THE RELATIONSHIP BETWEEN MMPI-2 PROFILE PATTERNS AND TREATMENT EFFICACY IN A HETEROGENEOUS PAIN POPULATION: A PROSPECTIVE OUTCOME STUDY

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DEDICATION

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by

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MMPI-2 PROFILE PATTERNS AND TREATMENT EFFICACY IN A HETEROGENEOUS CHRONIC PAIN POPULATION

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In a prior study, Gatchel, Mayer, and Eddington (2006) demonstrated the utility of an MMPI-2 profile pattern, formerly known as the "Floating Profile", for use with identifying treating outcomes in the context of pain management. Re-termed the "Disability Profile", this profile pattern comprised a large proportion of the sample being studied, and demonstrated several negative treatment outcomes for patients who exhibited such a profile. This current study was an attempt at replicating these findings in a heterogeneous pain population, while also comparing four MMPI-2 profile patterns and five pain categories with various intake and outcome measures.

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PRIOR PUBLICATIONS

Bernstein, D., Stowell, A.W., Haggard, R., Worzer, W., Polatin, P., & Gatchel, R.J. (2007). *Complex interplay of participants in opioid therapy.* Practical Pain Management, 7(2), 10-36.

Link, J., Haggard, R., Kelly, K., & Forrer, D. (2006) *Placebo/Nocebo symptom reporting in a sham herbal supplement trial.* Evaluation and the Health Professions, 29(4), 394-406.

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LIST OF ABBREVIATIONS

APA – American Psychological Association

BDI-2 – Beck Depression Inventory, 2nd Edition

CV – Conversion V Profile

DP – Disability Profile

HAM-D – Hamilton Rating Scale for Depression

MBMD – Millon Behavioral Medicine Diagnostic

MMPI-2 – Minnesota Multiphasic Personality Inventory, 2nd Edition

MPI-II – West-Haven Yale Multidimensional Pain Inventory, 2nd Edition

MVAS – Million Visual Analog Scale

OSW – Oswestry Pain Disability Questionnaire

PDA – Pain Drawing Analogue

NP – Normal Profile

NT – Neurotic Triad Profile

SF-36 – Medical Outcomes Shortform-36/Health Status Questionnaire

CHAPTER ONE
Introduction

Chronic pain has consequences for people from a variety of backgrounds and is omnipresent in our society. Treating chronic pain presents a socioeconomic challenge to our culture, in addition to the suffering of individuals who are distressed from the physical and emotional burden of chronic pain. Nearly 48 million people in the United States are subject to chronic pain and find little relief from current medications that may either have harmful side effects or provide little symptom relief (LeMoult, 2006). In a study released by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS)(2006), One in four U.S. adults reported a pain experience that lasted a full day during the previous month, and one in ten reported an experience of pain lasting a year or more. This study also revealed that one-fifth of adults over the age of 65 reported pain that lasted more than 24 hours, with three-fifths of these older adults reporting that their pain had lasted for more than one year.

According to the 2004 Americans Living with Pain Survey (LeMoult, 2006), 72 percent of people experiencing chronic pain have done so for more than three years, and approximately one-third of these individuals have lived this way for more than a decade. Findings from the NCHS (2006) indicated that low back pain, migraine (or severe headache), and joint pain (aching or stiffness) are among the most commonly reported pain complaints. More than a quarter of those surveyed by the NCHS (2006) had experienced low back pain in the preceding three months, and 15 percent reported migraine in the preceding three months. Adults in the 18-44 age range were 3-times as likely to have experienced a migraine in the previous three months versus adults 65 years

and older. Severe joint pain increased with age in the NCHS sample, with women reporting joint pain more often than men.

Although pain has a profound effect on people's daily lives, nearly half the people who experience pain wait months or longer before consulting a physician (LeMoult, 2006). When patients experiencing pain do finally seek professional help for their condition, they are faced with personal and financial challenges. For example, the NCHS (2006) reported that seven percent of adults under the age of 65 did not get the help they needed in the preceding year because of high costs. Further, findings from NCHS (2006) also indicated that the percentage of adults who took a narcotic drug to alleviate pain during the previous month had increased from 3.2 percent to 4.2 percent, between the survey periods of 1988-1994 and 1999-2002. The professionals who treat these patients also face similar challenges when they seek methods that are both cost effective and therapeutic (LeMoult, 2006).

Currently, the most heuristic model for treating chronic pain assumes the biopsychosocial (BPS) perspective to be a crucial factor for successful therapy (Turk & Rudy, 1987). The BPS model allows for an interdisciplinary treatment approach, in which providers from multiple backgrounds collaboratively treat cases from their respective areas of expertise, including: medicine, physical therapy, behavioral health, and other venues (Wright & Gatchel, 2002). Chronic pain patients often present challenges to interdisciplinary pain management that may prevent their entry into, and success within, such treatment centers (Miller, Gatchel, Lou, Stowell, Robinson, & Polatin, 2005). Behavioral pre-screening instruments are routinely used in such settings as a means of determining whether a patient is an optimal candidate for the services

offered; and to predict, based upon previous research findings, which individuals are more likely to successfully complete a particular regimen (Gatchel, 2001), as well as to uniquely tailor treatment goals based upon screening findings. Among the factors being screened for in these settings are psychosocial variables for clinical syndromes, personality disorders, and drug use. Chronic pain patients presenting with personality disorders are at particular risk for being denied treatment either by their insurance carrier, or the particular treatment facility, because mental health issues are usually "carved out" from medical treatment (Dersh, Polatin, & Gatchel, 2002).

In a previous study, Gatchel and colleagues (Gatchel, Mayer, & Eddington, 2006) demonstrated the usefulness of the Minnesota Multiphasic Personality Inventory-Second Edition (MMPI-2; Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) for identifying psychopathology in patients with chronic occupational spinal disorders (COSD). Specifically, it was revealed that a profile pattern previously recognized in the psychiatric literature as the "floating profile" was more predictive of psychopathology and poor treatment outcomes within the COSD cohort than more commonly utilized profile patterns like the Conversion V (elevations on scales one and two, with a diminished scale three) and Neurotic Triad (in which scales one, two, and three are elevated at similar levels). The researchers relabeled and repurposed this previously unrecognized pattern as the "Disability Profile" when used in the context of identifying psychopathology in pain management (Gatchel, Mayer, & Eddington, 2006).

The purpose of this current study is to further contribute to the understanding of the utility of the "Disability Profile" in evaluating and treating chronic pain. It examined patients in a large heterogeneous pain population. In addition to musculoskeletal pain, the

cohort consisted of patients who were also being treated for vascular, visceral, and neuropathic pain diagnoses. As with Gatchel and colleagues (Gatchel, Mayer, & Eddington, 2006) groundbreaking examination of MMPI-2 profile patterns, these patients were further categorized by four specific patterns of Clinical Scale elevations as assessed during pre-treatment screening with the MMPI-2 in an interdisciplinary treatment program. The MMPI-2 profile classifications at pre-treatment were compared to identify the presence of psychopathology in this cohort. These specific MMPI-2 profile classifications were also compared with treatment outcome measures at post-treatment and one-year follow-up. Additionally, this study was the first of its kind to compare scores from the MMPI-2 with scores on the Millon Behavioral Medicine Diagnostic (Millon, Antoni, Millon, & Davis, 2003) in a large, heterogeneous, interdisciplinary pain management cohort.

CHAPTER TWO
Review of the Literature

CHRONIC PAIN AND PSYCHOPATHOLOGY

Annually, the associated cost of chronic pain: exceeds $70 billion in lost-productivity and health-care expenses; results in more than 80% of all physician visits; and impacts more than 50 million Americans (Gatchel, 2001; Gatchel & Turk, 1996). As more research was conducted in the last century, the way we conceptualize pain has evolved to include more than physiological symptoms. Chronic pain encompasses a diverse array of heterogeneous clinical conditions that are now popularly viewed as a biopsychosocial process resulting from the interactions of biological, behavioral, and social factors (Engel, 1977). There is accumulating evidence that chronic pain is associated with high rates of diagnosable psychopathology (Dersh, Gatchel, Mayer, Polatin, & Temple, 2006). The exploration of psychosocial factors associated with chronic pain indicates a contribution of behavioral, cognitive, and affective components to the individual experience and expression of pain.

Theories of Chronic Pain

The biopsychosocial (BPS) perspective runs counter to the traditional biomedical reductionist viewpoint in which body and mind are perceived as dual mechanisms (Susman, 2001). The BPS model consists of multiple components (physiological, behavioral, and sociological) interacting in a dynamic manner that is unique to each individual. This direction in thinking progressed from the *gate control theory of pain* introduced by Melzack and Wall (Melzack & Wall, 1965), which emphasized the significant role that psychosocial factors potentially play in the perception of pain. In this

model, pain is viewed as an intricate assortment of occurrences instead of a single, straightforward, continuous phenomenon.

Engel (1977) initially introduced what became known as the biopsychosocial (BPS) model in the 1970s and 1980s. Prior to this time, pain was divided into dual categories of organic pain and psychogenic pain. The term *psychogenic* insinuated that the experience of pain was not "real" since no organic etiology could be determined. Individuals with psychological pain etiology often received inadequate treatment, because this dualistic perspective impeded the development of interdisciplinary strategies that combine psychology and medicine. Fortunately, contemporary diagnostic criteria from the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR, American Psychiatric Association, 2000) do not include *psychogenic pain* as a descriptive term, nor does the assessment of organic pain preclude the critical function of psychosocial factors for particular individuals (Dersh, Polatin, & Gatchel, 2002). *Pain disorder* as a diagnostic category is defined according to the relative extent with which psychological and medical conditions correspond with extant pain. Pain, as viewed by the BPS model, is a unique, individualized experience (Gatchel, 2004). Symptoms are modulated by the complex interaction of psychological and sociological factors impacting physical pathology in variant ways (Gatchel, 2004).

Gatchel developed a three-stage model that describes a progression from acute pain to chronic pain disability with associated psychosocial distress in a way that is supported by the preceding research (R.J. Gatchel, 1991, 1996). In his model, anxiety is considered a common reaction to acute pain, while other severely disabling psychopathologies like MDD or substance abuse are more often linked to chronic pain.

According to this model, as pain becomes more chronic, patients undergo a significant psychological metamorphosis in which behavioral/psychological problems are layered over the original pain experience (Gatchel, 1991). The first stage of the model is comprised of normal emotional reactions like fear, anxiety, and worry resulting from the perception of pain during the acute phase. If the pain persists more than 2-4 months (the standard for acute pain), the patient enters into the second stage that consists of increased psychological distress, including learned helplessness, anger, and somatization as a result of suffering from more chronic pain. According to Gatchel's hypothesis, pre-existing psychological characteristics, socioeconomic factors, and other environmental conditions collude in determining the form these problems take. Thus, the stress of coping with chronic pain intensifies the patient's premorbid characteristics in a diathesis-stress process. Further, if these problems persist, they will become the focus of the patients' attention as their lives begin to be restructured around their pain. This culminates in the third stage of Gatchel's model, in which the patient habituates into a sick role by avoiding normal responsibilities and obligations thus further reinforcing their state (Gatchel, 1991).

Psychopathology as a Factor in Pain Management

In the context of pain management, it is vital to assess for psychiatric variables that contribute to each patient's progress throughout treatment. This is so because the individual experience of pain may be intensified by comorbid psychopathology, thereby perpetuating the dysfunction and disability associated with pain (Dersh, Polatin, & Gatchel, 2002). Dersh and colleagues reported that patients experiencing chronic pain are at increased risk for depression, suicide, and sleep disorders. Emotional factors become

more significant in the maintenance of dysfunction and suffering as pain becomes more chronic (Gatchel, 1996). The three major psychiatric concomitants of chronic pain are: mood disorders, anxiety disorders, and substance abuse disorders (Dersh, Polatin, & Gatchel, 2002).

Researchers have demonstrated several relationships between psychopathologies and the experience of pain. Specifically, anxiety has been linked to decreased pain threshold and tolerance, depression has been linked to less successful treatment rates, anxiety and depression have been linked with the amplification of medical symptoms, and emotional distress has been associated with multiple physical symptoms (Dersh, Gatchel, Mayer, Polatin, & Temple, 2006). Research conducted primarily on patients with chronic low back pain (CLBP) in the 1980s documented increased prevalences of depression, anxiety, substance abuse/dependence, somatization, and personality disorders (Fishbain, Goldberg, Labbe, Steele, & et al., 1988; Katon, Egan, & Miller, 1985; Magni, Caldieron, Rigatti-Luchini, & Merskey, 1990; Reich, Rosenblatt, & Tupin, 1983). Chronic pain patients from these studies experienced rates of major depressive disorder (MDD) ranging from 34% to 57%. In comparison, the rates of MDD in the general population at this time were 5% to 26% (American Psychiatric Association, 1987).

