THE EFFECTIVENESS OF BIOPSYCHOSOCIAL INTERVENTIONS AT THE DALLAS SPINAL REHABILITATION CENTER: APPLYING THE NIDRR LOGIC MODEL

APPROVED BY SUPERVISORY COMMITTEE

Chung-Yi Chiu, Ph.D., CRC

Tina Wolf, CCM, LPC

Gerald Casenave, Ph.D., CRC

DEDICATION

I would like to thank the members of my Graduate Committee, my family, my friends, all the faculty members at the Department of Rehabilitation Counseling at UT Southwestern Medical Center of Dallas, and lastly, all the faculty at the Dallas Spinal Rehabilitation Center.

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by

MELISA GARCIA SILES

THESIS

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Abstract

BACKGROUND: The National Institute on Disability and Rehabilitation Research has developed a program evaluation framework, the NIDRR logic model describing and assessing the relationship between planning, implementing, and evaluating outcomes in rehabilitation service environments, such as the Dallas Spinal Rehabilitation Center. Standard primary care facilities have treated chronic pain with narcotic medications; however, controversies surrounding the lack of long-term efficacy, risk of addiction, and the physical and psychological side effects of these medications continue to be heavily debated. There is strong evidence to support a biopsychosocial treatment approach for chronic pain which reduces narcotic dependence and restores daily functioning. The purpose of this study is to assess the effectiveness of the comprehensive interdisciplinary pain rehabilitation (IPR) program at the DSRC based on the NIDRR logic model.

SUBJECTS: A total of 226 patients (131 males [58%] and 95 females [42%]) with chronic pain were admitted to the IPR program at the DSRC between January 2010 and December 2012. Among the 226 patients, 150 patients required medication tapering at admission. The average age of patients was 47 years old (*SD*= 9.74). The DSRC assigned patients to one of two groups after assessing the severity of their chronic pain curbing their ADL limitations, their social functioning, and their individualized treatment goals; 60 patients were in the chronic pain program, and 166 patients were in the functional restoration program. Patients attended between 80 hours to 160 hours of treatment that included medication management, physical therapy, cognitive-behavioral therapy with psychoeducation and biofeedback, and vocational counseling.

METHOD: The current study is a descriptive design. All patients completed self-report measures assessing their current level of pain, functioning, depression, anxiety, and fear-avoidance beliefs at pre- and post-treatment. A dependent paired-samples *t*-test was used to assess the significance of treatment effect.

RESULTS: Overall, significant improvements were seen among patients in the areas of independent functioning, depression, anxiety, fear-avoidance beliefs, medication tapering, and return to work status. Physical demand level, assessing independent functioning, improved significantly, $t_{(225)}$=27.79, p=.000, among all patients. Results indicated significant improvements in depression scores, $t_{(225)}$=13.38, p= .000, and anxiety scores, $t_{(225)=}$ 12.94, p= .000. Average fear-avoidance beliefs pertaining to physical activity improved significantly, $t_{(225)=}$ 13.68, p= .000, as did those beliefs pertaining to work, $t_{(223)}$= 15.33, p= .000. Additionally, 93% of patients successfully returned to work after completion of the program, and 96% of patients who required tapering at admission successfully tapered or discontinued their medication use. Improvements were also found within each treatment group. Physical demand level in the chronic pain program improved significantly, $t_{(59)=}$12.19, *p.000.* Results indicated significant improvements in depression scores, $t_{(59)}$= 5.79, p= .000, as well as anxiety scores, $t_{(59)}$= 5.83, p=.000. Average fear-avoidance beliefs pertaining to physical activity improved significantly, $t_{(59)}$= 7.16, p= .000, as did those beliefs pertaining to work, $t_{(59)}$=8.77, p= .000. Forty-four (73%) patients in the chronic pain program successfully returned to work. Of the 45 patients that required medication tapering at admission, 101 (96%) tapered or discontinued their medications.

DISCUSSION: The NIDRR logic model has provided an excellent framework to assess treatment effectiveness in rehabilitation centers. Findings suggest that a biopsychosocial

approach for chronic pain (e.g., the IPR program) is effective and efficient in diminishing overall distress and corroborating more biopsychosocial long-term effects than a short term "quick fix" of narcotic medications.

Keywords: Chronic pain, biopsychosocial treatment, interdisciplinary pain rehabilitation, NIDRR logic model

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LIST OF ABBREVIATIONS

IPR -- Interdisciplinary Pain Rehabilitation

DSRC -- Dallas Spinal Rehabilitation Center

NIDRR -- National Institute on Disability and Rehabilitation Research

CARF -- Commission on Accreditation of Rehabilitation Facilities

ADL -- Activities of Daily Living

PDL -- Physical Demand Level

BDI-II -- Beck Depression Inventory - II

BAI -- Beck Anxiety Inventory

FABQ -- Fear-Avoidance Beliefs Questionnaire

DPQ -- Dallas Pain Questionnaire

CHAPTER ONE

Introduction

Chronic pain is a major public health problem that can lead to devastating consequences to both patients and their families. Dauntingly, the Institution of Medicine Report (2011) has reported an estimated 100 million Americans in the United States living with chronic pain. Along with the tremendous costs of health care utilization, the societal cost related to loss of work productivity for individuals affected has brought remarkable attention to the field of pain medicine. Research has begun to turn its attention towards the treatments involving pain medications, psychosocial factors, and individual behaviors (Rosenblum, Marsh, Joseph, and Portenoy, 2008).

Generally speaking, pain is an "unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage," and chronic pain is typically defined as pain that persists for at least three months and causes impairments in an individual's life (International Association for the Study of Pain, 2011). Implications of chronic pain have led to increased reports of emotional distress, increased rates of pain related disability, pain related alternations in cognition, and overall reduced quality of life (Kinder, Mayer, and Gatchel, 2010). In 2005, a large epidemiological study estimated a 19% prevalence of chronic spinal pain (back and neck) in the United States for the year 2004, and a 29% lifetime rate (Von Korff, 2005). The staggering prevalence of chronic pain, chronic spinal pain in particular, has led researchers to conduct many studies worldwide to determine common chronic conditions and their associations with emotional regulation, such as depression and anxiety, as well as individual behaviors.

Diverse treatment interventions have been continuously studied in the last century to determine the best method of relieving pain. Individuals typically seek medical attention when their pain intensifies and outweighs one's ability to comfortably perform daily activities. Pain medications are the most common treatment intervention used for chronic pain patients in primary care settings; however, medications raise controversy among practicing physicians due to concerns of long-term efficacy, the risk of abuse, and multiple side effects. Clinicians are turning their attention to a biopsychosocial practice when treating chronic pain patients; in particular, psychological and social-behavioral factors are now being considered to be as equally important as biological factors. Literature (Linton and Shaw, 2011) suggests that biopsychosocial treatment methods not only address the speculations and controversies attributed to pain medications, but also looks at the psychological and social-behavioral factors contributing to experienced pain.

Interdisciplinary pain rehabilitation (IPR) programs, such as the one provided at the Dallas Spinal Rehabilitation Center (DSRC), have developed a biopsychosocial approach that incorporates all aspects of treating spinal chronic pain, including medication regulation, psychological implications, and social-behavioral modifications. The Dallas Spinal Rehabilitation Center (DSRC) provides an integrative, individualized, goal-oriented IPR program that aims to improve independent living skills, contain further medical costs, and improve overall quality of life. The effectiveness of interdisciplinary pain rehabilitation programs is being continuously researched in the field of pain medicine; however, the framework for describing the relationships between what these programs invest, what activities they provide, and what outcomes they report has been overlooked in the literature.

The NIDRR logic model, an outcomes focused approach to describe such relationships, provides a common approach for integrating, planning, implementing, evaluating, and reporting the outcomes of interdisciplinary pain rehabilitation programs. At the Dallas Spinal Rehabilitation Center (DSRC), the NIDRR program model can be applied by integrating interdisciplinary treatment, planning an individualized comprehensive treatment, implementing institutional management and a consistent treatment protocol, evaluating biopsychosocial and cost-effective behavioral evaluations, and reporting program outcomes. The NIDRR logic model assures accountability for reported outcomes while promoting a common language among clinicians in an interdisciplinary setting. The NIDRR logic model promotes communication and supports continuous improvements within a rehabilitation treatment center.

The purposes of this current study is (1) to determine the effectiveness of the interdisciplinary pain rehabilitation program at the Dallas Spinal Rehabilitation Center by applying the NIDRR logic model for program evaluation on a patient-centered level by assessing program outcomes, such as increased quality of life, decreased pain symptoms, and increased functionality, and (2) to determine the effectiveness of the program provided on an administration level by assessing return to work status, time of surface delivery, and improvement rate of admitted patients between January 2010 and December 2012, which will be determined by selected outcomes. It is predicted that given the investments and activities provided by the Dallas Spinal Rehabilitation Center, there will be positive outcomes on both the patient-centered level and the administration.

CHAPTER TWO

Review of Literature

Chronic Pain

The duration and intensity of pain presents itself in various ways and differs in how it affects individuals. Literature (Rosenblum et al., 2008) suggests pain that persists for at least 1 month following the usual healing time of an acute injury, pain that occurs in association with a non-healing lesion, or pain that recurs frequently over a period of months, is considered chronic pain. In most clinical and research reports, chronic pain is typically defined as pain that has persisted for at least 3 months (Rosenblum et al., 2008).

Chronic pain can be primarily driven by tissue damage. In the literature, the most common forms of chronic pain are divided into those labeled "nociceptive" pain and "neuropathic" pain. Nociceptive pain is pain that is caused by ongoing stimulation of pain receptors by tissue damage, while neuropathic pain is pain presumed to be related to damage or dysfunction of the peripheral or central nervous system (Rosenblum et al., 2008). These classifications throughout the literature have established that pain is associated with peripheral and central mechanisms caused by neurophysiological processes. Recently, the role of neuroimmune activation following a tissue injury has been highlighted in the development of chronic pain and has suggested that the development of chronic neuropathic pain is associated with central sensitization of neural pathways (DeLeo, Tanga, and Tawfik, 2004). As these neural pathways associated with pain continue to be researched, clinicians have confidently ascertained

one important aspect of chronic pain that is undeniable, that is, all types of chronic pain are profoundly influenced by psychological processing and responses (Rosenblum et al., 2008).

Negative Impacts of Chronic Pain

Chronic spinal pain, characterized as back and neck pain, has drawn tremendous attention to the field of pain medicine. The staggering prevalence of chronic spinal pain has continuously increased over the last decade with more than 80% of the population experiencing an episode of back pain at some time during their lives (Rubin, 2007). Low back pain has been associated with substantial disability and has been reported as having negative economic impact on work productivity, absenteeism, and increased health care utilization (Hoffman et al., 2007). Literature (Guo et al., 1999; Katz, 2006) suggests approximately 150 million days of work per year is lost because of low back pain, with total costs estimating between $100 and $200 billion annually, two-thirds of which are due to decreased wages and productivity. Furthermore, the percentage of recurrent episodes of low back pain within a year range from 20% to 44% for working populations, to lifetime recurrences to up to 85% (van Tulder, Koes, and Bombadier, 2002). The impact of the staggering prevalence and shocking costs associated with chronic spinal pain are just the tip of the iceberg, however.

The widespread implications of chronic pain also influence a number of psychological and social factors. Chronic spinal pain has been linked to numerous accounts of increased reports of emotional distress (e.g., depression, anxiety, and fear avoidance), pain-related alterations in cognition, and reduced quality of life (Roditi and Robinson, 2011). Moreover, in regard to social and environmental factors, decrease in independent functioning, especially in the work place, has also been associated with chronic spinal pain, perhaps partially accounting for

the tremendous costs related to loss of work productivity (Roditi and Robinson, 2011). Clinicians and practitioners have become increasingly aware of these pernicious effects that chronic spinal pain can have on individuals. Those specialized in the field of pain medicine have been researching and implementing numerous diverse treatment interventions for chronic spinal pain in multiple settings to ascertain the best treatment methods.

Limitations of Biomedical Practices

Historically, treatment interventions for chronic spinal pain have encompassed the "standard practice" of the biomedical model, which is centered on the treatment of biological factors. The biomedical model's core philosophy addresses physical impairments based on biomedical concepts, with the primary goal being symptom reduction (Main and George, 2011). This standard practice is typically applied in primary care settings, and primary care physicians provide the majority of care for patients with chronic pain (Barry et al., 2010). Literature (Barry et al., 2010) suggests that while a biological approach to chronic pain may be helpful in treating some immediate pain symptoms in chronic pain patients, there are numerous barriers primary care physicians are faced with that impede the effectiveness of treatment interventions.

A study conducted by Barry, Irwin, and Jones (2010) focused on determining the key barriers posed on primary care physicians when treating chronic pain patients. Results suggested primary care physicians openly voiced their lack of expertise in treating chronic pain, and further, acknowledged problematic barriers that hindered their ability to effectively treat chronic pain patients. These barriers included the lack of qualified staff in the treatment of pain management, poor diagnostic workup of pain, and apprehension to prescribe pain medications due to potential risk factors associated. The study also comprised of patient reports after being

treated by physicians in primary care. Barriers reported by patients included feeling that they were not being adequately listened to and were misunderstood by treating physicians, and feeling that they were not thoroughly diagnosed for their pain symptoms (2010).

In such primary care settings practicing from a biomedical perspective, symptom (pain) reduction is not only a goal, but also is the most common reason patients seek medical intervention. One of the most frequent ways to obtain symptom reduction is through narcotic pain medications, specifically, opioids. The current study focuses on exploring pain from a biopsychosocial perspective encompassing multiple aspects of chronic pain that affect an individual's life.

Side effects of Narcotic Medications (Opioids)

Traditionally, opioids have been the cornerstone for treatment of moderate to severe pain. Opioids, also known as narcotics in some clinical settings, are compounds that bind to opiate receptors in the brain that are distributed to many neural pathways (Rosenblum et al., 2008). Receptors involved in pain modulation are situated in both central nervous system and the peripheral nervous system (Rosenblum et al., 2008). Receptors are mediated in many structures of the brain that include modulations of reinforcement and reward mechanisms, as well as mood and stress (Rosenblum et al., 2008). Due to these effects on neural receptors, controversies arise on how these medications play a role in pain behaviors, cognitions, emotional regulations, and functional outcomes in affected individuals. Nonetheless, literature suggests that in clinical settings, as many as 90% of patients have received opioids for chronic pain management (Soin et al., 2008). This treatment intervention has led the sale of pain medication to increase

dramatically over the past 10 years, with hydrocodone increasing 178% from 1997 to 2004, and oxycodone increasing 6,390% during that same time, respectfully (Manchikanti, 2006).

