Questionnaire (CPAQ; Geiser, 1992; McCracken, 1998, 1999; McCracken, Vowles, et al., 2004). A strength of the CPAQ (McCracken, Vowles, et al., 2004) is its subscales, Activities Engagement and Pain Willingness, which allow for the examination of how these facets of chronic pain acceptance influence adjustment to chronic pain. Findings reported by McCracken and colleagues (McCracken, 1998; McCracken et al., 1999; McCracken, Vowles, et al., 2004) provide support for the validity of the theoretical process of acceptance of pain by demonstrating its ability to explain incremental variance in indices of patient adjustment beyond the contribution of pain intensity. Thus, research suggests that acceptance of chronic pain is an important behavioral process and a significant predictor of emotional and physical functioning independent of the influence of pain intensity.

Purpose

Empirical evidence supports the general prediction derived from a modern behavioral theory of acceptance of chronic pain (McCracken, 2005) suggesting that acceptance is a key behavioral process that contributes to undermining suffering, enhancing functioning, and promoting adjustment among patients with chronic pain. Although a growing body of literature supports the role of acceptance in patient functioning and adjustment, it is limited in some respects. For example, the vast majority
of studies examining acceptance in patients seeking specialty treatment for chronic pain have been generated by the same primary authors (i.e., McCracken, Vowles, Eccleston), many of whom were affiliated with the pain programs from which the research participants were recruited. This calls into question the reliability of the observed findings and highlights the need for independent replication and extension. Additionally, adjustment among patients seeking treatment for chronic pain has been assessed with the same standardized self-report measures of emotional and physical functioning (i.e., McCracken, 1998; McCracken & Eccleston, 2003, 2005, 2006; McCracken et al., 1999; McCracken, Vowles, et al., 2004). In these studies, McCracken and colleagues assessed adjustment in terms of perceived pain intensity, pain-related anxiety, depression, and disability using the 100-mm Visual Analog Scale, the Pain Anxiety Symptoms Scale (McCracken, Zayfert, & Gross, 1992), the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), and the Sickness Impact Profile (Bergner, Bobbitt, Carter, & Gilson, 1981), respectively. Testing this robust predictor of adjustment to chronic pain using different established measures of patient functioning would increase confidence in the reliability of the observed findings and enhance their generalizability to other groups of patients seeking specialized treatment for chronic pain.

Given the increased prevalence of distress and disability among persons entering specialty pain treatment programs, chronic pain patients are a particularly appropriate population in which to examine the theoretical prediction of acceptance of pain and adjustment. An independent test of the validity of a modern behavioral theory of acceptance of chronic pain can further inform acceptance-based treatment approaches and
extend traditional treatments that seek to facilitate behavior change, enhance functioning, and promote adjustment to chronic pain.

The aim of the present study is to investigate a modern behavioral theory of acceptance of chronic pain, as operationalized by the CPAQ (McCracken, Vowles, et al., 2004). This study will provide an independent test of the validity of chronic pain acceptance in terms of pain intensity, emotional distress, and pain-related disability in patients seeking specialty treatment at an interdisciplinary chronic pain rehabilitation program. To test the generalizability of previous research findings to other groups of patients seeking specialty treatment for chronic pain, the relation and contribution of acceptance to patient adjustment will be assessed with different standardized measures of pain intensity, depression and anxiety, and disability than those used previously: the Numerical Rating Scale, the Depression Anxiety Stress Scales (S. H. Lovibond & Lovibond, 1995), and the Pain Disability Index (Pollard, 1984), respectively.

Definitions and Operational Terms

Acceptance and commitment therapy (ACT): A “third-generation” or “modern behavioral” approach to psychological intervention based on functional contextualism and behavior analysis (Hayes et al., 1996). ACT interventions seek to improve quality of life through the promotion of six core processes of behavior change: acceptance, defusion, self as context, contact with the present moment, values, and committed action (Hayes, Strosahl, et al., 1999).
Acceptance of chronic pain: A behavioral process that includes a willingness to experience pain (and other unwanted pain-related thoughts and emotions) without attempts to avoid or control pain in the service of engaging in meaningful activities that enhance functioning and promote adjustment to chronic pain (McCracken, Vowles, et al., 2004).

Acute pain: Pain generally associated with identifiable disease, inflammation, or tissue injury, the duration of which is finite, that typically remits with time and treatment (Melzack & Wall, 1982).

Avoidance: Any behavior intended to prevent, decrease, or terminate exposure to an aversive (public or private) event (Fordyce, 1976).

Behavior: All observable actions of the whole organism including not only external/overt but also internal/private actions (e.g., pain and other bodily sensations, thoughts, emotions, perceptions) that are observable only to the individual experiencing them (Hayes, Hayes, & Reese, 1988).

Chronic nonmalignant pain: Any type of persistent (e.g., low back pain) or recurrent (e.g., migraine) acute pain, the duration of which exceeds 3 months or is beyond the expected period of healing for the original injury (Bonica & Loeser, 2001).

Chronic Pain Acceptance Questionnaire (CPAQ) Activity Engagement: A behavioral facet of acceptance of chronic pain; the tendency to participate in activities regardless of the presence of pain and the relative absence of attempts to control or avoid the experience of pain (McCracken, 1999; McCracken, Vowles, et al., 2004).
**Chronic Pain Acceptance Questionnaire (CPAQ) Pain Willingness:** A behavioral facet of acceptance of chronic pain; the relative absence of attempts to control or avoid the experience of pain (McCracken, 1999; McCracken, Vowles, et al., 2004).

**Experiential acceptance:** The antithesis of experiential avoidance; a willingness to experience private events (i.e., physical sensations, emotions, thoughts, etc.) for the purpose and benefit of engaging in meaningful and satisfying activities (Hayes, Follette, & Linehan, 2004).

**Experiential avoidance:** A process whereby a person is unwilling to remain in contact with particular private experiences (i.e., pain sensations, pain-related thoughts and emotions, etc.) and takes action to alter these aversive experiences and the situations that elicit them (Hayes et al., 1996).

**Failure rate:** The proportion of a sample that fails or is unable to respond to a measure either completely or in part (Kremer, Atkinson, & Ignelzi, 1981).

**Kinesiophobia:** The fear of (re)injury due to physical activity (Kori, Miller, & Todd, 1990).

**Modern behavioral therapies:** Psychotherapeutic approaches that are based on functional contextualism and are designated by Hayes as “third wave” or “third generation” to convey their evolution from operant–behavioral and cognitive–behavioral empirical traditions (Hayes et al., 2006). Modern behavioral therapies focus on the context and functions of psychological phenomena rather than their form and apply acceptance-based behavior change processes to promote flexible and effective behavioral repertoires (Hayes, 2004).
Modern behavioral therapies for chronic pain: Therapies characterized, in part, by a functional contextual approach to chronic pain and related psychological phenomena (i.e., pain-related thoughts and emotions, etc.) that emphasizes the application of contextual and experiential strategies for changing overt (i.e., observable) behavior (Hayes, Strosahl, et al., 1999); examples include ACT (Dahl, Wilson, & Nilsson, 2004) and contextual cognitive–behavioral therapy (McCracken, 2005).

Pain: “An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (International Association for the Study of Pain, 2009, “Pain”).

Pain behaviors: Observable responses or overt actions indicating the experience of pain (e.g., limping, grimacing, use of analgesic medication, resting; Fordyce, 1976).

Pain intensity: How much pain a person experiences (Jensen & Karoly, 2001).

Pain-related coping behavior: Efforts aimed at directly controlling or modifying the experience of pain or one’s reaction to pain-related emotions and thoughts (Jensen, Turner, Romano, & Karoly, 1991).

Pain-related disability: The extent to which chronic pain interferes with a person’s ability to participate in daily life activities (Pollard, 1984).

Suffering: “A state of severe distress associated with events that threaten the intactness of the person” (Bonica, 1990, p. 12).
CHAPTER II
REVIEW OF THE LITERATURE

This chapter offers a comprehensive review of the literature regarding conventional psychological approaches to chronic pain, a modern behavioral approach to chronic pain, and a modern behavioral theory of experiential avoidance and acceptance of chronic pain. Empirical support for a modern behavioral theory of acceptance of chronic pain is demonstrated with a review of relevant experimental studies of pain, clinical studies of acceptance of chronic pain and patient functioning, and outcome studies of acceptance-based treatment for chronic pain. Finally, the limitations of the chronic pain acceptance literature, a summary, and general research questions are presented.

Conventional Psychological Approaches to Chronic Pain

The contribution of one’s response to pain in the development and maintenance of chronic pain and pain-related distress and disability is a long-standing and widely accepted notion by pain psychologists (Fordyce, 1976; Turk, Meichenbaum, & Genest, 1983; Vlaeyen & Linton, 2000). Operant behaviorists’ early interpretations of the suffering of chronic pain primarily emphasized an individual’s observable responses, known as pain behaviors, and their interaction with environmental reinforcement.
contingencies (Fordyce, 1976). Operant–behavioral theory and methods are widely accepted and supported by studies demonstrating the effectiveness of behavioral interventions (Keefe, Dunsmore, & Burnett, 1992; Morley, Eccleston, & Williams, 1999; Turk & Flor, 1984) and the influence of social factors, particularly the reinforcing influence of spouses and significant others on patient pain-related behavior (Block, Kremer, & Gaylor, 1980; Romano et al., 1992). Among the criticisms of the early operant approach is the claim of its failure to adequately address reinforcing influences that are not directly observable, particularly pain-related cognitions (i.e., patient appraisals or expectations of pain; Sharp, 2001; Turk & Flor, 1984).

Accordingly, the early 1980s marked a shift in focus to the role of cognitive responses to pain in relation to chronic pain–related distress and disability (Sharp, 2001). One particularly dominant theme emerging from cognitive–behavioral pain research and clinical practice is the influence of cognitions on pain-related coping behavior (Jensen et al., 1991; Van Damme, Crombez, & Eccleston, 2008). This is most frequently operationalized in the literature as any efforts aimed at directly controlling or modifying the experience of pain or one’s reaction to the experience of pain sensations and related emotions and thoughts (Keefe, Salley, & Lefebvre, 1992; McCracken, 2005; McCracken & Eccleston, 2003). Support for cognitive–behavioral theory and methods, and, in particular, the contribution of pain-related coping behavior, is provided by many studies. These studies have demonstrated the benefits of cognitive–behavioral interventions (Eccleston, Morley, Williams, Yorke, & Mastroyannopoulou, 2002; Morley et al., 1999) and the role of cognitive processes in the utilization of coping strategies that influence
Criticisms of the cognitive–behavioral approach include the claim of its often narrow research and treatment focus on pain-related coping as the principal contributory behavior to patient adjustment (McCracken & Eccleston, 2003). Also, despite almost two decades worth of published studies on coping, there remains a lack of clarity regarding which coping behaviors are most helpful and should be adopted to promote improved adjustment (Keefe et al., 2004). The ambiguity is partly attributed to the predominant research focus on unhelpful or maladaptive pain-related coping behaviors (Geisser et al., 1999; Jensen et al., 1991) and methodological issues that may inflate, or at least confound, findings of the predictive and clinical utility of coping strategies in relation to chronic pain patient outcomes (Van Damme et al., 2008).

Specifically, pain-related coping behaviors have been conceptualized and operationalized categorically, rather than functionally. The categorical approach to classification has focused on structural differences, with active (or problem-solving) behaviors classified as generally adaptive and passive (or emotion-focused) behaviors classified as generally maladaptive (Carroll, Cassidy, & Cote, 2006; Lopez-Martínez, Esteve-Zarazaga, & Ramirez-Maestre, 2008). The frequently used dichotomy of adaptive or maladaptive behavior is argued to be problematic because the distinction is based on structural or formal differences, yet pain-related coping behaviors often have shared functions (Van Damme et al., 2008). The structural dichotomy is seen in the classification of analgesic medication as passive (maladaptive) and exercise persistence as active
(adaptive), yet both coping strategies share the same function (i.e., avoidance of pain sensations; Vlaeyen & Morley, 2004).

One consequence of this categorical classification of pain-related behavior is conflicting research findings, with many pain-related coping strategies being associated with both positive and negative patient outcomes (Keefe et al., 2004). To illustrate, exercise persistence is typically categorized in the literature as an adaptive pain-related coping behavior, yet there are mixed findings for the association of this behavior with patient outcomes. For example, persistence with physical activity can function as an effective and necessary pain management strategy for simple low back pain (Vlaeyen & Morley, 2004); however, poor pacing and excessive exercise despite severe back pain can function as a pathogenic pain management strategy in terms of increasing the risk of long-term pain-related disability (Rusu & Hasenbring, 2008). Thus, modern behaviorists assert that a meaningful and clinically useful assessment of behavior as adaptive (or maladaptive) can only be derived from a functional and contextual analysis of behavior (e.g., Fordyce, 1976; McCracken, 2005; Skinner, Edge, Altman, & Sherwood, 2003).

Operant–behavioral and cognitive–behavioral principles have prevailed and informed effective pain treatments for almost three decades (Eccleston et al., 2002; Morley et al., 1999). The operant–behavioral approach has contributed to the understanding of the influence of environmental contingences of reinforcement on overt pain behaviors associated with chronic pain–related distress and disability. Operant–behavioral principles inform treatment methods aimed at changing overt behavior by directly manipulating the context and reinforcing consequences associated with patient
behavior patterns (Fordyce, 1976). These methods are effective for many patients in terms of enhancing emotional and physical functioning (e.g., Morley et al., 1999). The cognitive–behavioral approach expanded on the earlier focus on overt behavior by demonstrating the importance of private experiences, particularly the influence of cognitive responses (e.g., irrational beliefs, pain catastrophizing; Jensen et al., 1991; Main & Waddell, 1991; Tan, Jensen, Robinson-Whelen, Thornby, & Monga, 2001; Turner, Jensen, & Romano, 2000) on distressing emotions and maladaptive coping behaviors (Turk et al., 1983). As the predominant treatment approach in multidisciplinary and interdisciplinary pain programs, cognitive–behavioral intervention continues to be effective for many patients with chronic pain (e.g., Flor et al., 1992; Morley et al., 1999; Turk, 2002).

The predominance of the cognitive–behavioral approach and the historical research emphasis on a single class of somewhat rigid behaviors (i.e., “pain-related coping”) may have inadvertently occluded more flexible behaviors from consideration (McCracken, 1998; McCracken & Eccleston, 2003). McCracken (1998) acknowledged that, in some cases, pain control and coping strategies are successful in producing positive results with negligible drawbacks and, therefore, should be continued. However, he contended that, for some patients, in some circumstances, persisting with a narrow pain control agenda and rigid set of coping strategies that repeatedly fail to control or eliminate pain can actually, over time, produce adverse psychological and physiological consequences. These consequences include increased distress (e.g., fear, worry, catastrophic thinking, hypervigilance; Crombez, Eccleston, De Vlieger, Van Damme, &
De Clercq, 2008) and disability and the promotion of harmful health behaviors (McCracken, 1998; McCracken et al., 1999). Thus, McCracken and colleagues assert the utility of a modern behavioral acceptance-based approach to pain that promotes the adoption of a flexible behavioral repertoire aimed at increasing one’s willingness to experience pain sensations in some circumstances where doing so serves to enhance adaptation and life functioning (McCracken & Vowles, 2006). Indeed, the utility of acceptance of chronic pain is receiving increased attention from pain researchers and clinicians. This behavioral process is emerging as a robust predictor of enhanced psychosocial and physical functioning in patients with chronic pain (Esteve et al., 2007; McCracken, 1998; McCracken & Eccleston, 2003, 2006; McCracken et al., 1999; McCracken & Yang, 2006; Vowles, McCracken, McLeod, et al., 2008).

A Modern Behavioral Approach to Chronic Pain

The promise of a modern behavioral approach to chronic pain parallels the emergence of what Hayes has designated as broader acceptance-based “modern behavioral therapies” (e.g., acceptance and commitment therapy, ACT; Hayes, Strosahl, et al., 1999; dialectical behavioral therapy, Linehan, 1993; mindfulness-based stress reduction, Kabat-Zinn, 1990). Modern behavioral therapies are characterized, in part, by their emphasis on acceptance of aversive experiences rather than control or avoidance of them (Hayes, Strosahl, et al., 1999). These approaches are dubbed by Hayes as “modern,” “third wave,” or “third generation” to convey their evolution from the general operant–behavioral and cognitive–behavioral empirical traditions (Hayes et al., 2006). Similarly, a
modern behavioral approach to chronic pain is proposed as a modern, or third-wave, approach to pain because it expands upon conventional models of pain and emphasizes the disutility of experiential avoidance and the utility of acceptance in adjustment to chronic pain (Hayes, Follette, et al., 2004; McCracken, 2005).

Consistent with operant principles (Fordyce, 1976), modern behaviorists conceptualize behavior functionally rather than structurally, as behavior is considered in relation to antecedent events and consequences. In this way, the probability of the occurrence or suppression of a given behavior is a function of the presence of particular stimuli and the influence of previous direct and indirect (language or instruction) contingencies of reinforcement. When behavior is followed by reinforcing consequences, the function of the given behavior is strengthened, and behaviors with different forms or topographical features that share the same function are also strengthened in the process (McCracken, 2005). Modern behavioral theory diverges from operant theory by defining behavior as all observable actions of the whole organism including not only external/overt but also internal/private actions (e.g., pain and other bodily sensations, thoughts, emotions, perceptions) that are observable only to the individual experiencing them (Hayes et al., 1988; K. G. Wilson, Hayes, Gregg, & Zettle, 2001). Thus, private responses or internal experiences, such as pain sensations and pain-related thoughts and emotions, are considered to be appropriate subject matter for investigation and intervention according to modern behavioral theory. Consistent with cognitive–behavioral principles (Turk et al., 1983), modern behaviorists acknowledge the reinforcing influence of cognition and other private events on behavior; however, the
emphasis is on the function, rather than the form or topographical features, of behavior (McCracken, 2005). This difference was articulated very clearly by Segal, Williams, and Teasdale (2004), who stated, “Unlike cognitive-behavioral therapy, there is little emphasis on changing the content of thoughts; rather the emphasis is on changing awareness of and relationship to thoughts” (p. 185). This conceptualization applies equally to physical sensations, emotions, memories, and any other private experience evaluated as aversive.

A modern behavioral perspective (Hayes, 2004) diverges from conventional psychological models that view chronic pain–related distress and disability either as a problem of external contingencies of reinforcement and their influence on maladaptive overt pain behaviors (Fordyce, 1976) or as a problem of the presence, form, or frequency of pain sensations and associated content of pain-related thoughts and emotions and their reinforcing influence on maladaptive coping behaviors (Turk et al., 1983). Instead, chronic pain–related distress and disability is viewed as a problem of experiential avoidance or the unwillingness to remain in contact with pain sensations and other pain-related private events (i.e., pain-related thoughts and emotions) and the deliberate attempts to control or avoid the form or frequency of these aversive experiences and the situations that elicit them (Hayes, Strosahl, et al., 1999).