Identifying Psychopathology in Pain Management

The multiaxial classification system first introduced with the DSM-III (American Psychiatric Association, 1980) has become the benchmark for addressing the physiological and psychosocial components of chronic pain with a systematized approach (Reich, Rosenblatt, & Tupin, 1983). Semi-structured and structured clinical interviews based on diagnostic criteria from the various revisions of the DSM allow for direct

comparisons of prevalence of psychopathology across different contexts (Gatchel, Garofalo, Ellis, & Holt, 1996). Structured methods for assessing psychopathology include the Structured Clinical Interview for Axis I DSM-IV Disorders (SCID-I, First, Spitzer, Gibbon, & Williams, 1994) and the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II, (First, Spitzer, Gibbon, & Williams, 1994; First, Spitzer, Gibbon, Williams, & Lorna, 1994). In addition to having demonstrated good reliability and validity, the SCID allows for the determination of current and lifetime diagnoses of psychopathology, which is useful in determining whether the current pain episode preceded the occurrence of psychopathology or vice versa (Gatchel, 1996). This latter ability to distinguish the onset of pain from the onset of psychopathology aids in illuminating the synergistic relationship between the two domains (Gatchel, 1991).

The SCID I and SCID II have been used to make Axis I and Axis II diagnoses by assessing for current and lifetime psychiatric disorders in chronic pain populations. One such study examining the relationship between the onset of pain and the current and lifetime prevalence of psychiatric disorders in CLBP patients showed that 77% met lifetime diagnostic criteria for at least one psychiatric diagnosis (Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993). Additionally, 59% of these patients demonstrated current symptoms for at least one psychiatric diagnosis based on the then current SCID I and SCID II for the DSM-III-R (Kinney, Gatchel, Polatin, Fogarty, & Mayer, 1993; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993; Spitzer, Williams, Gibbon, & First, 1988). Estimates in the general population for lifetime and current rates of Axis I and Axis II diagnoses ranged from 15% to 38% (American Psychiatric Association, 1987; Regier, Boyd, Burke, Rae, Myers, Kramer, Robins, George, Karno, & Locke, 1988; Robins,

Helzer, Weissman, Orvaschel, Gruenberg, Burke, & Regier, 1984). The most commonly reported Axis I diagnoses were MDD, substance abuse, and anxiety disorders. Approximately half of the patients in this study also met diagnostic criteria for an Axis II personality disorder. Prevalence rates for psychopathology were significantly higher among the chronic pain population than in the general population. For patients with a lifetime history of anxiety disorder, 95% experienced symptoms prior to the onset of pain. MDD appeared to develop before the onset of pain in some cases, while in others it developed subsequent to the onset of pain. Of patients with a lifetime history of MDD, 54% experienced symptoms prior to the onset of pain (Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993). Among patients with a lifetime history of substance abuse, 94% experienced symptoms prior to the onset of pain. Thus, substance abuse and anxiety disorders appeared to precede chronic pain. Gender differences were also demonstrated, with males more likely to have a substance abuse diagnosis, and females were more likely to have diagnoses of MDD or an anxiety disorder (Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993).

The prevalence of psychiatric comorbid disorders has been investigated in comparisons of acute low back pain (ALBP) versus CLBP. Higher rates of psychopathology were found in the CLBP group of one such study (Kinney, Gatchel, Polatin, Fogarty, & Mayer, 1993). These chronic pain patients had higher rates of MDD, substance use disorders, and personality disorders than the ALBP group. Conversely, the ALBP patients presented with higher prevalences of anxiety disorders. Gatchel, Bernstein, Stowell, and Pransky (In Press) also found higher rates of SCID diagnosed Axis I & II psychopathology among CLBP compared to ALBP patients. A similar

pattern of results was demonstrated in a study of patients with temporamandibular disorder (TMD) that compared acute pain patients with chronic pain patients (Gatchel, Garofalo, Ellis, & Holt, 1996). These results indicated that the higher prevalence rates of mental health disorders are linked to both the onset of pain and the development of chronic pain (Gatchel, 1991).

Still unresolved is the precise nature of a causal relationship between chronic pain and psychiatric disorders. While the above referenced research pertains chiefly to chronic musculoskeletal pain, it is important to note that high rates of comorbid psychiatric disorders have been demonstrated with other conditions, including: TMD, headaches, pelvic pain, and fibromyalgia (Epstein, Kay, Clauw, Heaton, Klem, Krupp, Kuck, Leslie, Masur, Wagner, Waid, & Zisook, 1999; Kight, Gatchel, & Wesley, 1999; Okasha, Ismail, Khalil, El Fiki, Soliman, & Okasha, 1999; Savidge & Slade, 1997; Wright, Gatchel, Wildenstein, Riggs, Buschang, & Ellis, 2004). Research continues to illuminate a relationship between medical conditions, especially those chronic in nature, and higher prevalences of psychopathologies (Maier & Falkai, 1999). While 2% to 4% of the general population suffers from a mood or anxiety disorder, one study found that between 15% and 33% of medically ill inpatients suffered from such disorders (Katon & Sullivan, 1990).

Prevalence of Specific Axis I Diagnoses in Pain Populations

The multiaxial classification system utilized in the DSM-IV-TR (American Psychiatric Association, 2000) allows for the comprehensive and systematic evaluation of psychiatric disorders, while including relevant information from medical conditions, environmental factors, and level of functioning (American Psychiatric Association,

2000). Psychiatric disorders and conditions are parsed into separate domains within the multiaxial context. Clinical disorders and other conditions that may be a focus of clinical attention are coded on Axis I. Personality Disorders (PDs) and Mental Retardation (MR) are reported on Axis II. Among the Axis I disorders that have markedly high prevalences in pain populations are: MDD (Kinney, Gatchel, Polatin, Fogarty, & Mayer, 1993; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993); anxiety disorders (Burton, Polatin, & Gatchel, 1997; Fishbain, Goldberg, Meagher, Steele, & Rosomoff, 1986; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993); and substance use disorders (Fishbain, Goldberg, Meagher, Steele, & Rosomoff, 1986; Katon, Egan, & Miller, 1985; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993; Reich, Rosenblatt, & Tupin, 1983). Numerous techniques exist for evaluating Axis I disorders, including: non-structured interviews, the SCID I (First, Spitzer, Gibbon, & Williams, 1997); MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989); and MCMI-III (Millon, 1997) among these techniques.

Depression. While there is a general acknowledgement that depression is often linked to chronic pain, identifying and diagnosing depression is complicated by the lack of uniformity in assessing its symptoms. It has been defined as a mood, symptom, or syndrome, and assessed by multiple methods that make it difficult to compare results across study designs (Dersh, Polatin, & Gatchel, 2002). Likely because of the high prevalence of depression in chronic pain populations, research investigating the association between chronic pain and depression is much more abundant than other areas of research in this field. Several previously discussed studies (Kinney, Gatchel, Polatin, Fogarty, & Mayer, 1993; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993) have revealed

particularly high rates of MDD in chronic pain patients, with current rates of about 45%, and lifetime rates of approximately 65% for this disorder. In a review of 14 studies that diagnosed depression in chronic pain patients using DSM-III, DSM-III-R or DSM-IV criteria, 9 studies reported current prevalence of MDD between 30% and 54% (Banks & Kerns, 1996). Estimates around this time for MDD in the U.S. population were reported as 5% for current major depression and 17% for lifetime major depression (Blazer, Kessler, McGonagle, & Swartz, 1994).

The heterogeneity of chronic pain populations has also contributed to the difficulty in comparing results across study designs. Many researchers have examined patients with various pain sites and in multiple treatment contexts, while others have indicated that specific pain sites are more frequently associated with depression which, itself, may vary across treatment contexts. Additionally, there is an overlap in the symptoms attributed to chronic pain and depression, such as sleep disturbance, motor retardation, fatigue, and changes in weight and appetite (Dersh, Polatin, & Gatchel, 2002). Thus, the diagnostic criteria for depression in a chronic pain population are not usually straightforward. Because of the resulting impact these confounds have on assessing depression in a chronic pain population, standardized diagnostic systems based on the DSM are the most reliable methods for valid diagnoses of MDD. Using structured clinical interviews like the SCID can reduce assessment variability across study designs, thus allowing for direct comparisons (Dersh, Polatin, & Gatchel, 2002).

Recent breakthroughs have also been made in understanding the temporal nature of chronic pain and depression. Polatin et al. (Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993) demonstrated depression as both preceding chronic pain and as a consequence of

chronic pain. Depression as a consequence to chronic pain has been further demonstrated in an additional study (Magni, Moreschi, Rigatti-Luchini, & Mersky, 1994). Chronic pain and depression have also been described as similar from a physiological standpoint (Roy, Thomas, & Matas, 1984). The similarities between chronic pain and depression include anatomically coinciding affective and nociceptive (pain sensing) pathways (Hodgkiss, 1997; Magni & de Bertolini, 1983). Also, neurotransmitters involved in the gate-control mechanism for pain are the same ones (norepinephrine and serotonin) thought to be involved in mood disorders. Additionally, antidepressant medications have demonstrated efficacy in treating some chronic pain patients.

Substance Use Disorders. High comorbidity of substance use disorders in chronic pain populations has been demonstrated in numerous studies (Fishbain, Goldberg, Meagher, Steele, & Rosomoff, 1986; Katon, Egan, & Miller, 1985; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993; Reich, Rosenblatt, & Tupin, 1983). In reviewing studies that included the SCID as part of a diagnostic assessment battery, Brown and colleagues (Brown, Patterson, Rounds, & Papasouliotis, 1996) found rates of current substance use disorders ranging from 15% to 28%, while lifetime substance use disorders ranged from 23% to 41%. These disorders were higher for males than females in the chronic pain population, just as they are in the general population. However, the prevalence rates of lifetime and current substance use disorders were significantly higher for both males and females than those in the general population (Dersh, Polatin, & Gatchel, 2002).

Chronic pain may not trigger the onset of substance use disorders as frequently as once believed, as evidenced by a study that found 94% of chronic pain patients

experienced lifetime substance use disorders prior to the onset of chronic pain (Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993). While it is likely that rates of current substance use disorders are higher in chronic pain patients than the general population, the review by Brown and colleagues (Brown, Patterson, Rounds, & Papasouliotis, 1996) found chronic pain patients no more likely than other patients in a medical setting to have current substance use disorders. These findings suggest that there is not a unique risk for substance abuse among chronic pain patients, though they do have an increased risk for new substance use disorders during the five years following the onset of chronic pain (Brown, Patterson, Rounds, & Papasouliotis, 1996). Iatrogenic factors (conditions induced inadvertently by a physician or as a result of medical treatment) may be partially responsible for this increased risk, though those individuals predisposed to such disorders are at the greatest risk for new or recurrent disorders. Additionally, patients with substance use disorders had higher comorbidity rates of other DSM-III-R disorders, including MDD, anxiety disorders, and Axis II personality disorders than patients without substance use disorders. This may be indicative of patients with multiple comorbidities self-medicating their psychiatric symptoms with drugs or alcohol (Dersh, Polatin, & Gatchel, 2002).

Anxiety Disorders. Among chronic pain patients, high rates of anxiety disorders have been documented (Burton, Polatin, & Gatchel, 1997; Fishbain, Goldberg, Meagher, Steele, & Rosomoff, 1986; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993). Panic disorder and generalized anxiety disorder tend to be the most commonly diagnosed of the specific anxiety disorders, which also include agoraphobia, specific phobia, social phobia, posttraumatic stress disorder (PTSD), and obsessive compulsive disorder (OCD)

(Dersh, Polatin, & Gatchel, 2002). In studies that used the SCID and other structural interviews based on DSM criteria, the overall prevalence for anxiety disorders was similar to those estimated in the general population (Dersh, Polatin, & Gatchel, 2002). Recent findings suggest, however, that anxiety disorders are more often linked with chronic pain than has been previously reported (Dersh, Polatin, & Gatchel, 2002). In distinguishing between lifetime and current prevalences of anxiety disorders, studies have found lifetime prevalences similar to the general population, while current prevalences in chronic pain patients are significantly higher (Burton, Polatin, & Gatchel, 1997; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993).

Anxiety disorders have been diagnosed frequently in both acute and chronic pain populations, though higher prevalences of overall psychopathology have been found in chronic pain patients (Gatchel, Garofalo, Ellis, & Holt, 1996; Kinney, Gatchel, Polatin, Fogarty, & Mayer, 1993). Anxiety thus appears to be a common reaction to acute pain, while other psychiatric disorders such as MDD are more closely associated with chronic pain. These findings support Gatchel's model of progression from acute pain to chronic pain disability (Gatchel, 1991). Diatheses may include genetic predispositions to one of the anxiety disorders that are then activated by the stress of chronic pain experience. Chronic pain may thus be maintained by physiological mechanisms following the activation of an anxiety response. Fear of pain, movement, or re-injury contribute to the maintenance of pain by avoidance of activities like exercise that could contribute to pain reduction. Further, unwanted responsibilities and social obligations may be avoided, leading to decreased self-esteem and increased cognitive beliefs that exertion will increase pain. This cognitive-behavioral mediation cycle may be instituted by anxiety-

sensitive patients who catastrophically misinterpret sensations of arousal as indicative of pain (Reiss, 1991).