Pain medications have become the "quick fix" of pain management in primary care settings. However, practitioners are constantly faced with the dilemma of balancing the desire to help their patients while avoiding potential harm to their patients through adverse effects of opioid-induced hyperalgesia, addiction, tolerance, abuse, and diversion of medications (Soin et al., 2008). One of the main areas of controversy of narcotic treatment has focused on the potential of clinical implications of opioid-induced hyperalgesia. Hyperalgesia is a condition that occurs when there is "long-lasting changes in the neuroplastic signaling pathway" that increase ones resistance to opioid medications, in turn making individuals more sensitive in the pain area (Joseph, Reichling, and Levine, 2010). Experimental studies are being conducted to analyze the neuron receptors associated with this clinical phenomenon.

Clinicians suspect some affiliation with high levels of opioid consumption and the experience of pain (Joseph, Reichling, and Levine, 2010). Mao (2002) speculated that some patients are not experiencing more pain because of the injury itself, but rather as a result of opioid induced neuropsychological changes associated with central sensitization of neurons leading to the potential implication of opioid-induced hyperalgesia. Dose escalation and more frequent consumption appear to put individuals at risk for developing hyperalgesia, and further, pave a path for other controversial issues, such as increased tolerance and addiction (Mao, 2002).

Tolerance and addiction are common concerns for patients receiving opioid treatment for chronic pain; however, patients may not be fully aware of the potential risks involved with narcotic medications. Literature (Aronoff, 2004) suggests that estimates of chemical dependency

among patients who present themselves to a pain practice are as high as 20% to 30%. Furthermore, addiction encompasses an aspect of psychological components that are associated with the experienced distress and physical discomfort in the form of narcotic withdrawal symptoms (Aronoff, 2004).

Psychological Effects of Chronic Pain

Individuals experience and perceive pain in different ways, and it is evident that one's behaviors and reactions to pain are diversely driven by multiple psychological factors. Linton and Shaw (2011) reported that one of the most disruptive features of pain is the emotional distress. Along with frustration, individuals are predisposed to feel other negative emotions that are associated with pain, such as anxiety, guilt, anger, and depression (Linton and Shaw, 2011). As stated above, narcotic medications act upon neural receptors that are associated with multiple brain structures, including neural pathways influencing mood and affect. For this reason, emotions and moods become powerful drivers of behavior and can shape an individual's experience of pain through direct neural connections. Narcotic medications can therefore alter an individual's mood, and affect their emotional responses associated with experienced pain.

Supported by research conducted by Nicholas, Wilson, and Goyen (1992), the transition from acute to chronic pain is catalyzed by psychological processes, which are highly intertwined and function together (Linton and Shaw, 2011). Linton and Shaw (2011) argue that a sequence of psychological and cognitive processes (attention to pain, interpretation of pain, and coping strategies) mold one's behaviors and expectations, as well as regulate emotions. Each psychological process plays a different role in the perception and experience of pain, and although attention to pain is under the control of some basic brain processes, it is the

psychological function that motivates behavior (Linton and Shaw, 2011). The subjectivity of the experience of pain leads persons to behave the way they do in reaction to their pain. Thus, experienced pain felt by an individual is mirrored in the expectations they have about the cause of pain, its management, and how long it should take for recovery; these expectations appear to drive coping behavior (Linton and Shaw, 2011).

Exploring the emotional regulations resulting from pain and one's pain coping behaviors is a helpful task. Pain itself causes emotional distress that most people have experienced. Anxiety, worry, fear, depression, frustration, and guilt, for example, are prevalent emotions associated with pain. If these emotions are persistent and recurrent, however, they can lead to changes in behaviors and cognitions, even without medication interventions. Individuals show tremendous differences in their ability to regulate emotions as well as their "attributions about pain, their judgments about the seriousness of pain, their expectations of assistance and emotional support from others, and their sense of control and mastery over pain (Nicholas et al., 2011. 767-768)."

Psychological effects of pain management, emotional regulations affected by narcotic medications, and co-morbid conditions such as depression and anxiety, have added to practitioners' dilemma of treatment options for individuals with chronic pain, especially in primary care settings. Research and clinical studies surrounding the effects of psychological and emotional reactions to pain have become the focal point in the field of pain medicine. This has enabled practitioners to turn their attention to a biopsychosocial approach to the treatment of chronic pain.

By joining these two methods of treatment, practices can "incorporate a patient's beliefs, attitudes, and emotional responses into patient management based on biopsychosocial models (Main and George, 2011. 822)" while preventing disability. Literature (Nicholas and George, 2011) suggests a considerable amount of evidence has been accumulated to support the use of biopsychosocial approach in the treatment of chronic spinal pain. In particular, by applying the use of operant-behavioral and cognitive-behavioral techniques to increase activity levels, improve moods, decrease pain experiences, and reduce medication use (Nicholas, Wilson, and Goyen, 1992). Many interdisciplinary pain rehabilitation programs have effectively adopted biopsychosocial models into their practice to enhance psychological, social, and functional outcomes in individuals suffering from chronic spinal pain.

Interdisciplinary Pain Rehabilitation programs (IPR) consider all aspects of experienced pain through the eyes of the biopsychosocial perspective in which pain is viewed as a an illness rather than a disease, and is described as a "complex, multifaceted experience emerging from the dynamic interplay of patient's psychological state, thoughts, emotions, behaviors, and sociocultural influences (Roditi and Robinson, 2011. 41)." Such programs recognize the subjective experience of pain and include interventions that aim to increase self-management and alter behavior and cognitions associated with pain rather than directly focus on eliminating pain (2011).

With this perspective on chronic pain treatment, IPR programs have established extraordinary effectiveness in treating chronic pain patients compared to non-psychological treatments. For example, Nicholas, Wilson and Goyen (1992) conducted a study comparing post-treatment improvement in chronic low back pain patients receiving a cognitive-behavior

group treatment versus those receiving an alternative non-psychological treatment approach. Participants (*n*= 20) were placed in a treatment condition or control condition for 5 weeks, meeting for 3.5 hours per week. The treatment condition group consisted of cognitive-behavioral treatment (including relaxation training) plus physiotherapy, while the control group received physiotherapy plus discussion sessions. Clinicians used an experimental design featuring separate 2 X 3 repeated measures ANOVAs (Analysis of covariance) on the seven measures used assessing functional impairments (Pain Rating Chart [PRC], Beck Depression Inventory [BDI], Pain Beliefs Questionnaire [PBQ], Coping Strategy Questionnaire [CSQ], Sickness Impact Profile [SIP], and Pain Self-Efficacy Questionnaire [PSEQ]. The study determined comparison results at pretreatment vs. post-treatment, pre-treatment vs. 6-month follow up, and post-treatment vs. 6 month follow-up. Results indicated that the combined psychological treatment and physiotherapy condition improved significantly more than the control group at post-treatment on measures of other-rated functional impairment, the employment of active coping strategies (CSQ) ($f= 21.1; p< 0.01$), medication use, and self-efficacy (PSEQ) ($f=9.89; p<0.05$). Differences in post-treatment improvement were maintained at a 6-month follow-up.

In a different, more recent study conducted by Bosy et al. (2010), an interdisciplinary pain rehabilitation program (IPR) was evaluated in order to describe the essential elements and results of an 8-week program with a cognitive-behavioral emphasis. Participants (*n*= 338) were part of a private outpatient program providing services to patients with long-term disabling pain arising from work or accident related musculoskeletal injuries; participants completed the program over a 3-year period. The IPR program consisted of interdisciplinary assessment,

cognitive-behavioral and biofeedback therapy, and physical and occupational rehabilitation. Clinicians used *t*-tests for unequal variances, and analyses of variance (ANOVAs) to determine statistical analyses on five measures (work status, pain rating (using a numeric pain rating scale (NPRS), pain medication change, Hospital anxiety and Depression scale (HADS), and an eight-item Client Satisfaction Survey (CSQ-8). Results suggested promising results for the effectiveness of interdisciplinary pain rehabilitation programs. Overall, 91% of patients rated the program *good to excellent;* there was an average improvement of 16.4% in primary pain complaints (f= 3.11; p<.001; *CI*= 0.58-0.90), with a substantial number of patients (49%) reporting taking less pain medication at discharge, and 12% of patients eliminated all pain medications. Of the 338 patients, 253 (75%) made vocational improvements in their work status, with 82% of patients who were disabled at the time of intake making promising improvements to return to work. Anxiety scores improved by 12.6% (t= 7.21; p<0.001; *CI*= 0.23-0.54), and depression scores improved by 16.8% (t= 8.86; p<0.001, *CI*= 0.27-0.58), respectfully.

Results derived from studies like the ones conducted by Bosy et al. (2010) and Nicholas et al. (1992) have led clinicians to not only support biopsychosocial treatment approaches, but also have strengthened the effectiveness of interdisciplinary pain rehabilitation programs for the treatment and management of chronic spinal pain compared to those of biomedical practices. In the current study, outcomes have been calculated from multiple aspects of treatment that encompass the biological, psychological, and social-behavioral impacts of chronic pain. By focusing on the biopsychosocial implications of chronic pain, IPR programs can thoroughly determine the salient factors that contribute to an individual's quality of life related to their perceived pain.

When assessing psychological factors, one of the most important and note-worthy cognitions to consider in the treatment of pain is a depressed mood. The presence of depression in a pain condition has been associated with higher levels of pain intensity, an increased risk of disability, and poor rehabilitation outcomes (Bair, Robinson, Kanton, and Kronke, 2003). Studies have also shown that high levels of pretreatment depression are associated with poor, bleak rehabilitation outcomes (Bair et al., 2003). For this reason, screening individuals for pre-treatment depression and anxiety and monitoring their levels of depression and anxiety throughout treatment becomes an imperative aspect of treatment.

Impacts of Chronic Pain on Functioning

As clinicians become more aware of how psychological factors, such as depression and anxiety, play a role in the development and maintenance of pain, they begin to further question what other psychological aspects contribute to an individual's experienced pain and functioning. Particular attention has been paid to the theories of fear-avoidance surrounding a patient's belief about how physical activity and work affect their chronic spinal pain, namely low back pain. Fear-avoidance beliefs suggest "individuals fall along a continuum ranging from a tendency to confront a painful experience by remaining active to a tendency to avoid movement and activity because of pain-related fear (Moore, 2010. 802)." Research states that pain-related fear and anxiety can lead to chronic pain even after healing of tissue damage has occurred. Kachur (2004) emphasizes that anxiety "precipitates cognitive scanning of [pain] symptoms, which leads to increased physiological autonomic arousal, motivating individuals to prevent painful or perceived painful situations (220-222);" this may then produce avoidance behaviors that lead to

decreased mobility, further pain experience, negative treatment expectancies, and reinforcement of avoidance behaviors (Kachur, 2004).

Fear-avoidance beliefs, along with the emotional distressed caused by depression and anxiety that is commonly seen in chronic pain patients, play an important role in functional limitation. Many IPR programs, such as the one at the Dallas Spinal Rehabilitation Center, measure functioning by the Physical Demand Level (PDL) definition provided from the Dictionary of Occupational Titles (DOT), a resource used to ascertain occupation descriptions and demands supported by the United States Department of Labor. Physical Demand Level (PDL) categories range from Sedentary work to Very Heavy work. Individuals that have been treated by a doctor and are affected by a medical condition, such as chronic spinal pain, can be put on medically-related work restrictions, which limit the amount of physical activity that may be exerted on the job, as recommended by a medical professional. Therefore, it is vital to determine how individual psychosocial factors influence chronic pain and disability in the work place. In a series of longitudinal studies conducted by Papageorgiou et al. (1998), subjects who reported having limited control over their work, had excessive work load and physical demands, and had low job satisfaction, proved to have an increased risk for future back pain, perhaps partly attributable to the emotional distress and avoidance behaviors they may be engaging in (Papageorgiou et al., 1998).

In addition to assessing independent living functioning and physical demand levels, IPR programs determine individual functioning related to the "timely return of injured employees to productive roles in the Texas workforce (Texas Department of Insurance)." Return to work is determined by a number of factors that are influenced by employers, employees, health care

providers, and insurance carriers and the Texas Department of Insurance and Division of Workers' Compensation (TWI-DWC). All parties agree "the longer an employee is away from work after an injury, the harder it is for him or her to get back to work at all; and the longer an employee is away from work, the higher are the employer's workers' compensation costs and related business costs (Texas Department of Insurance)."

Return to work at the Dallas Spinal Rehabilitation Center follows Texas policy and is measured by individual PDL levels and medical restrictions that are assessed and determined after completion of the IPR program. Programs aim to return inured employees to their previous or current job, or assist in vocational rehabilitation to successfully place a patient to participate in the Department of Assistive Rehabilitative Services (DARS) program to actively seek employment.

The learned implications of patients' fear-avoidance beliefs and emotional distress on the experience of chronic spinal pain have noticeably influenced independent functioning and return to work. It has become essential to effectively screen for biopsychosocial factors influencing an individual's pain experience before treating chronic spinal pain patients and provide according psychosocial adjustment therapy.

Dallas Spinal Rehabilitation Center (DSRC)

Using appropriate measures, clinicians are able to study the relationship between the variables as well as determine the differences between variables to facilitate the delineation of specific treatment goals and interventions for individual patients.

The relationships between specific psychosocial variables, such as depression, anxiety, fear-avoidance, and perceived pain, have a dynamic interplay contributing to experienced pain

that patients may not be aware of. Clinicians that work with individual patients are able to hone in on specific cognitions and behaviors (e.g., irrational thoughts, maladaptive and avoidance behaviors, and negative thinking) contributing to a patient's anxiety and perhaps exacerbating pain symptoms, beliefs, and behaviors. Treatment teams observe and assess patients during numerous treatment interventions within the IPR program offered at the DSRC, such as physical therapy (stretching, aerobic conditioning, and weight training and stabilization), behavioral medicine (relaxation with biofeedback, individual counseling, and group counseling), and medication management. Applying clinical observations allows clinicians to detect changes in mental status (mood, affect, thought processes, appearance, etc.) and behaviors that could shed light on a patient's condition. Using cognitive behavioral interventions, including patient education, IPR programs incorporate various aspects of behavioral medicine, such as biofeedback relaxation, coping skills training, and vocational counseling, to encompass all factors contributing to the individual's overall quality of life.

In the current study, the interdisciplinary pain rehabilitation program at the Dallas Spinal Rehabilitation Center provides a comprehensive, individualized biopsychosocial treatment that assess all aspects of overall quality of life and includes all of the treatment interventions suggested above.