A Modern Behavioral Theory of Experiential Avoidance of Chronic Pain

A modern behavioral theory of experiential avoidance asserts that efforts aimed at deliberately suppressing, controlling, or avoiding the form, frequency, or situations that
occasion unwanted private events (e.g., pain sensations, pain-related thoughts or emotions) may seem to be effective in the short term but are largely ineffective and deleterious in the long term (Hayes, Strosahl, et al., 1999). Findings from the extant experimental and clinical literature on pain are consistent with the prediction derived from a modern behavioral theory of experiential avoidance. In experimental studies, the deliberate suppression of acute pain and pain-related thoughts and emotions has had paradoxical effects in future circumstances in terms of decreased pain tolerance and increased pain intensity, subjective distress, and frequency of thought intrusions (e.g., Cioffi & Holloway, 1993; Feldner et al., 2006). In clinical studies, avoidance behavior is a well-documented key feature and powerful correlate of chronic pain–related distress and disability (Aronoff & McAlary, 1992; Asmundson, Norton, & Norton, 1999; Bortz, 1984; Crombez, Vervaet, Lysens, Baeyens, & Eelen, 1998; Fordyce, 1976; Kori et al., 1990; McCracken, Gross, Aikens, & Carnrike, 1996; Philips, 1987). Avoidance behavior has repeatedly been shown to be a significant risk factor in the pathogenesis of acute to persistent pain (e.g., Boersma & Linton, 2005; Linton, 2005) and to play a significant role in sustaining chronic pain (e.g., Philips, 1987). A vast body of clinical research has consistently shown the disutility of excessive avoidance of chronic pain in terms of producing substantial, sustained pain reduction (Philips, 1987) and contributing, over time, to physical deconditioning (Fordyce, 1976), increased muscular tension (Feuerstein, Papciak, & Hoon, 1987), inaccurate expectations of pain during exercise (McCracken, Gross, Sorg, & Edmands, 1993), drug dependency (Fordyce, 1988), depression and
disability (McCracken et al., 1992), and increased sensitization to nociception (Philips, 1987).

Within a modern behavioral model of chronic pain, acceptance is conceptualized as an alternative to experiential avoidance (Hayes, Strosahl, et al., 1999). Acceptance is viewed as a particularly relevant process for a subgroup of patients with chronic pain for whom the distress and disability is viewed as arising from experiential avoidance. Therefore, the presence or perceived intensity of pain is not considered to be the primary determinant of suffering for some patients with chronic pain (McCracken, 2005). The inclusion of acceptance in a framework of behavior change assumes a willingness to experience aversive pain sensations and to relinquish experiential avoidance behaviors. The goal of relinquishing these experiential avoidance behaviors, such as pain control and avoidance strategies, is to engage in other meaningful activities that reduce distress and enhance well-being and physical functioning (McCracken, Vowles, et al., 2004).

A Modern Behavioral Theory of Acceptance of Chronic Pain

Given the apparent contribution of experiential avoidance to the problem of intractable pain and the related distress and disability experienced by some patients with chronic pain, modern behaviorists assert the utility of its alternative—acceptance. McCracken (2005) viewed patients’ attempts to control or avoid pain, despite the deleterious long-term consequences of doing so, as expected when the private experience of continuing pain sensations is viewed as unacceptable and intolerable. McCracken (1998, 1999) contended that chronic pain–related distress and disability are logical
consequences for patients who are excessively “unaccepting,” because repeatedly engaging in unproductive attempts to avoid, control, or eliminate pain that is defined by its chronicity not only is inherently distressing but also engenders narrow behavioral repertoires that deprive patients of the reinforcing consequences derived from engaging in meaningful activities and striving for achievable goals (Aldrich et al., 2000; McCracken, 1998). Accordingly, McCracken and colleagues (1999) proposed that it may be beneficial for some patients in some circumstances to respond to pain in a manner that is more “accepting.” This entails acknowledging that pain will likely continue indefinitely, letting go of the futile struggle with pain by giving up ineffective attempts to control or avoid it, discerning the distinction between pain and disability, and directing efforts toward achievable goals. Responding with acceptance also involves engaging in meaningful activities that enhance mental and physical well-being despite the presence and perceived intensity of pain and other unwanted pain-related private events and situations that occasion it.

Psychological acceptance per se is described by modern behaviorists as the antithesis of experiential avoidance. Acceptance is considered a willingness to live in the present moment by actively contacting all aspects of the human experience (public and private) as they arise without defending against or modifying them with avoidance or control efforts, reliving past experiences that cannot be changed, or residing in a contrived future that does not yet exist (see Hayes, Jacobson, Follette, & Dougher, 1994, for further discussion of acceptance). Experiential acceptance, a term emerging from a number of third-wave behavioral psychotherapies, most notably ACT (Hayes, Strosahl, et
al., 1999), is defined as a willingness to experience private events (e.g., physical sensations, emotions, thoughts) for the purpose and benefit of engaging in meaningful and satisfying activities (Hayes, Follette, et al., 2004). A modern behavioral theory asserts that behavioral acceptance is observed when historically aversive stimuli do not elicit behaviors that serve an avoidant, escape, or control function but, rather, behavior that functions to enable one to maintain contact with aversive events when doing so allows for engagement in valued action and enhances functioning (Cordova, 2001).

Although acceptance is not a novel therapeutic concept (Freud, 1920; Rogers, 1961; Yalom, 1980, all as cited in Hayes et al., 1996), empirical evidence has only recently emerged supporting its role in adjustment for a range of behavioral problems (e.g., Bach & Hayes, 2002; Hayes et al., 1994; N. S. Jacobson, Christensen, Prince, Cordova, & Eldridge, 2000; Kabat-Zinn, Lipworth, & Burney, 1985; Linehan, 1993). Data from a variety of studies have provided support for the efficacy of a number of therapeutic approaches (i.e., dialectical behavioral therapy, Linehan, 1993; mindfulness-based cognitive therapy, Teasdale et al., 2000, 2002; ACT, Bach & Hayes, 2002) that incorporate acceptance strategies into the treatment of behavioral problems and conditions such as borderline personality disorder (Linehan, 1993), marital problems (N. S. Jacobson et al., 2000), problems associated with workplace stress (Bond & Bunce, 2000), and depression (Teasdale et al., 2000, 2002). In a randomized controlled study involving participants experiencing positive symptoms of schizophrenia (e.g., hallucinations, delusions), a brief ACT intervention was effective in reducing the frequency of inpatient rehospitalizations (Bach & Hayes, 2002).
Though it may seem counterintuitive to view relinquishing attempts to control or avoid unwanted private experiences associated with aversive health problems as adaptive, there are many occasions when it is beneficial to do so (Burger, 1988; Thompson, 1981). Findings that support this assertion are found in a number of studies demonstrating the utility of letting go of unsuccessful attempts at behavioral control (as distinguished from perceived control) in the context of long-term, largely uncontrollable, and incurable chronic health conditions. For example, studies of patients with epilepsy (Rosenbaum & Palmon, 1984) and end-stage renal disease (Eitel, Hatchett, Friend, Griffin, & Wadhwa, 1995) have suggested that, for some individuals, directing efforts away from unsuccessful forms of behavioral control toward understanding and acceptance of the aversive event leads to enhanced emotional and physical health status. Evers et al. (2001) demonstrated the adaptive function of acceptance (operationalized as a way to diminish the aversive meaning of chronic illness) in terms of the long-term physical and emotional health status of patients with rheumatoid arthritis \( n = 95 \) and multiple sclerosis \( n = 100 \). Acceptance was measured with a self-report instrument (i.e., the Illness Cognition Questionnaire; Evers et al., 2001) developed to assess illness cognitions across different chronic diseases. Acceptance-related thoughts about illness were significantly correlated with disease-specific standardized physiological and psychological health status outcome measures of disease activity \( r = -.31, p < .01 \), physical complaints \( r = -.24, p < .01 \), negative mood \( r = -.17, p < .05 \), and positive mood \( r = .18, p < .05 \).

There are many misconceptions associated with acceptance in the context of chronic pain, such as the idea that acceptance is analogous to giving up or resignation.
Some studies have argued against these negative views (Risdon et al., 2003) and have indicated that acceptance is best conceived as involving two behavioral components. These are responding to pain and pain-related experiences with an openness or willingness and without deliberate attempts at control or avoidance, and engaging in meaningful activities and directing action toward valued goals regardless of the presence or intensity of pain or pain-related events (e.g., McCracken, Vowles, et al., 2004). The clinical relevance of a modern behavioral theory of acceptance of pain is that enhanced patient adjustment to chronic pain is not contingent upon first controlling, avoiding, eliminating, or otherwise modifying the frequency or form of pain sensations or pain-related thoughts and emotions. Rather, enhanced well-being and improved patient functioning occur when the choice is made to engage in meaningful activities despite the presence, intensity, or frequency of pain sensations and other unwanted private events (Vowles, McCracken, & Eccleston, 2008). Acceptance is not necessarily proposed as an alternative to either psychological approaches to pain management or medical management of underlying physical pathology, nor is it an appropriate approach for all persons with chronic pain. However, this approach is highly relevant for a subgroup of patients for whom the suffering of chronic pain and related distress and disability appears to arise, in part, from excessive avoidance responding (McCracken, 2005). Thus, acceptance is a pragmatic approach to the unwanted experience of continuing pain because it entails discerning when it is optimal to engage (or disengage) in behavior aimed at either controlling and avoiding or accepting pain sensations and related thoughts and emotions (McCracken, Carson, et al., 2004; McCracken & Vowles, 2006).
Empirical Support for a Modern Behavioral Theory of Acceptance of Chronic Pain

An emerging body of research supports the notion that acceptance is a key behavioral process in enhanced adjustment for patients with chronic pain (see McCracken, Carson, et al., 2004; McCracken & Vowles, 2006, for reviews). Experimental studies of thought suppression and induced laboratory pain have suggested the utility of applying acceptance-based strategies (Gutierrez, Luciano, Rodriguez, & Fink, 2004; Hayes, Bisset, et al., 1999; Keogh, Bond, Hanmer, & Tilston, 2005; Korn, 1997; Masedo & Esteve, 2007). Clinical studies have shown that acceptance is a robust correlate of enhanced adjustment in patients seeking treatment for chronic pain (McCracken, 1998; McCracken & Eccleston, 2003, 2006; McCracken et al., 1999; Viane et al., 2003; Vowles, McCracken, McLeod, et al., 2008). Furthermore, a growing number of clinical outcome studies have provided support for modern behavioral acceptance-based treatment interventions (i.e., ACT, Dahl et al., 2005; contextual cognitive–behavioral therapy, McCracken, 2005) in terms of improving functioning in patients with chronic pain (Dahl et al., 2004; McCracken, MacKichan, & Eccleston, 2007; McCracken, Vowles, & Eccleston, 2005; Vowles, Gross, & Sorrell, 2004; Vowles, McCracken, & Eccleston, 2007).

Experimental Studies of Acceptance of Pain

Several studies have investigated processes of control and acceptance of experimentally induced pain. Hayes, Bisset, et al. (1999) conducted one of the few laboratory tests of control and acceptance processes by investigating the impact of
acceptance- versus control-based rationales on the experience and tolerance of pain in response to a stressor (i.e., cold pressor task). Undergraduate participants (N = 30) were randomly assigned to one of three intervention conditions (i.e., control focused, acceptance, education/placebo) involving 90-min training sessions and underwent cold pressor tasks. The rationale for the control-focused condition, drawn from a widely used cognitive–behavioral pain management package, included strategies for controlling thoughts and feelings to minimize discomfort (i.e., imagining a vivid and pleasant scene). The rationale for the acceptance condition, drawn from the acceptance and commitment model of pain management (Hayes, Bisset, et al., 1999), included strategies for enhancing acceptance of aversive thoughts and emotions by simply acknowledging them without attempting to control the response to the pain sensations (i.e., practicing experiential tasks). The education/placebo condition included an educational presentation on types of pain and reviewed methods for coping with pain that participants had utilized in the past. For the first and second cold pressor tasks, participants were instructed to place their nondominant hands in ice water (1°C, or 33°F) for as long as possible and were asked to rate the pain intensity and pleasantness every 60 s and after voluntarily terminating exposure to the stimulus. Pain intensity (level of pain) and unpleasantness (degree of adversity experienced) were assessed using numerical ratings (whole numbers from 0 to 100; 0 = none at all, 100 = extremely intense and extremely unpleasant). Results showed no significant differences in self-reported ratings of the aggregate aversiveness variable (composed of ratings of pain intensity and unpleasantness) among the three groups. The acceptance condition demonstrated the greatest pain tolerance (as measured by seconds
under water) compared to the control-focused and placebo conditions (240.0, 184.6, and 127.3 s, respectively). Compared to the control-focused approach, the acceptance-based approach had a greater impact on overt behavior in response to pain. By adopting an acceptance approach, such that pain and related thoughts and feelings did not function as guides for escape, avoidance, or control efforts, participants increased their tolerance to induced, transient pain.

Gutierrez et al. (2004) provided additional empirical evidence for acceptance-based strategies in the context of laboratory-induced pain. The investigators compared the impact of acceptance- and control-based interventions on pain tolerance in response to two series of repeated electric stimulations in undergraduate participants ($N=40$). Participants were randomly assigned to acceptance- or control-based protocols and exposed to two series of repeated electric shocks of increasing intensity and duration while completing a simple cognitive matching-to-sample task. All participants underwent the pain procedure with the collateral cognitive task prior to (Time 1) and following (Time 2) their respective acceptance or control interventions. The acceptance-based condition provided participants ($n=20$) with ACT-derived strategies for reducing pain by diminishing the influence of thoughts and feelings as guides for action. The control-based condition provided participants ($n=20$) with cognitive–behavioral strategies for reducing pain by controlling thoughts and feelings. A statistically significant increase in pain tolerance (as measured by the significant increase in the mean number of shocks tolerated from Time 1 to Time 2) was observed for the acceptance condition, $t(19) = –3.79, p < .001$, but not for the control condition $t(11) = –.11, p = .91$. The study showed that
adopting an acceptance approach improved pain tolerance, demonstrating support for the utility of acceptance relative to control strategies for coping with induced, transient pain.

Other laboratory tests of pain tolerance in response to cold pressor tasks have also demonstrated the relative utility of acceptance versus control strategies in terms of increased pain tolerance and endurance, lower perceived pain intensity and subjective distress, and fewer pain-related thought intrusions (Keogh et al., 2005; Korn, 1997; Masedo & Esteve, 2007). Collectively, the findings from experimental studies suggest the greater utility of acceptance-based strategies relative to control-based strategies in terms of enhanced adjustment to laboratory-induced pain. This may have important implications in terms of better understanding these processes and their contribution to the experience of, and problems associated with, aversive, transient pain sensations. Some limitations may affect the interpretation of these findings. Because of the correlational nature of these data analyses, causality cannot be inferred. Moreover, the reliance of these studies on homogenous convenience samples (i.e., undergraduate participants) limits the extent to which the findings generalize to other populations. Finally, participants across these studies were not experiencing chronic pain, which further limits the generalizability of the findings, particularly to patients seeking treatment for chronic pain.

Clinical Studies of Acceptance of Chronic Pain and Patient Functioning

In clinical studies, the association of chronic pain acceptance with less emotional distress (e.g., depression and pain-related anxiety) and less physical disability is a consolidated finding among patients seeking treatment for chronic pain (Esteve et al.,
Findings also show that acceptance contributes to the prediction of adjustment to chronic pain above and beyond the contribution of pain intensity (e.g., McCracken, 1998; McCracken, Vowles, et al., 2004) or pain-related coping behaviors (e.g., McCracken & Eccleston, 2003, 2006) among treatment-seeking patients with chronic pain.

Results from the first published study of acceptance among treatment-seeking patients with chronic pain ($N = 160$) indicated that greater acceptance of chronic pain, as measured by the Chronic Pain Acceptance Questionnaire (CPAQ; Geiser, 1992), was significantly correlated with all indices of patient functioning (McCracken, 1998). McCracken (1998) reported significant negative correlations between acceptance and pain-related anxiety ($r = -.66, p < .001$) and avoidance ($r = -.55, p < .001$) behaviors (Pain Anxiety Symptoms Scale [PASS]; McCracken et al., 1992), depression ($r = -.58, p < .001$; Beck Depression Inventory [BDI]; Beck et al., 1961), psychosocial disability ($r = -.54, p < .001$), and physical disability ($r = -.46, p < .001$; Sickness Impact Profile [SIP]; Bergner et al., 1981). A significant and positive correlation was observed between acceptance and reports of average daily uptime ($r = .46, p < .001$). After controlling for pain intensity (100-mm Visual Analog Scale [VAS]) in the hierarchical multiple regression analyses, acceptance remained a significant predictor of all criterion variables. Although pain intensity was entered into the regression equation first, acceptance accounted for more variance ($\Delta R^2$) than pain intensity in measures of pain-related anxiety.
(acceptance = .32, pain intensity = .19) and avoidance (.25, .07), depression (.29, .06), psychosocial disability (.22, .14), physical disability (.12, .18), and daily uptime (.17, .06). All results were significant at $p < .01$. The findings provide initial support for a modern behavioral theory of acceptance of pain, as greater chronic pain acceptance predicted better adjustment across widely used indices of patient functioning. The relatively weak association between acceptance of chronic pain and pain intensity ($r = -.28, r^2 = .078$) suggests that acceptance is not merely a function of lower levels of reported pain intensity. The study also provides further support for the relevance of an acceptance approach: Results from the regression analyses indicate the utility of a functional view of private events, as acceptance of pain was a stronger predictor of enhanced adjustment than was perceived level of pain intensity.

A subsequent investigation conducted by McCracken et al. (1999) explored the relative predictive utility of the behavioral processes of acceptance and pain-related anxiety in terms of predicting adjustment among patients seeking treatment for chronic pain. The authors utilized an empirical classification system developed by Turk and Rudy (1988) that classified patients into three groups—dysfunctional copers ($n = 41$), interpersonally distressed copers ($n = 28$), and adaptive copers ($n = 59$)—based on factors derived from the Multidimensional Pain Inventory (Kerns, Turk, & Rudy, 1985). Results from a discriminant function analysis including pain intensity (VAS), pain-related anxiety (PASS; McCracken et al., 1992), and depression (BDI; Beck et al., 1961) showed that chronic pain acceptance (CPAQ; Geiser, 1992) was the strongest single predictor of group membership, with 72.5% of the dysfunctional ($z = 5.27, p = .001$) and 90.9% of the
adaptive \((z = 6.71, p = .001)\) copers correctly classified as such. This study provides further empirical support for the contributory role of acceptance in enhanced adjustment to chronic pain.