In a study examining patients with TMD-related pain, those patients at high risk for developing chronic jaw pain were found to be eleven times more likely to have a DSM-IV Axis I diagnosis than the general population (Wright, Gatchel, Wildenstein, Riggs, Buschang, & Ellis, 2004). Specifically, these high risk patients had a greater prevalence of anxiety disorders than the low risk group. Another study examining emotional distress in acute jaw pain (JAW) and acute low back pain (ALBP) patients revealed that both groups had more Axis I and Axis II diagnoses than the general population (Edwards, Gatchel, Adams, & Stowell, 2006). These authors also found that the JAW group specifically demonstrated higher rates of anxiety disorders than the general population.

Somatoform Disorders. The DSM-IV-TR (American Psychiatric Association, 2000) categories of somatoform disorders include pain disorder, somatization disorder, conversion disorder, and hyponchondriasis. According to DSM-IV-TR criteria, diagnosing a patient with pain disorder is appropriate when pain: is the focus of clinical presentation; causes significant distress or functional impairment; and psychological factors have an important role in the onset, severity, or maintenance of the pain (American Psychiatric Association, 2000). DSM-IV-TR criteria for somatoform pain disorder no longer consider an absence of organic etiology as relevant to the diagnosis because failure to find organic causes does not mean they are truly absent. Pain disorder can be diagnosed in both acute and chronic pain conditions. Clinicians may also specify whether the condition is associated with psychological factors or a combination of

psychological factors and a general medical condition (American Psychiatric Association, 2000). By this standard, pain disorder likely applies to most chronic pain patients.

Prevalence of Axis II Diagnoses in Pain Populations

The presence of Axis II personality disorders (PDs) can affect both the assessment and treatment phases of pain management programs. Personality disorders precede the development of chronic and acute pain disorders because, by definition, they are long-term patterns of behavior or traits that likely developed early in life (no later than early adulthood). Although they develop early in life, personality disorders may never be identified in many individuals due to lack of presentation or assessment for such a diagnosis. Comorbidity of Axis II and Axis I disorders typically indicates a poor psychiatric prognosis and higher relapse rate than comparable psychiatric patients with only Axis I diagnoses (Joffe & Regan, 1988). High rates of PDs have been documented among chronic pain patients, with prevalences ranging from 31% to 81% (Burton, Polatin, & Gatchel, 1997; Fishbain, Goldberg, Meagher, Steele, & Rosomoff, 1986; Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993; Reich, Tupin, & Abramowitz, 1983; Weisberg, Gallagher, & Gorin, 1996). Dissecting the PDs into their 10 distinct categories indicates that these disorders are more prevalent in the chronic pain population than in the general population (Weisberg & Keefe, 1997; Weisberg & Keefe, 1999). The PDs identified as most common in chronic pain patients in different studies are: histrionic (Reich, Rosenblatt, & Tupin, 1983); dependent (Fishbain, Goldberg, Meagher, Steele, & Rosomoff, 1986; Wright, Gatchel, Wildenstein, Riggs, Buschang, & Ellis, 2004); paranoid (Polatin, Kinney, Gatchel, Lillo, & Mayer, 1993); borderline (Weisberg, Gallagher, & Gorin, 1996); avoidant (Wright, Gatchel, Wildenstein, Riggs, Buschang, &

Ellis, 2004); and obsessive-compulsive personality disorder (Wright, Gatchel, Wildenstein, Riggs, Buschang, & Ellis, 2004). Overlap in diagnostic criteria and discrepancies in assessment methods and patient samples may explain some of the inconsistencies across different studies (Dersh, Polatin, & Gatchel, 2002). As with Axis I disorders, numerous techniques exist for assessing Axis II disorders, including: non-structured interviews, the SCID II (First, Spitzer, Gibbon, & Williams, 1997), MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989), and MCMI-III (Millon, 1997). Although these instruments can provide information necessary for making a diagnosis, they are intended to be used in aggregate for the declaration of a diagnosis.

Impact of Personality Disorders on Pain Treatment Outcomes. Further support for Gatchel's model of the progression from acute to chronic pain (Gatchel, 1991) was documented in a sample of patients with CLBP, in which the prevalence of PDs was much higher (60%) than in a comparable sample of patients with ALBP (Kinney, Gatchel, Polatin, Fogarty, & Mayer, 1993). Using the SCID diagnostic criteria, Gatchel and colleagues found that the presence of any PD was predictive of which ALBP patients had not returned to work six months later, although no specific PD predicted chronicity (Gatchel, Polatin, & Kinney, 1995). Gatchel and colleagues thus proposed that any Axis II diagnosis may indicate a broad deficit in coping skills associated with chronic disability. In a follow up to this study, PDs were not found to be predictive of patients who had returned to work one year later (Gatchel, Polatin, & Mayer, 1995). Further inconsistencies were documented in patients with pre-existing chronic pain. One study of CLBP patients found no association between PDs and one-year return to work status (Gatchel, Polatin, Mayer, & Garcy, 1994). In a sample of patients with chronic upper

extremity disorders, an association was found between a diagnosis of Borderline PD and lower one-year return to work status (Burton, Polatin, & Gatchel, 1997).

Gatchel additionally has researched whether psychiatric disorders are a limiting factor in the successful rehabilitation of chronic pain patients. Using the Structured Interview for DSM-III-R Diagnosis (Spitzer, Williams, Gibbon, & First, 1988) to assess prevalences of current and lifetime diagnoses in CLBP patients (n=152) beginning an intensive 3-week rehabilitation program, Gatchel and colleagues (Gatchel, Polatin, Mayer, & Garcy, 1994) found that, despite high rates of Axis I and Axis II psychiatric disorders, neither type nor degree of psychopathology were predictive of a patient's ability to successfully return-to-work one year after program completion.

More recently, researchers have investigated whether changes occur in psychopathology after intensive rehabilitation of chronic pain patients. Two studies in particular have demonstrated that effective rehabilitation can significantly diminish the prevalences of Axis I and Axis II disorders in CLBP patients (Owen-Salters, Gatchel, Polatin, & Mayer, 1996; Vittengl, Clark, Owen-Salters, & Gatchel, 1999). One such study used the Structured Clinical Interview (Non-Patient Version) for Diagnostic and Statistical Manual of Mental Disorders-III-Revised (DSM-III-R) disorders (Spitzer & Williams, 1986) to evaluate CLBP patients (n=56) for current psychiatric disorders as part of a pre-treatment screening for a comprehensive 3-week rehabilitation program (Owen-Salters, Gatchel, Polatin, & Mayer, 1996). These patients were again assessed with the SCID at six months following completion of the program. There was a significant decline in the prevalence of psychiatric disorders following treatment; in particular, somatoform pain disorder and MDD decreased significantly.

In a similar study design, rates of SCID-diagnosed Axis I and Axis II psychiatric disorders in a sample of CLBP patients preceding and following treatment in a comprehensive pain rehabilitation program were documented in a study by Vittengl and colleagues (Vittengl, Clark, Owen-Salters, & Gatchel, 1999). The prevalences of several Axis I disorders, such as somatoform pain disorder and MDD, declined following treatment (approximately six months). Notably, the authors also documented a decrease in the overall rates of PDs. Decreases in the rates of specific PDs (paranoid, obsessive-compulsive, passive-aggressive, and self-defeating PDs) were also found. These findings for Axis II disorders were unexpected considering the chronic nature of PDs and the lack of focus on treating these disorders in a rehabilitation setting (Dersh, Polatin, & Gatchel, 2002). Self-report measures of maladaptive personality traits like the Schedule for Nonadaptive and Adaptive Personality (Clark, 1993) and the original Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943) demonstrated much less change preceding and following treatment than the SCID's categorical measure results (Vittengl, Clark, Owen-Salters, & Gatchel, 1999). The SNAP and both versions of the MMPI assess personality pathology using a trait-dimensional approach in which individuals are assessed with an array of distinct, continuous traits. In this study, only measures of anger/aggression and workaholism, as measured with the SNAP, decreased significantly from pre- to post-treatment. Although significant elevations in other dimensions (such as feelings of guilt, anxiety, and cynicism) were documented prior to treatment, these did not significantly diminish. The original MMPI demonstrated similar results, with only a minor decrease in social introversion (Scale 0) from pre- to post-treatment (Vittengl, Clark, Owen-Salters, & Gatchel, 1999). In this sample, the

SNAP and MMPI demonstrated stable mean scores and profiles from pre- to post-treatment in a physical rehabilitation program, indicative of trait measures. PD diagnoses did not show such stability when assessed with the SCID II for DSM-III-R. Thus, it is questionable whether this structured interview is assessing a trait or state variable in chronic pain populations (Vittengl, Clark, Owen-Salters, & Gatchel, 1999). These findings suggest that PD diagnoses derived from interview techniques may not be based upon stable or trait characteristics (Dersh, Polatin, & Gatchel, 2002). Alternatively, these findings may indicate that the presence of chronic pain may promote regressive defenses and intensify personality traits (Monti, Herring, Schwartzman, & Marchese, 1998).

This latter explanation is consistent with Gatchel's model of the progression from acute to chronic pain, and a diathesis-stress model of the association between chronic pain and psychopathology (Gatchel, 1996). Similarly, in an examination of patients at high risk for developing chronic TMD, Wright and colleagues (2004) demonstrated that these patients tend to suppress emotional expression resulting in muscle tension and pain. Viewed from this perspective, personality disorders may result from an expression of personality patterns that are linked to maladaptive coping styles that breakdown when dealing with the stress of injury, disability, and pain. Stress likely decreases following treatment with a primary goal of functional improvement. Thus, the criterion traits for PDs may exist with these individuals from pre- to post-treatment, but are significantly decreased subsequent to treatment.

Screening for Psychopathology with the MMPI-2

When considering pain from the BPS perspective, it is only fitting that the Minnesota Multiphasic Personality Inventory-Second Edition (MMPI-2) has been used

perhaps more than any other psychological screening instrument for identifying personality factors and psychopathologies that may contribute to, or complicate, the treatment of chronic pain (Fordyce, 1976). Since the original MMPI was used to study a low back pain population in 1951 (Hanvik, 1951), the literature has become abundant and ever expansive with support for use of this measure for the intent of identifying psychiatric variables that contribute to treatment outcomes (Costello, Hulsey, Schoenfeld, & Ramamurthy, 1987).

Gatchel and colleagues (Gatchel, Mayer, & Eddington, 2006) conducted further research with the SCID I and II, while also utilizing data obtained with the MMPI-2. In their sample of patients with chronic occupational spinal disorder (COSD) who completed the MMPI-2, four distinct profile groups were identified. Aside from those identified as having a normal profile from their MMPI-2 responses, three additional profiles were identified that indicated a potential role for psychopathology in chronic pain populations. Previous research with pain populations identified the Neurotic Triad (NT) and Conversion V (CV) profiles as significant for individuals who tend to be preoccupied with somatic concerns (Sternbach, 1974). The major difference between these two profile types is that individuals with NT profiles [elevations on Scales 1 (Hypochondriasis), 2 (Depression), and 3 (Hysteria)] were expected to have a good response to treatment of musculoskeletal pain. Individuals who produced a CV profile [elevations on Scales 1 (Hypochondriasis) and 3 (Hysteria), with scale 2 (Depression) diminished by comparison] were generally shown to have poor treatment outcomes, particularly when they produced a subthreshold Scale 3 elevation. Several studies have reproduced the findings with these profiles, and the use of the MMPI-2 as a pre-treatment screening

measure has become standard procedure in many practices (Bradley, Prokop, Margolis, & Gentry, 1978; McGill, Lawlis, Selby, Mooney, & McCoy, 1983; Turk & Fernandez, 1995).

The fourth profile identified by Gatchel and colleagues (Gatchel, Mayer, & Eddington, 2006) was previously identified in the psychiatric literature as the "Floating Profile". This profile is often significant for psychological distress and turmoil. Individuals who produce such profiles are often identified as having an Axis II personality disorder, most often the DSM-IV-TR Cluster B category of Borderline Personality Disorder. Gatchel and colleagues (Gatchel, Mayer, & Eddington, 2006) relabeled this profile as the "Disability Profile" (DP) for the specific purpose of identifying, in musculoskeletal spine pain, and behavorial medicine literature, patients who may present with distinct complications. This profile in particular presents with a minimum of four elevations on the Clinical Scales. Individuals with such a profile typically lack any one specific defense mechanism with which to manage life stressors, and thereby experience much severe emotional distress. Often, these individuals are resistant to traditional psychiatric approaches. The DP and Floating Profile are similar in most ways, save for the lack of research conducted with this profile in the context of chronic pain and disability treatment (Gatchel, Mayer, & Eddington, 2006).

In Gatchel's study analyzing the DP in a COSD population, more than half (53.2%) were identified as having this particular MMPI-2 response pattern (Gatchel, Mayer, & Eddington, 2006). Of the sample of patients with a classifiable MMPI-2 profile in the COSD population, more than two-thirds (66.9%) of such profiles were of the DP code type. While patients with a normal profile were twice as likely to retain work one

year after treatment than the other three code types, those with the DP code type were 14 times more likely than those with a normal profile to have an Axis I diagnosis. There was also an occurrence of Axis II personality disorder diagnoses at almost five times that of patients with a normal profile. With such a high prevalence for identifiable psychopathology with this MMPI-2 code type, the researchers concluded that this instrument may have additional uses for identifying such psychopathology in pre-surgical, interdisciplinary pain management, and COSD treatment contexts (Gatchel, Mayer, & Eddington, 2006). This increased utility stems from the greater degree of psychopathologies (almost two-thirds) that were identified using the DP, in addition to the relatively small samples often identified with the CV and NT code types in pre-surgical and chronic pain screenings.