Commission on Accreditation of Rehabilitation Facilities (CARF)

IPR programs can obtain useful data from their patients and services through the use of reliable and valid measures. In particular, outcomes data allows interdisciplinary pain rehabilitation programs to seek international accreditation for their merits and excellent quality of care. In the medical field of rehabilitation, one of the most prestigious organizations is the

Commission on Accreditation of Rehabilitation Facilities (CARF). Founded in 1966, CARF is an independent, nonprofit accreditor of health and human services in various fields of rehabilitation and medicine. The CARF accreditation process, thoroughly established over 40 years, begins with a provider's commitment to "continuous improvement and culminates with external review and recognition that the provider's business and service practices meet international standards of quality -- with all the steps in between focused on optimal outcomes for the persons the provider serves and sustained organizational success (CARF International, 2013)." After an extensive process of self-evaluations, on site-surveys, interviews, observations, and documentation, CARF members render a decision and deliver a report establishing the provider's strengths and areas of improvement and level of demonstrated conformance to CARF standards (2013). CARF proudly accredits interdisciplinary pain rehabilitation programs that provide "outcomes-focused, coordinated, goal-oriented interdisciplinary team services to benefit persons who have impairments associated with pain that impact their activity and participation [in the community] (CARF International, 2013)."

Interdisciplinary pain rehabilitation programs effectively use measurement tools to derive data outcomes for accreditation purposes; these tools can also be used to evaluate specific program areas and assess its effectiveness and contribution to the field of medical rehabilitation. In doing so, IPR programs establish a common language of effective treatment among rehabilitation providers, and also collaborate with one another to continuously make improvements.

Program evaluations typically focus on the program development that includes a series of planning, implementing, and evaluating a sequence of events or procedures that encompass the

program. The National Institute on Disability and Rehabilitation Research (NIDRR) has expanded the field of program evaluations to provide a theoretical framework for describing the relationships between investments, activities, and results in a rehabilitation setting; they call it the NIDRR Logic Model.

The NIDRR Logic Model was developed to represent the stages of short-term, intermediate, and long-term outcomes that program investments and research and development (R&D) are designed to contribute to rehabilitation research; it provides a common approach for integrating treatment resources, planning treatment evaluations, implementing services, evaluating effectiveness, and reporting outcomes. Through the framework provided, the logic model focuses on interconnected domains, such as employment (return to work status) and health and function (quality of life, medication management, and independent functionality) in order to focus on and be accountable for program outcomes.

In regards to interdisciplinary pain rehabilitation programs, the NIDRR logic model can be applied by evaluating the effectiveness of IPR programs not only on an administration level, but also on an individual, patient-centered level. By separately assessing these two hierarchies of an IPR program, health care professionals can focus on meaningful, expected outcomes, determine which factors influence process and outcomes, and establish support for continuous improvements through providing a common language among clinicians and treatment teams in similar rehabilitation settings. On an administration level, the NIDRR logic model can guide outcomes evaluation by determining how desired outcomes are occurring and who is benefitting from the process. On an individual, patient-centered level, the logic model can clearly delineate factors and activities that contribute to an increased quality of life, as well as assess patient

satisfaction in relation to their participation. Having clearly delineated factors and outcomes can facilitate the CARF accreditation process for IPR programs by allowing for consistent outcomes documentation and assessing change seen between variables to assist in the modification of treatment process.

The purpose of the current study is to evaluate the effectiveness of psychosocial treatment interventions in a CARF accredited spinal rehabilitation center by applying the NIDRR Logic Model. In doing so, the relationship between the IPR program investments, activities, and results were assessed on two hierarchies, the administration level, and the patient-centered level. By reviewing the relationships between the inputs, outputs, and outcomes of an accredited IPR program, this study aims to identify the salient biopsychosocial treatment interventions that improve individuals' overall quality of life based on documented outcomes.

Using the logic model's framework and applying its theory-of-change, the current study aspires to evaluate the process and outcomes of an IPR program. This study analyzed the outcomes of psychological measures corresponding to emotional distress and quality of life (depression, anxiety, fear-avoidance, and pain), and the biological measures attributable to experienced pain (functionality and medication tapering).

CHAPTER THREE

Method

Participants

The current study has used archival patient medical records from the interdisciplinary pain rehabilitation program (i.e. chronic pain program and functional restoration program) at the Dallas Spinal Rehabilitation Center (DSRC). The current study collected and analyzed data from patients admitted from January 2010 through December 2012 that completed at least 10 sessions (80 hours) of treatment in the IPR program at the DSRC (n=226). Participants include patients referred to the DSRC by their treating physicians for the purpose of seeking biopsychosocial rehabilitation as their last comprehensive treatment option. Referred patients 1) were over medicating, 2) were difficult to medically regulate, 3) were non-compliant or unresponsive to treatment, and/or 4) were significantly distressed from psychological stressors.

Programs at the DSRC incorporate biopsychosocial pain management caused by all types of back and neck chronic pain issues; chronic pain typically presents as a primary trauma or secondary injury in the musculoskeletal system in the form of lumbar injuries, cervical injuries, injuries occurring in multiple sites, and/or injuries affecting the extremities.

Demographic data. Patient demographic data relevant to this study was gathered from individual access reports and include age, gender, ethnicity, days in treatment, and diagnostic criteria. Additionally, for the purpose of assessing medication regulation in the current study, patient demographic data included adherence to narcotic tapering.

Ethnicity has been divided into 4 categories: White, Hispanic/Latino, African American, and Other. “Other” represents individuals who identified themselves with a different ethnicity

than one of the three provided; such ethnicities could include, but are not limited to, American Indian, Alaska Native, Asian, Native Hawaiian, or Pacific Islander. Diagnostic category has also been divided into four categories: Lumbar, Cervical, Multiple sites, and Other. "Multiple sites" refers to patients who present with two or more injuries that are contributing to their chronic pain; individuals in this category are evaluated and treated for all of the injuries they present with. "Other" refers to individuals who present with injuries to the extremities (arms, hands, legs, and feet, knees, and wrists).

Treatment Protocol

The Dallas Spinal Rehabilitation Center (DSRC) provides high-quality biopsychosocial interdisciplinary treatment to all patients. Treatment teams include medical doctors, physical therapists, physical assistants, occupational therapists, psychologists, exercise technicians, medical psychotherapists, counselors, and certified trainers. When a patient is referred to the DSRC, a treatment team collaborates and arranges for an initial appointment to meet with the individual. During the initial session, a treatment plan evaluation (TPE) is generated through a detailed psychological diagnostic interview. The psychological diagnostic interview is conducted by one of the physicians on staff. Clinicians assess all aspects of an individual's life to obtain a thorough, extensive picture of the individual's presenting problem, such as s a detailed history of the present illness, prior outpatient treatment, current and past medications, a psychological status, limitations of current functioning, medical background, social history, current stressors, family history, and specific goals of treatment.

Once the treatment plan evaluation is completed and individual treatment goals are clearly delineated, the treatment team makes a diagnosis and determines whether or not the

patient meets criteria to be eligible for the interdisciplinary pain rehabilitation program available. The patient is then placed into one of two programs that encompass the interdisciplinary pain rehabilitation program, the chronic pain program or the functional restoration program. Patients eligible for the chronic pain program typically focus on improving their overall quality of life by diminishing pain, increasing independent functioning, and reducing medication intake. Patients placed in the functional restoration program also focus on improving their overall quality of life, but additionally, they focus on increasing their physical demand level of functioning in order to return to work.

Both programs operate Monday through Friday from 8:00 am to 4:45 pm and are usually 20 days (80 hours), unless otherwise specified by an individual's treatment team. A patient, together with their treatment team, can determine scheduling alternatives, if necessary; modified scheduling can be arranged if requested by the patient and deemed appropriate by the individual's treatment team.

Once a patient has agreed to participate in treatment, they attend a program orientation in which they are informed of the program schedule, the treatment interventions, and the medication management that will be part of their treatment. Patients are educated on the interdisciplinary treatment schedule that encompasses a variety of behavioral medicine and physical therapy. The behavioral medicine treatment interventions include relaxation with biofeedback, individual counseling, and group counseling. Relaxation with biofeedback is comprised of teaching patients breathing techniques, mindfulness awareness, and imagery strategies to help decrease muscle tension contributing to their pain. Individual counseling is strictly confidential and aims at teaching patients how to identify and process their anxiety and

depression while simultaneously exploring ways to problem-solve and adjust to their condition. Counselors use a variety of cognitive-behavioral therapy techniques to restructure negative thoughts and help change maladaptive behaviors that may be exacerbating an individual's experienced pain. Group counseling is used to teach patients practical techniques to aid their self-care at home. By sharing and learning from others' experiences in group counseling, individuals gain a better sense of how to further their adjustment. The physical therapy component of treatment includes stretching, aerobic conditioning, and weight training and stabilization, which is considered to be most important in improving independent functionality. Patients are informed of the purpose of each treatment intervention and are encouraged to ask questions throughout their treatment. Also during orientation, patients are issued a personal locker to store their belongings during the day, a treatment manual, and relaxation CD's. The treatment manual and relaxation CD's are given to patients to encourage them to practice learned treatment exercises at home and to facilitate continuous self care after discharge.

Additionally, patients are educated on the benefits and rational behind scheduled medication tapering, if applicable. The medical director individually designs tapering schedules. Patients are informed that injury related medications are refilled and monitored by the medical doctors at the DSRC. Tapering usually begins during the patient's second week of treatment. Clinicians at the DSRC maintain communication with each patient's referral physician and provide weekly progress notes to assure tapering adherence and to reduce the chance of polypharmacy. In the current study, participants were divided into two groups: 1) individuals presently taking injury related medications upon admission, and 2) those that were not. Injury related medication refers to narcotic medications and includes: hydrocodone, lortab, norco,

oxycontin, percocet, darvocet, opana, and methadone. The DSRC does not consider muscle relaxers and anti-inflammatories as medications that require tapering. Other non-injury related medications that participants may have been on upon admission were not considered to require tapering and were not included in the data collection.

After the orientation, patients are advised to address concerns, issues, or problems they may have about their treatment plan and schedule. Patients are ready to formally begin treatment after the orientation.

Treatment activities are arranged on an hourly schedule and are repeated daily. Patients alternate between behavioral interventions and physical activities. A physical therapy team consisting of 4 staff members demonstrates and directs physical activities, as well as monitors patient progress and limitations.

During the first hour of treatment (8:00-9:00 am), patients engage in stretching exercises aimed to warm up the body and increase flexibility; patients are then instructed to do a physical activity designed for their individual goals. The next hour is divided into 30 minutes of individual counseling and 30 minutes of another physical activity (9:00-10:00 am). Patients are given 30 minute breaks throughout the day (10:00-10:30 am). Patients resume treatment with another physical activity or yoga if preferred (10:30-11:30 am). Yoga is offered optionally for patients that wish to participate. Lunch is provided by the DSRC (11:30 am-12:30 pm). After the lunch break, patients engage in stretching exercises (12:30-1:00 pm), aerobic condition through walking (1:00-1:30 pm), and another individually assigned physical activity (1:30-2:00). In the afternoon (2:00-3:00 pm) during the first two weeks, patients attend a patient education “class” in which they are informed of the multiple, biopsychosocial factors that may be contributing to

their pain. Patients are educated on topics such as endorphins, stress, pain management, worker's compensation, depression, sleep, aerobic conditioning, breathing, and nutrition. During the third and fourth weeks of treatment, patients use this afternoon hour (2:00-3:00 pm) to attend group counseling. After a short break (3:00-3:15 pm), patients continue with a physical activity, ending the day with stabilization exercises (4:00-4:45 pm).

Treatment teams meet weekly to discuss individual progress made, identify barriers, adjust treatment plan if necessary, and assure appropriate documentation is being maintained. Patients are discharged from the program when 1) all treatment team and individual goals have been accomplished and/or 2) all treatment time approved by the insurance carrier has been completed.

Measurements

The DSRC uses a variety of validated questionnaires assessing biopsychosocial and functional aspects of treatment such as depression, anxiety, fear-avoidance, pain, and independent living functioning. Measures are carefully chosen and specific data is collected on a weekly staffing/summary form. This allows the team to observe and document the entire treatment progress, track where goals are being met and not met, and adjust the treatment plan in a timely manner in order to meet individual patient needs accordingly. In addition, data collected is reviewed by the entire team weekly, which enhances reliability/validity of the data collected.

The psychological/behavioral and physical/functional measurements chosen for the current study are considered to be part of the outcomes reports. Data from appropriate measures was collected upon admission (baseline) from the psychological testing completed through the

psychological diagnostic interview during the treatment plan evaluation (TPE), and also was collected again at discharge (post-treatment). The final staffing note provides all the data indicators from admission to discharge to calculate outcomes; outcomes were then transferred to a spreadsheet utilized to revise and analyze data. The behavioral staff documents scores from psychosocial measures (BDI, BAI, FAB-Q, DPQ), as well as weekly medication use, number of hours utilized, pain level, and response to biofeedback. The physical staff documents physical demand levels (PDL) derived from individual performance on various physical activities.

Measurement tools used in IPR programs, such as the BDI, BAI, FAB-Q, and DPQ, have strong psychometric properties that allow clinicians to rely on the validity of the screening tools being used in their practice. Clinicians can easily administer the measures periodically in order to track a patient's current emotional well being at any point during treatment. The obtained variables help health practitioners in an interdisciplinary pain rehabilitation setting modify treatment approaches if needed, and target specific symptoms using biopsychosocial interventions.

Beck Depression Inventory-Second Edition (BDI-II). The BDI-II is a 21-item self-report instrument designed to assess DSM-IV depressive symptomatology in adolescents and adults; it includes items that assess both cognitive and somatic complaints associated with depression. The BDI-II consists of 21 groups of statements; each item is a list of four statements arranged in increasing severity about a particular symptom of depression as listed in the DSM-IV. After reading each group of statements, participants mark the statement in each group that best describes the way they have been feeling over the last two weeks.

Example: Sadness

0. I do not feel sad
1. I feel sad much of the time
2. I feel sad all the time
3. I feel so sad and unhappy I can't stand it

Respondents are asked to rate each of the depressive symptoms, ranging from 0 (not present) to 3 (severe). The BDI-II is designed to provide a single overall score that can range from 0 to 63. The following cut-score guidelines are suggested tor patients diagnosed with major depression: minimal (0-13); mild (14-19); moderate (20-28) and severe (29-63).

Beck et al. (1988) performed a meta-analysis on 25 years of psychometric studies of the BDI using a variety of studies. One way Beck et al. (1988) measured the usefulness of the BDI-II was by comparing its correlation with a similar measure that was previously validated, the Hamilton Depression Rating Scale. Results measured a positive correlation with a Pearson r of 0.71, showing good agreement. The BDI-II also proved to have strong test-retest reliability (r= 0.93, p < .001), suggesting it is not overly sensitive to daily variations in mood. Furthermore, the test proved strong internal consistency (α= 0.91, p <.001). With specific populations, the BDI-II strong psychometric properties remain reliable and valid. For example, internal consistency estimates yielded a mean of 0.86 for psychiatric inpatients and 0.81 for nonpsychiatric participants; test-retest correlations ranged from 0.48 to 0.86. The authors also reported high correlations with clinical ratings of depression (r= 0.72, p < .001), indicating good construct validity (Beck et al., 2008).