Other studies of treatment-seeking patients with chronic pain have also found acceptance to be strongly associated with more daily uptime; better work status; and lower reports of pain-related anxiety and avoidance, and physical and psychosocial disability (McCracken, Vowles, et al., 2004; Vowles, McCracken, McLeod, et al., 2008). Viane et al. (2003) found that acceptance \( (\Delta R^2 = .05) \) accounted for 5% of the variance in predicting mental health beyond the contribution of pain intensity and pain catastrophizing among patients seeking specialty treatment for chronic pain \((N = 120)\). However, no effect of acceptance or pain catastrophizing upon physical well-being was observed. The lack of relation between acceptance and physical disability may be attributed to the researchers’ use of a general measure of physical health that may have been unreliable in chronic pain patient populations (Viane et al., 2003).

Subsequent studies of patients seeking treatment for chronic pain have shown greater levels of acceptance to be associated with better overall quality of life independent of pain intensity (Mason et al., 2008), maintenance of adaptive functioning (Esteve et al., 2007), and greater success in living in accordance with personal values (McCracken & Yang, 2006). In a study of women \((N = 122)\) diagnosed with osteoarthritis \((n = 86)\) or fibromyalgia \((n = 36)\), greater acceptance of pain was associated with less negative affect and less adverse impact from pain flares on physical functioning (Kratz et al., 2007).
The cognitive–behavioral construct of pain-related coping is a well-documented correlate of functioning in patients with chronic pain (Turk & Rudy, 1991; D. Williams & Keefe, 1991; P. H. Wilson et al., 1993). However, emerging evidence from studies of a modern behavioral theory of chronic pain acceptance has provided preliminary support for the assertion of acceptance as a behavioral process distinct from “pain-related coping” and a more robust predictor of functioning in treatment-seeking chronic pain patients (McCracken & Eccleston, 2003, 2006).

In a study of 230 participants, McCracken and Eccleston (2003) found chronic pain acceptance to be distinct from coping and a stronger predictor of patient functioning as measured by six subscales of the Coping Strategies Questionnaire (Rosenstiel & Keefe, 1983), a standardized and widely used measure of pain-related coping strategies. Specifically, the correlation analyses showed that the six coping variables (i.e., diverting attention, reinterpreting pain sensations, making coping self-statements, ignoring pain sensations, praying/hoping, and increasing behavioral activity) were not highly correlated with acceptance of pain. Acceptance was not related to distraction or to considering pain sensations in other ways, was only weakly related to ignoring and thinking positively about pain, and was inversely related to passively praying and hoping for pain to remit. Results from correlation analyses showed chronic pain acceptance (CPAQ; Geiser, 1992) to be significantly correlated with each of the seven measures of patient functioning: pain intensity (VAS), pain-related anxiety (PASS; McCracken et al., 1992), depression (BDI; Beck et al., 1961), psychosocial and physical disability (SIP; Bergner et al., 1981), uptime, and work status. McCracken and Eccleston (2003) reported that the average
magnitude of the coefficients for acceptance across the measures of functioning was \( r = .47 \). Of the 42 correlations between coping scores and measures of patient adjustment, only half were significant at \( p < .05 \). The average magnitude of the significant correlations between the coping variables and the measures of functioning was \( r = .25 \). Findings from the initial and more conservative hierarchical regression model showed that, relative to the Coping Strategies Questionnaire subscale scores, the CPAQ total scale score accounted for almost as much variance across all indicators of adjustment to chronic pain, with variance increments averaging 13% and 15% for coping and acceptance variables, respectively. When the order of entry in the regression model was reversed and acceptance was entered before the significant coping variables, the effect of coping across all outcome measures diminished, with variance increments averaging 4.5% and 24% for coping and acceptance variables, respectively. These results provide further support for a modern behavioral theory of acceptance of chronic pain, suggesting that acceptance is a key psychological process and indicator of enhanced patient adjustment to pain. More important, these findings underscore the assertion that acceptance is a distinct process that is not captured by conventional conceptualizations of coping with pain. A broader view of patient behavior and adjustment to chronic pain that includes acceptance appears to hold significant promise for informing more effective interventions for pain sufferers.

Data from their 2003 comparison of coping and acceptance-based approaches to chronic pain were reanalyzed by McCracken and Eccleston (2006). They addressed methodological limitations in an effort to replicate and extend earlier findings regarding
the utility of acceptance relative to coping. The authors used the revised scoring system for the Coping Strategies Questionnaire–Revised (Riley & Robinson, 1997) and the newly developed and confirmed CPAQ Activity Engagement and Pain Willingness subscale scores (McCracken, Vowles, et al., 2004). Activity engagement and pain willingness were significantly negatively correlated with each of the seven measures of patient adjustment: pain intensity (VAS), pain-related anxiety (PASS; McCracken et al., 1992), depression (BDI; Beck et al., 1961), psychosocial and physical disability (SIP; Bergner et al., 1981), uptime, and work status. McCracken and Eccleston (2006) reported that the average magnitudes of the coefficients for activity engagement and pain willingness across the measures of patient functioning were $r = .47$ and $r = .41$, respectively. Of the 35 correlations between the five coping scores and measures of patient adjustment, 20 were significant at $p < .05$. The average magnitude of the significant correlations between the coping score and measures of patient adjustment was $r = .25$. Regardless of the priority given to the five standard coping variables in the regression analyses, acceptance accounted for more incremental variance across the measures of patient functioning. When the coping variables were tested as predictors for entry prior to the acceptance variables in the initial and more conservative hierarchical regression model, the average variance accounted for ($\Delta R^2$) by the coping and acceptance variables across the seven equations was .13 and .19, respectively. In the second set of regression analyses, in which the order of entry was reversed, the average variance accounted for ($\Delta R^2$) by the acceptance and coping scores was .29 and .04, respectively. These findings suggest that McCracken and Eccleston’s (2003) earlier results were
reliable, rather than the result of measurement error. These data also provide initial support for the utility of the CPAQ subscales, as both predictors contributed incremental variance and were associated with better patient functioning. The Activity Engagement and Pain Willingness subscales do not appear to be redundant, as they were moderately intercorrelated ($r = .48$, $p < .001$). Notably, pain intensity showed the weakest relationship with acceptance variables, providing further support for the view that acceptance is related to patient functioning regardless of pain level (McCracken, 1998; McCracken & Eccleston, 2003; McCracken et al., 1999). These findings underscore the claim that the cognitive–behavioral coping approach offers an incomplete account of behavior and patient adjustment to the presence of continuing pain. The results suggest that a broader view, such as a modern behavioral model of chronic pain, offers a more complete and pragmatic psychological approach to adjustment that views both control/coping and acceptance efforts as potentially effective means of enhancing patient functioning (McCracken, 2005).

**Outcome Studies of Acceptance-Based Treatment for Chronic Pain**

Emerging modern behavioral acceptance-based treatment approaches for chronic pain (i.e., ACT, Dahl et al., 2005; contextual cognitive–behavioral therapy, McCracken, 2005) are increasingly recognized as innovative and effective interventions in terms of improving patient functioning and adjustment to chronic pain. In an analysis of the psychological aspects of chronic pain and a review of the current state of the science by Keefe et al. (2004), acceptance was included as a key factor in adaptive patient
functioning with significant clinical implications for the effective management of persistent pain. A growing number of clinical outcome studies have provided evidence supporting the effectiveness of acceptance-based treatments for enhanced emotional and physical functioning and decreased health care utilization in patients with chronic pain (Dahl et al., 2004; Geiser, 1992; McCracken, MacKichan, et al., 2007; McCracken, Vowles, et al., 2005; Vowles et al., 2004, 2007).

In summary, emotional distress and physical disability may appear to be inevitable responses to chronic pain given the survival function of nociception (e.g., Waxman, 2006) and the myriad internal and environmental reinforcing contingencies (e.g., Fordyce, 1976; Turk et al., 1983) for experiential avoidance behaviors (Dahl et al., 2005; McCracken, 2005). However, the assumption of a modern behavioral theory of acceptance of chronic pain is that, although a person may not be able to effectively control, avoid, or otherwise alter pain sensations (and related unwanted private events), he or she can modify the function or behavioral impact they have on daily psychosocial and physical functioning. Thus, according to this view, improved adjustment to chronic pain is achieved once an individual increases contact with reinforcing contingencies while aversive pain sensations and other uncomfortable pain-related thoughts and emotions continue to occur, as this serves to diminish the behavioral impact of aversive sensations and promote valued actions that enhance functioning (McCracken, 2005). Indeed, a growing body of empirical research has demonstrated acceptance to be a key behavioral process and potent correlate of enhanced adjustment to chronic pain (Esteve et al., 2007; Kratz et al., 2007; Mason et al., 2008; McCracken, 1998; McCracken &
Limitations of the Chronic Pain Acceptance Literature

The consistent findings from the past decade of research investigating acceptance of chronic pain in four countries (i.e., Esteve et al., 2007; McCracken, 1998; McCracken & Eccleston, 2005; McCracken, Vowles, et al., 2004) as measured by the CPAQ (Geiser, 1992; McCracken, Vowles, et al., 2004) are that greater acceptance is associated with enhanced emotional and physical functioning, less medication use and health care utilization, and better work status in patients seeking treatment for chronic pain. The accumulating literature also supports the role of acceptance in accounting for less distress and disability independent of perceived pain intensity (e.g., McCracken, 1998; McCracken et al., 1999; McCracken, Vowles, et al., 2004) or pain-related coping behaviors (e.g., McCracken & Eccleston, 2003, 2006) among some patients seeking specialty treatment for chronic pain. However, the notion that acceptance of pain is an important behavioral process that produces improved functioning and enhanced adjustment to chronic pain remains unproven because of some limitations in these studies.

For example, there have been strikingly few independent investigations of a modern behavioral theory of acceptance of pain. Almost 80% of the extant literature demonstrating the relation of acceptance as measured by the CPAQ to adjustment in patients seeking specialized treatment for chronic pain has been generated by the same
authors (i.e., McCracken, Eccleston, and Vowles), many of whom were affiliated with the pain management centers from which the research participants were recruited. In addition, many of the studies had overlapping samples. For example, the sample from Vowles, McCracken, McLeod, et al. (2008) had substantial overlap with the sample that served as the basis for an earlier investigation of the factor structure of the 34-item CPAQ (e.g., McCracken, Vowles, et al. 2004). The sample from McCracken, Gauntlett-Gilbert, and Vowles (2007) had considerable overlap with the sample that served as the basis for earlier studies of acceptance and coping (e.g., McCracken & Eccleston, 2003, 2006). Some overlap in sample is also found in clinical outcome studies investigating acceptance-based treatment strategies (i.e., McCracken & Eccleston, 2005; McCracken, MacKichan, et al., 2007; McCracken, Vowles, et al., 2005; Vowles et al., 2007).

Another consideration involves the use of the same standardized measures of patient functioning across the majority of studies (i.e., McCracken, 1998; McCracken & Eccleston, 2003, 2005, 2006; McCracken et al., 1999; McCracken, Vowles, et al., 2004). This reliance upon the same measures of pain intensity (i.e., VAS), pain-related anxiety (i.e., PASS), depression (i.e., BDI), and physical and psychosocial disability (i.e., SIP) restricts the reliability and generalizability of the observed findings. A test of a modern behavioral theory of acceptance of chronic pain that utilizes different established measures of pain intensity (e.g., Numerical Rating Scale [NRS-11]), depression and anxiety (e.g., Depression Anxiety Stress Scales [DASS]; S. H. Lovibond & Lovibond, 1995), and pain-related disability (e.g., Pain Disability Index; Pollard, 1984) can increase
confidence in the reliability of the observed findings and enhance their generalizability to other groups of patients seeking specialized treatment for chronic pain.

Research findings support the validity and reliability of the NRS-11 and the VAS for assessing pain intensity among chronic pain populations (for a review, see Jensen, Turner, Romano, & Fisher, 1999). However, the NRS-11 appears to have some advantages to the VAS in terms of simplicity, potential for measurement error, and clinical practicality (Jensen, Karoly, & Braver, 1986; Williamson & Hoggart, 2005). Although both pain rating scales have equivalent abilities to detect changes in pain, the NRS-11 offers a relative advantage in terms of lower failure rates and increased practicality (Jensen et al., 1986). When completing the NRS-11, patients are asked to rate (verbally or in written form) their current level of pain from 0 to 10, with a score of 0 indicating no pain and a score of 10 indicating the worst pain imaginable. Successful use of the VAS requires patients to indicate their level of pain by placing a pencil mark on a 100-mm line anchored by verbal descriptors (i.e., “no pain” and “worst imaginable pain”). Given the relative complexity of the VAS, it is not surprising that it has higher failure rates than other single-item pain intensity scales such as the NRS-11 (Kremer et al., 1981). Jensen, Turner, and Romano (1994) demonstrated that an 11-point scale (such as that used in the NRS-11) offers more than adequate levels of discrimination for chronic pain patients to communicate their pain intensity, whereas 101-point scales (such as that used in the VAS) have more levels of discrimination than most patients use. When using the 101-point scale, almost 75% of the 124 patients in Jensen, Turner, and Romano’s (1994) study used only multiples of 10 to describe their pain intensity,
suggesting that the 101-point scale was being treated as if it had only 11 points. In addition to lacking utility, the VAS, with its 101 response categories, is confusing for some chronic pain patients, contributing to increased failure rates (Kremer et al., 1981). Unlike the NRS-11, which can be administered verbally or in written form, the VAS is limited in that it can only be administered on paper or electronically; lack of care in photocopying the scale has led to significant changes in its apparent length, rendering some responses invalid (Jensen et al., 1986). Thus, assessing pain intensity with the NRS-11 can provide a means of increasing the reliability and enhancing the generalizability of observed findings for the relative contributions of pain intensity and acceptance to adjustment to chronic pain among other groups of patients seeking specialized pain treatment.

Research findings support the validity and reliability of both the DASS Depression scale and the BDI for assessing depression among chronic pain populations. However, the DASS Depression scale does not include items assessing somatic symptoms, which may offer an advantage in terms of its ability to accurately discriminate depressed patients from nondepressed patients in a chronic pain population (R. Taylor, Lovibond, Nicholas, Cayley, & Wilson, 2005). Relative to nonsomatic items, somatic items are preferentially endorsed on depression questionnaires by patients with chronic pain; this may be because of reasons other than depression (A. C. Williams & Richardson, 1993). For example, somatic symptoms can be due to neurovegetative changes (e.g., sleep disturbance, changes in appetite and weight, decreased libido, loss of energy, psychomotor retardation) that arise from pain, pain-related physical pathology,
physical deconditioning, or analgesic medication use (R. Taylor et al., 2005). Thus, traditional questionnaires that emphasize somatic symptoms in the assessment of depression (e.g., BDI) may be less suitable for use in chronic pain settings because of potential inflation of false-positive findings (Dworkin & Gitlin, 1991; A. C. Williams & Richardson, 1993). A measure such as the DASS Depression scale that excludes somatic items is less likely to include spurious variance and may provide a more reliable assessment of depression. Moreover, assessing depression with the DASS Depression scale provides a test of the generalizability of the observed findings for the relation of acceptance and emotional functioning among other samples of treatment-seeking chronic pain patients (R. Taylor et al., 2005).

Given the limitations of the research to date, the field needs further inquiry into the relation of acceptance and functioning in patients seeking treatment for chronic pain at pain clinics that are unaffiliated with the primary investigator/author. Additionally, different measures of adjustment can increase the degree of confidence in the relations observed as well as provide a test of the generalizability of these findings to other groups of patients seeking specialized treatment for chronic pain. Such a research agenda seems particularly important given the prevalence and severity of distress and disability experienced by some patients and the apparent contribution of acceptance to enhanced patient functioning and adjustment.
Summary

In light of these limitations, the aim of the present study is to provide an independent test of the validity of a modern behavioral theory of acceptance of chronic pain as operationalized by the CPAQ (McCracken, Vowles, et al., 2004). Such a test seeks to (a) demonstrate the association of pain acceptance, and the facets of acceptance (e.g., activity engagement and pain willingness), with better adjustment in patients seeking interdisciplinary treatment for chronic pain; (b) demonstrate the contribution of pain acceptance, and the facets of acceptance, to the prediction of patient adjustment to chronic pain above and beyond the contribution of pain intensity—a variable known to influence patient adjustment to pain; and (c) test the generalizability of previous findings of pain acceptance and adjustment observed in patients seeking interdisciplinary treatment for chronic pain (i.e., McCracken, 1998; McCracken, Vowles, et al., 2004) by assessing patient functioning with different standardized self-report measures of pain intensity (i.e., NRS-11), emotional distress (i.e., DASS), and pain-related disability (i.e., Pain Disability Index) than those used previously (i.e., VAS, BDI and PASS, and SIP, respectively).

General Research Questions

Based on a modern behavioral theory of acceptance of pain (Hayes, Strosahl, et al., 1999) and empirically supported relationships (i.e., McCracken, 1998; McCracken, Vowles, et al., 2004), the following general research questions were generated for the present study.
General Research Question 1: Is there a relation between the dimensions of chronic pain acceptance and measures of patient adjustment to chronic pain among patients seeking interdisciplinary treatment for chronic pain?

General Research Question 2: Do the dimensions of chronic pain acceptance contribute to the prediction of patient adjustment to chronic pain above and beyond the contribution of pain intensity among patients seeking interdisciplinary treatment for chronic pain?
CHAPTER III
RESEARCH METHOD

This chapter discusses the research methodology used to determine whether dimensions of chronic pain acceptance are related to adjustment to chronic pain among patients seeking specialty pain treatment and whether these dimensions contribute to the prediction of adjustment to chronic pain above and beyond any significant demographic or confounding pain-related variables. Discussion of participants, measures, procedures, data analysis, and general and specific hypotheses follows.

Participants

Participants were 117 adult patients who sought treatment at The Cleveland Clinic Foundation Chronic Pain Rehabilitation Program (CPRP) from December 2006 to December 2007. Patients suffering from intractable chronic nonmalignant pain were referred to the CPRP by their general practitioners or by medical specialists. All data for this study were archival in nature and included demographic and pain-related data, as well as self-report data provided by patients upon entry to the CPRP.

Sample size was determined by examining the alpha, power, and effect size of the data. For all analyses, alpha was set at .05 (α = .05), a common level in social science research (Cohen, 1992). Hence, a p value of .05 or less was required to ensure with 95%
confidence \( (1 - \alpha = .95) \) that a relationship exists. Given this alpha level, there was a 5% probability of Type I error, or a false positive. Power for the analyses was set at .80 \( (\text{power} = .80) \), a generally accepted value in social science research. Thus, there was a 20% probability \( (1 - \beta = .20) \) of Type II error, or a false negative (Pagano, 1990). Past research has suggested that the relationship between dimensions of chronic pain acceptance and measures of patient functioning has a medium effect size \( (r = .30 \text{ or } R^2 = .09; \text{ McCracken, Vowles, et al., 2004}) \). Cohen reported that, for a regression analysis with three predictor variables at a .05 level of significance, a sample size of 76 will allow for a power of .80 to detect a medium effect size. A total of 117 complete data sets for patients admitted to the CPRP from December 2006 to December 2007 were utilized to test the hypotheses generated for this study.