Screening with the Millon Behavioral Medicine Diagnostic (MBMD)

The Millon Behavioral Medicine Diagnostic (MBMD; Millon, Antoni, Millon, & Davis, 2003) was developed by Theodore Millon and colleagues with the purpose of identifying patients with chronic medical conditions who may be experiencing psychiatric difficulties. The MBMD is intended to go further than solely identifying potential psychiatric complications by also indicating specific interventions that may be helpful. Further, the authors indicate in the manual (Millon, Antoni, Millon, Meagher, & Grossman, 2001) that this instrument may be used to identify beneficial psychosocial assets for adjusting to disability and lifestyle changes, whether more communication and support is necessary to aid in treatment compliance, and to assist in developing post-treatment protocols and self-care plans. A broad normative sample was used in the development of the instrument, and as such it is now used in pre-surgical, cancer

treatment, interdisciplinary pain treatment, and other medical and behavioral environments.

The Modifying Indices of the MBMD help characterize the patient's communication style (Bockian, Meager, & Millon, 2000). As with other personality measures, the Validity Scale identifies random response patterns or confusion. Openness to share personal information is measured with the Disclosure Scale. A Desirability Scale is included that measures the tendency of some patients to present themselves in a favorable light, sometimes even at the risk of concealing a diagnosis. Conversely, the Debasement Scale measures a tendency to over-report symptoms (Bockian, Meager, & Millon, 2000).

A Psychiatric Indicators Domain, consisting of five scales, assesses for psychopathology that can contribute negatively to health maintenance and delivery (Bockian, Meager, & Millon, 2000). These scales are matched to DSM-IV-TR criteria for Axis I disorders that are most often encountered in medical populations. These diagnostic areas include: Anxiety, Depression, Cognitive Dysfunction, Emotional Lability, and Guardedness. Although these do not match up precisely with DSM-IV-TR diagnostic criteria, they may be used as supporting documentation for such diagnoses. The MBMD also consists of 11 Personality/Coping Style scales useful for identifying coping styles that are not necessarily in the range of diagnosable Axis II PDs. Additionally, the MBMD has a Health Moderators Domain for the purpose of identifying patient characteristics that may influence medical outcomes including use of medical services, treatment success, and adherence to treatment. A synthesis of all the other domains is contained in the Treatment Prognostics Domain of the MBMD. This

summative domain is useful for making predictions regarding a patient's reaction to a diagnosis and treatment in order to optimize patient care (Bockian, Meager, & Millon, 2000).

Because of the recency with which this instrument became available, the literature has not yet reached the levels as that of other measures like the MMPI-2 or the SCID I and II in different populations. Of the few publications available via PsycInfo, no study in particular pertained to a heterogeneous chronic pain cohort. One dissertation study (Meagher, 2005) demonstrated that the MBMD was an effective instrument for predicting medication regimen adherence for patients with HIV. Another researcher (Diaz, 2004) found the MMPI-2 to be useful for predicting length of stay in a chronic headache inpatient program, but did not find the MBMD to be useful for such a prediction. Two separate studies of gastric bypass patients utilized the MBMD as a psychosocial outcome measure (List Kalnins, 2006; Schelling, 2004). Another dissertation found no significant effects for predicting the roles of psychosocial factors on diabetes control using the MBMD (Kleinman, 2000). A comprehensive search of EBSCO Host and PsycInfo databases for the MBMD yielded no publications that compared the use of the MBMD with the MMPI-2 in heterogeneous pain populations participating in interdisciplinary treatment.

Scope of the Problem

It is important to consider comorbid psychiatric disorders when treating patients with chronic pain. As the above referenced items indicate, Axis I and Axis II disorders have a fundamental influence on the individual experience of pain. Axis II disorders

seem to have a particularly strong relationship with the development of chronic pain. When interdisciplinary treatment professionals try to account for comorbid mental disorders in a pain population, the question of what instrumentation is best for the assessment of psychiatric disorders must be considered as intrinsic to successful treatment. The strengths and the limitations of such instruments and the contexts in which they have been validated must also be taken into consideration.

Purpose of the Current Study. The current study examined patients entering the interdisciplinary pain treatment program at The Eugene McDermott Center for Pain Management (The Center) at The University of Texas-Southwestern Medical Center at Dallas. We sought to evaluate the presence of psychiatric disorders as measured with the MMPI-2 at pre-treatment. Success within the pain management program was measured by multiple behavioral outcome instruments. Additionally, responses on the MMPI-2 and outcome measures were compared to response sets on the MBMD for a subset of patients who also completed the MBMD. Patients were further divided within each of the pain categories as either classifiable or non-classifiable by one of four profile types from the MMPI-2. Only valid MMPI-2 results were used for analysis. As with the study by Gatchel and colleagues (Gatchel, Mayer, & Eddington, 2006), of those patients with valid profiles who were classifiable based upon MMPI-2 response patterns, the following categories were used to determine into which category a patient was classifiable:

Group 1. Normal Profile (NP) – Patients with no clinical scale elevations.

Group 2. Disability Profile (DP) – Patients with MMPI-2 profiles that have four or more elevations on the clinical scales.

Group 3. Conversion V (CV) – Patients with MMPI-2 elevations on Scales 1 and 3 only.

Group 4. Neurotic Triad (NT) – Patients with Clinical Scale elevations on Scales 1, 2, and 3 only.

Classification into these profile types was based upon the procedure used by Gatchel and colleagues (2006). Patients who did not meet criteria for any of these profile types were not included in the subsequent analyses. Subjects were further categorized into groups according to their specific pain diagnosis upon entry into the interdisciplinary pain program.

Group 1. Musculoskeletal Pain – Patients diagnosed with musculoskeletal pain affecting one or more body regions. Specific diagnoses included: temporamandibular jaw pain (TMJ), cervical, thoracic, lumbar, myalgia, myositis, myofascial pain, osteoarthritis, sacroillitis, facet arthropathy, muscle spasm, post-laminectomy syndrome, lumbosacral spondylosis without myelopathy, cervical spondylosis without myelopathy, and other musculoskeletal pain diagnoses.

Group 2. Neuropathic Pain – Patients diagnosed with various forms of neuropathies. Diagnoses included: reflex sympathetic dystrophy (RSD) for specified and unspecified sites, phantom limb syndrome, diabetic polyneuropathy, herpes zoster with unspecifified complication, neuralgia, and neuritis.

Group 3. Visceral Pain – Patients diagnosed with pain resulting from injury or inflammation to internal organs, affecting areas including the

abdominal and pelvic regions, pain may also have resulted from a diagnosis with cancer.

Group 4. Headache – Patients diagnosed with pain resulting in or from headache.

Group 5. Fibromyalgia – Patients with a singular diagnosis of fibromyalgia.

Group 6. Multiple Categories of Pain – Patients diagnosed with pain that meets the criteria for two or more of the above classification groups.

Hypotheses for the proposed study were as follows:

Hypothesis 1. It was predicted that patients from all pain categories, who also presented with the NP (normal profile) response pattern on the MMPI-2 at pre-treatment, would be more likely than patients from the three non-normal groups (DP, CV, and NT) combined to have better socioeconomic outcomes (e.g., return-to-work, work retention, etc.) at post-treatment and at one-year following treatment.

Hypothesis 2. It was expected that patients with the DP response pattern on the MMPI-2 in all pain categories would endorse more pathology on the Millon Behavioral Medicine Diagnostic (MBMD; Millon, Antoni, Millon, & Davis, 2003) at pre-treatment, relative to the other three MMPI-2 categories.

Hypothesis 3. It was expected that patients with the DP response pattern on the MMPI-2 in all pain categories would have had more individual pain diagnoses from:

a. pre- to post-treatment, relative to the other three MMPI-2 categories.
b. pre-treatment to one-year follow-up, relative to the other three MMPI-2 categories.

Hypothesis 4. It was expected that patients with the DP response pattern on the MMPI-2 in all pain categories would have had more procedures for pain treatment from:

a. pre- to post-treatment, relative to the other three MMPI-2 categories.
b. pre-treatment to one-year follow-up, relative to the other three MMPI-2 categories.

Hypothesis 5. It was expected that patients with the DP response pattern on the MMPI-2 in all pain categories would have greater psychosocial issues (e.g., determined by scores on the SF-36, MPI-II, BDI-2, MVAS, etc.) from:

a. pre- to post-treatment, relative to the other three MMPI-2 categories.
b. pre-treatment to one-year follow-up, relative to the other three MMPI-2 categories.

Hypothesis 6. It was anticipated that DP patients would be more likely than the other three MMPI profile categories to be classified as having more than one pain categorization. For instance, patients with the DP code type would be more likely to be classified as having multiple categories of pain, as these individuals were expected to have more complications in treatment.

Hypothesis 7. It was expected that patients in the Multiple Pain Category group would endorse more pathology on the MMPI-2 and MBMD at pre-treatment relative to patients with a single pain diagnostic category.

Hypothesis 8. It was expected that patients in the Multiple Pain Category group would have had more medical requirements(e.g., procedures) for pain treatment and medication needs from:

a. pre- to post-treatment, relative to patients with a single pain diagnostic category .
b. pre-treatment to one-year follow-up, relative to patients with a single pain diagnostic category.

Hypothesis 9. It was expected that patients in the Multiple Pain Category group would have greater psychosocial issues (as measured with instruments such as the SF-36, Oswestry Disability Questionnaire, MPI-II, BDI-2, MVAS, etc.) from:

a. pre- to post-treatment, relative to patients with a single pain category.
b. pre-treatment to one-year follow-up, relative to patients with a single pain category.

CHAPTER THREE
Methodology

Participants

The cohort (*n*= 755) for analysis was drawn from a database of consecutive patients (*N*= 3,586) who were at varying points of treatment in an interdisciplinary pain management program, from January 1998 to June 2007, at The Eugene McDermott Center for Pain Management at The University of Texas-Southwestern Medical Center in Dallas (The Center). The remaining patients were participants in Medical only, Physical Therapy only, or Behavioral Medicine only programs. Patients were considered eligible for participation if they were over 18 years old at the time of their entry into one of the programs. The following groups were attained for the final analysis:

A total of 755 patients were selected from the database for analysis. Valid and classifiable profiles from the MMPI-2 were used to determine if symptoms of psychopathology were present, and to categorize patients based upon the following four response patterns for the final analysis: Normal Profile (NP, *n*= 92); Disability Profile (DP, *n*= 461); Conversion V (CV, *n*= 118); and Neurotic Triad (NT, *n*= 79). A profile was considered valid based upon interpretation of the L, F, and K scales. For the purpose of analysis an MMPI-2 profile was considered valid if the T-scores for L were below 65, for F below 100, and between 40 and 65 for the K scale. Profiles were then classifiable into one of the four profile types based upon the number of Clinical Scale elevations over a T-score of 65. A total of four or more scales were required to be elevated for the DP group. Scales 1, 2, and 3 must be similarly elevated for the NT group. For the CV group, Scales 1 and 2 only were required to be elevated. The NP group was required to have no

elevations over a T-score of 65. Patients who did not meet criteria of valid and classifiable MMPI-2 profile types were not included in the subsequent analyses.

Documentation of patients' specific pain pathology was used to divide the participants into the following separate categories based upon pain typology. Of the sample of patients with valid and classifiable MMPI-2 profiles, a total of 668 patients had physical diagnoses that were classifiable into one of the six pain categories. Musculoskeletal Pain (*n*= 345) accounted for the largest membership in a pain category. The remaining groups were composed of: Neuropathic Pain (*n*= 7); Visceral Pain (*n*= 63); Headache (*n*= 22); Fibromyalgia (*n*= 30); and Multiple Pain Categories (*n*= 266).

Procedure

The study exclusively examined patients in the interdisciplinary pain management programs. Patients were referred to The Center by their treating physicians. After scheduling an appointment with one of the pain physicians at The Center, patients were mailed a packet which they completed and returned to The Center at their first appointment. Included in this packet were consent forms for treatment, and variables pertaining to medical history, level of pain, previous treatment, medications, vocational status, and demographic variables. Following an initial evaluation by a physician, a determination of pain diagnosis was made, along with a treatment plan. In order to determine eligibility to participate in the treatment protocols, the patients were referred to a psychologist and a physical therapist within The Center for additional evaluations.

The patient completed several self-report psychological measures and participated in a diagnostic interview with the treating psychologist. Testing and interview results were combined to arrive at a behavioral medicine treatment plan,

consisting of specific cognitive-behavioral goals and a regimen that might include recommendations for individual, group, and family sessions. Individual sessions often consisted of cognitive-behavioral therapy, biofeedback, relaxation training, and stress management. Patients participating in group sessions received psycho-educational training on topics including sleep hygiene, nutrition, gate control theory of pain, and rational-emotive behavioral therapy to interrupt the cycle of pain. Single family sessions were designed to educate family members about the biopsychosocial model of pain and how communication was important for optimal results.