More specifically, in studies measuring reliability and validity of the BDI-II in chronic pain populations, high internal consistency in (Cronbach's α= 0.92, p<.001) was determined by Davidson et al. (2008), and supported by Pool et al. (2009). Davidson et al. (2008) meticulously

studied the factor validity, internal consistency, and gender invariance of the BDI-II in 481 patients (n=418) with chronic pain. Overall, results found from their study support the construct validity and internal consistency reliability (r= 0.35; α = 0.92; p<.001) of the BDI-II for assessing depressive symptoms in both men and women with chronic pain.

Poole et al. (2009) conducted a study to determine the prevalence of depression in chronic pain patients by comparing results on the Beck Depression Inventory II (BDI-II) with Structured Clinical Interviews (SCID) to determine the utility of the BDI-II as a screening tool for this population. Participants (n= 36) were heterogeneous with regard to their pain, and most reported pain in more than one site; back pain (58%), neck and shoulder pain (44%), head pain (25%), whole body pain (14%), and pain in other extremities (legs, arms, etc. 50%). All participants were given a structured clinical interview (SCID) as well as administered the BDI-II. Poole et al. (2009) used a ROC curve analysis to calibrate the screening tool (BDI-II) against the diagnostic tool (SCID) to determine the usefulness of the screening tool (BDI-II) with a chronic pain population. Results indicated that the SCID diagnosed 26 cases (76%) of depression, while the BDI-II scores showed 31 (86%) of patients reported at least mild depression. Agreements between the scores were assessed by Cohen's kappa (κ= 0.6) giving a large area under the ROC curve (0.97; CI=0.93 to 1.02). Using a BDI-II score of 22 as the cut-off point, the ROC curve provided 89% sensitivity. These results suggest that the BDI-II is an excellent screening tool for chronic pain patients (Poole et al, 2009).

The BDI-II has been consistently used in numerous clinical settings to assess current depressive symptoms in presenting individuals. Having strong validity and inter-rater reliability, the BDI has proven to be a useful assessment tool with a chronic pain population. The BDI can

be repeatedly administered which is extremely helpful in tracking a patient's depressive symptoms and progress throughout treatment. In the current study, BDI was considered a scaled variable as well as a categorical variable defined by the depression severity categories established by the numerical ranges.

Beck Anxiety Inventory (BAI). The development of self-report inventories screening for anxiety have historically included a number of measures with an overwhelming amount of items, and did not differentiate anxiety from depression well. Beck et al. (1988) set out to reduce the item pool between multiple measures while "developing an instrument that would reliably discriminate anxiety from depression while displaying convergent validity (Beck et al., 1988)". The resulting Beck Anxiety Inventory (BAI) was derived from a series of analyses. The BAI is a 21-item scale; each of the 21 items represents one symptom of anxiety. Responses are indicated on a four-point Likert scale, framing from 0 (not at all) to 3 (severe). A total anxiety score is calculated.

Example: Fear of the worst happening

0. It did not bother me at all
1. It bothered me a little
2. It bothered me a lot but I could stand it
3. I almost could not stand it

The BAI has repeatedly been shown to have high internal consistency (α =.92, p<.001), as well as solid test-retest reliability over one week (r=.75, p<.001). When tested for validity, the BAI was found to have moderate to high concurrent and discriminant validity (ranging from 0.35 to 0.69, p<.001) across four different measures comparing depression and anxiety (Hamilton Anxiety Rating Scale-Revised (HARS-R), Hamilton Rating Scale for Depression

(HRSD-R), Cognition Checklist-Anxiety (CCL-A), and Beck Depression Inventory (BDI) (Beck et al., 1988).

When administered to a relatively large sample (n=160) in a study conducted by Beck et al (1988), the scale showed high internal consistency (α=.92, p<.001) and item-total correlations ranging from .30 to .71, with the median being .60. A subsample (n=83) of patients completed the BAI after one week, and the correlation between intake and one week BAI scores was .75, proving solid rest-retest reliability over one week.

One study conducted by Davidson et al. (2008) aspired to assess the factor structure underlying various measures used to evaluate chronic pain; one of the measures examined was the Beck Anxiety Inventory (BAI). Using participants from an outpatient pain clinic (n=65), clinicians sought out to determine the psychometric characteristics and use of the measures. Similar to Beck's (1988) findings, the BAI demonstrated high internal consistency (Cronbach's alpha ranged from 0.90 to 0.92, p<.001) and satisfactory test-retest reliability (r=.75, p<.001) in the present study. Factor analysis of the BAI yielded two interesting factors: somatic complaints and subjective fear; these two findings were consistent with previous studies of this measure and did not alter the reliability and validity. The present study empirically derived chronic pain factor subscales for other measures, while strengthening the case for the BAI as a useful tool in assessing anxiety in a chronic pain population (Davidson et al., 2008).

In the current study, the BAI is considered a scaled variable as well as a categorical variable with ranges varying from minimal anxiety to severe anxiety. The numerical ranges are: 0-7 (minimal anxiety), 8-15 (mild anxiety), 16-25 (moderate anxiety), and 26-63 (severe anxiety).

Fear-Avoidance Belief Questionnaire (FAB-Q). The Fear-Avoidance Beliefs Questionnaire (FAB-Q) was developed by Waddell et al. (1994) based on theories of fear and avoidance behaviors focused specifically on patients' beliefs about how physical activity and work affect their back pain. The FAB-Q is a 16-item self-report questionnaire divided into two sub-scales: fear-avoidance beliefs about physical activities (4 items; items 2-5) and fear-avoidance beliefs about work (7 items; items 6, 7, 9-12, and 15). Five of the 16 items were designed as distracters in the questionnaire and are not included in scoring. Each of the 16 items is rated on a 7-point Likert scale (0= "do not agree at all" to 6= "completely agree"). The work subscale score ranges from 0 to 42; the physical activity subscale score ranges from 0-24.

Example: Physical activity makes my pain worse

Completely Disagree			Unsure			Completely Agree
0	1	2	3	4	5	6

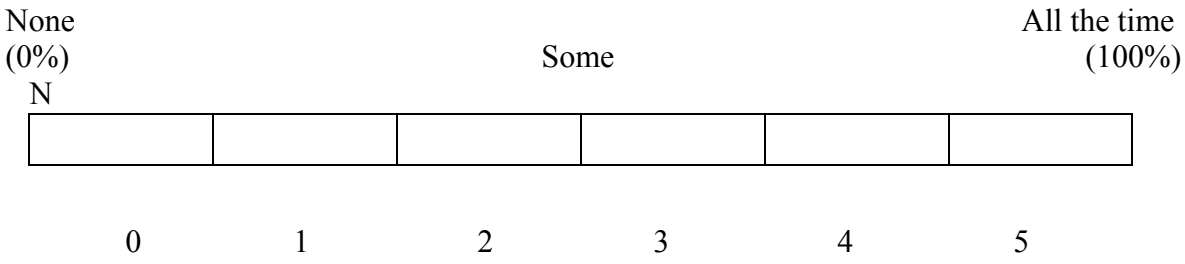
In a multitude of studies conducted by Waddell et al. (1993), clinicians set out to determine how fear-avoidance beliefs affect individuals' perception of pain. Participants (n=210) all suffered from low back pain, although the severity of their pain differed. Reliability statistics were calculated on 26 patients that participated in the test-retest study; reproducibility was high among these patients accounting for good reliability. Results of statistical analysis suggest that the FAB-Q has strong internal consistency (α=0.88, $p<.001$ for the work subscale and α=0.77, $p<.001$ for the physical activity subscale), as well as good correlation (r=0.95, $p<.01$ for the work subscale and r=0.88, $p<.01$ for the physical activity subscale). A measurement of interrater reliability using Cohen's kappa also was found to strong (κ= 0.74) (Waddell et al., 1994). This study not only provides strong empirical evidence for the fear avoidance theory

through the use of the FAB-Q, but also implies the necessity of screening for fear avoidance beliefs when treating chronic spinal pain patients.

In the current study, the FAB-Q is considered a scaled variable; the physical activity subscale scores range from 0 to 24, while the work subscale scores range from 0 to 42. Literature suggests (Crombez et al., 1999) that FABQ-PA scores above 15 can be considered elevated, and may contribute to impairments in functioning; FABQ-W scores are considered elevated if above 29. In general, the higher the scale scores, the higher the degree of fear and avoidance beliefs play a role in a patient's perception of pain.

Dallas Pain Questionnaire (DPQ). The Dallas Pain Questionnaire (DPQ) was developed to assess the amount of chronic spinal pain that affects four aspects of patients' lives (daily work and leisure activities, anxiety, depression, and social interest) (Lawlis et al., 1989). Compared to other chronic low back pain questionnaires, the DPQ assesses a wider exploration in the areas of social, interpersonal, and psychological states, exceeding that of strictly physical assessments. It includes 16 items that are organized into the four subscales. Each item is presented as a general title that is associated with a question.

Example: Pain and Intensity: to what degree do you rely on pain medications or pain relieving substances for you to be comfortable?



Scoring is done on a visual analog scale divided into five to eight segments. Participants evaluate the amount of impact their pain is contributing in their daily lives; they rate the items between 0% (no pain/ no influence) and 100% (extreme pain/ tremendous influence). A percentage score is given for each subscale in order to determine which aspect of the patients' life has been impacted the most by their pain. Results of the DPQ's statistical properties suggest that the DPQ is an externally reliable instrument as well as internally consistent. This has been supported by many clinical studies. Calmels et al. (2005) conducted a thorough study to determine the most reliable and valid low back disability assessment tools. The DPQ proved to have adequate internal consistency (α=0.44 to 0.95, p<.01), excellent test-retest reproducibility (r=0.90, p<.01), and solid construct and content validity. Importantly, the predictive validity suggested in the original study by Lawlis et al. (1989) determined "when the dimensions of "daily activities" and "work-life" are over 50% and dimensions "anxiety-depression" and "behavior social "are less than 50% pure medical intervention is effective, when the dimensions" daily activities "and" work-life "less than 50% and dimensions" anxiety-depression "and" social behavior "are above 50 %, the behavioral approach should be used as first-line and finally when all factors are above 50%, the association of medical care with measurements of behavioral therapy would be desirable (513)."

In the current study, the DPQ is administered upon admission. It is considered to be a scaled variable with subscale scores ranging from 0% to 100%.

The higher the percentage, the more impact/influence that category has on the individual's pain perception. Scores are considered individually and are assessed to determine treatment modifications and goals.

Physical Demand Level (PDL). Physical Demand Level (PDL) definitions were derived from the Dictionary of Occupational Titles (DOT) and are supported by the US Department of Labor. The physical demand levels provide a general language that is shared among rehabilitation facilities and can be applied to an individual's ability to function in the workplace. Physical demand levels refer to the amount of force that an individual can exert in while performing duties on the job. Physical demand levels range from sedentary work to very heavy work; the demand level is then broken down into how often it can be preformed, occasionally, frequently, or constantly. "Occasionally" refers to an activity or condition existing up to one-third of the time, "frequently" refers to the activity or condition existing from one-third to two-thirds of the time at work, and "constantly" is when the activity or condition exists two-thirds or more of the time.

Sedentary is was defined as exerting up to 10 pounds of force occasionally and/or a negligible amount of force frequently to lift, carry, push, pull, or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are sedentary if walking and standing are required only occasionally and all other sedentary criteria are met. The next level of work is called Light work. Light work is defined as exerting up to 20 pounds of force occasionally, and/or up to 10 pounds of force frequently, and/or a negligible amount of force constantly to move objects. A job is rated "light work" when it requires walking or standing to a significant degree, and/or when it requires sitting most of the time but entails pushing and/or pulling of arm and leg controls, and/or when the job requires working at a production rate pace entailing the constant pushing or puling of materials even though the weight of those materials is negligible.

The next level of work is called medium work. Medium work is defined by exerting 20 to 50 pounds of force occasionally, and/or 10 to 25 pounds of force frequently, and/or greater than negligible up to 10 pounds of force constantly to move objects. The demand level following medium work is considered heavy work. Heavy work is defined as exerting 50 to 100 pounds of force occasionally, and/or 25 to 50 pounds of force frequently, and/or 10 to 20 pounds of force constantly to move objects. Lastly, the most demanding and most difficult demand level is very heavy work. Very Heavy work is defined by exerting in excess of 100 pounds of force occasionally, and/or in excess of 20 pounds of force constantly to move objects (Dictionary of Occupational Titles, 2012)

At the Dallas Spinal Rehabilitation Clinic, the physical demand levels are determined by the physical therapy staff that denotes a patient's treatment progress through the various activities an individual performs. Patients are encouraged to engage in the physical activities to the best of their ability and/or until they feel harmful pain. Physical therapists and occupational therapists monitor a patient's progress and gradually increase the amount of weight that a patient works with in order to increase their physical demand level; physical activities are individually administered and are based on individual treatment goals. Physical demand levels were assessed at baseline and post-treatment.

In the current study, physical demand level was a categorical variable that was divided into 5 subscales (sedentary, light, medium, heavy, and very heavy). Subscales were assigned to each individual depending on their current level of functioning after treatment.

Data Analysis

In the current study, collected variables were analyzed and divided into nominal (categorical) variables. Patient-level variables that were assessed at baseline and post-treatment include the BDI, BAI, FAB-Q, PDL, and narcotic intake; the DPQ was measured at baseline but not at post-treatment. Variables measured on the administration level include return to work, time of surface delivery, and improvement rate of admitted patients between January 2010 and December 2012 based on selected outcomes.

Descriptive Statistical Analysis. All categorical data was analyzed using a frequency analysis to assess the frequency distribution among categorical variables. The central tendency of measures was derived from the sample (n=226), and the variability was determined to assess the distribution of participant scores. The mean (M), standard deviation (SD), and range of each variable were assessed from scores of each participant.

Return to work is a categorical variable that was determined by "Yes," "No," "SSI," "Pension," or "Retirement." Return to work status was considered as "Yes" if the patient successfully returned to their previous or current job in a timely manner after the completion of the program, if they were successfully placed with DARS in order to actively seek employment, or if they obtained a job in addition to receiving SSDI. Patients were considered "No" if they failed to return to work or be placed with DARS. Patients who were on SSI, pension, or are retired were placed in their own categories to assure valid and reliable data. Narcotic tapering was considered a categorical variable divided into three groups for the current study. The first group was categorized as those who completely discontinued their narcotic medication or significantly tapered their intake ("Yes"). The second group refers to those who struggled with

tapering and did not decrease their medication intake from admission to discharge ("No"). Out of the 226 patients, 76 did not qualify for outcomes results because they did not require tapering or discontinuation of their medications. When assessing narcotic tapering outcomes in the current study, 150 participants were considered.