The sample consisted of 74 (63.2%) women and 43 (36.8%) men. Patients ranged in age from 23 to 81 years \( (M = 45.70, SD = 12.469) \). The majority of the patients were married or cohabitating \( (n = 73, 62.4\%) \); others were single \( (n = 26, 22.2\%) \), divorced or separated \( (n = 16, 13.7\%) \), or widowed \( (n = 2, 1.7\%) \). The average duration of pain was 10.98 years \( (SD = 9.856 \text{ years, range} = 1–38) \). The pain complaint reported most frequently by the patients was low back pain \( (n = 47, 40.2\%) \) followed by fibromyalgia \( (n = 21, 17.9\%) \), neck pain \( (n = 14, 12.0\%) \), migraine or other headache \( (n = 8, 6.9\%) \), neuropathy \( (n = 7, 6.0\%) \), complex regional pain syndrome \( (n = 4, 3.4\%) \), joint pain \( (n = 4, 3.4\%) \), lower limb pain \( (n = 3, 2.6\%) \), abdominal pain \( (n = 2, 1.7\%) \), myofascial pain \( (n = 2, 1.7\%) \), total body pain \( (n = 1, 1.9\%) \), or other \( (n = 4, 3.4\%) \). Only 15.4% of patients \( (n = 18) \) were employed full time outside the home at the time of the admission
evaluation. The majority of patients were not working or were working only part time due to their pain ($n = 67, 57.3\%$); 10 (8.5\%) patients were retired and 2 (1.7\%) were homemakers or volunteers. The remaining 20 (17.1\%) patients were either unemployed ($n = 9, 7.7\%$), employed part time ($n = 8, 6.8\%$), or in school ($n = 3, 2.6\%$).

Measures

Data on demographic and pain-related variables—including primary pain complaint, duration of pain, number of hours spent resting or sleeping per day due to pain, and pain intensity—were obtained from patients upon admission to the CPRP as part of the pretreatment evaluation and were documented in a discharge summary. In addition to the Chronic Pain Acceptance Questionnaire (CPAQ), participants completed a battery of self-report measures upon admission, including the Depression Anxiety Stress Scales (DASS), Numerical Rating Scale (NRS-11), and Pain Disability Index (PDI).

*Chronic Pain Acceptance Questionnaire*

The Chronic Pain Acceptance Questionnaire (McCracken, Vowles, et al., 2004) is a 20-item self-report inventory designed to measure acceptance of pain in chronic pain populations (see Appendix A). It is derived from a questionnaire developed by Geiser (1992) that originally included 34 rationally derived items based on a very early version of a general measure of experiential avoidance, the Action and Acceptance Questionnaire (Hayes, Strosahl, et al., 2004). The CPAQ consists of two subscales, Activity Engagement and Pain Willingness, designed to assess (a) patients’ tendency to participate
in activities regardless of the presence of pain and (b) the relative absence of attempts to control or avoid the experience of pain, respectively (McCracken, 1999; McCracken, Vowles, et al., 2004). Patients rate each item on a 7-point Likert-type scale (0 = never true, 1 = very rarely true, 2 = seldom true, 3 = sometimes true, 4 = often true, 5 = almost always true, 6 = always true). The Activity Engagement subscale contains 11 items (e.g., “Despite the pain, I am now sticking to a certain course in my life”; range of scale scores = 0–66), and the Pain Willingness subscale contains 9 reverse-keyed items (e.g., “I would gladly sacrifice important things in my life to control this pain better”; range of scale scores = 0–56). Scores for the Activity Engagement and Pain Willingness subscales are calculated separately by summing the relevant items and also combine to form a total scale score (range = 0–122), with higher scores indicating greater acceptance of chronic pain.

Preliminary analyses of the original 34-item CPAQ (Geiser, 1992) supported its psychometric properties (Cronbach’s $\alpha = .85$). The total scale score correlated significantly and negatively with the Behavioral Assessment of Pain (Tearnan & Lewandowski, 1988) Depression and Anxiety scale scores ($r = -.73, p < .001; r = -.54, p < .001$, respectively) and the Sickness Impact Profile (Bergner et al., 1981) Psychosocial and Physical Disability scale scores ($r = -.72, p < .001; r = -.66, p < .001$, respectively), providing support for the divergent validity of the CPAQ as a measure of acceptance in chronic pain populations. Data from several other investigations of the 34-item CPAQ (Geiser, 1992) supported its psychometric properties (Cronbach’s $\alpha = .84–.85$) and significant and negative relation with standardized measures of emotional distress and
physical functioning in chronic pain patient populations (McCracken, 1998; McCracken et al., 1999). Among a group of 160 treatment-seeking patients with chronic pain, McCracken (1998) reported significant negative correlations between the CPAQ total scale score and the total score for the Beck Depression Inventory (BDI; $r = -0.58, p < .001$; Beck et al., 1961), scores for the Sickness Impact Profile Psychosocial Disability ($r = -0.54, p < .001$) and Physical Disability ($r = -0.46, p < .001$) scales, and scores for the Pain Anxiety Symptoms Scale (McCracken et al., 1992) Pain-Related Anxiety ($r = -0.66, p < .001$) and Avoidance ($r = -0.55, p < .001$) subscales. Total scale scores for the CPAQ were significantly and positively correlated with patient reports of daily uptime ($r = 0.46, p < .001$) but were unrelated to age, gender, or duration of pain (all $r_s < .06, p_s > .05$).

McCracken (1999) examined the factor structure of the original 34-item CPAQ (Geiser, 1992) by analyzing responses to the measure from 230 patients seeking treatment for chronic pain. McCracken also sought to empirically demonstrate whether acceptance of pain was a unitary construct or was composed of multiple behavioral components as implied by the rationally derived definition and reflected in the item content of the CPAQ. The initial analysis indicated that seven items could be excluded because of poor frequency distributions and poor item–total correlations. The remaining 27 items were submitted to principal components analysis with oblique rotation. Four components were extracted, accounting for 52.7% of the total variance in the selected items. They were labeled (1) Engaging in Normal Life Activities, (2) Believing that Controlling Thoughts Controls Pain, (3) Recognizing the Chronicity of Pain, and (4) Needing to Avoid or Control. Component 2 showed the smallest correlation with the
corrected total ($r = .23, p < .001$), accounting for just 5% of the shared variance with the other factors. The correlation for Component 3 ($r = .33, p < .001$) was the next smallest in magnitude, accounting for 11% of the variance with the other components. The corrected component–total correlations for Factors 1 and 4 were $r = .63$ and $r = .40$ ($ps < .001$), respectively. McCracken (1999) considered the relatively low corrected component–total correlation for Component 2 to be an indication that this component may be divergent from the overall construct of acceptance of pain.

For further clarification of the multiple related processes underlying acceptance of pain, McCracken, Vowles, et al. (2004) investigated the item content, internal consistency, and factor structure of the 34-item CPAQ. Their study of 235 patients with chronic pain provided the first evaluation of the relations between the separate acceptance factors and other standardized measures of chronic pain–related distress and disability. After the initial analyses of the item content, 28 of the remaining items were submitted to principal components analysis with oblique rotation. The resulting four components accounted for 46.8% of the variability in the 28 items. Although the previously demonstrated component structure (McCracken, 1999) was generally supported, analyses of item variability, item intercorrelation, internal consistency, and predictive validity strongly supported the continued use of only two components: Activity Engagement and Pain Willingness. McCracken’s (1999) Factor 2 (Believing that Controlling Thoughts Controls Pain) and Component 3 (Recognizing the Chronicity of Pain) were generally unrelated to measures of pain-related distress and disability. McCracken, Vowles, et al. (2004) reported significant negative correlations between the CPAQ Activity
Engagement and Pain Willingness subscale scores and scores from the BDI ($r = -0.51, -0.49, ps < .001$, respectively), Pain Anxiety Symptoms Scale Pain-Related Anxiety subscale ($r = -0.51, -0.63, ps < .001$, respectively), and Sickness Impact Profile Physical Disability ($r = -0.19, p < .01; r = -0.33, p < .001$, respectively) and Psychosocial Disability ($r = -0.36, -0.46, ps < .001$, respectively) subscales. The acceptance subscales were also negatively correlated with hours of daily rest ($r = -0.32, -0.32, ps < .001$, respectively). The Activity Engagement and Pain Willingness subscales were moderately correlated ($r = -0.36, p < .001$), demonstrating both the interrelation and distinctiveness of these behavioral components of acceptance. After pain intensity (100-mm Visual Analog Scale [VAS]) was controlled in hierarchical multiple regression analyses, both acceptance subscales were significant predictors of all five criterion measures; the only exception was the lack of effect of activity engagement on physical disability ($\beta = -0.13, p > .05$). Although activity engagement was not a significant predictor of physical disability, the average increments of explained variance ($\Delta R^2$) contributed by the acceptance subscales and pain intensity scores across the five equations were .24 and .06, respectively. Based on these results, McCracken, Vowles, et al. (2004) reduced Geiser’s original 34-item scale to include only items reflecting the two-component solution. The publication of their 20-item, revised version of the CPAQ was an important step toward operationalizing the theoretical process of acceptance of chronic pain.

Evaluations of the 20-item CPAQ total score and subscale scores have supported its psychometric properties ($\alpha = .78–.82$; McCracken & Eccleston, 2006; McCracken, Vowles, et al., 2004) and its ability to reliably predict patient functioning (e.g., pain-
related anxiety and avoidance, depression, physical disability, analgesic medication use, health care utilization, and employment status). This has provided further support for the revised CPAQ total scale and subscales as reliable and valid measures of chronic pain acceptance among pain populations (Dahl et al., 2004; Mason et al., 2008; McCracken & Eccleston, 2006; McCracken, Vowles, et al., 2004; McCracken & Yang, 2006).

The 20-item CPAQ has also demonstrated adequate test–retest reliability in a prospective study of patients (N = 118) awaiting interdisciplinary treatment for complex chronic pain (McCracken & Eccleston, 2005). Consecutively referred patients completed measures, including the CPAQ, at Time 1 (initial assessment for suitability of treatment) and Time 2 (initial day of treatment; M = 3.9 months after Time 1, SD = 2.8 months, range = 0.5–15 months). CPAQ scores at Time 1 and Time 2 were moderately intercorrelated: total scale (r = .75), Activity Engagement (r = .76), Pain Willingness (r = .59; all ps < .001), suggesting a reasonable level of test–retest reliability for the questionnaire. Consistent with a modern behavioral conceptualization of acceptance, CPAQ total, Activity Engagement, and Pain Willingness subscale scores at Time 1 were largely unrelated to scores for pain intensity at Time 2 and were significantly negatively related to measures of patient functioning at Time 2 (i.e., BDI rs = −.50, −.37, −.42, ps < .001, respectively).

Subsequent studies (Vowles, McCracken, McLeod, et al., 2008; Wicksell et al., in press) have further evaluated the psychometric properties and two-factor model of the 20-item CPAQ in response to questions regarding an alternative factor structure (Nicholas & Asghari, 2006). Nicholas and Asghari conducted a principal components analysis of the
A 20-item CPAQ in a sample of 271 chronic pain patients and found evidence for a four-component model. The first factor was composed entirely of items from the Activity Engagement subscale, and the other three factors were composed of items from the Pain Willingness subscale. Vowles, McCracken, McLeod, et al. (2008) tested this four-factor structure in two large samples of chronic pain patients and found that it adequately fit the data. However, they viewed the separation of the 20 items into four factors as unnecessarily complex, particularly given that results from their exploratory ($N = 333$) and confirmatory ($N = 308$) factor analyses showed that the previously suggested two-factor structure (McCracken, Vowles, et al., 2004) also adequately fit the data. The authors concluded that the two-factor model for the 20-item CPAQ provides a parsimonious and interpretable solution with the best overall fit to the data (McCracken, Vowles, & Thompson, 2007; Vowles, McCracken, McLeod et al., 2008).

Wicksell et al. (in press) provided further support for the two-factor model and the predictive validity of the Activity Engagement and Pain Willingness subscales in a study of randomly selected participants ($N = 611$) reporting persistent pain and symptoms of whiplash-associated disorders. Compared to other relevant constructs such as kinesiophobia, or the fear of (re)injury due to physical activity, acceptance of pain, activity engagement, and pain willingness explained more variance in terms of predicting adjustment to pain (e.g., perceived pain intensity, disability, life satisfaction, and depression). This lent further support for the theoretical and clinical utility of the CPAQ as a measure of pain acceptance. Alpha coefficients for the Activity Engagement and Pain Willingness subscales in the present sample were .79 and .75, respectively.
Depression Anxiety Stress Scales

The Depression Anxiety Stress Scales (P. F. Lovibond & Lovibond, 1995) is a 42-item self-report inventory of emotional distress developed to differentiate symptoms of depression from anxiety (see Appendix B). The DASS consists of three 14-item scales designed to assess the core symptoms of depression, anxiety, and stress and to distinguish symptoms of depression from anxiety (P. F. Lovibond & Lovibond, 1995). The Depression scale contains only items that assess symptoms associated with dysphoric mood (e.g., worthlessness, hopelessness, anhedonia). None of the items reflect somatic symptoms (e.g., sleep disturbance, appetite change, guilt, indecisiveness, decreased libido). Somatic items are frequently endorsed yet relatively weak markers of depression in medical (Endicott, 1984) and chronic pain (Dworkin & Gitlin, 1991) samples, as somatic symptoms may be due to physical pathology, deconditioning due to physical limitations, or the side effects of medications rather than depression. Moreover, somatic items fail to distinguish symptoms of depression from symptoms of anxiety in normal and chronic pain samples (R. Taylor et al., 2005). Thus, DASS Depression scale scores are less likely to be artificially inflated than more traditional measures of depression. The Anxiety scale assesses symptoms associated with fear, panic, and autonomic arousal (e.g., muscle trembling, faintness, situational anxiety, subjective symptoms of anxious affect). The Stress scale assesses symptoms associated with irritability, tension, and a tendency to become frustrated or overact to stressful events.

Individuals rate the extent to which they have experienced each of the symptoms during the past 7 days on a 4-point scale of severity [or frequency] (0 = did not apply to
me at all, 1 = applied to me to some degree [or some of the time], 2 = applied to me to a considerable degree [or a good part of the time], 3 = applied to me very much [or most of the time]). The Depression, Anxiety, and Stress scale scores are calculated separately by summing the scores of the relevant items, with greater scores indicating greater symptom severity (Brown, Korotitsch, Chorpita, & Barlow, 1997; P. F. Lovibond & Lovibond, 1995; R. Taylor et al., 2005). Scores on each scale can range from 0 to 42. Clinical interpretation of the DASS is based on cutoff scores, with percentile scores of 0 to 78 classified as normal, 78 to 87 as mild, 87 to 95 as moderate, 95 to 98 as severe, and 98 to 100 as extremely severe (S. H. Lovibond & Lovibond, 1995).

Evaluations of the psychometric properties of the DASS in normative, clinical, and chronic pain samples have demonstrated good levels of internal consistency for the scales. S. H. Lovibond and Lovibond (1995) assessed the psychometric properties of the Depression, Anxiety, and Stress scales in a large normative sample (N = 2,914) and reported adequate levels of reliability (Cronbach’s α = .91, .84, and .90, respectively). Similar internal consistency values for the DASS scales have been obtained in clinical (α = .97, .92, .95, respectively; Antony, Bieling, Cox, Enns, & Swinson, 1998) and chronic pain (α = .96, .90, .95, respectively; R. Taylor et al., 2005) samples. The three-factor solution of the 42-item DASS proposed by P. H. Lovibond and Lovibond (1995) has been reproduced in large normative (Crawford & Henry, 2003), clinical (Antony et al., 1998; Brown et al., 1997), and chronic pain (R. Taylor et al., 2005) samples.

The DASS Depression and Anxiety scales have demonstrated good convergent validity with other measures of depression and anxiety in normative, clinical, and chronic
pain samples. P. F. Lovibond and Lovibond (1995) administered the DASS, the BDI, and the Beck Anxiety Inventory (BAI; Beck et al., 1988) to a large normative sample ($N = 717$) and reported high correlations between the DASS Depression scale and the BDI ($r = .74$, $p < .001$) and between the DASS Anxiety scale and the BAI ($r = .81$, $p < .001$). In two studies using large clinical anxiety and mood disorder samples ($N = 437$ and $N = 241$, respectively), Brown et al. (1997) demonstrated that the DASS Depression and Anxiety scales had good concurrent validity with the BDI ($r = .75$, $p < .001$) and the BAI ($r = .83$, $p < .001$). Janotta, Scheman, and Covington (2007) administered the DASS, the BDI, and the Profile of Mood States (McNair, Lorr, & Droppleman, 1992) to a chronic pain sample ($N = 190$) and found a similar pattern of correlations between the DASS Depression scale and the BDI ($r = .81$, $p < .001$) and between the DASS Anxiety scale and the Profile of Mood States Tension-Anxiety subscale ($r = .71$, $p < .001$). Janotta et al. also provided evidence for the divergent validity, with significant and negative correlations reported between the Profile of Mood States Vigor subscale and the DASS Depression scale ($r = -.32$, $p < .001$) and the DASS Anxiety scale ($r = -.16$, $p < .04$). R. Taylor et al. (2005) administered both the Zung Self-Rating Depression Scale (Zung, 1965), a traditional and widely used measure of depression in pain research that includes somatic items, and the DASS to a large sample of 398 patients with chronic pain. The DASS Depression items loaded higher and discriminated depression from the combined Anxiety/Stress factor significantly better than the Zung Self-Rating Depression Scale depression items. The concurrent validity of the DASS Stress scale with related
constructs and the discriminant validity from anxiety have yet to be clarified; thus, further research is necessary (P. F. Lovibond & Lovibond, 1995).

In the present study, the DASS Depression and Anxiety scales were used to measure emotional distress, as both of these scales have good internal consistency and concurrent and discriminant validity with other measures of depression and anxiety in clinical and chronic pain samples. The DASS Stress scale was not used, as there is little evidence regarding its concurrent validity with other measures of stress. Alpha coefficients for the DASS Depression and Anxiety scales in the present sample were .96 and .91, respectively.

*Numerical Rating Scale-11*

The Numerical Rating Scale-11 is a single-item self-report scale measuring pain intensity that can be administered verbally or in written form (Jensen & Karoly, 2001). In the CPRP, the NRS-11 is administered verbally by asking patients to state the single number from among 11 options (whole numbers from 0 to 10; 0 = *no pain*, 10 = *the worst pain imaginable*) that best represents their current level of pain. The NRS-11 is a valid and reliable method for assessing self-reported acute and chronic pain levels (Jensen & Karoly, 2001). The measure is widely used across a range of clinical and research settings because of its ease and simplicity of administration and scoring, as compared to the 100-mm VAS and the Verbal Rating Scale (VRS; Jensen et al., 1986). Another benefit of the NRS-11 relative to the VAS and VRS is that it can be administered to patients of varying numerical, graphic, and verbal skill levels (Kremer et al., 1981).
The NRS-11 has demonstrated extensive evidence of reliability as a measure of pain intensity with cancer (Kremer et al., 1981), chronic pain (Jensen et al., 1986), and chiropractic (Bolton & Wilkinson, 1998) patients. Evidence of convergent validity has been established for the NRS-11 through strong correlations with other single-item pain intensity scales commonly used in chronic pain samples (Downie et al., 1978; Reading, 1980).