A physical therapy component was included in the treatment regimen. Physical therapists (PT) evaluated patients according to level of functioning on five scales: Aerobic Fitness, Range of Motion, Strength, Activities of Daily Living, and Fear of Exercise. Treatment recommendations for number of physical therapy sessions prescribed and other treatment modalities were made based upon these scales by the PT.

Weekly conferences were held by the interdisciplinary treatment team to discuss patients from the interdisciplinary treatment programs. Patient progress was typically evaluated at three different points (initial evaluation, mid-point, and discharge). Patient results were also reviewed at conference if any particular compliance or treatment complications arose along the way.

Data were collected at pre-treatment, post-treatment, and one-year follow-up. These data sets were examined for any changes that occurred from one collection point to the next. Results of the MMPI-2 collected at pre-treatment were compared to several instruments and outcome measures to determine if differences on the MMPI-2 at the pre-treatment collection point were predictive of outcomes of treatment in a heterogeneous

pain population at post-treatment and one-year follow-up. Patient data, including physical and emotional variables, were analyzed to determine whether the presence of three abnormal response patterns on the MMPI-2 at pre-treatment affected success and progression in the pain management program at post-treatment and one-year follow-up.

Instruments and Outcome Measures

Minnesota Multiphasic Personality Inventory-Second Edition (MMPI-2; Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989). Administered at pre-treatment, the MMPI-2 is a 567 item self-report measure of personality functioning and psychiatric symptoms. The MMPI-2 is useful in identifying Axis I symptoms but may also be applied to the identification of Axis II disorders. It is the most commonly used personality assessment tool in general, and it is used prominently in the assessment of musculoskeletal chronic pain patients (Turk & Fernandez, 1995). The MMPI-2 has a reported test-test reliability coefficient of .74 and internal consistency correlation of .87 (Parker, Hanson, & Hunsley, 1988). It was deemed to have good discriminate validity, with effectiveness in distinguishing between psychiatric and control groups, neurotic and psychotic groups, and depression versus anxiety (Zalewski & Gottesman, 1991).

Millon Behavioral Medicine Diagnostic (MBMD; Millon, Antoni, & Millon, 2001). Administered at pre-treatment, the MBMD is a 165 item self-report battery useful for helping to identify psychosocial factors that may influence a patient's response to treatment, treatment compliance, and communicative needs during and following treatment. Reliability has been reported as satisfactory for this instrument, with an internal consistency estimate of .79 and median test-retest estimates of .83 (Millon, Antoni, Millon, Meagher, & Grossman, 2001).

Oswestry Disability Questionnaire (OSW; Fairbank, Couper, Davies, & O'Brien, 1980) This 10 item scale allows patients to self-rate the degree of functioning impairment they are experiencing in their routine daily activities. Each question is rated from 0 to 5, with higher scores representing higher degrees of self-perceived functional impairment. A total score of 50 is attainable with the OSW, with questions concerning pain intensity, personal care, lifting, sitting, standing, walking, traveling, social activities, sleeping, and degree of improvement. Degree of disability is assessed by categorizing responses with the following cut-off scores: 0-10 minimal disability; 11-20 moderate disability; 20-30 severe disability; 30-40 is categorized as "crippled"; and scores in the 40-50 range are classified as "bed-bound or exaggeration of symptoms". The Oswestry has been determined to have strong internal consistency, strong validity, and a high degree of test-retest reliability (Fairbank, Couper, Davies, & O'Brien, 1980).

West-Haven-Yale Multidimensional Pain Inventory-2 (MPI-2; Kerns, Turk, & Rudy, 1985). The MPI is a self-administered 56-item inventory composed of three sections. The first section of questions pertains to psychosocial impacts of pain on daily activities, perceived control, and support from significant others. The second section asks patients how they believe their significant others react to their pain. The third section pertains to the patient's level of activity in several areas. A composite of these three sections results in the identification of the coping style the patient presently relies upon. The MPI is based on the BPS and cognitive-behavioral perspectives of pain, and was normed and developed for use with chronic pain patients (Turk, Meichenbaum, & Genest, 1983). The MPI has internal consistency reliability in the range of .70 to .90, and

test-retest reliability in the range of .62 to .91. The test developers assessed validity through correlation with other measures and deemed it sufficient.

Medical Outcomes Shortform-36 Health Status Questionnaire (SF-36; Ware, Snow, Kosinski, & Gandek, 1993). This 36-item self-report inventory assesses the health related quality of life in physical and mental arenas. Commonly used for monitoring of outcomes in healthcare venues, the SF-36 is composed of eight subscales and two composite scales. The composite scales serve a summary function for patients' reported sense of physical (Physical Component Scale; PCS) and mental (Mental Component Scale; MCS) well-being. This measure is especially useful because of normative data available from medical populations, as well as a reported high test-retest reliability coefficient. Cronbach's alphas have been reported above .80 for internal consistency (Ware, Snow, Kosinski, & Gandek, 1993).

CAGE Questionnaire (CAGE; Ewing, 1984; Mayfield, McLeod, & Hall, 1974). Administered as a self-reported instrument during intake at The Center, the CAGE consists of four items used to assess alcohol use and abuse. CAGE is actually an acronym based upon the four questions it is composed of: Have you ever considered Cutting down on the amount you drink? Do you feel Annoyed when friends or family members express concern about the amount you drink? Do you feel Guilty about your drinking? Do you ever need and Eye-opener to help you get going in the morning? The CAGE has good sensitivity and specificity in distinguishing between alcohol abusers and non-abusers (Beresford, Blow, Hill, Singer, & Lucey, 1990).

Beck Depression Inventory-II (Beck, Steer, & Brown, 1996). Administered at pre- and post-treatment, the BDI-II is a 21-item multiple-choice instrument that measures

behavioral signs of depression in the ranges of: normal (0-9); mild depression (10-15); mild to moderate (16-19); moderate to severe depression (20-29); and severe depression (30+). The BDI-II has demonstrated good internal consistency reliability coefficients (> . 73) in non-clinical populations. Good validity has been demonstrated as well, in a comparison with the Hamilton Rating Scale for Depression, correlations of .73 and greater were found (Beck, Steer, & Brown, 1996).

Hamilton Rating Scale for Depression. (HAM-D; Hamilton, 1960). Administered at pre-treatment during the behavioral evaluation, the HAM-D consists of a structured interview format designed to assess the symptomatology of depression. Seventeen items from multiple content areas are ranked on 3- to 5-point scales, with higher rankings representing higher degrees of symptom severity. Rush and colleagues (Rush, Beck, Kovacs, & Hollon, 1977) reported good inter-rater reliability for the instrument, with a correlation coefficient of .90. Concurrent validity has been reported as high as .73 with the BDI-II (Beck, Steer, & Garbin, 1996).

Million Visual Analog Scale (MVAS; Million, Haavik-Nilsen, Jayson, & Baker, 1981). The MVAS is composed of 15 self-report items with response on a visual analog scale ranked from 0 to 10. In this continuum, 0 represents an absence of pain and 10 represents the highest degree of physical pain for this series of questions. A total score is computed by summing each of the scores from the 15 individual items. The MVAS is useful when reported pain exceeds that which can be objectively measured through physical findings, and may indicate a psychosocial component playing a role in pain (Capra, Mayer, & Gatchel, 1985).

Pain Drawing Analogue (*PDA; Anagnostis, Mayer, Gatchel, & Proctor, 2003).* Similar to the first question of the MVAS, the PDA consists of one question on a single scale ranked from 0 to 10, with 0 representing an absence of pain and 10 representing the highest degree of pain. An anthropomorphic drawing is available above this line for patients to indicate the location of their pain, while the line itself is used to rate the pain experience. The PDA has demonstrated good psychometric properties (Gatchel, Mayer, Capra, Diamond, & Barnett, 1986).

Design and Statistical Analyses

Categories based upon MMPI-2 elevations consisted of: NP, DP, CV, and NT. Patients who did not meet criteria for any of the four MMPI-2 profile types were not included in the subsequent analyses. The presence of psychopathology was deemed as true if a patient responded with one of the abnormal MMPI-2 profile types of DP, CV, or NT. Patients were considered to have an absence of psychopathology if they responded with a NP code type on the MMPI-2. The second stage of analyses involved identifying patients based upon pain typology into the categories of: musculoskeletal, neuropathic pain, visceral pain, headache, fibromyalgia, and multiple categories of pain. Demographic data were analyzed with Pearson Chi-square analyses for the groups. Chi-square analyses were used to analyze outcome measures with categorical responses. Statistical analyses of group mean differences at pre-treatment were performed using ANOVAs for outcome measures with a single response scale and MANOVAs for outcome measures with multiple response scales. Repeated measures ANCOVAS and MANCOVAS were performed on outcome measures administered at pre-, post-treatment

and one-year follow-up to assess outcomes from pre- to post-treatment and pre-treatment to one-year follow-up for within group differences.

CHAPTER FOUR
Results

Demographic Variables: Descriptive Analyses

During the time period of January 1998 to June 2007, there were 3,586 patients evaluated at The Center and subsequently tracked via database for quality assurance purposes. As can be seen in Table 1, 63.5% of this sample was female and 36.1% was male. The majority of the sample was Caucasian (73.2%). The remaining portions of the sample were comprised of African-American (10.4%), Hispanic (4.1%), Asian-American (1.4%), and Other races/ethnicities (1.1%). An additional 9.8% of the cohort did not endorse a demographic variable for Race/Ethnicity during intake. The average age of the sample was 51.73 years, and ranged from a minimum of 12-years-old to a maximum of 98-years-old. More than half (54.8%) of the sample was married. A total of 12.5% of the sample was single, 12.5% was separated or divorced, 5.4% reported their spouse as deceased, and 2.6% reported living with a significant other. Approximately 12.2% of patients from this sample did not endorse any of the marital status choices during their intake. The average duration of pain was 85.25 months, with a median of 36 months since the reported first onset of pain. The majority of the sample had a chronic pain condition, with duration greater than six months (77.7%). Sub-acute pain conditions, with durations of three to six months, accounted for 6.8% of the cohort, while 3.4% reported acute pain conditions, or duration less than three months. An additional 12.1% did not report statistics for the duration since the onset of their pain during their intake. The majority of the sample reported having no pending litigation related to his or her pain condition (71.9%) and was not receiving disability payments (63.8%). Approximately 56.1% of the

sample participated in an interdisciplinary treatment program that included behavioral therapy as part of the treatment plan. The remainder of the sample participated in the various other programs offered at The Center, including: medical treatment only, medical & physical therapy combined, and behavorial medicine only.

The core sample for analysis was composed of the patients who were at least 18 years old at the time of treatment, participated in interdisciplinary treatment with a behavioral component, and completed an MMPI-2 that was valid and could be classified into one of four profile types (n= 755). An ANOVA for demographic differences demonstrated no significant differences for age for those patients who met selection criteria versus those who did not, $F(1, 3{,}553) = 3.24$, $p > .05$. Gender was also not a significant factor for those patients who met selection criteria versus those who did not, χ^2 (1, n= 3,573) = .52, $p > .05$. However, race/ethnicity was a significant factor for those patients who met selection criteria versus those who did not, χ^2 (5, n= 3,235) = 14.34, $p < .05$. Caucasian patients were significantly more likely to meet criteria for selection than patients from other race/ethnic groups.

Of the 755 patients selected for analysis, approximately 64.8% was female and 35.2% was male. The majority of the sample was Caucasian (82.5%). The remaining portions of the sample were comprised of African-American (9.3%), Hispanic (3.7%), Asian-American (.7%), and Other races/ethnicities (.5%). An additional 3.3% of the cohort did not endorse a demographic variable for Race/Ethnicity during intake. The average age of the sample was 50.91 years and ranged from a minimum of 18-years-old to a maximum of 91-years-old. More

than half (59.3%) of the sample was married. A total of 13.1% of the sample was single, 14.2% was separated or divorced, 5% reported their spouse as deceased, and 3.2% reported living with a significant other. Approximately 5.0% of patients from this sample did not endorse any of the marital status choices during their intake. The average duration of pain was 95.51 months, with a median of 48 months since the reported first onset of pain. The majority of the sample had a chronic pain condition (85.6%). Sub-acute pain conditions accounted for 7% of the cohort, while 2.1% reported acute pain conditions. An additional 5.3% did not report statistics for the duration since the onset of their pain during their intake. The majority of the sample reported having no pending litigation related to his or her pain condition (78%) and was not receiving disability payments (65.8%). From the core sample of 755 patients, 669 had physical diagnoses available for analysis in the database. Patients were classifiable by the pain categories of: Musculoskeletal Pain (n= 280), Neuropathic Pain (n= 7), Visceral Pain (n= 63), Headache Pain (n= 22), Fibromyalgia (n= 30), and Multiple Categories of Pain (n= 266). A summary of these findings is in Table 2.