The treatment outcome variables are scaled variables determined by the psychometric properties defined by the authors of the corresponding measures. In addition, the BDI and BAI also provide depression and anxiety status categories that were used to determine patient improvement through those categories. All scale data measured twice were analyzed by dependent paired-samples *t*-test to assess biopsychosocial improvements. According to Cohen (1988), the three levels of affect size (*r*) are small (.1), medium (.3), and large (.5).

Improvements from pre to post scores of BDI, BAI, FAB-Q, and PDL. In the current study, the measures that are assessed at baseline (pre-treatment) and discharge (post-treatment) were the BDI, BAI, FAB-Q, and PDL. In order to determine whether the two groups are significantly different from each other, a *t* test will be preformed. A *t* test will be determined by evaluating the changed scores of each group to compare their improvements; the significance level used in the current study is the alpha level (α=.05). The null hypothesis assumes that there will be no change in post scores of the measures of BDI, BAI, FAB-Q, and PDL, compared to their baseline measured data. The alternative hypothesis predicts that there will be a statistically significant change in post scores for the BDI, BAI, FAB-Q and PDL in patients participating in the IPR program at the Dallas Spinal Rehabilitation Clinic; it predicts that scores on the BDI, BAI, and FAB-Q will be lower at discharge (post-treatment) compared to those at baseline (pre-

treatment), and predicts that PDL scores will be higher at discharge (post-treatment) compared to those at baseline (pre-treatment).

Administration Efficiency. In the current study, we will be reporting efficiency on an administration level. From the descriptive statistics described above, the study aims to report the patient-level outcome results derived from the BDI, BAI, FAB-Q, and PDL. Additionally, it will consider the administration level results based on return to work, time of surface deliver, narcotic tapering, and improvement rate among participants.

The reporting will include three factors. The first factor will assess the duration that patients participated in treatment, that is, the time of surface delivery. The duration of treatment considered standard for the Dallas Spinal Rehabilitation Center is 160 hours (20 sessions). Participants considered in this study (n=226) attended a minimum of 80 hours (at least 10 sessions, over a two-week period). The current study will report the efficiency of treatment depending on the duration of participation a patient completed.

The second factor will assess the improvement rate of patients; it will assess how many patients improved their overall quality of life, defined by BDI, BAI, FAB-Q, and PDL. Improvements will be assessed on an individual level. Narcotic tapering will also be considered as an improvement for individuals who were presently taking narcotic medications at admission. The third factor that will be assessed is return to work; the current study will determine how many participants returned to work successfully.

CHAPTER FOUR

Results

All subjects (*n*= 226)

Demographics. A total of 226 patients were recruited. One hundred thirty one (58%) were males and 95 (42%) were females. The mean age of the 226 participants was 47 years old (*Range*= 20-77, *SD*= 9.74). One hundred and thirty nine (61%) participants were White, 62 (27%) were Hispanic, 19 (8%) were African American, and 6 (2%) identified themselves as other ethnicities (e.g., American Indian, Alaska Native, Asian, Native Hawaiian, or Pacific Islander). One hundred and four (46%) participants reported their primary injury being lumbar, 10 (4%) reported cervical injuries, 75 (33%) reported injuries in multiple sites, such as lumbar injuries in conjunction with an injury to the extremities, and 37 (16%) had injuries to the extremities, reported as "other" injured sites (e.g., hands, wrists, arms, feet, ankles, knees, and/or legs). Of the 150 individuals who required tapering at admission, 145 (96%) patients substantially tapered or even completely discontinued taking narcotic medications at discharge. Return to work was inquired at discharge. Five conditions of return to work were noted: yes, no, SSI, pension, and retirement. Two-hundred and nine (93%) patients were considered to successfully return to work ("Yes"), while six (3%) patients did not ("No"), three (1%) were using SSI, five (2%) were receiving "pension", and three (1%) were retired

The Dallas Pain Questionnaire (DPQ) was administrated once at admission, it was administered to 205 of the 226 patients (90%). Patients self-reported the impact of their pain on a 0%-100% rating scale, the higher the percentage the more impact; assessing DPQ scores at admission assisted clinicians to better understand how patients' chronic pain had influenced

different areas of their daily life activities and psychosocial domains. DPQ scores above 50% on any of the four subscales was considered a high amount of influence on the patient's life. One hundred and ninety-six (95%) patients reported a high amount of pain influencing daily activities, work/leisure, anxiety/depression, and social interests. On average, these patients reported their pain interfered with their daily activities as much as 74%, while 75% was the most reported interference level by 22 patients (10%) (*Mode*=75%, *Median*=75%, *SD*=12.41, *Range*=39%-100%). The work/leisure subtest was scored at 78% on average (*Mode*= 80%, *Median*= 80%, *SD*= 13.93, *Range*= 35%-100%). Patients scored an average of 65% on the subscale contributing to anxiety and depression (*Mode*= 90%, *Median*= 70%, *SD*= 22.16, *Range*= 0%-100%). Lastly, patients reported an average score of 64% among the social interests subscale (*Mode* =80%, *Median*= 70%, *SD*= 20.36, *Range*= 0%-100%). Scores derived from the DPQ at baseline provide legitimate indications for clinicians to recommend a patient at least 10 or more sessions (80 hours) of bio-psycho-social intervention for their chronic pain. Thirty-two patients (14%) received 80 treatment hours. The most common number of treatment hours was 160 for 88 patients (39%), while the mean of treatment hours was 139 hours (*Median*= 158, *SD*= 31.9, *Range*= 80-200) (see Table 1).

Descriptive results of measures for all subjects (*n*= 226). At intake, all patients' baseline scores were measured. Physical demand level (PDL), Beck Depression Inventory-II (BDI-II), and Beck Anxiety Inventory (BAI) derived raw scores and categorical scores. PDL scores were placed in the one of the corresponding categories: sedentary, light, medium, heavy, and very heavy. The average PDL at admission, was 1.90; it falls between the "sedentary" level and "light" level (*Range*= 1-3 [sedentary-medium], *SD*= .60, *Median*= 2 [light], *Mode*= 2

[light]). Fifty-three patients (23%) were placed in the "sedentary" level, and 143 (63%) were placed in the "light" level. At discharge, the average PDL score was improved to 3.1, between "medium" and "heavy" (*Mode*= 3 [medium], *Median*= 3 [medium], *SD*= .60, *Range*=1-5 [sedentary-very heavy]). One-hundred and eighteen patients (52%) placed in the "medium" level, and 64 patients (28%) placed in the "heavy" level upon completion of the program.

Similarly, the Beck Depression Inventory-II (BDI-II) and the Beck Anxiety Inventory (BAI) also provide severity categories. Average depression at admission was 24.62 (*Mode*= 21, *Median*= 25, *SD*= 12.35, *Range*= 1-58). The score was placed between "mild" and "moderate" severity category (*M*= 2.74, *Mode*= 3 [moderate], *Median*= 3 [moderate], *SD*= 1.21, *Range*= 1-4 [minimal-severe]). Out of the 226 participants, 18 (8%) reported "mild" depression, and 65 (29%) reported "moderate" depression. At discharge, average depression was decreased to 15.79 (*Mode*= 1, *Median*= 14, *SD*= 11.92, *Range*= 0-50), which corresponds to a severity level between "minimal" and "mild" (*M*= 1.90, *Mode*= 1 [minimal], *Median*= 1 [minimal], *SD*= 1.16, *Range*= 1-4 [minimal-severe]). One hundred and thirty-two patients (58%) reported "minimal" depression after completion of the program, and 18 patients (8%) reported "mild" depression.

At admission, average anxiety reported was 21.59 (*Mode*= 16, *Median*= 20, *SD*= 12.22, *Range*= 0-63, ,), falling between the "mild" and "moderate" severity (*M*=2.92, *Mode*=4 [severe], *Median*= 3 [moderate], *SD*=.995, *Range*-1-4 [minimal-severe]). Forty-nine (22%) patients reported "mild" anxiety and 74 patients (33%) reported "moderate" anxiety. Average anxiety at discharge was reduced to 13.92 (*Mode*= 1, *Median*= 11, *SD*= 11.04, *Range*= 0-61), considered "minimal" to "mild" severity (*M*= 2.18, *Mode*= 1 [minimal], *Median*= 2 [light], *SD*= 1.05,

Range= 1-4 [minimal-severe]). Seventy-seven patients (34%) reported "minimal" anxiety at discharge, 61 patients (27%) "mild" anxiety.

Fear-avoidance beliefs and behaviors were assessed using the Fear-Avoidance Beliefs Questionnaire (FABQ) consisting of two subscales, the physical activities subscale and the work subscale; physical activity subscale scores >15 and work subscale scores >29 were considered elevated. At admission, 151 participants (67%) reported an elevated amount of fear beliefs about physical activities; 75 participants (33%) reported scores that were not elevated (*M*= 18.42, *Mode*= 24, *SD*= 5.21, *Range*= 4-30, *Median*= 20). For the work subscale, 216 patients (96%) reported elevated scores at admission; 21 patients (4%) reported scores that were not elevated (*M*= 36.79, *Mode*= 48, *Median*= 38, *SD*= 8.87, *Range*= 0-57). At discharge, only 78 patients (35%) reported elevated scores for the physical activity subscale, while 148 (65%) reported non-elevated scores. For the work subscale, however, 205 patients (91%) reported elevated scores at discharge, and 21 (9%) reported non-elevated scores (see Table 2).

Treatment effectiveness. The mean of PDL improvement was 1.24 (*SD*= .67, *95% C.I.*= 1.15-1.33); this result was found to be significant ($t_{(225)}$= 27.78, *p*= .000), producing a large effect size (*r*= .88). Results indicated an 8.83 average improvement in BDI scores (*SD*= 9.91, *95% C.I.*= 7.52-10.12), which showed a significantly positive change ($t_{(225)}$=13.38, *p*= .000) and a large effect size (*r*= .66). In terms of the BDI severity category, reported depression improved from between mild and moderate (2.74) to between minimal and mild (1.90) (*M*= .845, *SD*= 1.11, *95% C.I.*= .67-.99). The reduction in depression scores is significant ($t_{(225)}$= 11.39, *p*= .000), showing a large effect size (*r*= .60). In regard to anxiety, results indicated an average improvement of 7.66 on BAI scores (*SD*= 8.91, *95% C.I.*= 6.50-8.83), showing a significantly

positive change ($t_{(225)}$= 12.94, *p*= .000) and a large effect size (*r*= .65). In terms of the BAI severity category, anxiety diminished from between mild and moderate (2.92) to between minimal and mild (2.18) (*M*= .74, *SD*= .88, *95% C.I.*= .62-.86). This result was significant ($t_{(225)}$= 12.57, *p*= .000), generating a large effect size (*r*= .64).

Results also indicated improvements among fear-avoidance beliefs. After completion of treatment, average FABQ-physical activity scores improved by 5.04 points (*SD*= 5.53, *95% C.I.*= 4.31-5.76). Seventy-eight patients (34%) reported improvements in their fear-avoidance beliefs pertaining to physical activity. One hundred and forty-three patients (63%) maintained their not elevated fear-avoidance beliefs during the treatment. Overall reduced fears were significant ($t_{(225)}$= 13.68, *p*=.000) indicating a large effect size (*r*= .67). The work subscale of the FABQ indicated that the average improvement among participants was 6.44 (*SD*= 6.28, *95% C.I.*= 5.61-7.27). While 11 (5%) patients improved their work fear-avoidance beliefs, 215 (95%) maintained their not-elevated work fear-avoidance beliefs during the treatment. Improvements of reduced work fears were found to be significant ($t_{(223)}$=11.39, *p*=.000), indicating a large effect size (*r*= .72) (see Table 2).

Chronic Pain program (*n*=60)

Demographics. Sixty patients were in the chronic pain program. Thirty-two (53%) were male and 28 (47%) were female. The mean age of the 60 patients was 51 years old (*Range*= 29-71, *SD*= 8.75). Thirty-six (60%) patients were White, 17 (28%) Hispanic, six (10%) African American, and 1 (2%) identified themselves as other ethnicities (e.g., American Indian, Alaska Native, Asian, Native Hawaiian, or Pacific Islander). Thirty-two (53%) patients reported their primary injury being lumbar, 2 (3%) reported cervical injuries, 17 (28%) reported injuries in

multiple sites (such as lumbar injuries in conjunction with an injury to the extremities), and 9 (15%) had injuries to the extremities, reported as other injured sites (e.g., hands, wrists, arms, feet, ankles, knees, and/or legs). Forty-five of the 60 patients (75%) required tapering at admission, while 15 (25%) did not. Of those that required tapering, 44 (98%) patients significantly tapered or completely discontinued taking narcotic medications, and only 1 (2%) did not. In terms of return to work, 44 (73%) patients successfully returned to work ("Yes") at discharge, while six (10%) patients did not ("No"). Three patients (5%) were receiving SSI, 4 (7%) were placed in the "pension" condition, and 3 (5%) were retired.

The Dallas Pain Questionnaire (DPQ) was administered to 53 of the 60 patients (88%) on intake for recommending treatment hours. These patients reported their pain interfered with their daily activities as much as 76% on average, while 72% was the most reported interference level among 5 patients (8%) (*Mode*= 72%, *Median*= 75%, *SD*= 14.21, *Range*= 39%-100%). The work/leisure subtest generated an average of 81% among patients (*Mode*= 75%, *Median*= 80%, *SD*= 12.60, *Range*= 45%-100%). Patients scored an average of 70% on the subscale contributing to anxiety and depression (*Mode*= 90%, *Median*= 75%, *SD*= 21.73, *Range*= 15%-100%). Lastly, patients scored an average of 70% among the social interests subscale (*Mode*= 85%, *Median*= 75%, *SD*= 18.64, *Range*= 25%-100%). Regarding treatment hours, 10 patients (17%) received the minimum amount of treatment hours. The most common number of treatment hours is 160 for 21 patients (35%), while the mean of treatment hours is 138 hours (*Median*= 157, *SD*= 33.39, *Range*= 80-200) (see Table 3).