Downie et al. (1978) compared the NRS-11, VAS, and VRS in a study of 100 patients with a variety of rheumatic diseases. All three scales were significantly and positively correlated in the measurement of pain intensity and pain relief; however, the authors preferred the NRS-11 to the other scales on the basis of the relative potential for measurement error. For example, Downie et al. noted that the responses on the VRS (e.g., no pain, mild pain, moderate pain, and severe or worst possible pain) are often assigned numbers for ease of recording, yet these rank numbers can lead to the false assumption that the intervals between each descriptor are equal when they are not (Jensen & Karoly, 2001).

Kremer et al. (1981) examined the relative failure rates of the NRS-11, VRS, and VAS. All of the chronic pain patients in that study ($N = 56$) were able to complete the VRS, 2% ($n = 1$) failed to complete the NRS-11, and 11% ($n = 6$) were unable to complete the VAS. The mean age of the patients who were unable to complete the VAS (73.3 years) was significantly higher than that of patients who were able to complete it (54.4 years).
Jensen et al. (1986) compared the failure rate and concurrent validity of the NRS-11 with various methods for measuring pain (e.g., VAS, VRS, Box Scale, Behavioral Rating Scale) among 75 patients with chronic pain. Incorrect responding, or the inability to understand and complete the item, was observed with each scale, but the differences were not significant, indicating consistency of incorrect responses across all scales. Concurrent validity was demonstrated by high correlations for all scales. The researchers concluded that although all of the scales are useful for measuring pain intensity, the NRS-11 has several practical benefits in terms of administration and scoring. For example, the VAS was difficult for some older patients to understand, and some responses were invalid because of lack of administrator care in photocopying (Jensen et al., 1986).

Bolton and Wilkinson (1998) compared the three most commonly used measures of pain intensity (i.e., NRS-11, VAS, and VRS) in a sample of 79 chiropractic patients. The NRS-11 and VAS were scored from 0 to 10, and scores from the 5-point VRS (no pain, mild pain, moderate pain, severe pain, and worst possible pain) were transformed to a 0 to 10 scale. The NRS-11 demonstrated good concurrent validity with the VAS ($r = .91, p < .001$) and VRS ($r = .85, p < .0001$) for current pain. Yet despite the strong associations, Bolton and Wilkinson considered the NRS-11 to have advantages in terms of ease of use and scoring.

A high degree of test–retest reliability ($r = .91, p < .001$) over a 24-hr period for the NRS-11 was demonstrated by Lundeberg et al. (2001) in a study of 69 patients with chronic pain enrolled in a multidisciplinary pain program. As ratings of pain intensity are used to assess pain itself as well as change in pain due to treatment effects, the NRS-11
demonstrates sensitivity to treatment effects associated with short-term increases (e.g., physiotherapy; Smith, Gracely, & Safer, 1998) and decreases (e.g., pharmacotherapy; Farrar, Young, LaMoreaux, Werth, & Poole, 2001; relaxation training; Keefe, Schapira, Williams, Brown, & Surwit, 1981) in pain.

Pain Disability Index

The Pain Disability Index (Pollard, 1984) is a 7-item self-report inventory designed to assess the extent to which chronic pain interferes with physical and psychosocial functioning across seven broad domains of life activities: family/home responsibility, recreation, social activity, occupation, sexual behavior, self-care, and life support activity (see Appendix C). Pain disability is defined as the subjective level of interference in a person’s ability to participate in various life activities because of chronic pain (Pollard, 1984). Pollard’s definition of pain disability acknowledges that disability due to chronic pain arises from the interaction of psychosocial and pain-related factors and is conceptually distinct from physical impairment, which refers to a person’s incapacitation due to a medical condition with clear anatomic evidence (Tait, Pollard, Margolis, Duckro, & Krause, 1987). Response options for the PDI’s seven items and respective domains range from 0 (no disability) to 10 (total disability). The scores from the seven items are summed to generate a global disability score (ranging from 0 to 70), with greater scores indicating greater disability (Chibnall & Tait, 1994; Gatchel & Okifuji, 2006; Jerome & Gross, 1991; Pollard, 1984; Richards, Nepomuceno, Riles, & Suer, 1982; Tait, Chibnall, & Krause, 1990; Tait et al., 1987).
Pollard (1984) provided initial support for the validity of the PDI in a study that demonstrated its ability to discriminate high- and low-disability groups among patients with back pain. Tait et al. (1987) provided further support for the validity of the PDI by showing significantly greater disability scores among inpatients than outpatients. Studies have also demonstrated support for the measure’s construct validity (Jerome & Gross, 1991; Tait et al., 1990). Convergent validity by Gronblad et al. (1993) was demonstrated by high intercorrelations between the raw scores \( r = .83 \), factor scores \( r = .84 \), and percentage scores \( r = .82 \) of the PDI and a widely used standardized measure of disability, the Oswestry Low Back Pain Disability Questionnaire (Fairbank, Couper, Davies, & O’Brien, 1980).

Although the PDI was initially found by Tait et al. (1987) in an exploratory factor analysis to have a two-factor solution, with the first factor representing voluntary activities in the domains of family/home responsibility, recreation, social activity, occupation, and sexual behavior and the second factor representing essential activities of daily living in the domains of self-care and life support activity, subsequent studies have found a single-factor solution to be the most appropriate (Chibnall & Tait, 1994; Tait et al., 1990). The PDI has adequate internal consistency, with alpha coefficients ranging from .85 (Chibnall & Tait, 1994) to .87 (Tait et al., 1987, 1990) in chronic pain samples. In the present sample, the alpha coefficient for the PDI was .82.
Procedures

All data collected for this study were archival in nature and were collected at the CPRP in Cleveland, Ohio. Permission to use archival data was obtained from the Program Director at the CPRP (see Appendix D), and ethical approval for the study was obtained from the Cleveland Clinic Foundation Institutional Review Board (see Appendix E). The study was exempted from review by the Institutional Review Board of The University of Akron (see Appendix F).

Founded in 1979, the CPRP is a comprehensive, interdisciplinary program accredited by the Commission on Accreditation of Rehabilitation Facilities. The CPRP is a 3- to 4-week outpatient program designed to provide specialized treatment for patients suffering from chronic nonmalignant pain. The CPRP maintains a Cleveland Clinic Foundation IRB–approved database that is based entirely on clinically obtained data on all patients evaluated by and/or treated in the program since 1999. Within the database, no patient is individually identifiable, and all of the data are clinically relevant and are collected during the standard course of treatment. All patients provided informed consent as part of their inclusion in the CPRP. As in many clinics, patients completed background and medical forms prior to the initial day of treatment. More detailed demographic information, as well as an assessment of mood, pain, medication, medical history, and psychosocial history, was collected by the interdisciplinary team (i.e., physicians, a psychologist, postdoctoral fellows, and nurses) on the first day of treatment as part of the standard initial patient evaluation process. The CPAQ, DASS, NRS-11, and PDI were among the measures administered at intake. All patient information was stored and
secured on site, with electronic files maintained by the CPRP staff, the psychologist, and postdoctoral psychology fellows.

Hypotheses

Based on theorized and empirically supported relationships, the following two general hypotheses and seven specific hypotheses were generated for this study.

General Hypothesis 1: There is a significant relation between the dimensions of chronic pain acceptance and measures of patient adjustment to chronic pain among patients seeking interdisciplinary treatment for chronic pain.

Specific Hypothesis 1 (SH1): Total chronic pain acceptance is negatively correlated with depression (SH1a), anxiety (SH1b), pain-related disability (SH1c), and hours of daily rest (SH1d) among patients seeking interdisciplinary treatment for chronic pain.

Specific Hypothesis 2 (SH2): Activity engagement is negatively correlated with depression (SH2a), anxiety (SH2b), pain-related disability (SH2c), and hours of daily rest (SH2d) among patients seeking interdisciplinary treatment for chronic pain.

Specific Hypothesis 3 (SH3): Pain willingness is negatively correlated with depression (SH3a), anxiety (SH3b), pain-related disability (SH3c), and hours of daily rest (SH3d) among patients seeking interdisciplinary treatment for chronic pain.

General Hypothesis 2: The dimensions of chronic pain acceptance will contribute to the prediction of patient adjustment to chronic pain above and beyond pain intensity among patients seeking interdisciplinary treatment for chronic pain.
Specific Hypothesis 4 (SH4): Activity engagement and pain willingness will contribute to the prediction of depression above and beyond the contribution of pain intensity.

Specific Hypothesis 5 (SH5): Activity engagement and pain willingness will contribute to the prediction of anxiety above and beyond the contribution of pain intensity.

Specific Hypothesis 6 (SH6): Activity engagement and pain willingness will contribute to the prediction of pain-related disability above and beyond the contribution of pain intensity.

Specific Hypothesis 7 (SH7): Activity engagement and pain willingness will contribute to the prediction of hours of daily rest above and beyond the contribution of pain intensity.

Data Analysis

The Statistical Program for the Social Sciences version 12.0 for Windows (SPSS Inc., Chicago, IL) was used to analyze the data. Both descriptive and inferential statistics were calculated. Descriptive statistics included frequencies, means, standard deviations, and correlations. Cronbach’s alpha tests of reliability and internal consistency were conducted for each of the measures.

SH1–SH3 were tested by calculating Pearson product–moment correlations. Use of correlation analysis is appropriate when the goal of the research is to assess the strength and direction of a linear relationship between two variables. The Pearson
correlation coefficient ($r$) was the appropriate bivariate statistic given that SH1–SH3 examine the relation of continuous variables (Pagano, 1990). The correlation coefficients were evaluated according to Cohen’s standard, with .20, .50, and .80 representing weak, moderate, and strong associations, respectively (Howell, 1992).

SH4–SH7 were tested by conducting a series of hierarchical multiple linear regression analyses. To assess the combined and unique contribution of the dimension of acceptance (i.e., activity engagement and pain willingness) to the prediction of patient adjustment to chronic pain, pain intensity was entered first into the regression equation to control for the effect of this variable on the given criterion measure. The acceptance factors were entered simultaneously into the regression equation in the second step.

Multiple regression analysis is a well-established and efficient method for examining the unique and combined contribution of one or more independent variables to the variance in a dependent variable while simultaneously controlling for multiple potential confounds (Wampold & Freund, 1987). Use of multiple linear regression is appropriate when the goal is to assess the extent of a relationship among multiple predictor variables with a criterion variable (Stevens, 2002). Hierarchical regression is appropriate when there is a theoretical basis for entering any particular independent variable prior to any other independent variable (Wampold & Freund, 1987).

Multiple regression assumes a linear relationship between the predictor variables and the dependent variable (i.e., linearity), normality of distributions (i.e., homoscedasticity), and heterogeneity of variance (i.e., the absence of multicollinearity). These assumptions were assessed by screening all data for outliers, or observations
beyond three standard deviations of the mean (Tabachnick & Fidell, 2007). Three observations were identified as outliers and removed from the analyses, resulting in a final sample size of 117. Normality, linearity, and homoscedasticity were also assessed by checking the residuals scatterplots for relative symmetry and normality of distribution. All regression analyses met the assumptions of linearity and normality of distributions. No correlations greater than .90 (Tabachnick & Fidell, 2007) or variance inflation factor values above 10 (Stevens, 2002) were observed, suggesting the absence of multicollinearity.
CHAPTER IV

RESULTS

This chapter discusses the data screening, descriptive statistics, and results of the tests of the hypotheses. Data screening included analysis of outliers and normality. The descriptive statistics include the means and standard deviations for each measure and correlations for variables of interest and identification of covariates. Tests of the hypotheses are presented in terms of the correlation and regression analyses.

Descriptive Statistics

After the data were cleaned, the mean, standard deviation, and internal consistency reliability for each measure were calculated (see Table 1). The participants reported a mean total score on the Chronic Pain Acceptance Questionnaire (CPAQ) of 44.85 ($SD = 15.61$). Internal consistency reliability was calculated using the coefficient alpha and was .83 for the CPAQ total scale. The sample mean score was 28.09 ($SD = 10.37$) on the CPAQ Activity Engagement subscale and 16.78 ($SD = 7.83$) on the CPAQ Pain Willingness subscale. Alpha coefficients for the Activity Engagement and Pain Willingness subscales were .79 and .75, respectively.

The sample mean scores were 15.71 ($SD = 12.20$) on the Depression Anxiety Stress Scales (DASS) Depression scale and 13.10 ($SD = 9.86$) on the DASS Anxiety
scale. Alpha coefficients for the DASS Depression and Anxiety scales were .96 and .91, respectively. The sample mean score for the Pain Disability Index (PDI) was 43.50 (SD = 12.13) and an alpha of .82.

The sample mean for the number of hours of daily rest (HDR) due to pain was 16.03 (SD = 4.80). Finally, the sample mean score on the Numerical Rating Scale-11 (NRS-11) was 6.74 (SD = 1.76). Although it is important to establish reliability for pain intensity measures, doing so is difficult because internal consistency reliability cannot be calculated for single-item rating scales such as the measure of HDR and the NRS-11 used here (Jensen & Karoly, 2001). However, the NRS-11 has been shown to be highly reliable, and it has adequate test–retest reliability (i.e., r = .91; Lundeberg et al., 2001) over short periods (e.g., 24 hr).

Table 1. Means, Standard Deviations, and Internal Reliability of Study Measures (N = 117)

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPAQ total scale</td>
<td>44.85</td>
<td>15.61</td>
<td>.83</td>
</tr>
<tr>
<td>CPAQ Activity Engagement</td>
<td>28.09</td>
<td>10.37</td>
<td>.79</td>
</tr>
<tr>
<td>CPAQ Pain Willingness</td>
<td>16.78</td>
<td>7.83</td>
<td>.75</td>
</tr>
<tr>
<td>DASS Depression</td>
<td>15.71</td>
<td>12.20</td>
<td>.96</td>
</tr>
<tr>
<td>DASS Anxiety</td>
<td>13.10</td>
<td>9.86</td>
<td>.91</td>
</tr>
<tr>
<td>Pain Disability Index</td>
<td>43.50</td>
<td>12.13</td>
<td>.82</td>
</tr>
<tr>
<td>Hours of daily rest</td>
<td>16.03</td>
<td>4.80</td>
<td></td>
</tr>
<tr>
<td>Numerical Rating Scale-11</td>
<td>6.74</td>
<td>1.76</td>
<td></td>
</tr>
</tbody>
</table>

*Note. CPAQ = Chronic Pain Acceptance Questionnaire; DASS = Depression Anxiety Stress Scales.*
Hypothesis Testing

Based on theorized and empirically supported relationships, the following two general hypotheses and seven specific hypotheses were tested for this study.

General Hypothesis 1 (GH1)

Consistent with a modern behavioral theory of acceptance of chronic pain (Hayes, Strosahl, et al., 1999; McCracken, 2005) and empirically supported relationships (i.e., McCracken, 1998; McCracken, Vowles, et al., 2004), it was hypothesized that the dimensions of chronic pain acceptance would be significantly related to measures of patient adjustment to chronic pain among patients seeking interdisciplinary treatment for chronic pain.

Specific Hypotheses 1–3 (SH1–SH3)

Pearson correlation coefficients were used to test SH1–SH3. Correlation coefficients for the acceptance (i.e., CPAQ total scale, CPAQ Activity Engagement, and CPAQ Pain Willingness) and patient adjustment (i.e., DASS Depression, DASS Anxiety, PDI, and HDR) variables are presented in Table 2.
Table 2. Correlations (Pearson’s $r$) Between Study Measures: Specific Hypotheses 1–3 ($N = 117$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CPAQ total scale</td>
<td>—</td>
<td>.89***</td>
<td>.80***</td>
<td>–.49***</td>
<td>–.33***</td>
<td>–.41***</td>
<td>–.13</td>
</tr>
<tr>
<td>2. CPAQ-AE</td>
<td>—</td>
<td>.45***</td>
<td>–.46***</td>
<td>–.25**</td>
<td>–.40***</td>
<td>–.12</td>
<td></td>
</tr>
<tr>
<td>3. CPAQ-PW</td>
<td>—</td>
<td>–.36***</td>
<td>–.33***</td>
<td>–.30**</td>
<td>–.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. DASS-D</td>
<td>—</td>
<td>—</td>
<td>.72***</td>
<td>.33***</td>
<td>.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. DASS-A</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.34***</td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. PDI</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. HDR</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. CPAQ = Chronic Pain Acceptance Questionnaire; CPAQ-AE = CPAQ Activity Engagement subscale; CPAQ-PW = CPAQ Pain Willingness subscale; DASS-D = Depression Anxiety Stress Scales Depression scale; DASS-A = Depression Anxiety Stress Scales Anxiety scale; PDI = Pain Disability Index; HDR = hours of daily rest due to pain. 

SH1 stated that total chronic pain acceptance is negatively correlated with depression (SH1a), anxiety (SH1b), pain-related disability (SH1c), and HDR (SH1d) among patients seeking interdisciplinary treatment for chronic pain. Statistically significant Pearson product–moment correlation coefficients were found between the CPAQ total scale and DASS Depression ($r = –.49, p < .001$), DASS Anxiety ($r = –.33, p < .001$), and the PDI ($r = –.41, p < .001$), providing support for SH1a, SH1b, and SH1c, respectively. The nonsignificant correlation ($p = .16$) between the CPAQ total scale and HDR ($r = –.13$) did not support SH1d, suggesting that no significant relation exists between total chronic pain acceptance and HDR. The results suggest that a significant negative relation exists between total chronic pain acceptance and three of the four measures of patient adjustment to chronic pain, providing partial support for GH1 and SH1.
SH2 stated that activity engagement is negatively correlated with depression (SH2\textsubscript{a}), anxiety (SH2\textsubscript{b}), pain-related disability (SH2\textsubscript{c}), and HDR (SH2\textsubscript{d}) among patients seeking interdisciplinary treatment for chronic pain. Statistically significant Pearson product–moment correlation coefficients were found between CPAQ Activity Engagement and DASS Depression ($r = -.46$, $p < .001$), DASS Anxiety ($r = -.25$, $p < .01$), and the PDI ($r = -.40$, $p < .001$), providing support for SH2\textsubscript{a}, SH2\textsubscript{b}, and SH2\textsubscript{c}, respectively. The nonsignificant correlation ($p = .19$) between CPAQ Activity Engagement and HDR ($r = -.12$) did not support SH2\textsubscript{d}, suggesting that no significant relation exists between activity engagement and HDR. The results suggest that a significant negative relation exists between activity engagement and three of the four measures of patient adjustment to chronic pain, providing partial support for GH1 and SH2.