Comparison of Measures at Pre-Treatment

Pearson chi-square analyses were performed on the categorical variables collected in the pre-treatment database to determine if there were any significant differences between the four MMPI profile groups based on the following measures: Assignment to IDIS or MDBH; Workers Compensation or Private Insurance; Gender; Race/Ethnicity; Disability Payments; Pending Litigation (related to injury); Status of the

Pain Condition; Vocational Status; Marital Status; Smoker or Non-Smoker; Acknowledgment of Substance Abuse History; and alcohol abuse as measured by the CAGE questionnaire. Parametric analyses were consisting of MANOVAs and ANOVAs were performed for the remaining pre-treatment outcome measures and scales, including: Pain Category; time in months since the onset of pain; total physical diagnoses at intake; total procedures for pain prior to intake; total surgeries for pain condition prior to intake; total number of prescriptions taken for pain; physical (PCS) and mental component scales (MCS) of the SF-36 (and associated subscales); selected MMPI-2 content scales; Hamilton Rating Scale for Depression; all subscales of the MBMD; all subscales from the MPI-II; the BDI-2; Pain Drawing Analogue; Million Visual Analogue Scale; Oswestry Pain Disability Questionnaire; healthcare visits in the preceding six months; number of emergency room visits related to pain in the preceding six months; and the total from the CAGE alcohol use questionnaire.

Chi-Square Analyses

Track Assignment. When examining track assignment to treatment with or without physical therapy, the results of the Pearson chi-square analyses were not significant between the MMPI-2 profile categories, χ^2 (3, n= 755) = 1.23, $p > .05$. When MMPI-2 profile categories were collapsed to Normal versus Non-normal for a 2x2 comparison with track assignment, Pearson chi-squares were not significant, χ^2 (1, n= 755) = .001, $p > .05$.

Workers' Compensation or Private Insurance. When examining whether there were differences among MMPI-2 profile groups depending on whether or not the patient was utilizing workers' compensation, the results of the Pearson chi-square analyses were

not significant among the MMPI-2 profile categories, χ^2 (3, n= 62) = 3.17, p > .05. When MMPI-2 profile categories were collapsed to Normal versus Non-normal for a 2x2 comparison with insurance, Pearson chi-squares were again not significant, χ^2 (1, n= 62) = 3.09, p > .05.

Gender. There were significant differences among MMPI-2 profile groups depending on gender, χ^2 (3, n= 755) = 11.07, p < .05. When MMPI-2 profile categories were collapsed to Normal versus Non-normal for a 2x2 comparison with gender, Pearson chi-squares remained significant, χ^2 (1, n= 755) = 6.08, p < .05. These results indicate that women were more likely than men to obtain one of the Non-normal profiles (DP, CV, or NT). Further 2x2 chi-square analyses were then performed comparing each of the Non-normal profile types to the other three. In comparing the DP profile to all other profiles, chi-square analyses were significant, χ^2 (1, n= 755) = 9.39, p < .01, again indicating that women were more likely than men to obtain a Disability Profile on the MMPI-2 in this sample. Similar analyses were compared for the CV and NT groups in comparison to the other profile types, with no significant results obtained.

Race/Ethnicity. Results of the Pearson chi-square analysis were not significant among the MMPI-2 profile categories for race/ethnicity, χ^2 (12, n= 730) = 13.39, p > .05. When MMPI-2 profile categories were collapsed to Normal versus Non-normal for a 2x2 comparison with Caucasian and Non-White, Pearson chi-squares were significant, χ^2 (1, n= 730) = 4.92, p < .05. The results indicated that non-Caucasian patients were more likely to obtain a Non-normal profile with the MMPI-2. Further 2x2 chi-square analyses were then performed comparing each of the Non-normal profile types to the other three.

In comparing the DP profile to all other profiles, chi-square analyses were not significant, χ^2 (1, n= 730) = 2.89, p > .05, indicating that Non-White patients were no more likely than Caucasian patients to obtain a Disability Profile on the MMPI-2 in this sample. Similar analyses were compared for the CV and NT groups in comparison to the other profile types, with no significant results found.

Disability Payments. When examining whether there were differences among MMPI-2 profile groups depending on whether or not the patient was receiving disability payments, the results of the Pearson chi-square analyses were significant, χ^2 (3, n= 699) = 26.27, p < .001. When MMPI-2 profile categories were collapsed to Normal versus Non-normal for a 2x2 comparison with receipt of disability payments, Pearson chi-squares were significant, χ^2 (1, n= 699) = 22.46, p < .001. Further analyses revealed that individuals in the DP group were most likely to be receiving disability payments, followed by NT, CV, and NP in rank order.

Pending Litigation. When examining whether there were differences among MMPI-2 profile groups depending on whether or not the patient had pending litigation, the results of the Pearson chi-square analyses were not significant, χ^2 (3, n= 686) = 2.69, p > .05. When MMPI-2 profile categories were collapsed to Normal versus Non-normal for a 2x2 comparison with pending litigation, Pearson chi-squares remained non-significant, χ^2 (1, n= 686) = .91, p > .05.

Status of Pain Condition. Depending upon the reported duration of a patient's pain, a rating was entered into the database as: Acute (< 3 Months), Sub-Acute (3-6 Months), or Chronic (> 6 Months). When examining whether there were differences

among MMPI-2 profile groups depending on status of the pain condition, the results of the Pearson chi-square analyses were not significant among the MMPI-2 profile categories, χ^2 (6, n= 715) = 3.14, $p > .05$.

Diagnosis Category. Based upon the type of pain, patients were assigned to Pain Category groups for the purpose of analysis. When examining whether there were differences among MMPI-2 profile groups depending on diagnosis categories, the results of the Pearson chi-square analyses were not significant among the MMPI-2 profile categories, χ^2 (15, n= 668) = 23.79, $p > .05$.

Vocational Status. A code was entered into the database depending upon each patient's status of retaining work, returning to work, or being unemployed at the time of intake. For the purposes of analysis, 14 different vocational codes were re-coded into a binomial variable of working or not-working. When examining whether there were differences among MMPI-2 profile groups depending on vocational status, the results of the Pearson chi-square analyses were significant among the MMPI-2 profile categories, χ^2 (3, n= 660) = 29.31, $p < .001$. Analyses were then performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal. Chi-square analysis results for this comparison were significant, χ^2 (1, n= 660) = 22.59, $p < .001$. Results of these analyses indicated that NP and CV patients were more likely than DP and NT patients to be employed at the time of intake.

Marital Status. Marital status was initially rated as: Single, Married, Living with Significant Other, Separated/Divorced, or Spouse Deceased. When examining whether there were differences among MMPI-2 profile groups depending on marital status, the results of the Pearson chi-square analyses were significant among the MMPI-2 profile

categories, χ^2 (12, n= 717) = 28.49, $p < .05$. When marital status categories were collapsed to Married versus Not Married for a 2x2 comparison with MMPI-2 profile category, Pearson chi-squares were significant, χ^2 (3, n= 717) = 14.20, $p < .01$. The DP group (n= 437) had the highest percentage (42.3%) of non-married individuals compared to the other three groups.

Smoker or Non-Smoker. There were no significant differences among MMPI-2 profile groups depending on smoker status, χ^2 (3, n= 282) = 1.75, $p > .05$. The CV group (n= 38) had the highest percentage (39.5%) of smokers compared to the other three groups.

Acknowledgment of Substance Abuse History. When examining whether there were differences among MMPI-2 profile groups depending on ASAH responses, the results of the Pearson chi-square analyses were not significant among the MMPI-2 profile categories, χ^2 (3, n= 274) = 2.35, $p > .05$. The CV group (n= 35) had the highest percentage (14.3%) of individuals who acknowledged a history of substance abuse compared to the other three groups.

Analysis of Pre-Treatment Data by ANOVA

Duration of Pain. An ANOVA revealed that MMPI-2 profile category did not have a statistically significant effect on duration of pain, F(3,600) = 1.67, $p > .05$. A similar comparison, revealed that category of pain did have a statistically significant effect on duration of pain, F(5,600) =.62, $p > .05$. Further, there were no statistically significant interaction effects between pain category and MMPI-2 profile type, F(13, 600) = .81, $p > .05$.

Total Number of Physical Diagnoses. Individual diagnoses were entered into the database for quality assurance purposes and a sum of diagnoses was computed for the purpose of analyses. An ANOVA revealed that MMPI-2 profile category did not have a statistically significant effect on the number of individual diagnoses, $F(3,667) = .79$, $p > .05$. An additional ANOVA, however, revealed that pain category did have a statistically significant effect on the total number of physical diagnoses, $F(5,667) = 88.24$, $p < .001$. Predictably, patients in the Multiple Categories pain group ($n = 266$) had the highest mean (3.33) for number of diagnoses.

Total Number of Procedures. During intake at The Center, patients were asked to report the number and different types of non-surgical procedures they had received for their pain prior to intake. An ANOVA revealed that MMPI-2 profile category had a statistically significant effect on the total number of pain procedures, $F(3,662) = 4.07$, $p < .01$. Post-hoc analysis revealed patients from the Neurotic Triad group had the highest number of procedures. An additional ANOVA revealed that pain category had a statistically significant effect on the total number of pain procedures, $F(5,662) = 4.48$, $p = .001$. Predictably, patients in the Multiple Categories pain group ($n = 265$) had the highest mean (2.66) for number of procedures. Further analysis revealed an interaction between pain category and MMPI-2 profile type that had a statistically significant effect on total number of pain procedures, $F(13, 662) = 1.97$, $p < .05$. Closer analysis revealed that this effect may have resulted from an inflated number of diagnoses from one patient in the Neurotic Triad and Headache Pain cross-comparison.

Total Number of Surgeries. Patients were asked to report the number and different types of surgical procedures they had received for their pain prior to intake. An

ANOVA revealed that MMPI-2 profile category did not have a statistically significant effect on the total number of surgical procedures, $F(3,652) = .16$, $p > .05$. An additional ANOVA revealed that pain category had a statistically significant effect on the total number of surgical procedures, $F(5,652) = 3.34$, $p < .01$. Further analysis revealed no statistically significant interaction between pain category and MMPI-2 profile type on total number of surgical procedures, $F(13, 652) = .36$, $p > .05$.

Number of Different Pain Prescriptions. During their treatment at The Center, patients were often treated with a number of prescriptions for pain. As part of this process, the numbers of different prescriptions for pain were entered into the database for quality assurance purposes. A sum total for these prescriptions was computed for the purpose of this analysis. An ANOVA revealed that MMPI-2 profile category did not have a statistically significant effect on the total number of pain prescriptions, $F(3,632) = .87$, $p > .05$. An additional ANOVA revealed that pain category did not have a statistically significant effect on the total number of pain prescriptions, $F(5,632) = .16$, $p > .05$. Further analysis revealed no statistically significant interaction between pain category and MMPI-2 profile type on total number of pain prescriptions, $F(13, 632) = .71$, $p > .05$.

Hamilton Rating Scale for Depression. A number of patients who completed the MMPI-2 also completed the HAM-D. MMPI-2 profile type had a statistically significant effect on HAM-D scores, $F(3,248) = 17.81$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the DP profile group ($n = 163$, $\mu = 20.50$) had a significantly higher mean score on the HAM-D than the other three profile types. Pain category did not have a significant effect upon the HAM-D, nor was there any significant interaction between MMPI-2 profile type and pain category.

Additional Self-Report Measures. MMPI-2 profile type did not have a statistically significant effect on the PDA Total Score, $F(3, 597) = 1.84$, $p > .05$. Pain category did not have a significant effect upon the PDA, nor was there any significant interaction between MMPI-2 profile type and pain category. MMPI-2 profile type had a statistically significant effect on the MVAS Total Score, $F(3,582) = 12.41$, $p < .001$. Post-hoc analysis revealed that patients from the NP group reported the lowest mean score ($n = 69$, $\mu = 73.62$), relative to the three non-normal profile types. Pain category had a significant effect on the MVAS, $F(5,582) = 3.11$, $p < .01$. MMPI-2 profile type had a statistically significant effect on the Oswestry Total Score, $F(3,573) = 6.19$, $p < .001$. Post-hoc analysis revealed that patients from the NP group obtained the lowest mean score ($n = 65$, $\mu = 16.06$), relative to the three non-normal profile types. Pain category had a significant effect on the Oswestry, $F(5,573) = 2.79$, $p < .05$.

MMPI-2 profile type did not have a statistically significant effect on the number of healthcare visits in the preceding six months, $F(3,506) = 1.26$, $p > .05$. Further, MMPI-2 profile type did not have a statistically significant effect on the number of ER visits in the preceding six months, $F(3,532) = .09$, $p > .05$. Pain category did not have a significant effect upon healthcare or ER visits, nor were there any significant interactions between MMPI-2 profile type and pain category upon these variables.