Descriptive results of all measures. On intake, baseline scores were gathered from the physical demand level (PDL), Beck Depression Inventory-II (BDI-II), and Beck Anxiety

Inventory (BAI) deriving raw scores and categorical scores. The average PDL at admission among patients was 1.75; it falls between the "sedentary" level and "light" level (*Mode*= 2 [light]), *Median*= 2 [light], *SD*= .65, *Range*= 1-3 [sedentary-medium]). Twenty-two patients (37%) were placed in the "sedentary" level, and 31 (52%) were placed in the "light" level. At discharge, the average PDL score was 2.8, between "light" and "medium" (*Mode*= 3 [medium], *Median*= 3 [medium], *SD*= .74, *Range*= 1-5 [sedentary-very heavy]). Sixteen patients (27%) placed in the "light" level, and 33 patients (55%) placed in the "medium" level upon completion of the program.

Similarly, the Beck Depression Inventory-II (BDI-II) and the Beck Anxiety Inventory (BAI) also provide severity categories. Average depression at admission was 28.10 (*Mode*= 21 *Median*= 26, *SD*= 14.24, *Range*= 1-58). The score was placed between "moderate" and "severe" categories (*M*= 2.95, *Mode*= 4 [severe]), *Median*= 3 [moderate], *SD*= 1.19, *Range*= 1-4 [minimal-severe]). Nineteen (32%) reported "moderate" depression, while 25 (43%) reported "severe" depression. At discharge, average BDI was decreased to 20.12 (*Mode*= 1, *Median*= 19, *SD*= 12.64, *Range*= 1-49), which corresponds to a severity level of "moderate" (*M*= 2.28, *Mode*= 1 [minimal], *Median*= 2 [mild], *SD*= 1.28, *Range*= 1-4 [minimal-severe]). Twenty patients (45%) reported "minimal" depression after treatment, 14 patients (23%) reported "moderate" depression, and 15 patients (25%) reported "severe" depression.

At admission, average BAI was 24.90 (*Mode*= 10, *Median*= 26.5, *SD*= 12.40, *Range*= 5-59), falling at the high end of "moderate" severity (*M*=2.92, *Mode*=4 [severe], *Median*= 3 [moderate], *SD*=.995, *Range*-1-4 [minimal-severe]). Fifteen patients (25%) reported "moderate" severity, and 31 (52%) patients reported "severe" anxiety. Average anxiety at discharge was

reduced to 17.32 (*Mode*= 9, *Median*= 17, *SD*= 11.10, *Range*= 0-48), considered at the low end of "moderate" severity (*M*= 2.55, *Mode*= 3 [moderate], *Median*= 3 [moderate], *SD*= 1.08, *Range*= 1-4 [minimal-severe]). Eighteen (30%) patients reported "moderate" anxiety and 14 patients (23%) reported "severe" anxiety.

Regarding FABQ at admission, physical activity subscale scores >15 and work subscale scores >29 were considered elevated. Fifteen patients (66%) reported an elevated amount of fear beliefs about physical activities; the 45 remaining participants (75%) reported scores that were not elevated (*M*= 19.27, *Mode*= 24, *Median*= 20, *SD*= 4.82, *Range*= 5-24). For the work subscale, 60 patients (100%) reported elevated scores upon admission (*M*= 39.63, *Mode*= 42, *Median*= 41, *SD*= 6.61, *Range*= 18-51). At discharge, 28 patients (47%) reported elevated scores for the physical activity subscale, while 32 (53%) reported non-elevated scores. For the work subscale, 56 patients (97%) reported elevated scores at discharge, and 2 (3%) reported non-elevated scores (see Table 5).

Treatment effectiveness. The mean of PDL improvement was 1.03 (*SD*= .66, 9*5% C.I.*= .86-1.20); this result was found to be significant ($t_{(59)}$=12.19, *p*=.000), indicating a large effect size (*r*= .85). Results indicated an 7.98 average improvement in BDI score (*SD*= 10.68, *95% C.I.*= 5.22-10.74), which showed a significantly positive change ($t_{(59)}$=5.79, *p*= .000) and a large effect size (*r*= .60). Reported depression severity improved from near the upper limits of "moderate" severity (*M*= 2.95) to near the lower limits of "moderate" severity (*M*= 2.28) (*M*= .67, *SD*= 1.11, *95% C.I.*= .38-.96). This result was a significant reduction ($t_{(59)}$= 4.63, *p*= .000), indicating a large effect size (*r*= .52). In regard to anxiety, results indicated an average improvement of 7.58 on BAI scores (*SD*= 10.08, *95% C.I.*= 4.98-10.19), which showed a

significant change ($t_{(59)}$= 5.83, *p*= .000) indicating a large effect size (*r*= .60). On average, reported anxiety severity reduced from between moderate and severe (*M*= 3.22) to between mild and moderate (*M*=2.55) (*M*= .67, *SD*= 1.04, *95% C.I.*= .38-.96). This result was a significant reduction ($t_{(59)}$= 4.98, *p*= .000), indicating a large effect size (*r*= .51).

After completion of treatment, average FABQ-physical activity scores improved by 4.18 points (*SD*= 4.52, *95% C.I.*= 3.01-5.35). Nineteen patients (31%) reported improvements in their fear-avoidance beliefs pertaining to physical activity. Thirty-nine patients (65%) maintained their perceived fear-avoidance beliefs about physical activity; however, beliefs are not regarded as elevated by FABQ. These reduced fears were significant ($t_{(59)}$= 7.16, *p*= .000) and produced a large effect size (*r*= .68). The work subscale of the FABQ indicated that the average improvement among participants was 5.85 (*SD*= 5.16, *95% C.I.*= 4.52-7.18). Two (3%) patients improved their work fear-avoidance beliefs, and 58 (96.7%) maintained their work fear-avoidance beliefs that are not regarded as elevated by FABQ. Improvements of reduced work fears were found to be significant ($t_{(59)}$=8.77, *p*=.000), with a large effect size (*r*= .75) (see Table 5).

Functional Restoration program (*n*=166)

Demographics. One hundred sixty-six patients were in the chronic pain program (*n*= 166). Ninety-nine (60%) were males and 67 (40%) were females. The mean age among participants was 46 years old (*Range*= 20-77, *SD*= 9.73). One-hundred and three (62%) patients were White, 45 (27%) Hispanic, 13 (8%) African American, and 5 (3%) identified themselves as other ethnicities (e.g., American Indian, Alaska Native, Asian, Native Hawaiian, or Pacific Islander). Seventy-two (43%) patients reported their primary injury being lumbar, eight (5%)

reported cervical injuries, 58 (35%) reported injuries in multiple sites (such as a lumbar injury coupled with an injury to the extremity), and 28 (17%) had injuries to the extremities, reported as other injured sites (e.g., hands, wrists, arms, feet, ankles, knees, and/or legs.). One-hundred and five patients (63%) required tapering at admission, while 61 (37%) did not. Of those that required tapering, 101 (96%) patients significantly tapered or completely discontinued taking narcotic medications, and 4 (4%) did not. At discharge, the condition of return to work were as following: 165 (99%) patients were considered to successfully return to work ("Yes"), while only one patient (1%) was receiving "pension."

According to DPQ evaluation, patients reported their pain interfered with their daily activities as much as 73% on average, while 75% was also the most reported interference level among 18 patients (11%) (*Mode*= 75%, *Median*= 75%, *SD*= 11.43, *Range*= 45%-99%). The work/leisure subtest generated an average of 78% among patients (*Mode*= 80%, *Median*= 80%, *SD*= 14.29, *Range*= 35%-100%). Patients scored an average of 64% on the subscale contributing to anxiety and depression (*Mode*= 75%, *Median*= 68%, *SD*= 22.18, *Range*= 0%-100%). Lastly, patients scored an average of 62% among the social interests subscale (*Mode*= 80%, *Median*= 65%, *SD*= 20.61, *Range*= 0%-95%). In regards to treatment hours, 22 patients (13%) received the minimum amount of treatment hours. The most common number of treatment hours is 160 for 67 patients (40%), while the mean of treatment hours is 140 hours (*Median*= 158, *SD*= 30.86, *Range*= 80-200) (see Table 4).

Descriptive results of all measures. The average PDL at admission, assessed by an individual's ability to exert force without pain, among patients was 1.95; it falls between the "sedentary" level and "light" level (*Mode*= 2 [light], *Median*= 2 [light], *SD*= .57, *Range*= 1-3

[sedentary-medium]). Thirty-one patients (19%) were placed in the "sedentary" level, and one-hundred and twelve (68%) were placed in the "light" level. At discharge, the average PDL score was 3.27, between "medium" and "heavy" (*Mode*= 3 [medium], *Median*= 3 [medium], *SD*= .70, *Range*=1-5 [sedentary-very heavy]). Seventeen patients (28%) placed in the "light" level, and 33 patients (55%) placed in the "medium" level upon completion of the program.

The average BDI score at admission was 23.36 (*Mode*= 25, *Median*= 24, *SD*= 11.39, *Range*= 1-51). The score was placed between "light" and "moderate" categories (*M*= 2.67, *Mode*= 4 [severe], *Median*= 3 [moderate], *SD*= 1.21, *Range*= 1-4 [minimal-severe]). Out of the 166 participants, 46 (28%) reported "moderate" depression, while 56 (34%) reported "severe" depression. At discharge, average depression was reduced to 14.23 (*Mode*= 1, *Median*= 11, *SD*= 11.30, *Range*= 0-50), which corresponds to a severity level between "minimal" and "mild" (*M*= 1.76, *Mode*= 1 [minimal], *Median*= 1 [minimal, *SD*= 1.09, *Range*= 1-4 [minimal-severe]). One-hundred and five patients (63%) reported "minimal" depression after completion of the program, 14 patients (8%) reported "mild" depression, and 29 patients (18%) reported "moderate" depression.

Average BAI at admission was 20.39 (*Mode*= 18, *Median*= 19, *SD*= 11.80, *Range*= 0-63), representing "moderate" severity (*M*=2.81, *SD*=.988, *Range*-1-4 [minimal-severe], *Median*= 3 [moderate], *Mode*=3 [moderate]). Fifty-nine patients (36%) reported "moderate" severity, and 48 (29%) patients reported "severe" anxiety. Average anxiety at discharge was diminished to 12.69 (*Mode*= 1, *Median*= 11, *SD*= 10.80, *Range*= 0-61), considered "mild" severity (*M*= 2.05, *Mode*= 1 [minimal], *Median*= 2 [mild], *SD*= 1.01, *Range*= 1-4 [minimal-severe]). Sixty-four (39%) patients reported "minimal" anxiety and 46 patients (28%) reported "severe" anxiety.

In terms of FABQ at admission, 106 out of the 166 patients (64%) reported an elevated fear beliefs about physical activities, while the 60 remaining patients (36%) had not elevated fear-avoidance beliefs (*M*= 18.12, *Mode*= 24, *Median*= 29, *SD*= 5.32, *Range*= 4-30). For the work subscale, 156 patients (94%) reported elevated scores upon admission (*M*= 35.75, *Mode*= 36, *Median*= 37, *SD*= 9.34, *Range*= 0-57). At discharge, 116 patients (70%) reported elevated fear-avoidance beliefs for the physical activity subscale, while 50 (30%) reported non-elevated fear-avoidance beliefs. For the work subscale, 147 patients (89%) reported elevated fear-avoidance beliefs at discharge, and 19 (11%) reported non-elevated fear-avoidance beliefs (see Table 6).

Treatment effectiveness. The mean of PDL improvement was 1.31 (*SD*= .66, 9*5% C.I.*= 1.21-1.42), a significant improvement ($t_{(165)}$= 25.58, *p*=.000), indicating a large effect size (*r*= .89). Results indicated an 9.13 average improvement in BDI score (*SD*= 9.64, *95% C.I.*= 7.66-10.61), showing a significantly positive change ($t_{(165)}$=12.20, *p*= .000) and a large effect size (*r*= .69). Reported depression severity improved from between "light" and "moderate" (*M*= 2.67) to between "minimal" and "mild" severity (*M*= 1.76) (*M*= .91, *SD*= 1.11, *95% C.I.*= .74-1.08). This result was significant ($t_{(165)}$= 10.55, *p*= .000), indicating a large effect size (*r*= .63). In regard to anxiety, results indicated an average improvement of 7.70 on BAI scores (*SD*= 8.48, *95% C.I.*= 6.40-8.90), which showed a significant change ($t_{(165)}$= 11.70, *p*= .000) and a large effect size (*r*=.67). On average, reported anxiety improved from 2.81 (between "mild" and "moderate" severity) to 2.05, representing "mild" severity (*M*= .77, *SD*= .823, *95% C.I.*= .64-.89). This result was significant ($t_{(165)}$= 11.97, *p*= .000), and produced a large effect size (*r*= .68).

Results also indicated improvements among fear-avoidance beliefs. After completion of treatment, average FABQ-physical activity scores improved by 5.34 points (*SD*= 5.84, *95% C.I.*= 4.45-6.24). Fifty-nine patients (36%) reported improvements in their fear-avoidance beliefs pertaining to physical activity. One-hundred and four patients (63%) maintained their perceived fear-avoidance beliefs about physical activity; however, beliefs are not regarded as elevated by FABQ. These reduced fears were significant ($t_{(165)}$= 11.80, p= .000) and produced a large effect size (r= .68). The work subscale of the FABQ indicated that the average improvement among participants was 6.66 (*SD*= 6.66, *95% C.I.*= 5.63-7.69). Nine (5%) patients improved their work fear-avoidance beliefs, and 157 (95%) maintained their non-elevated work fear-avoidance beliefs. Improvements of reduced work fears were found to be significant ($t_{(163)}$=12.81, p=.000), with a large effect size (r= .71) (see Table 6).

CHAPTER FIVE

Discussion

The present study has supported the significant effectiveness of an integrative interdisciplinary pain rehabilitation (IPR) program for chronic pain by validating the effectiveness of the IPR program at the Dallas Spinal Rehabilitation Center (DSRC) based on the NIDRR logic model for program evaluation. Patients improved on measures of depression (r= .67), anxiety (r= .65), and fear-avoidance beliefs (r= .67 for physical activity; r= .72 for work), as well as increased their physical demand level (r= .88); results from all measures were found to be significant and produced a large effect size. Moreover, consistent with prior studies, 93% of patients successfully returned to work after completion of the program; this result compares favorably with the return-to-work rates reported by Gatchel et al. (2006). Of those who were required medication tapering , 97% successfully discontinued or significantly tapered their narcotic medication intake; these results compliment those found in previous studies (Bosy et al., 2010), suggesting patients diminished their need for narcotic pain medication while being treated at an IPR program. In the present study, 88% of patients completed the 160 recommended treatment hours for optimal outcomes. However, results indicate that patients who participated in the program less than 160 hours still showed improvements on psychosocial measures; these findings suggest the IPR program had benefits on patients attending at least 80 hours, just half of the recommended treatment time. These results suggest interdisciplinary and individualized bio-psycho-social intervention for chronic pain could be effective and cost-efficient.