SH3 stated that pain willingness is negatively correlated with depression (SH3\textsubscript{a}), anxiety (SH3\textsubscript{b}), pain-related disability (SH3\textsubscript{c}), and HDR (SH3\textsubscript{d}) among patients seeking interdisciplinary treatment for chronic pain. Statistically significant Pearson product–moment correlation coefficients were found between CPAQ Pain Willingness and DASS Depression ($r = -.36$, $p < .001$), DASS Anxiety ($r = -.33$, $p < .001$), and the PDI ($r = -.30$, $p < .01$), providing support for SH3\textsubscript{a}, SH3\textsubscript{b}, and SH3\textsubscript{c}, respectively. The nonsignificant correlation ($p = .31$) between CPAQ Pain Willingness and HDR ($r = -.10$) did not support SH3\textsubscript{d}, suggesting that no significant relation exists between activity engagement and HDR. The results suggest that a significant negative relation exists
between pain willingness and three of the four measures of patient adjustment to chronic pain, providing partial support for GH1 and SH3.

Following these initial analyses, pain intensity (NRS-11) and other pain-related and demographic variables (e.g., duration of pain, age, gender, marital status [married vs. unmarried]) were assessed as covariates with the dependent variables of depression (DASS-D), anxiety (DASS-A), pain-related disability (PDI), and HDR. A total of 20 correlation (Pearson’s $r$) analyses were conducted to assess for covariates. The results revealed significant relations between pain intensity and three of the four dependent variables; the exception was HDR (see Table 3). Statistically significant Pearson product–moment correlation coefficients were found between the NRS-11 and DASS Depression ($r = .23, p < .05$), DASS Anxiety ($r = .38, p < .001$), and the PDI ($r = .38, p < .001$). The correlation analyses failed to demonstrate a significant correlation between the NRS-11 and HDR ($r = .10, p = .28$). No other pain-related or demographic variables were significantly related ($p < .05$) to any of the dependent variables.
Table 3. Correlations (Pearson’s $r$) Between Study Variables ($N=117$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NRS-11</td>
<td>—</td>
<td>.20*</td>
<td>.04</td>
<td>.16</td>
<td>.22*</td>
<td>.23*</td>
<td>.38***</td>
<td>.38***</td>
<td>.10</td>
</tr>
<tr>
<td>2. Age</td>
<td>—</td>
<td>.16</td>
<td>.24**</td>
<td>.39***</td>
<td>.04</td>
<td>.10</td>
<td>.04</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>3. Gender</td>
<td>—</td>
<td>.12</td>
<td>.11</td>
<td>.04</td>
<td>.03</td>
<td>.05</td>
<td>.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Marital status$^a$</td>
<td>—</td>
<td>.13</td>
<td>.07</td>
<td>.00</td>
<td>.03</td>
<td>.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Duration of pain$^b$</td>
<td>—</td>
<td>-.03</td>
<td>-.01</td>
<td>-.17</td>
<td>-.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. DASS-D</td>
<td>—</td>
<td>.72***</td>
<td>.33***</td>
<td>.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. DASS-A</td>
<td>—</td>
<td>.34***</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. PDI</td>
<td>—</td>
<td>.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Hours of daily rest$^c$</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. NRS-11 = Numerical Rating Scale-11; DASS-D = Depression Anxiety Stress Scales Depression scale; DASS-A = Depression Anxiety Stress Scales Anxiety scale; PDI = Pain Disability Index.

$^a$Married vs. unmarried. $^b$Duration of time since onset of pain (in years). $^c$Due to pain.

$p < .5$. **$p < .01$. ***$p < .001$. All $p$s two-tailed.

**General Hypothesis 2 (GH2)**

It was hypothesized that the dimensions of chronic pain acceptance would contribute to the prediction of patient adjustment to chronic pain above and beyond pain intensity among patients seeking interdisciplinary treatment for chronic pain. A series of hierarchical multiple linear regression analyses were performed to test GH2.

**Specific Hypotheses 4–7 (SH4–SH7)**

Four hierarchical multiple regression analyses were conducted to determine whether activity engagement and pain willingness predicted depression, anxiety, pain-related disability, and HDR after the influence of pain intensity was controlled. For these analyses, the covariate pain intensity (i.e., NRS-11) was entered first, and the primary
predictor variables (i.e., CPAQ Activity Engagement and CPAQ Pain Willingness) were entered simultaneously in the second block.

SH4 predicted that activity engagement and pain willingness would contribute to the prediction of depression above and beyond the contribution of pain intensity. The covariate of pain intensity was entered first into the hierarchical multiple regression model; the model was significant ($R^2 = .05, p < .05$), with the covariate serving as a significant positive predictor of depression ($\beta = .23, p < .05$). CPAQ Activity Engagement and CPAQ Pain Willingness were added next and were found to be significant negative predictors of depression above and beyond pain intensity ($\beta = -.35, p < .001$; and $\beta = -.21, p < .05$, respectively). The total model was significant ($R^2 = .28, p < .001$), and the addition of the CPAQ subscale scores accounted for 23% more variance than the covariate alone ($\Delta R^2 = .23, p < .001$; see Table 4).

Table 4. Multiple Regression Analysis for Pain Willingness and Activity Engagement Predicting Depression, Controlling for Pain Intensity (NRS-11): Specific Hypothesis 4 ($N = 117$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain intensity (NRS-11)</td>
<td>1.60</td>
<td>.63</td>
<td>.23*</td>
<td>.23***</td>
<td>.05*</td>
<td>.05*</td>
<td>6.49*</td>
</tr>
<tr>
<td>Pain intensity</td>
<td>1.44</td>
<td>.55</td>
<td>.21*</td>
<td>.53***</td>
<td>.28***</td>
<td>.23***</td>
<td>18.31***</td>
</tr>
<tr>
<td>CPAQ-AE</td>
<td>-0.41</td>
<td>.11</td>
<td>-.35***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPAQ-PW</td>
<td>-0.33</td>
<td>.14</td>
<td>-.21*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


SH5 predicted that activity engagement and pain willingness would contribute to the prediction of anxiety above and beyond the contribution of pain intensity. The covariate of pain intensity was entered first into the hierarchical multiple regression.
model; the model was significant ($R^2 = .14, p < .001$), with the covariate serving as a significant positive predictor of anxiety ($\beta = .38, p < .001$). CPAQ Activity Engagement and CPAQ Pain Willingness were added next, and only CPAQ Pain Willingness was found to be a significant negative predictor of anxiety above and beyond pain intensity ($\beta = -.08, p = .38$; and $\beta = -.31, p < .01$, respectively). The total model was significant ($R^2 = .26, p < .001$), and the addition of the CPAQ subscale scores accounted for 12% more variance than the covariate alone ($\Delta R^2 = .12, p < .001$; see Table 5).

Table 5. Multiple Regression Analysis for Pain Willingness and Activity Engagement Predicting Anxiety, Controlling for Pain Intensity (NRS-11): Specific Hypothesis 5 ($N = 117$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain intensity (NRS-11)</td>
<td>2.11</td>
<td>.48</td>
<td>.38***</td>
<td>.38***</td>
<td>.14***</td>
<td>.14***</td>
<td>19.14***</td>
</tr>
<tr>
<td>Pain intensity</td>
<td>2.11</td>
<td>.45</td>
<td>.38***</td>
<td>.51***</td>
<td>.26***</td>
<td>.12***</td>
<td>9.33***</td>
</tr>
<tr>
<td>CPAQ-AE</td>
<td>-0.08</td>
<td>.09</td>
<td>-0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPAQ-PW</td>
<td>-0.38</td>
<td>.11</td>
<td>-0.31**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* NRS-11 = Numerical Rating Scale-11; CPAQ-AE = Chronic Pain Acceptance Questionnaire Activity Engagement subscale; CPAQ-PW = Chronic Pain Acceptance Questionnaire Pain Willingness subscale. **$p < .01$. ***$p < .001$. All $p$s two-tailed.

SH6 predicted that activity engagement and pain willingness would contribute to the prediction of pain-related disability above and beyond the contribution of pain intensity. The covariate of pain intensity was entered first into the hierarchical multiple regression model; the model was significant ($R^2 = .14, p < .001$), with the covariate serving as a significant positive predictor of pain-related disability ($\beta = .38, p < .001$). CPAQ Activity Engagement and CPAQ Pain Willingness were added next and were found to be significant negative predictors of pain-related disability above and beyond pain intensity ($\beta = -.29, p < .05$; and $\beta = -.18, p < .05$, respectively). The total model was
significant \( (R^2 = .30, p < .001) \), and the addition of the CPAQ subscale scores accounted for 16% more variance than the covariate alone \( (\Delta R^2 = .16, p < .001) \); see Table 6).

Table 6. Multiple Regression Analysis for Pain Willingness and Activity Engagement Predicting Pain-Related Disability, Controlling for Pain Intensity (NRS-11): Specific Hypothesis 6 \((N = 117)\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>( B )</th>
<th>( SE B )</th>
<th>( \beta )</th>
<th>( R )</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
<th>( \Delta F )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain intensity (NRS-11)</td>
<td>2.58</td>
<td>.59</td>
<td>.38***</td>
<td>.38****</td>
<td>.14***</td>
<td>.14***</td>
<td>18.98***</td>
</tr>
<tr>
<td>Pain intensity</td>
<td>2.46</td>
<td>.54</td>
<td>.36***</td>
<td>.55***</td>
<td>.30***</td>
<td>.16***</td>
<td>16.29***</td>
</tr>
<tr>
<td>CPAQ-AE</td>
<td>-0.34</td>
<td>.10</td>
<td>-.29*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPAQ-PW</td>
<td>-0.27</td>
<td>.14</td>
<td>-.18*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. NRS-11 = Numerical Rating Scale-11; CPAQ-AE = Chronic Pain Acceptance Questionnaire Activity Engagement subscale; CPAQ-PW = Chronic Pain Acceptance Questionnaire Pain Willingness subscale. *\( p < .5. **p < .001 \). All ps two-tailed.

SH7 predicted that activity engagement and pain willingness would contribute to the prediction of HDR above and beyond the contribution of pain intensity. The covariate of pain intensity was entered first into the hierarchical multiple regression model; the model was not significant \( (R^2 = .01, p = .28) \), as the covariate was not predictive of HDR \( (\beta = .10, p = .28) \). CPAQ Activity Engagement and CPAQ Pain Willingness were added next and were not found to be predictive of HDR \( (\beta = -.09, p = .39; \text{and } \beta = -.06, p = .59, \text{respectively}) \). The total model was not significant \( (R^2 = .03, p = .40) \), and the addition of the CPAQ subscale scores accounted for 2% more variance than the covariate alone \( (\Delta R^2 = .02, p = .40; \text{see Table 7}) \).
Table 7. Multiple Regression Analysis for Pain Willingness and Activity Engagement Predicting Hours of Daily Rest, Controlling for Pain Intensity (NRS-11): Specific Hypothesis 7 (N = 117)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>R</th>
<th>R²</th>
<th>ΔR²</th>
<th>ΔF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain intensity (NRS-11)</td>
<td>0.27</td>
<td>.25</td>
<td>.10</td>
<td>.10</td>
<td>.01</td>
<td>.01</td>
<td>.28</td>
</tr>
<tr>
<td>Pain intensity</td>
<td>0.26</td>
<td>.25</td>
<td>.10</td>
<td>.16</td>
<td>.03</td>
<td>.02</td>
<td>.40</td>
</tr>
<tr>
<td>CPAQ-AE</td>
<td>−0.04</td>
<td>.05</td>
<td>−.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPAQ-PW</td>
<td>−0.04</td>
<td>.06</td>
<td>−.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* NRS-11 = Numerical Rating Scale-11; CPAQ-AE = Chronic Pain Acceptance Questionnaire Activity Engagement subscale; CPAQ-PW = Chronic Pain Acceptance Questionnaire Pain Willingness subscale.

Summary of Results

The present findings were consistent with a modern behavioral theory of acceptance of chronic pain (Hayes, Strosahl, et al., 1999; McCracken, 2005) and with empirically supported relationships (i.e., McCracken, 1998; McCracken, Vowles, et al., 2004). In particular, the results showed that greater acceptance was associated with better adjustment to chronic pain among patients seeking interdisciplinary treatment for chronic pain. The data provided partial support for GH1 and SH1–SH3, as there were significant negative relations between the dimensions of chronic pain acceptance (i.e., CPAQ total scale, CPAQ Activity Engagement, and CPAQ Pain Willingness) and measures of patient adjustment to chronic pain (i.e., DASS Depression, DASS Anxiety, and the PDI); the exception was the lack of association between the acceptance variables and HDR (see Table 8). The significant associations among the acceptance scores and measures of patient functioning were observed among the data from standardized self-report questionnaires assessing depression, anxiety, and pain-related disability. The lack of significant relation for HDR with the acceptance variables suggests that this single-item, self-report measure may be an unreliable indicator of the extent to which pain interferes...
with daily activities among the present sample of chronic pain patients. Overall, the results of the correlation analyses indicated that patients who reported (a) greater levels of engagement in daily activities despite the presence of pain (activity engagement) and (b) less need to avoid or control their experience of pain (pain willingness) were more likely to report less emotional distress and pain-related disability.

The results also showed that the dimensions of chronic pain acceptance predicted patient adjustment to chronic pain above and beyond pain intensity (see Table 8). The results of the hierarchical multiple regression analyses showed that the dimensions of chronic pain acceptance were significant negative predictors of three of the four measures of patient functioning beyond the contribution of pain intensity. Partial support for GH2 was provided by the regression analyses, as SH4 and SH6 were fully supported and SH5 was only partially supported (i.e., only pain willingness accounted for significant variance in anxiety). Moreover, the data failed to provide support for SH7, as neither activity engagement nor pain willingness was a significant predictor of HDR. In each of the three significant regression equations, the acceptance variables predicted incremental variance ($\Delta R^2$) in each measure of patient functioning beyond the contribution of pain intensity: 23%, 12%, and 16% for measures of depression, anxiety, and pain-related disability, respectively.
Table 8. Results of Hypothesis Testing

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Prediction</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>GH1</td>
<td>There is a significant relation between the dimensions of chronic pain acceptance and measures of patient adjustment to chronic pain.</td>
<td>Partially supported</td>
</tr>
<tr>
<td>SH1</td>
<td>Total chronic pain acceptance is negatively correlated with depression (SH1(_a)), anxiety (SH1(_b)), pain-related disability (SH1(_c)), and hours of daily rest (SH1(_d)).</td>
<td>Supported, except for SH1(_d)</td>
</tr>
<tr>
<td>SH2</td>
<td>Activity engagement is negatively correlated with depression (SH2(_a)), anxiety (SH2(_b)), pain-related disability (SH2(_c)), and hours of daily rest (SH2(_d)).</td>
<td>Supported, except for SH2(_d)</td>
</tr>
<tr>
<td>SH3</td>
<td>Pain willingness is negatively correlated with depression (SH3(_a)), anxiety (SH3(_b)), pain-related disability (SH3(_c)), and hours of daily rest (SH3(_d)).</td>
<td>Supported, except for SH3(_d)</td>
</tr>
<tr>
<td>GH2</td>
<td>The dimensions of chronic pain acceptance will contribute to the prediction of patient adjustment to chronic pain above and beyond pain intensity.</td>
<td>Partially supported</td>
</tr>
<tr>
<td>SH4</td>
<td>Activity engagement and pain willingness will contribute to the prediction of depression above and beyond the contribution of pain intensity.</td>
<td>Supported</td>
</tr>
<tr>
<td>SH5</td>
<td>Activity engagement and pain willingness will contribute to the prediction of anxiety above and beyond the contribution of pain intensity.</td>
<td>Supported, except for activity engagement</td>
</tr>
<tr>
<td>SH6</td>
<td>Activity engagement and pain willingness will contribute to the prediction of pain-related disability above and beyond the contribution of pain intensity.</td>
<td>Supported</td>
</tr>
<tr>
<td>SH7</td>
<td>Activity engagement and pain willingness will contribute to the prediction of hours of daily rest above and beyond the contribution of pain intensity.</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

Note. GH = general hypothesis; SH = specific hypothesis.
CHAPTER V
DISCUSSION

Summary

A modern behavioral theory of acceptance of pain (Hayes, Strosahl, et al., 1999) and past research (i.e., McCracken, 1998; McCracken, Vowles, et al., 2004) suggest that acceptance of pain is a key behavioral process associated with enhanced adjustment to pain among patients seeking specialty treatment for chronic pain. The present study provides an independent test of the validity of a modern behavioral theory of acceptance of chronic pain as operationalized by the Chronic Pain Acceptance Questionnaire (CPAQ; McCracken, Vowles, et al., 2004). Specifically, this study examined the relation between the dimensions of chronic pain acceptance and adjustment to chronic pain in terms pain intensity, emotional distress, and pain-related disability among patients seeking interdisciplinary treatment for chronic pain. The study also examined the contribution of the two facets of acceptance (i.e., activity engagement and pain willingness) to the prediction of patient adjustment to chronic pain above and beyond the contribution of pain intensity—a variable known to influence patient adjustment to pain (i.e., McCracken, Vowles, et al., 2004). Finally, the study tested the generalizability of previous findings of the relation between pain acceptance and adjustment in patients seeking interdisciplinary treatment for chronic pain (i.e., McCracken, 1998; McCracken,
Vowles, et al., 2004). The study did this by utilizing different established self-report measures of pain intensity (e.g., Numerical Rating Scale [NRS-11]), depression and anxiety (e.g., Depression Anxiety Stress Scales [DASS]; S. H. Lovibond & Lovibond, 1995), and pain-related disability (e.g., Pain Disability Index [PDI]; Pollard, 1984) than those used previously (i.e., pain intensity, 100-mm Visual Analog Scale; depression, Beck Depression Inventory, Beck et al., 1961; pain-related anxiety, Pain Anxiety Symptoms Scale, McCracken et al., 1992; and psychosocial and physical disability, Sickness Impact Profile, Bergner et al., 1981).

A total of 117 patients admitted to the Cleveland Clinic Foundation Chronic Pain Rehabilitation Program (CPRP) from December 2006 to December 2007 participated in pretreatment evaluations in which they provided demographic and pain-related information—including primary pain complaint, duration of pain, number of hours spent resting or sleeping per day due to pain, and pain intensity. In addition to the CPAQ (McCracken, Vowles, et al., 2004), participants completed a battery of self-report measures upon admission, including the DASS (P. F. Lovibond & Lovibond, 1995), NRS-11, and PDI (Pollard, 1984).