Analysis of Pre-Treatment Data by MANOVA

SF-36 and Associated Subscales. During the behavioral medicine assessment portion of the IDIS and MDBH treatment programs at The Center, patients completed several self-administered psychosocial questionnaires. Among these questionnaires is the Short Form 36 Question/Health Status Questionnaire (SF-36). Responses from this

questionnaire are entered into Q-Local software and a score is obtained. Following this, subscales are entered into an algorithm in a Microsoft Excel spreadsheet in order to obtain the Physical (PCS) and Mental (MCS) Composite Scores that are used to differentiate between the two major components of the SF-36. A MANOVA was performed that included all the subscales as well as the PCS and MCS components of the SF-36 to determine what effect, if any, the four MMPI-2 profiles had on the components of the SF-36. Additionally, this analysis resulted in individual ANOVAs for each subscale of the SF-36. The results of the MANOVA revealed that MMPI-2 profile type had a significant effect on the SF-36, Hotelling's $T = .33$, $F = 5.73$ (30, 1,562) $p < .001$. MANOVA revealed that pain category did not have a significant effect on the SF-36, Hotelling's $T = .11$, $F = 1.12$ (50, 2,602) $p > .05$. Further, there was no significant interaction between profile type and pain category on the SF-36, Hotelling's $T = .26$, $F = 1.03$ (130, 5,202) $p > .05$.

The following results were derived from the resulting individual ANOVAs to determine whether MMPI-2 profile type and pain category had an effect on components of the SF-36: MMPI-2 profile type had a statistically significant effect on the SF-36 subscale for Health Perception, $F(3, 552) = 18.54$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the DP group (n=339, $\mu = 35.65$) had the lowest mean for Health Perception. On this scale which ranks higher levels of pathology with lower scores, patients in the NP group (n= 62, $\mu = 69.15$) had the highest mean scores. Results for analysis of the effect of pain category on Health Perception revealed no statistically significant results, $F(5,552) = .73$, $p > .05$. Similarly, there was not a statistically

significant interaction between pain category and MMPI-2 profile type on Health Perception, $F(13, 552) = .59$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the SF-36 subscale for Physical Functioning, $F(3,552) = 18.54$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the NP group ($n=62$, $\mu = 54.10$) had significantly higher mean scores for Physical Functioning, relative to the three Non-normal profile types. Analysis of the effect of pain category on Physical Functioning revealed no statistically significant results, $F(5,552) = 1.68$, $p > .05$. Similarly, there was not a statistically significant interaction between pain category and MMPI-2 profile type on Physical Functioning, $F(13, 552) = .95$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the SF-36 subscale for Role Limitations/Physical, $F(3, 552) = 16.40$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the NP group ($n=62$, $\mu = 35.89$) had significantly higher mean scores for Role Limitations/Physical, than did the three Non-normal profile types. Additionally, patients from the CV profile group had significantly higher means ($n=93$, $\mu = 15.05$) than patients in the DP profile group. Analysis of the effect of pain category on Role Limitations/Physical revealed a statistically significant effect, $F(5,552) = 2.42$, $p < .05$. However, there was no statistically significant interaction between pain category and MMPI-2 profile type on Role Limitations/Physical, $F(13, 552) = 1.61$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the SF-36 subscale for Role Limitations/Emotional, $F(3, 552) = 16.93$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the NP group ($n=62$, $\mu = 73.65$) and the CV group

(n=93, μ = 61.83) had significantly higher mean scores for Role Limitations/ Emotional, relative to the DP (n=339, μ = 27.23) and NT (n=59, μ = 40.17) profile types. Analysis of the effect of pain category on Role Limitations/ Emotional revealed no statistically significant effects, $F(5,552) = .97$, $p > .05$. Similarly, there was no statistically significant interaction between pain category and MMPI-2 profile type on Role Limitations/ Emotional, $F(13, 552) = 1.18$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the SF-36 subscale for Social Functioning, $F(3, 552) = 8.94$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the NP group (n= 62, μ = 63.71) had significantly higher mean scores for Social Functioning than did the three Non-normal profile groups. Additionally, the CV group (n=93, μ = 47.31) had significantly higher mean scores for Social Functioning, than did the DP (n=339, μ = 31.67) and NT (n=59, μ = 36.44) profile types. Analysis of the effect of pain category on Social Functioning revealed no statistically significant effects, $F(5,552) = 1.95$, $p > .05$. Similarly, there was no statistically significant interaction between pain category and MMPI-2 profile type on Social Functioning, $F(13, 552) = .92$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the SF-36 subscale for Mental Health, $F(3, 552) = 15.21$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the NP group (n= 62, μ = 75.52) and the CV group (n= 93, μ = 69.63) had significantly higher mean scores for Mental Health, than did the patients with NT (n= 59, μ = 60.29) profile type. Further, patients from the DP profile group (n=339, μ = 47.22) had significantly lower mean scores than the other three profile types.

Analysis of the effect of pain category on the Mental Health scale revealed no statistically significant effects, $F(5,552) = .39$, $p > .05$. Similarly, there was no statistically significant interaction between pain category and MMPI-2 profile type on Mental Health, $F(13, 552) = .66$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the SF-36 subscale for Bodily Pain, $F(3, 552) = 9.38$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the NP group ($n = 62$, $\mu = 36.21$) had significantly higher mean scores for Bodily Pain, than did the patients with from the three Non-normal profile types. Analysis of the effect of pain category on the Bodily Pain scale revealed a statistically significant effects, $F(5,552) = 3.12$, $p < .01$. However, there was no statistically significant interaction between pain category and MMPI-2 profile type on Bodily Pain, $F(13, 552) = 1.39$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the SF-36 subscale for Energy/Fatigue, $F(3, 552) = 18.62$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the NP group ($n = 62$, $\mu = 52.77$) had significantly higher mean scores for Energy/Fatigue, relative to the patients with from the three Non-normal profile types. Additionally, patients from the CV group ($n = 93$, $\mu = 35.09$) had significantly higher mean scores for Energy/Fatigue, than did the patients with from the NT group ($n = 59$, $\mu = 23.11$) and the DP group ($n = 339$, $\mu = 21.09$). Analysis of the effect of pain category on the Energy/Fatigue scale revealed no statistically significant effects, $F(5,552) = .32$, $p > .05$. Similarly, there was no statistically significant interaction between pain category and MMPI-2 profile type on Energy/Fatigue, $F(13, 552) = .56$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the SF-36 Physical Component Scale (PCS), $F(3, 552) = 12.06$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from the NP group ($n = 62$, $\mu = 34.57$) had significantly higher mean scores for PCS, than did the patients with from the three Non-normal profile types. Analysis of the effect of pain category on the PCS scale revealed no statistically significant effects, $F(5,552) = 1.40$, $p > .05$. Similarly, there was no statistically significant interaction between pain category and MMPI-2 profile type on PCS, $F(13, 552) = 1.06$, $p > .05$. MMPI-2 profile type had a statistically significant effect on the SF-36 Mental Component Scale (MCS), $F(3, 552) = 22.03$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from each MMPI-2 profile group differed from the other groups to a significant degree. Analysis of the effect of pain category on the MCS scale revealed no statistically significant effects, $F(5,552) = .37$, $p > .05$. Similarly, there was no statistically significant interaction between pain category and MMPI-2 profile type on MCS, $F(13, 552) = 1.08$, $p > .05$.

Selected MMPI-2 Content & Supplementary Scales. As part of the quality assurance process at The Center, certain content and supplementary scales from the MMPI-2 are tracked for patients who have completed the instrument. The results of a MANOVA revealed that MMPI-2 profile type had a significant effect on these selected scales, Hotelling's $T = .72$, $F = 9.67$ (15, 608) $p < .001$. MANOVA revealed that pain category did not have a significant effect on the selected scales, Hotelling's $T = .11$, $F = .87$ (25, 1,012) $p > .05$. Further, there was no significant interaction between profile type and pain category on the selected scales, Hotelling's $T = .23$, $F = .93$ (50, 1,012) $p > .05$.

An ANOVA showed that MMPI-2 profile type had a statistically significant effect on the Ego Strength scale (ES), $F(3, 227) = 38.61$, $p < .001$. Post-hoc analysis and Tukey HSD revealed that patients from each MMPI-2 profile group differed from the other groups to a significant degree. Ranked from highest mean score to lowest, the groups were: NP group ($n = 31$, $\mu = 52.84$), CV group ($n = 29$, $\mu = 41.90$), NT group ($n = 23$, $\mu = 39.35$) and the DP group ($n = 144$, $\mu = 34.08$).

MMPI-2 profile type had a statistically significant effect on the MacAndrew Alcoholism Scale-Revised (MAC-R), $F(3, 227) = 2.75$, $p < .05$. Post-hoc analysis and Tukey HSD revealed that patients from the CV profile group ($n = 29$, $\mu = 52.97$) had a significantly higher mean score on the MAC-R scale, relative to the other three profile types. MMPI-2 profile type had no statistically significant effect on the Addiction Potential Scale (APS), $F(3, 227) = .74$, $p > .05$. MMPI-2 profile type had a statistically significant effect on the Addiction Acknowledgment Scale (AAS), $F(3, 227) = 3.15$, $p < .05$. Post-hoc analysis and Tukey HSD revealed that patients from the DP profile group ($n = 144$, $\mu = 51.38$) had a significantly higher mean score on the AAS scale than the NT and NP profile types, with the CV profile group having the second highest mean score ($n = 29$, $\mu = 48.76$). MMPI-2 profile type had a statistically significant effect on the Suicidal Ideation (SI), $F(3, 227) = 3.13$, $p < .05$. Post-hoc analysis and Tukey HSD revealed that patients from the DP profile group ($n = 144$, $\mu = 57.46$) had a significantly higher mean score on the SI scale than the other three profile types. Pain category did not have a significant effect upon these supplementary scales of the MMPI-2, nor were there any significant interactions between profile type and pain category upon these scales.

Scales of the MBMD. A number of patients who completed the MMPI-2 also completed the MBMD. MANOVAs were employed to determine if MMPI-2 profile type or pain category had an effect on MBMD. Resulting ANOVAs were used to analyze these effects on each of the scales of the MBMD. The results of a MANOVA revealed that MMPI-2 profile type had a significant effect on the MBMD, Hotelling's $T = 1.30$, $F = 2.59$ (87, 521) $p < .001$. MANOVA revealed that pain category had a significant effect on the MBMD, Hotelling's $T = 1.11$, $F = 1.32$ (145, 867) $p < .05$. However, there was no significant interaction between profile type and pain category on the MBMD, Hotelling's $T = 1.89$, $F = 1.13$ (290, 1,732) $p > .05$.

MBMD-Psychiatric Indicators, which are used to identify comorbid factors that can affect treatment, include scales for: Anxiety-Tension (AA), Depression (BB), Cognitive Dysfunction (CC), Emotional Lability (DD), and Guardedness (EE). MMPI-2 profile type had a statistically significant effect on AA scores, $F(3, 221) = 8.17$, $p < .001$. Post-hoc analysis revealed that patients from the DP profile type were significantly more likely to have an elevation on the AA scale than the other three MMPI-2 profile types. MMPI-2 profile type had a statistically significant effect on BB scores, $F(3, 221) = 28.60$, $p < .001$. Post-hoc analysis revealed that patients from the DP profile type ($n = 141$, $\mu = 80.01$) were significantly more likely to have an elevation on the BB scale, relative to the other three MMPI-2 profile types. Additionally, patients from the NT profile type ($n = 23$, $\mu = 63.43$) were significantly more likely to have an elevation on the BB scale than patients from the NP ($n = 30$, $\mu = 35.67$) and CV ($n = 28$, $\mu = 30.93$) profile types.

MMPI-2 profile type had a statistically significant effect on CC scores, $F(3, 221) = 10.68$, $p < .001$. Post-hoc analysis revealed that patients from the DP profile type ($n = 141$, $\mu = 56.03$) were significantly more likely to have an elevation on the CC scale, relative to the other three MMPI-2 profile types. MMPI-2 profile type had a statistically significant effect on DD scores, $F(3, 221) = 7.41$, $p < .001$. Post-hoc analysis revealed that patients from the DP profile type were significantly more likely to have an elevation on the DD scale relative to the other three MMPI-2 profile types. MMPI-2 profile type had a statistically significant effect on EE scores, $F(3, 221) = 4.68$, $p < .01$. Post-hoc analysis revealed that patients from the DP profile type were significantly more likely to have an elevation on the EE scale, relative to the other three MMPI-2 profile types.

ANOVAs were used to determine if MMPI-2 profile type had an effect on MBMD-Coping Styles; which are used to identify DSM-IV personality styles that affect the ways patients cope with life stressors and illness. The following results were obtained for each of the analyses that examined the effect of MMPI-2 profile type on MBMD-Coping Style: MMPI-2 profile type had a statistically significant effect on the Introversive (1) scale, an indicator of non-clinical Schizoid personality style, $F(3, 221) = 10.95$, $p < .001$. Post-hoc analysis revealed that patients from the DP profile type were significantly more likely to have an elevation on the 1 scale relative to the other three MMPI-2 profile types.

MMPI-2 profile type had a statistically significant effect on the Inhibited Style (2A) scale, an indicator of non-clinical Avoidant personality style, $F(3, 221) = 11.40$, $p < .001$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 62.86$) profile type were significantly more likely to have an elevation on the 2A scale, relative to the

other three MMPI-2 profile types. MMPI-2 profile type had a statistically significant effect on the Dejected Style (2B) scale, an indicator of non-clinical Depressive personality style, $F(3, 221) = 12.01$, $p < .001$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 57.33$) profile type were significantly more likely to have an elevation on the 2B scale relative to the other three MMPI-2 profile types.