Literature suggests that individuals living with chronic pain are at risk for increased disability, have greater emotional distress, and have reduced work productivity and increased

absenteeism leading to higher medical costs and health care utilization (Gatchel et al., 2006). Studies have ascertained that a biological treatment approach to chronic pain using medications as a "quick fix" for short-term pain relief has been the most common form of practice among primary care settings; however, at a risk of addiction, dependence, and experiencing side effects. In the last decade, pain medicine experts have been expanding treatment perspectives from a biological perspective to a more comprehensive biopsychosocial approach for the treatment of chronic pain. Comparison studies (Nicholas et al., 1992; Bosy et al., 2010) have shown better overall improvements in pain reduction and increased functioning in favor of biopsychosocial treatment. The aim of many of these programs is not pain reduction as the treatment goal; rather, the ability to cope with and manage pain while restoring function is the principal aim (Bosy et al., 2010). The IPR program at the DSRC not only strives to help individuals manage their pain while teaching coping skills, but also addresses psychological, social-behavioral, and vocational aspects of an individual's life through numerous cognitive-behavioral and vocational treatment interventions to improve an individual's overall quality of life.

The IPR program provided two types of treatment programs, the chronic pain program and the functional restoration program. Individuals were placed in one of the two groups by assessing the severity of their chronic pain curbing their ADL limitations, their social functioning, and their individualized treatment goals accordingly (e.g., whether of not an individual has a primary goal of returning to work). Generally, individuals placed in the chronic pain program aimed to increase their overall quality of life, diminish emotional distress, and learn to manage their pain while learning effective coping skills. Forty-four (73%) patients in the chronic pain program increased their physical demand level to continue working, while the

remainder of patients simply increased independent functioning for their activities of daily living. Findings from our study indicate that patients enrolled in the chronic pain program substantially improved their emotional distress, such as depression (r= .60), anxiety (r= .60), and fear avoidance beliefs (r= .68 for physical activity; r= .75 for work), that could have been limiting their ADLs and life role performance, affecting their self-efficacy, and catastrophizing their pain. Patients also restored and improved their physical demand level (r= .85), as well as decreased their need for narcotic medications.

Patients placed in the functional restoration program also aimed to improve their overall quality of life and diminish their emotional distress; however, patients placed in this program had a more specific treatment goal to increase their independent functioning and physical demand level required to return to work in a timely manner following an injury. Results from our study showed great improvements among patients in the functional restoration program in physical demand level (r= .89), as well as psychosocial measures related to depression (r= .69), anxiety (r= .67), and fear-avoidance beliefs (r=.68 for physical activity; r=.71 for work). Remarkably, 165 (99%) patients successfully returned to work, or were successfully placed with DARS for further vocational assistance; these results compare favorably to similar studies assessing return to work rates among patients in a functional restoration program (Gatchel et al., 2006).

A bio-psycho-social approach to chronic pain provides comprehensive treatment interventions to help patients cope with chronic pain efficiently and effectively allowing for positive functional outcomes. The IPR program at the DSRC incorporated a interdisciplinary treatment protocol and evidence-based interventions that rehabilitate patients physically, psychologically, behaviorally, and vocationally. Patients were encouraged and educated to

practice coping strategies and to do at-home exercises in order to eventually implement self-regulation for their chronic pain and emotional distress.

The NIDRR logical model was used as a program evaluation framework and applied to the IPR program at the DSRC. The present study found that the IPR program includes all critical administration and patient care components of the NIDRR logic model, and not surprisingly, achieves effective and efficient outcomes successfully. On the patient-level, the DSRC assessed individuals on psychosocial factors (depression, anxiety, fear-avoidance) as well as physical functionality (physical demand level) related to an individual's self-perceived pain. On the administration level, the DSRC provided a treatment protocol based on biopsychosocial perspectives, as well as established individualized treatment goals agreed upon amongst an interdisciplinary treatment team and patients; outcomes assessed included time of surface delivery (treatment hours), vocational status after completion of the program, and narcotic tapering. Considering individual self-reports and medical backgrounds, treatment teams modified aspects of treatment to best fit a patient's needs. Individualized treatment goals allowed teams to provide a variety of treatment methods including biological practices, cognitive-behavioral interventions, and physical therapy techniques. Findings from the current study corroborate that the NIDRR logic model could be useful for successfully administrating a comprehensive program evaluation.

Implications

Literature supports that an IPR program that incorporates a biopsychosocial perspective to treat and rehabilitate individuals affected by chronic pain is preferable to biological treatments alone, which aim to decrease pain symptoms temporarily through narcotic medications. Findings

from our study suggest that chronic pain rehabilitation and treatment from a biopsychosocial approach is an effective and an efficient evidence-based practice for health care professionals. By assessing and detecting debilitating psychological, social-behavioral, and vocational obstacles, rehabilitation professionals can treat patients in a comprehensive way that allows them to modify treatment interventions to meet individual needs and aid psychosocial improvement. In the field of rehabilitation counseling, professionals are then able to use specific therapeutic techniques deriving from a cognitive-behavioral modality to individualize sessions, obtain constructive feedback from patients, and evaluate progress made through treatment. Furthermore, counselors can provide psychoeducation for patients to help them learn about their pain experience and the limitations associated, as well as address external stressors that will help patients manage and cope with their injury and its repercussions. In doing so, individuals learn how to healthily and productively adapt to their injuries and improve their overall quality of life.

Findings from the current study have also found promising implications for the field of vocational rehabilitation. In applying the NIDRR logic model for program evaluations in our study, findings suggest that implementing biopsychosocial treatment interventions, establishing a delineated treatment protocol, and providing vocational assistance and counseling are crucial aspects of a program that lead to positive outcomes in psychosocial measures, as well as vocational status. IPR programs, such as the one at the DSRC, are aware of the tremendous financial stress that can fall on an individual after an injury limits them from continuing to work. Therefore, programs incorporate vocational rehabilitation to help patients manage that stress and work closely with employers to maintain expectations. The NIDRR logic model has provided an excellent framework for establishing a common language among vocational rehabilitation

professionals that allows them to clarify roles amongst each other and identify realistic expectations for their patients' vocational outcomes, as well as sets clear expectations for their professional niche. Furthermore, by implementing the investments and activities provided by an IPR program, vocational counselors can address particular barriers and limitations; this allows them to find appropriate resources for their patients, such as DARS, as well as provide assistance to patients for future vocational challenges they may face, such as speaking to employers, performing job analysis, and recommending appropriate accommodations and modifications.

Limitations

The majority of participants reported themselves as White; the second highest reported ethnicity was Hispanic. Given that the demographic composition is changing, a future study may like to recruit more minorities. The DSRC provides measures and treatment interventions in both English and Spanish according to patients' preference. However, we did not have enough accessibility to the resources used for minorities to determine how they differed from the interventions preformed in English; therefore, there was no comparison done between the two ethnic groups nor was there a comparison done between the languages used in cognitive-behavioral practices. Nonetheless, findings suggest that improvements were seen among patients regardless of ethnicity or language preference. In addition, the Dallas Pain Questionnaire (DPQ) was only administered to patients upon admission. It would be valuable if the program also evaluated the DPQ at discharge, seeing as how most patients had reported being bothered by their chronic pain in multiple ADL performance and social functioning.

The current study did not preform follow-up assessments on psychosocial measures to determine how patients maintained learned emotional distress or functionality post-treatment,

nor did we follow up on patients' pain perceptions; this limits the conclusion of the study because measures used to assess psychosocial emotional distress, functionality, and pain perception pertaining to the weeks individuals were participating in treatment. Nonetheless, results from similar previous studies (Oslund et al., 2009) found patients maintained treatment benefits at a 6-month follow up and a year follow up. A good majority of patients in the current study had been referred with a recommendation for a pain-management program before progressing further in their work status. As a result, they may not have been working at the time of entry to the program; at the end of treatment, they were considered ready for the next step in returning to work. However, we were unable to follow up with these patients after they returned to the work force, so we could not deem the occupational success or performance efficiency patients sustained; this will be a helpful consideration and step to take in the future that will allow vocational rehabilitation professionals to apply the NIDRR logic model to better understand the effectiveness of the vocational treatment interventions made in IPR programs. In doing so, programs will be able to modify vocational expectations, communicate better with employers, and assess an individual's pain perception in relation to work after completion of an IPR program.

Conclusions

The present study has found promising findings that strengthen the case for the treatment of chronic pain from a biopsychosocial perspective in interdisciplinary pain rehabilitation programs. Using the NIDRR logic model, we have been able to ascertain the framework for an effective and efficient treatment facility that treats all aspects of in individual's well being; these

findings will allow future research to continue to improve program effectiveness and efficiency in the field of rehabilitation.

References

American Society of Addiction Medicine. (2001). Definitions related to the use of opioids for the treatment of pain. Retrieved from www.ampainsoc.org/advocacy/opioids2.htm

Aronoff, G. (2000) Opioids in chronic pain management: is there a significant risk of addiction? *Current Review of Pain*, 4(2), 112-121

Bair, M. R., Katon, W., & Kroenke, K. (2003). Depression and pain comorbidity: a literature review. *Archives of Internal Medicine*, 163(20), 2433-2445.

Barry, D. I., Jones, E., Becker, W., Tetrault, J., Sullivan, L., Hansen, H., et al. (2010). Opioids, Chronic Pain, and Addiction in Primary Care. *Journal of Pain*, 11(12), 1442-1450.

Beck, A., Brown, G., & Steer, R. (1988). An Inventory for Measuring Clinical Anxiety: Psychometric Properties. *Journal of Consulting and Clinical Psychology*, 56(6), 893-897.

Beck, A., & Garbin, M., (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review*, 8(1), 77-100.

Bosy, D. E., Corey, D., & Lee, J. (2010). An Interdisciplinary Pain Rehabilitation Programme: Description and Evaluation of Outcomes. *Physiotherapy Canada*, 62(4), 316-326.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences, 2nd edition*. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc.

Commission on Accreditation of Rehabilitation Facilities (CARF). (2013). *CARF 2012 Medical Rehabilitation Program Descriptions.* Retrieved from www.carf.org

Crombez, V., Heuts, P. H., and Lysens, R. (1999). Pain-related fear is more disabling than pain itself: evidence on the role of pain-related fear in chronic back pain disability. *Pain*, 80(1-2), 329-339.

Davidson, M. T., Fabrigar, L., & Davidson, P. (2008). Chronic pain assessment: A seven-factor model. *Pain Research and Management*, 13(4), 299-308.

DeLeo, J. T. & Tawfik V. (2004). Neuroimmune activation and neuroinflammation in chronic pain and opioid tolerance/hyperalgesia. *Neuroscientist*, 10, 40-52.

Dictionary of Occupational Titles (DOT). (2012). *Physical Demand Levels.* Retrieved from www.occupationalinfo.org/appendxc_1.html#STRENGTH

Gatchel, R. J., & Okifuji, A. (2006). Evidence-based scientific data documenting the treatment and cost-effectiveness of comprehensive pain programs for chronic nonmalignant pain. *Journal of pain*. (7), 779-93.

Guo, H. S., Halperin, W., & Cameron, L. (1999). Back pain prevalence in US industry and estimates of lost workdays. *American Journal of Public Health*, 89(7), 1029-1035.

Harris, C. & D'Eon, J. (2008). Psychometric properties of the Beck Depression Inventory-Second Edition (BDI-II) in individuals with chronic pain. *Pain Journal*, 137(3), 609-622.

Hoffman, B. M., Charkoff, D. K., & Kerns, R. D. (2007). Meta-analysis of psychological intervention for chronic low back pain. *Health Psychology*, 26, 1-9.

Institute of Medicine Report from the Committee on Advancing Pain Research and Education. (2011). *Reviewing Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*. Retrieved from www.nap.edu/openbook.php?isbn=030921484X

International Association of for the Study of Chronic Pain. (2011). Pain taxonomy terms. Retrieved from www.iasp-pain.org/AM/Teplate.cfm?Section=Pain_Definitions

Texas Department of Insurance. (2012). *Return to Work/Stay at work*. Retrieved from www.tdi.texas.gov/wc/rtw/index.html

Joseph, E. K., Reichlin, D., & Levine, J. D. (2010). Shared mechanisms for opioid tolerance and a transition to chronic pain. *The Journal of Neuroscience*, 30(13), 4660-4666.

Kachur, S. (2004). *Understanding and Treating Fear of Pain*. New york, New York: Oxford University Press

Katz, J. (2006). Lumbar dis disorders and low-back pain: socioeconomic factors and consequences. *The Journal of Bone and Joint Surgery*, 88(2), 21-24.

Kendall, S., Sjogren, P., Pimenta, C., Hojsted, J., Kurita, G. (2010). The cognitive effects of opioids in chronic non-cancer pain. *Journal of the International Association for the Study of Pain,* 150(2), 225-230.

Kinder, C. M., & Gatchel, R. (2009). Higher Opioid Doses Predict Poorer Functional Outcome in Patients with Chronic Disabling Occupational Musculoskeletal Disorders. *The Journal of Bone and Joint Surgery*, 9(4), 19-27.

Linton, S., & Shah, W. (2011). Impact of Psychological Factors in the Experience of Pain. *Physical Therapy Journal*, 91(5), 700-710.

Main, C. & George, S. (2011). Psychologically Informed Practice for Management of Low Back Pain: Future Directions in Practice and Research. *Physical Therapy Journal*, 91(5), 820-824.

Manchikanti, L. (2006). Prescription drug abuse: what is being done to address this new drug epidemic? Testimony before the subcommittee on criminal justice, drug policy, and human resources. *Pain Physician*, 9, 287-321.

McCoy, C. E., Lawlis, G. F., Cuencas, R., & Shelby, D. (2008). The development of the Dallas Pain Questionnaire. An assessment of the impact of spinal pain on behavior. *Spine Journal,* 34(1), 511-516.

Moore, J. (2010). Chronic Low Back Pain and Psychosocial Issues. *Physical Medicine and Rehabilitation Clinics of North America,* 21(4), 801-815.

Nicholas, M., Wilson, P., & Goyen J. (1991). Comparison of cognitive-behavioral group treatment and an alternative non-psychological treatment for chronic low back pain. *Journal of Pain*, 48, 339-347.

National Institute on Disability and Rehabilitation Research (NIDRR) (2009). *Research Utilization Support and Help (RUSH)—NIDRR Logic Model*. Southwest Educational Development Laboratory (SEDL).

Oslund, S., Robinson, R., Clark, T., Garofalo, J., Behnk, P., & Walker, B., et al. (2009). Long-term effectiveness of a comprehensive pain management program: strengthening the case for interdisciplinary care. *Baylor University Medical Center Proceedings,* 22(3), 211-214.