The present data indicate that the dimensions of acceptance are significantly related to the experience of emotional distress and pain-related disability among patients seeking interdisciplinary treatment for chronic pain. The data also show that activity engagement and pain willingness contribute to the prediction of patient adjustment to chronic pain and account for incremental variance in measures of depression, anxiety, and pain-related disability above and beyond pain intensity.
Overall, the data suggest that patients with greater acceptance of chronic pain are more likely to report less distress and pain-related disability independent of their perceived level of pain. The current findings provide support for the validity of the theoretical process of acceptance of pain, as acceptance scores explained incremental variance in indices of depression, anxiety, and pain-related disability beyond the contribution of pain intensity. The findings are consistent with a modern behavioral theory of acceptance of pain (Hayes, Strosahl, et al., 1999; McCracken, 2005) and are in line with previous findings (i.e., McCracken, 1998; McCracken, Vowles, et al., 2004), suggesting that acceptance of pain is an important behavioral process that contributes to enhanced adjustment to chronic pain among patients seeking interdisciplinary pain treatment.

Conclusions

The results from the present correlation and regression analyses provide support for the general prediction derived from a modern behavioral theory of acceptance of chronic pain (Hayes, Strosahl, et al., 1999; McCracken, 2005) suggesting that acceptance of pain is a key behavioral process that contributes to better adjustment among patients with chronic pain.

General Hypothesis 1 predicted that the dimensions of chronic pain acceptance would be significantly related to measures of patient adjustment among patients seeking interdisciplinary treatment for chronic pain. The results of the correlation analyses provided partial support for this general hypothesis, as moderate negative correlations
were observed between CPAQ total, CPAQ Activity Engagement, and CPAQ Pain Willingness scale scores and depression, anxiety, and pain-related disability; no correlations were found between CPAQ scores and hours of daily rest. In general, the results of the correlation analyses are consistent with previous studies that have found significant negative associations between CPAQ scores and other standardized measures of depression, pain-related anxiety, and psychosocial and physical disability among patients seeking treatment for chronic pain (i.e., McCracken, 1998; McCracken & Eccleston, 2003, 2006; McCracken et al., 1999; McCracken, Vowles, et al., 2004; Vowles, McCracken, McLeod, et al., 2008).

The results of the correlation analyses showed no significant correlations between CPAQ total, CPAQ Activity Engagement, and CPAQ Pain Willingness scores and hours of daily rest. This finding is inconsistent with results from McCracken, Vowles, et al.’s (2004) investigation of acceptance among patients seeking treatment for chronic pain. These researchers reported significant negative relations between the CPAQ scores and hours of daily rest ($r_s = –.36, –.32, \text{and} –.32$, for CPAQ total scale, Activity Engagement, and Pain Willingness, respectively; $p_s < .001$). Hours of daily rest was included in the present study with the intention that it would serve as an additional indicator of the extent to which pain interferes with daily activities among patients seeking interdisciplinary treatment for chronic pain. The lack of significant findings for the relation of this variable with the dimensions of chronic pain acceptance or with the covariate (pain intensity) suggests that hours of daily rest is not a relevant criterion variable in the present sample. This may not be surprising, given that the reliability of this single-item scale is not well
established and that this item has been used relatively infrequently among studies examining the relation of the CPAQ with indices of patient functioning (e.g., McCracken, Vowles et al. (2004). In contrast, *hours of daily uptime*, or the number of hours patients spend each day walking or standing, has been consistently examined among treatment-seeking patients and is significantly and negatively related to acceptance variables and other standardized indices of patient functioning (i.e., McCracken, 1998; McCracken & Eccleston, 2003, 2005, 2006).

It is important to note that although hours of daily rest was not a significant criterion variable for the present sample, the PDI was intended as the primary self-report measure of pain-related disability and indicator of the extent to which pain interferes with daily living. In addition to having strong psychometric properties ($\alpha = .86$; Tait et al., 1990), the PDI has been validated among samples of chronic pain patients in studies demonstrating significant correlations between scores on the PDI and direct observations of pain behaviors by nurses (Tait et al., 1990), evaluations of physical ability/functional capacity by physical therapists (Gronblad, Jarvinen, Hurri, Hupli, & Karaharju, 1994), and scores on other standardized disability measures (i.e., the Oswestry Disability Questionnaire; Gronblad et al., 1993). In the current sample, the PDI demonstrated good internal consistency reliability (Cronbach’s $\alpha = .82$) and was negatively correlated with the CPAQ total scale and subscale scores and positively correlated with the NRS-11, providing further support for its validity.

Consistent with previous correlation analyses (i.e., Viane et al., 2003), acceptance total and subscale and pain intensity scores were not significantly associated in the
current sample ($rs = –.03, –.07, –.02$ for CPAQ total scale, Activity Engagement, and Pain Willingness, respectively; $ps > .05$). The present results provide further support for the assertion that for some patients, the ability to participate in meaningful activities and pursue satisfying life goals without attempts to avoid or control their pain is not contingent upon a low level of perceived pain (McCracken, 1998, 2005; McCracken et al., 1999). Stated another way, the lack of significant relation between acceptance and pain intensity scores suggests that acceptance does not diminish the perceived intensity of pain, nor does it occur only in the presence of less severe pain. Rather, acceptance promotes better functioning regardless of a person’s level of pain. Overall, the results from the correlation analyses indicate that greater acceptance of chronic pain is related to less emotional distress and pain-related disability, providing support for acceptance as a key behavioral process that promotes enhanced adjustment to chronic pain (McCracken, 2005).

General Hypothesis 2 predicted that the dimensions of chronic pain acceptance would contribute to the prediction of patient adjustment to chronic pain above and beyond the contribution of pain intensity among patients seeking interdisciplinary treatment for chronic pain. The results of the hierarchical multiple linear regression analyses provided partial support for General Hypothesis 2, as the dimensions of chronic pain acceptance contributed to the prediction of three of the four measures of patient adjustment to chronic pain above and beyond pain intensity. Specific Hypotheses 4–7 predicted that activity engagement and pain willingness would predict depression, anxiety, pain-related disability, and hours of daily rest after the influence of pain intensity.
was controlled. The regression results fully supported the relationship for two of the specific hypotheses, as the CPAQ subscales together accounted for 23% and 16% more variance ($\Delta R^2$) in depression and pain-related disability, respectively, above and beyond pain intensity. These results are consistent with previous investigations demonstrating the ability of the CPAQ subscale scores to account for significant increments in explained variance in self-report measures of depression and psychosocial and physical disability beyond the contribution of pain intensity (i.e., Mason et al., 2008; McCracken & Eccleston, 2005; McCracken, Vowles, et al., 2004).

The effect of activity engagement in the prediction of anxiety was nonsignificant. However, CPAQ Pain Willingness was a significant negative predictor of anxiety, and the acceptance variables accounted for 12% more variance ($\Delta R^2$) beyond pain intensity in the prediction of anxiety. This finding is inconsistent with previous studies (i.e., McCracken & Eccleston, 2005; McCracken, Vowles, et al., 2004) demonstrating the contribution of both CPAQ Activity Engagement and CPAQ Pain Willingness to the prediction of pain-related anxiety above and beyond the effect of pain intensity among patients seeking treatment for chronic pain. Perhaps this discrepancy may be attributed to methodological differences between previous studies and the current investigation. As mentioned previously, the predictive utility of both CPAQ subscales beyond pain intensity was observed for the prediction of pain-related anxiety as measured by the PASS (McCracken et al., 1992). The PASS is designed to assess anxious behaviors related specifically to the experience of chronic or recurrent pain (e.g., cognitive anxiety symptoms, escape and avoidance responses, fearful appraisals of pain, symptoms of
physiological anxiety related to pain). The current study utilized the DASS Anxiety scale (P. F. Lovibond & Lovibond, 1995), which is designed to assess general symptoms of anxiety, including fear, panic, and autonomic arousal (e.g., muscle trembling, faintness, situational anxiety, subjective symptoms of anxious affect). For some patients in the present study, their willingness to experience pain without attempting to avoid or control it was related to their experiencing general symptoms of anxiety. However, given the methods used, engagement in activities in the presence of pain is not predictive of the experience of generalized symptoms of anxiety in the present sample.

The results of the regression analyses failed to support Specific Hypothesis 7, as hours of daily rest was not significantly predicted by the acceptance variables. This finding is inconsistent with results from McCracken, Vowles, et al.’s (2004) investigation of acceptance among patients seeking treatment for chronic pain. They found CPAQ Activity Engagement and CPAQ Pain Willingness to be significant negative predictors of hours of daily rest ($R^2 = .15; \beta = -.22, p < .005; \beta = -.23, p < .001$, respectively). Given that the analyses failed to demonstrate any significant ($p < .05$) correlation coefficients between hours of daily rest and either any of the acceptance variables or the covariate (pain intensity), it is not surprising that the regression equation predicting hours of daily rest was nonsignificant. Taken together, these results suggest that hours of daily rest is not a relevant criterion variable in the present sample. Furthermore, the results indicate that this single item may be an unreliable measure of patient functioning.

The results of the study add continuing support for the accumulating literature on the contributory role of acceptance in promoting better patient functioning and
adjustment to chronic pain (see McCracken, Carson, et al., 2004; McCracken & Vowles, 2006, for reviews). The present data demonstrate the combined and differential contribution of the facets of acceptance to the prediction of standardized measures of depression, anxiety, and pain-related disability above and beyond the contribution of pain intensity. This provides support for the conceptualization of acceptance as a behavioral domain consisting of two distinct, yet interrelated, facets of behavior: activity engagement and pain willingness (i.e., McCracken, Vowles, et al., 2004; Vowles, McCracken, McLeod, et al., 2008). This study shows that greater self-reported acceptance is related to less distress and disability independent of perceived pain intensity, providing support for a modern behavioral model of chronic pain in which acceptance of pain is viewed as an important behavioral in adjustment to pain (McCracken, 2005).

Implications for Research

The conventional and predominant chronic pain research paradigm is based on a cognitive–behavioral model of pain that begins with the assumption that controlling pain or controlling one’s cognitive, emotional, and coping behaviors in response to pain produces improved patient functioning (Jensen et al., 1991; Van Damme et al., 2008). Within a modern behavioral model of chronic pain, acceptance is viewed as a contributory process in enhanced patient functioning and adjustment (McCracken, 2005). The present results and those from past studies provide support for this conceptualization, as acceptance of pain was shown to be a reliable predictor of distress and disability
among patients seeking treatment for chronic pain. This suggests that it may be important for pain researchers to adopt a more comprehensive theoretical model of chronic pain that includes acceptance within a broader view of patient behavior. Doing so will be necessary for pain researchers to extend the chronic pain acceptance literature, as well as research examining other processes (i.e., defusion, self as context, contact with the present moment, values, and committed action; Hayes, Strosahl, et al., 1999; McCracken, 2005) that may promote behavior change and impact patient adjustment to chronic pain. Expanding the pain research agenda and including acceptance in a framework for change holds promise for informing the development of innovative and effective psychotherapeutic treatments that may empower the lives of those suffering from chronic pain.

In the present study, a modern behavioral theory of acceptance of chronic pain is operationalized by McCracken, Vowles, et al.’s (2004) 20-item version of the CPAQ. Among the present sample of patients seeking interdisciplinary treatment for chronic pain, CPAQ total and subscale scores were significantly negatively correlated with measures of emotional distress and pain-related disability independent of perceived level of pain intensity. In the present sample, the 20-item CPAQ total scale and subscales demonstrated adequate reliability (total scale, $\alpha = .83$; Activity Engagement, $\alpha = .80$; Pain Willingness, $\alpha = .74$), which is consistent with previous analyses of the scale’s psychometric properties (i.e., total scale, $\alpha = .78$; Activity Engagement, $\alpha = .82$; Pain Willingness, $\alpha = .78$; McCracken, Vowles, et al., 2004). Given the present results, past findings, and the fact the 20-item CPAQ is the only empirically validated measure of
acceptance specifically designed for use with chronic pain populations (McCracken, Vowles, et al., 2004), standard use of this measure is recommended.

An additional strength of McCracken, Vowles, et al.’s (2004) 20-item version of the CPAQ is the empirically validated Activity Engagement and Pain Willingness subscales that allow for the examination of the combined and differential relation of these facets of behavior to various indices of patient adjustment to chronic pain. Consistent with previous analyses (i.e., McCracken & Eccleston, 2006), the CPAQ Activity Engagement and Pain Willingness subscale scores were found here to be moderately intercorrelated ($r = .45, p < .001$), providing further support for the conceptualization of acceptance of chronic pain as a construct consisting of two interrelated and distinctive constituents of behavior. The relative merits of the behavioral facets of acceptance may need to be examined further, as some differences between the subscales’ individual contributions to the prediction of indices of patient functioning were observed in the present sample.

This study calls into question the utility of using the single-item variable hours of daily rest. In addition to the primary self-report measure of pain-related disability (e.g., PDI), hours of daily rest was used as an additional self-report measure of the extent to which pain interferes with daily activities. Given that neither of the three acceptance variables (e.g., CPAQ total and subscale scores) were significantly related to hours of daily rest in the present sample, it may be useful for researchers to consider using the converse of this measure or multiple methods to assess pain-related disability. One method may be to ask patients about hours of daily uptime (rather than hours of down
time), as this may be less prone to patient misinterpretation; hours of daily uptime also appears to be a more reliable indicator of functioning (e.g., McCracken, 1998; McCracken & Eccleston, 2003, 2005, 2006). Another method might involve the use of objective measures of physical functioning, such as direct observations of patient behavior by nurses (Tait et al., 1990) or evaluations of physical ability or functional capacity by physical therapists (Gronblad et al., 1994). Objective measures can provide persuasive, reliable data, serving as a useful addition to self-report indices of physical functioning (Jensen & Karoly, 2001).

This study adds to a growing body of research that has found that the acceptance of chronic pain, as measured by the CPAQ, reliably predicts important aspects of emotional and physical functioning among patients seeking interdisciplinary treatment for chronic pain (see McCracken, Carson, et al., 2004; McCracken & Vowles, 2006, for reviews). Further refinement of the CPAQ and tests of its validity and reliability will further elucidate the relation between the dimensions of chronic pain acceptance and other measures of patient adjustment.

Some differences between the contributions of the CPAQ subscales to the prediction of emotional distress (e.g., depression vs. anxiety) were observed in the present sample, suggesting the need for future studies to clarify the relative utility of the subscales in terms of predicting patient functioning and adjustment. Specifically, the correlation coefficients found for CPAQ Activity Engagement and DASS Anxiety were significant but relatively weak compared to those of CPAQ Pain Willingness and DASS Anxiety. Furthermore, CPAQ Activity Engagement did not contribute significantly to the
prediction of anxiety above and beyond the contribution of pain intensity. This finding is inconsistent with previous studies showing both facets of acceptance to be significant negative predictors of pain-related anxiety beyond the effect of pain intensity (i.e., McCracken, Vowles, et al., 2004). The discrepancy may be attributed to unmeasured differences between the samples or to the different methods used, as previous studies utilized the PASS (McCracken et al., 1992) to assess pain-related anxiety. Anxiety responses have a well-established role in the experience of chronic pain, with numerous studies demonstrating significant positive associations between anxiety responses and avoidance, depression, and disability among chronic pain patients (e.g., Fordyce, 1976; McCracken et al., 1992). Although there is a compelling rationale for assessing anxiety in relation to pain acceptance, the differential relation of chronic pain acceptance with general symptoms of anxiety and anxiety responses related specifically to the experience of chronic pain has yet to be addressed in the literature (McCracken, 2005). Thus, it seems warranted for researchers to examine the relation of the dimensions of chronic pain acceptance with scores from measures of pain-specific anxiety responses (i.e., the PASS; McCracken et al., 1992) and generalized anxiety response tendencies (i.e., the DASS Anxiety scale; P. F. Lovibond & Lovibond, 1995) among the same sample of treatment-seeking patients with chronic pain.

Researchers may also consider developing and testing a briefer version of the 20-item CPAQ, as this may enhance clinical utility (McCracken & Eccleston, 2005). The CPAQ has been negatively correlated with changes in outcome variables following acceptance-based interventions (i.e., Dahl et al., 2004) as well as acceptance-based
contextual cognitive–behavioral interventions (i.e., McCracken, Vowles, et al., 2005). It may be useful for future studies to address whether the CPAQ total scale and subscale scores can predict outcomes of biomedical treatments for pain (i.e., spinal cord stimulation, physiotherapy; Wicksell et al., in press).

Future studies may also consider using multiple methods and longitudinal designs. Developing and testing multiple methods for assessing chronic pain acceptance and other indices of patient functioning can strengthen the reliability and generalizability of research findings (McCracken & Eccleston, 2005). There is a dearth of studies examining the temporal nature of acceptance in relation to patient functioning (Esteve et al., 2007). The use of longitudinal designs can provide much-needed data about the dynamic nature of pain acceptance by allowing for the examination of this construct in relation to other theoretically relevant variables across multiple points in time (McCracken, Vowles, et al., 2004). There is some evidence demonstrating the effectiveness of acceptance-based approaches for chronic pain (i.e., acceptance and commitment therapy, contextual cognitive–behavioral therapy) in terms of improving patient functioning and adjustment to chronic pain. However, longitudinal studies are needed to determine the extent to which the changes in patient functioning are sustained post-treatment (Esteve et al., 2007).

In this emerging area of pain research, only one self-report questionnaire assessing acceptance of chronic pain exists (McCracken, Vowles, et al., 2004). As acknowledged by McCracken and Eccleston (2005), the CPAQ may not capture all facets of chronic pain acceptance. Thus, further research is needed to develop instruments that
assess potentially overlooked facets of chronic pain acceptance. Finally, it is important for researchers to recognize that acceptance of chronic pain is conceptualized as one of six core processes that contribute to behavior change in a modern behavioral model of chronic pain (McCracken, 2005). In addition to utilizing the CPAQ, it may be useful for pain researchers to consider using other instruments designed to assess other core processes of behavior change (i.e., values) related to patient functioning and adjustment to chronic pain (e.g., the Chronic Pain Values Inventory; McCracken & Yang, 2006; for reviews, see Hayes, Stoshal, et al., 1999; McCracken, 2005). Although preliminary findings demonstrate the significant negative relation of values to measures of emotional distress and disability among chronic pain patients (i.e., McCracken & Yang, 2006), future studies are needed to clarify the validity of the Chronic Pain Values Inventory.