Papadeorgiou, A. C., Croft, P., & Thomas E. (1998). Psychosocial risks for low back pain: are these issues related to work*? Annals of Rheumatic Diseases*, 57, 500-502.

Poole, H., White, S., Blake, C., Murphy E., & Bramwell, R. (2009). Depression in Chronic Pain Patients: Prevalence and Measurement. *Pain Practice: The Official Journal of World Institute of Pain*, 9(3), 173-180.

Roditi, D., & Robinson, M. (2011). The role of psychological interventions in the management of patients with chronic pain. *Psychology Research and Behavior Management*, 4, 41-49.

Rosenblum, A., Marsch, L., Joseph H., & Portenoy, R. (2008). Opioids and the Treatment of Chronic Pain: Controversies, Current Status, and Future Directions. *Experimental Clinical Psychopharmacology,* 16(5): 405-416.

Rubin, D. (2007). Epidemiology and risk factors for spine pain. *Neurologic Clinics*, 25(2), 353-371.

Soin, A. J., Brown, L., Moufawad, S., & Mekhail, N. (2008). Functional Outcomes in Patients with Chronic Nonmalignant Pain on Long-Term Opioid Therapy. *Pain Practice: The Official Journal of World Institute of Pain*, 8(5), 379-384.

van Tulder, M. B., & Bombardier, C. (2002). Low back pain. *Best Practice and Research Clinical Rheumatology*, 16(6), 761-776.

Von Korff, M. P., Lane, M., Miglioretti, D., Simon, G., Saunders, K., & Stang, P., et al. (2004). Chronic spinal pain and physical-mental comorbidity in the United States: results from the national comorbidity survey replication. *Pain Journal*, 113(3), 331-339.

Waddell, G. M., Henderson, I., Somerville, D., & Main C. (1993). A Fear-Avoidance Believes Questionnaire (FABQ) and the role of fear avoidance in chronic low back pain and disability. *Pain Journal*, 52, 157-168.

Table 1

Demographic Backgrounds for all subjects (n=226)

Demographics	n (%)	Mean (*M*)	Range	Standard Deviation (*SD*)
Program				
Chronic Pain	66 (29%)			
Functional Restoration	160 (71%)			
Gender				
Male	131 (58%)			
Female	95 (42%)			
Ethnicity				
White	139 (61%)			
Hispanic	62 (27%)			
African American	19 (8%)			
Other	6 (2%)			
Diagnostic Category				
Lumbar	104 (46%)			
Cervical	10 (4%)			
Multiple Sites	75 (33%)			
Other	37 (16%)			
Narcotic Tapering				
Yes	145 (97%)			
No	5 (3%)			
Return to Work				
Yes	209 (93%)			
No	6 (3%)			
SSI	3 (1%)			
Pension	5 (2%)			
Retirement	3 (1%)			
Age	226	47	20-77	9.74
Treatment Hours	226	139	80-200	31.49
Dallas Pain Questionnaire (DPQ)	205 (90%)			
Daily Activities		74	39-100	12.23
Work/Leisure		79	35-100	13.90
Anxiety/Depression		66	0-100	22.15
Social Interests		64	0-100	20.63

Table 2

Frequency of Severity Categories of BDI-II, BAI, PDL, and FAB-Q for all subjects (n=226)

	Admission		Discharge		Improvements	
	n	(%)	*n*	(%)	$t_{(df)}$	Effect Size (*r*)
BDI						
Minimal	61	27.0	132	58.4		
Mild	18	8.0	18	8.0	13.38*$_{(225)}$	.67
Moderate	65	28.8	43	19.0		
Severe	82	36.3	33	14.6		
BAI						
Minimal	24	10.6	77	34.1		
Mild	49	21.7	61	27.0	12.94*$_{(225)}$	.65
Moderate	74	32.7	58	25.7		
Severe	79	35.0	30	13.3		
PDL						
Sedentary	53	23.5	3	1.3		
Light	143	63.3	35	15.4	27.79*$_{(225)}$	.88
Medium	30	13.3	118	52.2		
Heavy	0	0	64	28.3		
Very Heavy	0	0	6	2.6		
FAB-Q_PA						
Elevated	151	67	78	35	13.68*$_{(225)}$	.67
Not Elevated	75	33	148	66		
FAB-Q_W						
Elevated	216	96	205	91	15.33*$_{(223)}$	.72
Not Elevated	10	4	21	9		

Note. *p <.000; *E.S.* = >.50. E.S. means the effect sizes of the comparison study among chosen measures were found to be large using *r*.

Table 3

Demographic Backgrounds for Chronic Pain Program (n=60)

Demographics	n (%)	Mean (*M*)	Range	Standard Deviation (*SD*)
Gender				
Male	32 (53)			
Female	28 (47)			
Ethnicity				
White	36 (60)			
Hispanic	17 (28)			
African American	6 (10)			
Other	1 (2)			
Diagnostic Category				
Lumbar	32 (53)			
Cervical	2 (3)			
Multiple Sites	17 (28)			
Other	9 (15)			
Narcotic Tapering				
Yes	44 (73)			
No	1 (2)			
Not Applicable	15 (25)			
Return to Work				
Yes	44 (73)			
No	6 (10)			
SSI	3 (5)			
Pension	4 (7)			
Retirement	3 (5)			
Age	60 (100)	51	29-71	8.75
Treatment Hours	60 (100)	138	80-200	33.38
Dallas Pain Questionnaire (DPQ)	53 (88)			
Daily Activities		76	39-100	14.20
Work/Leisure		81	45-100	12.60
Anxiety/Depression		70	15-100	21.73
Social Interests		70	25-100	18.64

Table 4

Demographic Backgrounds for Functional Restoration Program (n=166)

Demographics	n (%)	Mean (*M*)	Range	Standard Deviation (*SD*)
Gender				
Male	99 (60)			
Female	67 (40)			
Ethnicity				
White	103 (62)			
Hispanic	45 (27)			
African American	13 (8)			
Other	5 (3)			
Diagnostic Category				
Lumbar	72 (43)			
Cervical	8 (5)			
Multiple Sites	58 (35)			
Other	28 (17)			
Narcotic Tapering				
Yes	101 (60)			
No	4 (2)			
Not Applicable	61 (37)			
Return to Work				
Yes	165 (99)			
No	0 (0)			
SSI	0 (0)			
Pension	1 (.6)			
Retirement	0 (0)			
Age		46	20-77	9.73
Treatment Hours		140	80-200	30.86
Dallas Pain Questionnaire (DPQ)	152 (92%)			
Daily Activities		73	45-99	11.43
Work/Leisure		78	35-100	14.29
Anxiety/Depression		64	0-100	22.18
Social Interests		62	0-95	20.61

Table 5

Frequency of Severity Categories of BDI-II, BAI, PDL, and FAB-Q for Chronic Pain Program (n=60)

	Admission		Discharge		Improvements	
	n	(%)	*n*	(%)	$t_{(df)}$	Effect Size (*r*)
BDI						
Minimal	14	23.3	27	45.0		
Mild	1	1.7	4	6.7	5.788*$_{(59)}$	.60
Moderate	19	31.7	14	23.3		
Severe	26	43.3	15	25.0		
BAI						
Minimal	4	6.7	13	21.7		
Mild	10	16.7	15	25.0	5.827*$_{(59)}$	.60
Moderate	15	25.0	18	30.0		
Severe	31	51.7	14	23.3		
PDL						
Sedentary	22	36.7	2	3.3		
Light	31	51.7	17	28.4	12.191*$_{(59)}$	.85
Medium	7	11.7	33	55.0		
Heavy	0	0	7	11.7		
Very Heavy	0	0	1	1.7		
FAB-Q_PA						
Elevated	45	75	32	53.3	7.164*$_{(59)}$	.68
Not Elevated	15	25	28	46.7		
FAB-Q_W						
Elevated	60	100	58	96.7	8.774*$_{(59)}$	.75
Not Elevated	0	0	2	3.3		

Note. *p <.000; *E.S.* = >.50. E.S. means effect sizes of the comparison study among measures were found to be large using *r*.

Table 6

Frequency of Severity Categories of BDI-II, BAI, PDL, and FAB-Q for Functional Restoration Program (n=166)

	Admission		Discharge		Improvements	
	n	(%)	*n*	(%)	$t_{(df)}$	Effect Size (*r*)
BDI						
Minimal	47	28.3	105	63.3		
Mild	17	10.2	14	8.4	12.204*$_{(165)}$	.69
Moderate	46	27.7	29	17.5		
Severe	56	33.7	18	10.8		
BAI						
Minimal	20	12.0	64	38.6		
Mild	39	23.5	46	27.7	11.695*$_{(165)}$	.69
Moderate	59	35.5	40	24.1		
Severe	48	28.9	16	9.6		
PDL						
Sedentary	31	18.7	1	0.6		
Light	112	67.5	18	10.8	25.577*$_{(165)}$	.89
Medium	23	13.9	85	51.2		
Heavy	0	0	57	34.3		
Very Heavy	0	0	5	3.0		
FAB-Q_PA						
Elevated	106	63.9	50	30.1	11.797*$_{(165)}$	.68
Not Elevated	60	36.1	116	69.9		
FAB-Q_W						
Elevated	156	94.0	147	88.6	12.813*$_{(163)}$	.71
Not Elevated	10	6.0	19	11.4		

Note. *p <.000; *E.S.* = >.50. E.S. means the effect sizes of the comparison study among measures were found to be large using *r*.

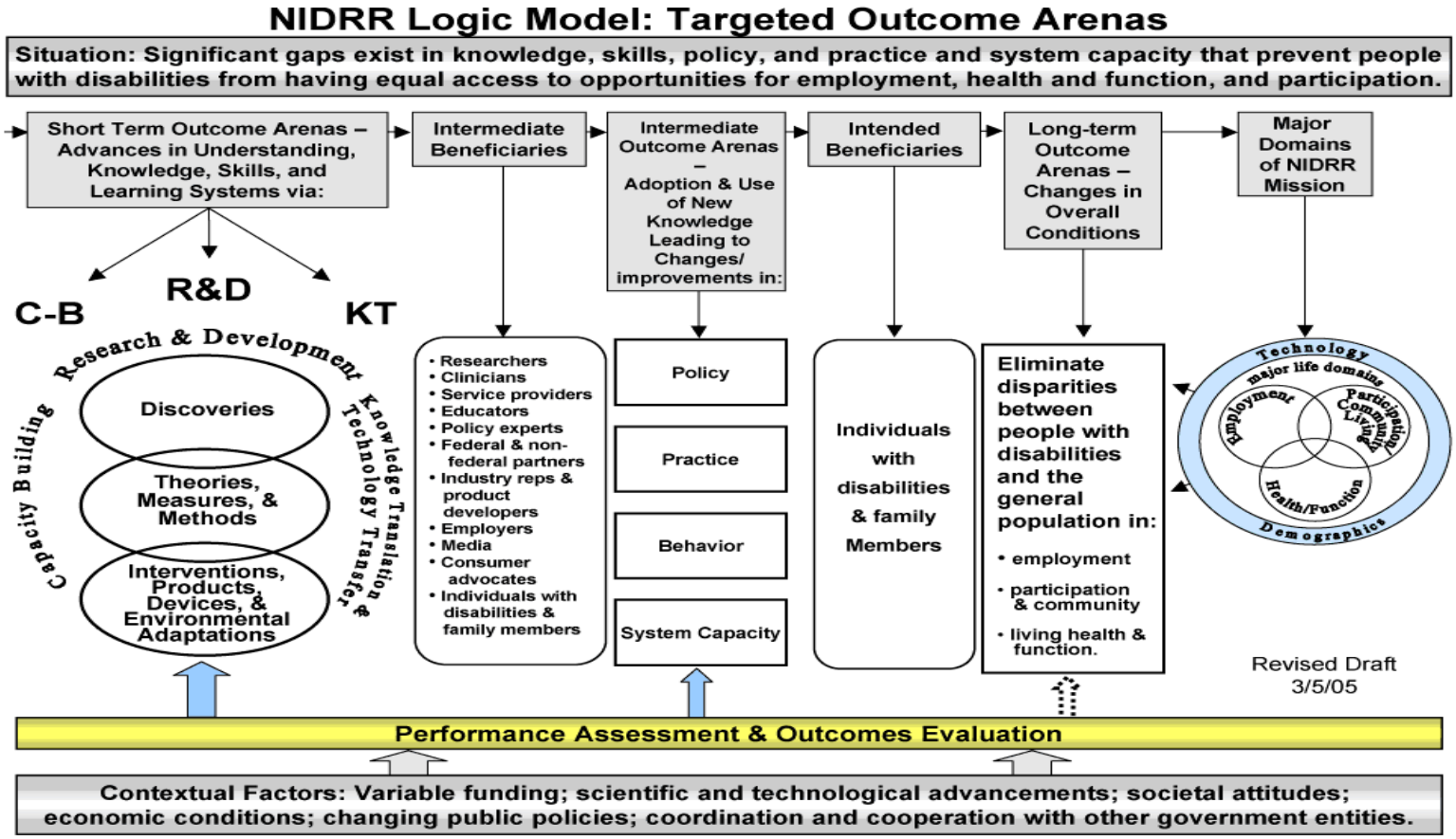


Figure 1. NIDRR Logic Model used to demonstrate the framework of inputs, outputs, and outcomes applied in the present study to assess program effectiveness.

BIOGRAPHICAL SKETCH

Melisa Siles
Melisa.siles11@gmail.com

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
The University of Texas Southwestern School of Health Professionals – Dallas, Texas	B.S.	2013	Rehabilitation Counseling Psychology
Southern Methodist University – Dallas, Texas	B.A.	2010	Psychology and Spanish, minor in Business Administration

Positions and Employment

2009-2010 – Southern Methodist University Psychology Department, Research assistant

2009-2010 – The Family Place, Child and Adolescent Psychology intern

2010-2011 – Children's Medical Center of Dallas, Milieu Therapist Inpatient Psychiatry

2010-2011 – Crystal Charity Ball Autism Program, Behavioral Analyst

2012-present – Dr. Matthew Housson and Associates, Coaching for Academic Success tutor

Clinical Experience

2012-2013 – UTSW Developmental Neuropsychology, Neuropsychological assessment intern

February 2013- August 2013 – Metrocare Services, Counseling Psychology intern

January 2012-present – Dallas Spinal Rehabilitation Center, Research and program evaluation intern

Presentations, Publications, and Awards

2013 – Dallas Spinal Rehabilitation Center, Treatment Outcomes and Effectiveness presentation

2013 – UTSW School of Health Professionals, Alpha Eta Honor's Society

Professional Memberships

2012-present – The National Rehabilitation Association member