Implications for Practice

Psychological factors have repeatedly been shown to be important in explaining outcomes in pain rehabilitation programs (Turk & Okifuji, 2002). Accumulating evidence, including the present results, suggests that greater acceptance of chronic pain is associated with enhanced functioning among some patients seeking specialty pain treatment (see McCracken, Carson, et al., 2004; McCracken & Vowles, 2006, for reviews). The present findings support the view that acceptance of pain is a key factor related to enhanced adjustment to pain among patients seeking specialty treatment for pain. These findings have clinical implications for the management of persistent pain (Keefe et al., 2004).
For many treatment-seeking patients, chronic pain is a dominant and often
disruptive life-focus. Chronic pain patients have long histories of repeated and often
ineffective attempts to avoid and control pain or pain-related thoughts and feelings
(Aldrich et al., 2000; Reitsma & Meijler, 1997). Control-based strategies like those
promoted in conventional cognitive–behavioral interventions can be effective for
improving the emotional and physical functioning of some chronic pain patients
(Eccleston et al., 2002; Morley et al., 1999). However, approaching an intractable health
condition like chronic pain with strategies focused predominantly on control or
modification of the experience of pain or one’s reactions to it may leave some chronic
pain patients demoralized and preoccupied with the often unachievable goal of
eliminating or (significantly) reducing their pain (McCracken, 2005). It is not surprising
that treatment-seeking chronic pain patients report the highest levels of pain intensity,
emotional distress, and pain-related disability (Reitsma & Meijler, 1997; S. E. Taylor,
1999). Interestingly, among the present sample and other groups of patients seeking
treatment for chronic pain (i.e., Viane et al., 2003), greater acceptance is related to less
distress and disability irrespective of the perceived pain intensity. It appears that
acceptance-based psychotherapeutic approaches may be particularly empowering and
effective for facilitating enhanced adjustment to persistent pain among this population
(Dahl et al., 2005).

Given that acceptance shows promise as a valuable clinical target among some
patients with chronic pain, it may be beneficial for psychologists and other health care
providers to systematically assess acceptance with the CPAQ. The systematic and
repeated assessment of acceptance (i.e., at admission, during treatment, at discharge, at follow-up) can allow for more tailored and effective treatment (Wicksell et al., in press). It also seems useful for treatment providers to consider applying acceptance-based approaches to the management of chronic pain (McCracken & Eccleston, 2003). Referred to as third-wave behavioral therapies, acceptance-based approaches utilize methods specifically designed to foster processes that promote behavior change, such as acceptance (Hayes, Strosahl, et al., 1999). Indeed, experimental studies of induced laboratory pain suggest the relative utility of acceptance to control-based strategies (Gutierrez et al., 2004; Hayes, Bisset, et al., 1999; Keogh et al., 2005; Korn, 1997; Masedo & Esteve, 2007). Support for acceptance-based treatment approaches for chronic pain (i.e., acceptance and commitment therapy, ACT, Dahl et al., 2005; contextual cognitive–behavioral therapy, CBBT, McCracken, 2005) is growing, as a number of clinical outcome studies provide support for the effectiveness of these interventions among patients with chronic pain (i.e., Dahl et al., 2004; McCracken, MacKichan, et al., 2007; Vowles et al., 2007).

Acceptance-based approaches to chronic pain, such as CCBT, are based on the general ACT treatment model which draws heavily on the gestalt, cognitive, and operant-behavioral techniques that align with the acceptance paradigm (Hayes, Strosahl, et al., 1999). Accordingly, acceptance-based approaches for chronic pain utilize didactic, exposure-based, and experiential exercises, mindfulness training, and metaphorical uses of language to engender acceptance (Dahl, 2005; McCracken, 2005). Rather than utilizing techniques that teach patients to control or modify their internal experiences,
acceptance-based strategies are employed to help patients recognize that their ability to identify values, pursue achievable goals, and fully participate in life is not contingent upon controlling their pain or their cognitive, emotional, or behavioral struggle with it (Hayes, Strosahl, et al., 1999).

The present findings underscore the importance of including acceptance in existing psychotherapeutic models of pain, as doing so appears to provide a more complete account of processes of behavior change associated with decreased distress and disability in the presence of persistent pain (McCracken, 2005). Acceptance-based treatments may have emerged as an alternative or modern behavioral psychotherapeutic approach to chronic pain (Hayes, Strosahl, et al., 1999; McCracken, 2005); however, the adoption of a broader framework of adjustment to chronic pain that includes acceptance may also enhance the effectiveness of conventional psychotherapeutic approaches (Kratz et al., 2007). As a pragmatic approach, acceptance can supplement existing approaches to pain management by promoting flexible behavior patterns that allow patients to discern when it is optimal to engage in control/avoidance efforts or simply to experience pain and related thoughts and emotions just as they are (McCracken, Carson, et al., 2004; McCracken & Vowles, 2006). Thus, a broader view of patient behavior and adjustment to chronic pain that includes acceptance appears to hold significant promise for informing more effective interventions for pain sufferers. It is important to note that acceptance-based methods are not appropriate for all persons with chronic pain. Acceptance may not be indicated in situations in which there is a high probability of successfully controlling pain. This treatment approach appears to indicated for those patients who are
substantially disengaged from activity because of pain and who struggle unsuccessfully
to avoid or control their pain (McCracken, 1998).

Strengths and Limitations

A strength of the current research is that indices of patient emotional and physical
functioning were assessed with different standardized self-report measures of pain
intensity (i.e., NRS-11), depression and anxiety (i.e., DASS), and pain-related disability
(i.e., PDI) than those used in previous research (i.e., the Visual Analog Scale, Beck
Depression Inventory, Pain Anxiety Symptoms Scale, Sickness Impact Profile,
respectively). This serves to enhance the generalizability of the findings to other groups
of patients seeking specialized treatment for chronic pain. It is notable, too, that the
present investigation was conducted by an independent researcher. That is, I am not
associated with the researchers who have produced nearly 80% of the extant literature on
chronic pain acceptance (i.e., McCracken, Vowles, Eccleston), nor am I employed by the
pain program (i.e., the CPRP) from which the present sample was derived. This serves to
increase confidence in the reliability of the observed findings.

Despite these strengths, several limitations should be considered when
interpreting the results of this study. First, data were archival in nature, and data analysis
was limited to patients with complete sets of data who were admitted to one chronic pain
rehabilitation program in one geographic area from December 2006 through December
2007. This sample of patients may differ in important ways from other groups of patients
with chronic pain, which may limit generalization of these findings. For example, it is
possible that the results from the present sample may not generalize to persons with chronic pain who do not seek specialty services, patients who seek monodisciplinary or biomedical pain management services, or patients at post-treatment. Because of the tertiary care setting of the study, the sample was limited to persons who could afford health insurance or were able to pay out-of-pocket. However, it is important to note that the present sample was highly reflective of typical chronic pain patient samples in terms of the proportion of women, the heterogeneity of pain complaints, pain duration, and pain intensity (McCracken, Vowles, et al., 2004; Turk & Okifuji, 2002).

Second, the measures utilized in the current study were designed to assess patient functioning across theoretically relevant emotional and physical domains of functioning. However, the sole reliance on self-report measures limits the reliability and validity of the results. Besides the issue of shared method variance, which may have contributed to the magnitude of some correlations, self-report questionnaires are vulnerable to errors in patient interpretation and to biased reporting (e.g., impression management, malingering; Schwarz, 1999). The lack of significant relations among the acceptance variables and hours of daily rest raises questions about the reliability of this single-item self-report scale.

Finally, like previous studies (i.e., McCracken, Vowles, et al., 2004), the present investigation used a cross-sectional, non-experimental design. The ability to make causal inferences from the results of retrospective data analyses is inherently limited, as such methods cannot prove the direction of causal relations between variables. Prospective and longitudinal investigations are needed to determine whether acceptance leads to
decreased levels of distress and disability or vice versa among treatment-seeking patients with chronic pain.

Despite these limitations, the present results provide support for the validity of a modern behavioral theory of acceptance of chronic pain (McCracken, 2005). The contributory role of this behavioral process to enhanced adjustment to pain was supported by the current data, as greater acceptance of chronic pain was associated with less emotional distress and pain-related disability independent of pain intensity among the present sample of chronic pain patients. For some chronic pain sufferers, the struggle to control and avoid pain is ineffective and can produce increased subjective distress and disability. The present data indicate that a greater willingness to experience pain and to engage in activity regardless of pain may lead to better life functioning for some patients with chronic pain. Furthermore, these data suggest that acceptance can occur despite the intensity of chronic pain. Thus, in terms of decreasing distress and disability, it may be more useful to direct efforts toward acceptance rather than avoidance or control of persistent pain.

A modern behavioral model of chronic pain suggests the disutility of attempting to avoid or control the aversive experience of persistent pain (e.g., experiential avoidance; Hayes, Strosahl, et al., 1999) and asserts the utility of accepting pain in order to promote better patient functioning and enhanced adjustment to chronic pain (McCracken, 2005). As evidence mounts for the contributory role of acceptance to enhanced patient functioning, acceptance-based interventions should be considered a useful addition to existing psychotherapeutic treatments for chronic pain. As this is one of
a limited number of independent investigations of the role of acceptance in adjustment among patients seeking specialty treatment for chronic pain, further independent replication and extension is encouraged.
REFERENCES


116


International Association for the Study of Pain. (1993). Assess the person, not just the pain. *International Association for the Study of Pain: Clinical Updates, 1*.


APPENDIX A

CHRONIC PAIN ACCEPTANCE QUESTIONNAIRE (CPAQ)

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

0 1 2 3 4 5 6
Never Very Seldom Sometimes Often Almost Always
True Rarely True True True True True

1. I am getting on with the business of living no matter what my level of pain is ____.
2. My life is going well, even though I have chronic pain ____.
3. It’s OK to experience pain ____.
4. I would gladly sacrifice important things in my life to control this pain better ____.
5. It’s not necessary for me to control my pain in order to handle my life well ____.
6. Although things have changed, I am living a normal life despite my chronic pain ____.
7. I need to concentrate on getting rid of my pain ____.
8. There are many activities I do when I feel pain ____.
9. I lead a full life even though I have chronic pain ____.
10. Controlling pain is less important than any other goals in my life ____.
11. My thoughts and feelings about pain must change before I can take important steps in my life ____.
12. Despite my pain, I am now sticking to a certain course in my life ____.
13. Keeping my pain level under control takes first priority whenever I’m doing something ____.
14. Before I can make any serious plans, I have to get some control over my pain ____.
15. When my pain increases, I can still take care of my responsibilities ____.
16. I will have better control over my life if I can control my negative thoughts about pain ____.
17. I avoid putting myself in situations where my pain might increase ____.
18. My worries and fears about what pain will do to me are true ____.
19. It’s a relief to realize that I don’t have to change my pain to get on with my life ____.
20. I have to struggle to do things when I have pain ____.

APPENDIX B

DEPRESSION ANXIETY STRESS SCALES (DASS)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Date:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please read each statement and circle a number 0, 1, 2 or 3 that indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

*The rating scale is as follows:*

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree, or a good part of time
- 3 Applied to me very much, or most of the time

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I found myself getting upset by quite trivial things</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>I was aware of dryness of my mouth</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>I couldn't seem to experience any positive feeling at all</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>I just couldn't seem to get going</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>I tended to over-react to situations</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>I had a feeling of shakiness (eg, legs going to give way)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>I found it difficult to relax</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>I found myself in situations that made me so anxious I was most relieved when they ended</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>I felt that I had nothing to look forward to</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>I found myself getting upset rather easily</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

*(Continued)*
### DEPRESSION ANXIETY STRESS SCALES (DASS) (Continued)

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>I felt that I was using a lot of nervous energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>I felt sad and depressed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>I found myself getting impatient when I was delayed in any way (eg, elevators, traffic lights, being kept waiting)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>I had a feeling of faintness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I felt that I had lost interest in just about everything</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>I felt I wasn't worth much as a person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>I felt that I was rather touchy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>I perspired noticeably (eg, hands sweaty) in the absence of high temperatures or physical exertion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>I felt scared without any good reason</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I felt that life wasn't worthwhile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>I found it hard to wind down</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>I had difficulty in swallowing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>I couldn't seem to get any enjoyment out of the things I did</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>I felt down-hearted and blue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>I found that I was very irritable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>I felt I was close to panic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>I found it hard to calm down after something upset me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>I feared that I would be &quot;thrown&quot; by some trivial but unfamiliar task</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>I was unable to become enthusiastic about anything</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>I found it difficult to tolerate interruptions to what I was doing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>I was in a state of nervous tension</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# DEPRESSION ANXIETY STRESS SCALES (DASS) *(Continued)*

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>I felt I was pretty worthless</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>35</td>
<td>I was intolerant of anything that kept me from getting on with what I was doing</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>36</td>
<td>I felt terrified</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>37</td>
<td>I could see nothing in the future to be hopeful about</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>38</td>
<td>I felt that life was meaningless</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>39</td>
<td>I found myself getting agitated</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>40</td>
<td>I was worried about situations in which I might panic and make a fool of myself</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>41</td>
<td>I experienced trembling (eg, in the hands)</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>42</td>
<td>I found it difficult to work up the initiative to do things</td>
<td>0 1 2 3</td>
</tr>
</tbody>
</table>

APPENDIX C

PAIN DISABILITY INDEX (PDI)

Rate each category listed below. The rating scales below are designed to measure the degree to which several aspects of your life are presently disrupted by chronic pain i.e. how much your pain is preventing you from doing normal activities. Respond to each category by indicating the overall impact of pain in your life, not just when the pain is at its worst. For each of the seven categories of life activity listed, please circle the number that best reflects your current level of disability. A score of 0 means no disability at all, and a score of 10 signifies that all of the activities in which you would normally be involved have been totally disrupted or prevented by your pain.

1. **Family and Home Responsibilities.** This category refers to activities related to home and family; includes chores or duties performed around the house (e.g., yard work) and errands for other family members (e.g., driving children to school).

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Disability</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. **Recreation.** This category includes hobbies, sports, and other leisure time activities.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Disability</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. **Social Activity.** This category includes parties, theater, concerts, dining-out, and other social activities attended with family and friends.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Disability</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. **Occupation.** This category refers to activities related to one’s job; includes nonpaying jobs, such as homemaker or volunteer worker.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Disability</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Continued)
5. **Sexual Behavior.** This category refers to the frequency and quality of one’s sex life.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability</td>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. **Self Care.** This category includes activities which involve personal maintenance and independent daily living activities (e.g., taking a shower, driving, getting dressed, etc).

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability</td>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. **Life Support Activities.** This category refers to basic life-supporting activities such as eating, sleeping, and breathing.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability</td>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX D

CHRONIC PAIN REHABILITATION PROGRAM PERMISSION

The University of Akron
Office of Research Services & Sponsored Programs (ORSSP)
302 Buchtel Common
Folsky Building Suite 284
Akrorn, OH 44325-2102
Phone: (330) 972-7666
Fax: (330) 972-6281

To Whom It May Concern:

This letter is to notify the University of Akron Institutional Review Board that Elizabeth A. Cascarella has our approval to use data collected at the Cleveland Clinic Chronic Pain Rehabilitation Program for her doctoral dissertation.

Thank you,

Judith Scheman, Ph.D.
September 18, 2009

TO: Judith Scharman, Ph.D. (C21)

RE: IRB 06645: REGISTRY: The Chrona Film Rehabilitation Program Outcome

Dear Dr. Scharman (C21):

Your renewal application submitted on September 17, 2008 was reviewed under the expedited review process on September 17, 2009 and has been approved for the period of September 17, 2008 to September 26, 2011 in compliance with the Registry and Database Research Application dated September 17, 2008 with Study Description including the updated Signature Page. This study is a Category 5B-research involving data, documents, or records collected in clinical practice.

This research involves no more than minimal risk and the risks to the subject have been met. The rights and welfare of the research subjects will not be adversely affected and the research could not practicably be conducted without the waiver of consent. This protocol plan to protect privacy-identifiable information (PII) from improper use and disclosure end to security breaches in the data in a confidential manner was acceptable. The release or disclosure of PII to any other person or entity is not allowable unless it is as identified or consistent with a limited data set specification and data use agreement and approved by the IRB.

Research activities may not continue beyond the study expiration date of September 26, 2011 without additional review and approval by the IRB. To continue the research beyond the expiration date requires submission of an approved application and approval by the IRB. If you are not renewing, you will need to submit a cancellation report to close this study.

Investigators must conduct the research in accordance with the approved protocol. Any changes or amendments must be reported and approved by the IRB prior to implementation. Any study deviations and unanticipated problems, including adverse events that are unexpected and related or possibly related to the research intervention must be promptly reported to the IRB. Please refer to IRB Policies #50 and #51 regarding specific reporting timelines.

Sincerely,

Daniel Bogor, M.D., RPM, CRP
Executive Director, Institutional Review Board

Expiration Date: September 26, 2011
Loar, Lana

From: Lewicki, Ph.D., R.N., Linda
Sent: Thursday, May 07, 2009 1:12 PM
To: Loar, Lana
Subject: IRB

February 4, 2009

Judith Schuman - Baumann, Ph.D. / C21

RE: IRB 5646: REGISTRY. The Chronic Pain Rehabilitation Program Outcomes

Dear Dr. Schuman - Baumann,

Your renewal application received on January 30, 2009 was reviewed under the expedited review process on February 3, 2009 and has been Approved for the period February 3, 2009 to September 26, 2009 in accordance with the Project Renewal Report received January 30, 2009 and one of the three required Signature Pages. Because the Signature / Financial Disclosure Statements were not provided for Dr. E. Coovington and R. Aker, as well as, expired CITI certification, both are being removed from the Investigator’s Panel. This study is a Category 5 - Research involving data, documents or records collected in clinical practice.

The submission was received 90+ days after study expiration. The PI is reminded to submit reports in a timely manner. IRB Policy states 30 days prior to expiration.

This research involves no more than minimal risk and the criteria for waiver of consent have been met. The rights and welfare of the research subjects will not be adversely affected and the research could not practically be conducted without the waiver of consent. The protocol plan to protect private identifiable information (PHI) from improper use and disclosure and to securely maintain the data in a confidential manner was acceptable. The release or disclosure of PHI to any other person or entity is not allowable unless it is de-identified or compliant with a limited data set application and data use agreement and approved by the IRB.

The approval period for this study <asp will expire on September 26, 2009. You are reminded to submit a continuing renewal report up to 30 days prior to the expiration date. If you are not renewing, submit a completion report to close your study.

Please note that any changes to the study as approved must be promptly reported and approved by the IRB prior to implementation. Any study deviations and unanticipated problems, including adverse events that are unexpected and related or possibly related to the research intervention must be promptly reported to the IRB. Please refer to IRB Policies #60 and #70 regarding specific reporting timeframes.

Sincerely,

Daniel Beyer, M.S., MHA, CIP
Executive Director, Institutional Review Board

DB.cnf

Expiration Date: September 26, 2009
I have reviewed your IRB exemption request and have determined that IRB review is not required. According to federal guidance, use of a de-identified data set is not considered human subjects research as long as certain conditions exist. The Cleveland Clinic IRB approval email that you included with your request indicates that the following conditions are met:

- The private information was not collected for the current study through interaction or intervention with individuals; and
- The investigator cannot readily ascertain the identity of the individuals to whom the information pertains because there are IRB-approved policies and procedures for a repository that prohibit the release of the key to the investigators.

Therefore, you are not involving human subjects and review by the UA IRB is not necessary.

Good luck with your dissertation.

Sharon McWhorter
IRB Administrator
Associate Director
Research Services and Sponsored Programs
The University of Akron
Akron, OH 44325-2102