MMPI-2 profile type had a statistically significant effect on the Cooperative Style (3) scale, an indicator of non-clinical Dependent personality style, $F(3, 221) = 4.20$, $p < .01$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 71.06$) profile type were significantly more likely to have an elevation on the 3 scale, relative to the CV ($n = 28$, $\mu = 53.64$) and NP ($n = 30$, $\mu = 47.43$) profile types. MMPI-2 profile type had a statistically significant effect on the Sociable Scale Style (4) scale, an indicator of non-clinical Histrionic personality style, $F(3, 221) = 4.91$, $p < .01$. Post-hoc analysis revealed that patients from the NP ($n = 30$, $\mu = 61.00$) and CV ($n = 28$, $\mu = 59.21$) profile types were significantly more likely to have an elevation on the 4 scale, relative to the other two profile types.

MMPI-2 profile type had a statistically significant effect on the Confident Style (5) scale, an indicator of non-clinical Narcissistic personality style, $F(3, 221) = 10.84$, $p < .001$. Post-hoc analysis revealed that patients from the CV ($n = 28$, $\mu = 63.54$) and NP ($n = 30$, $\mu = 63.17$) profile types were significantly more likely to have an elevation on the 5 scale, relative to the other two profile types. MMPI-2 profile type had no statistically significant effect on the Nonconforming Style (6A) scale, an indicator of non-clinical Antisocial personality style, $F(3, 221) = .34$, $p > .05$. Similarly, MMPI-2 profile type had

no statistically significant effect on the Forceful Style (6B) scale, an indicator of non-clinical Sadistic personality style, $F(3, 221) = 1.27$, $p > .05$. MMPI-2 profile type did not have a statistically significant effect on the Respectful Style (7) scale, an indicator of non-clinical Compulsive personality style, $F(3, 221) = 2.18$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the Oppositional Style (8A) scale, an indicator of non-clinical Negativistic personality style, $F(3, 221) = 10.20$, $p < .001$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 62.06$) profile type were significantly more likely to have an elevation on the 8A scale, relative to the other three profile types. MMPI-2 profile type had a statistically significant effect on the Denigrated Style (8B) scale, an indicator of non-clinical Masochistic personality style, $F(3, 221) = 6.98$, $p < .001$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 64.77$) profile type were significantly more likely to have an elevation on the 8B scale, relative to the other three profile types.

ANOVAs were used to determine if MMPI-2 profile type had an effect on MBMD-Stress Moderators; which are used to identify DSM-IV attitudes and relationships that impact treatment. The following results were obtained for each of the analyses that examined the effect of MMPI-2 profile type on MBMD-Stress Moderators:

MMPI-2 profile type had a statistically significant effect on the Illness Apprehension (A) scale, an indicator of excessive attention to potential bodily dysfunctions, $F(3, 221) = 5.10$, $p < .01$. Post-hoc analysis revealed that patients from the NP ($n = 30$, $\mu = 64.60$) profile type were significantly more likely to have a lower elevation on scale A, relative to the three non-normal profile types.

MMPI-2 profile type had a statistically significant effect on the Functional Deficits (B) scale, an indicator of patients' ability to conduct activities of daily living, $F(3, 221) = 14.40$, $p < .001$. Post-hoc analysis revealed that patients from the NP ($n = 30$, $\mu = 68.97$) profile type were significantly more likely to have a lower elevation on scale B, relative to the three non-normal profile types.

MMPI-2 profile type had a statistically significant effect on the Pain Sensitivity (C) scale, an indicator of the presence and intensity of physical pain symptoms, $F(3, 221) = 6.05$, $p = .001$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 96.54$) profile type were significantly more likely to have an elevation on the C scale, relative to the NP ($n = 30$, $\mu = 79.13$) profile type. MMPI-2 profile type had a statistically significant effect on the Social Isolation (D) scale, an indicator of perceived sources of social support, $F(3, 221) = 6.31$, $p < .001$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 59.13$) and NT ($n = 23$, $\mu = 45.78$) profile types were significantly more likely to have an elevation on the D scale, relative to the CV ($n = 28$, $\mu = 32.00$) profile type. The DP profile type was also significantly more likely to be elevated on scale D relative to the NP ($n = 30$, $\mu = 40.70$) profile type.

MMPI-2 profile type had a statistically significant effect on the Future Pessimism (E) scale, an indicator of patients' outlook toward the future regarding health status, $F(3, 221) = 14.06$, $p < .001$. Post-hoc analysis revealed that patients from the NP ($n = 30$, $\mu = 56.87$) profile type were significantly more likely to have a lower elevation on scale B, relative to the three non-normal profile types. MMPI-2 profile type had no statistically

significant effect on the Spiritual Absence (F) scale, an indicator of spiritual support for stress reduction, $F(3, 221) = 1.55$, $p > .05$.

ANOVAs were used to determine if MMPI-2 profile type had an effect on MBMD-Treatment Prognostics; which are used to identify patient characteristics that play a role in treatment. The following results were obtained for each of the analyses that examined the effect of MMPI-2 profile type on MBMD-Treatment Prognostics: MMPI-2 profile type had a statistically significant effect on the Interventional Fragility (G) scale, an indicator of the likelihood of a decompensatory reaction to treatment, $F(3, 221) = 5.83$, $p = .001$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 53.30$) profile type were significantly more likely to have an elevation on scale G, relative to the other three profile types. There was not a statistically significant effect on the Medication Abuse (H) scale, a risk indicator for rejection or addiction to prescribed treatment, $F(3, 221) = .27$, $p > .05$. There was not a statistically significant effect on the Information Discomfort (I) scale, an indicator of receptiveness or willingness to share personal health information, $F(3, 221) = .66$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the Utilization Excess (J) scale, an indicator of desire for medical resources beyond what is necessary or appropriate, $F(3, 221) = 5.00$, $p < .01$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 66.40$) profile type were significantly more likely to have an elevation on scale J, relative to the NP ($n = 30$, $\mu = 53.70$) and CV ($n = 28$, $\mu = 49.96$) profile types. There was not a statistically significant effect on the Problematic Compliance (K) scale, an indicator of adherence to treatment, $F(3, 221) = .44$, $p > .05$.

ANOVAs were used to determine if MMPI-2 profile type had an effect on MBMD-Management Guide; composed of two scales which are used to identify problems that may require behavioral interventions. MMPI-2 profile type had a statistically significant effect on the Adjustment Difficulties (L) scale, an indicator of the presence of psychological difficulties, $F(3, 221) = 8.27$, $p < .001$. Post-hoc analysis revealed that patients from the NP ($n = 30$, $\mu = 71.83$) profile type were significantly more likely to have a lower elevation on scale L, relative to the three non-normal profile types. Additionally, MMPI-2 profile type had a statistically significant effect on the Psych Referral (M) scale, a risk indicator of the likelihood of needing pharmacologic or psychosocial therapy, $F(3, 221) = 12.49$, $p < .001$. Post-hoc analysis revealed that patients from the DP ($n = 141$, $\mu = 74.21$) and NT ($n = 23$, $\mu = 67.96$) profile types were significantly more likely to have an elevation on scale M, relative to the CV ($n = 28$, $\mu = 50.46$) and NP ($n = 30$, $\mu = 48.90$) profile types.

Pain category did not demonstrate many significant effects upon the components and scales of the MBMD. The two exceptions to this finding were the Functional Deficits scale $F(5, 221) = 3.25$, $p < .01$; and the Future Pessimism scale $F(5, 221) = 3.51$, $p < .01$. Further, these scales, along with the Utilization Excess scale demonstrated an interaction from the MMPI-2 profile type and pain category. The specific findings from this interaction are: Functional Deficits scale $F(10, 221) = 1.95$, $p < .05$; Future Pessimism scale $F(10, 221) = 2.95$, $p < .01$; and Utilization Excess $F(10, 221) = 1.99$, $p < .05$.

The MPI-II. MANOVAs were used to determine if MMPI-2 profile type had an effect on the MPI-II and its associated scales. Resulting ANOVAs were used to analyze these effects on each of the scales of the MPI-II. The results of a MANOVA revealed

that MMPI-2 profile type had a significant effect on the MPI-II, Hotelling's T =.30, F = 4.34 (39, 1,670) $p < .001$. MANOVA revealed that pain category did not have a significant effect on the MPI-II, Hotelling's T = .12, F = 1.32 (65, 2,782) $p > .05$. Further, there was no significant interaction between profile type and pain category on the MPI-II, Hotelling's T = .26, F = .86 (169, 7,230) $p > .05$.

MMPI-2 profile type did not have a statistically significant effect on the MPI-II/Pain Severity scale, $F(3, 591) = 1.93$, $p > .05$. MMPI-2 profile type had a statistically significant effect on the MPI-II/Pain Interference scale, $F(3, 591) = 27.14$, $p < .001$. Post-hoc analysis revealed that patients from the DP (n= 366, μ = 49.30) and NT (n= 63, μ = 46.15) profile types were significantly more likely to have a higher elevation on Pain Interference, relative to the other two profile types. Additionally, patients from the CV (n= 85, μ = 44.62) profile type were significantly more likely to have a higher elevation on Pain Interference, relative to the patients from the NP (n= 78, μ = 34.29) profile type.

MMPI-2 profile type had a statistically significant effect on the MPI-II/Life Control scale, $F(3, 591) = 18.73$, $p < .001$. Post-hoc analysis revealed that patients from the NP (n= 78, μ = 54.50) and CV (n= 85, μ = 52.67) profile types were significantly more likely to have a higher elevation on Life Control, relative to the NT (n= 63, μ = 48.50) and DP (n= 366, μ = 46.29) profile types. MMPI-2 profile type had a statistically significant effect on the MPI-II/Affective Distress scale, $F(3, 591) = 20.68$, $p < .001$. Post-hoc analysis revealed that patients from each of the four profile types were significantly different from each other in order: DP (n= 366, μ = 50.57), NT (n= 63, μ = 45.43), CV (n= 85, μ = 41.95), and NP (n= 78, μ = 38.68). MMPI-2 profile type did not

have a statistically significant effect on the MPI-II/Social Support scale, $F(3, 591) = .22$, $p > .05$.

MMPI-2 profile type had a statistically significant effect on the MPI-II/Punishing Responses scale, $F(3, 591) = 5.16$, $p < .01$. Post-hoc analysis revealed that patients from the DP ($n = 366$, $\mu = 51.92$) profile type were significantly more likely to have higher elevations on Punishing Responses than the patients from the NP ($n = 78$, $\mu = 48.06$) profile type. MMPI-2 profile type did not have a statistically significant effect on the MPI-II/Solicitous Response scale, $F(3, 591) = .46$, $p > .05$.

MMPI-2 profile type did not have a statistically significant effect on the MPI-II/Distracting Responses scale, $F(3, 591) = 1.30$, $p > .05$. MMPI-2 profile type had a statistically significant effect on the MPI-II/Household Chores scale, $F(3, 591) = 3.47$, $p < .05$. Post-hoc analysis revealed that patients from the NP ($n = 78$, $\mu = 53.02$) profile type were significantly more likely to have higher elevations on Household Chores than the patients from the DP ($n = 366$, $\mu = 49.82$) and NT ($n = 63$, $\mu = 49.46$) profile types.

MMPI-2 profile type had a statistically significant effect on the MPI-II/Outdoor Work scale, $F(3, 591) = 3.48$, $p < .05$. Post-hoc analysis revealed that patients from the NP ($n = 78$, $\mu = 55.53$) profile type were significantly more likely to have higher elevations on Outdoor Work than the patients from the DP ($n = 366$, $\mu = 48.50$) and NT ($n = 63$, $\mu = 49.69$) profile types. MMPI-2 profile type had a statistically significant effect on the MPI-II/Activities Away From Home scale, $F(3, 591) = 5.71$, $p = .001$. Post-hoc analysis revealed that patients from the NP ($n = 78$, $\mu = 52.27$) and CV ($n = 85$, $\mu = 53.36$) profile types were significantly more likely to have higher elevations on Activities Away

From Home than the patients from the DP (*n*= 366, μ = 49.90) and NT (*n*= 63, μ = 53.37) profile types. Additionally, patients from the NT profile type were significantly more likely to have higher elevations on Activities Away From Home than patients from the DP profile type.

MMPI-2 profile type had a statistically significant effect on the MPI-II/Social Activity scale, $F(3, 591) = 10.39$, $p < .001$. Post-hoc analysis revealed that patients from the NP (*n*= 78, μ = 52.27) and CV (*n*= 85, μ = 49.97) profile types were significantly more likely to have higher elevations on Social Activity than the patients from the DP (*n*= 366, μ = 45.56) profile type. MMPI-2 profile type had a statistically significant effect on the MPI-II/General Activity Level scale, $F(3, 591) = 8.94$, $p < .001$. Post-hoc analysis revealed that patients from the NP (*n*= 78, μ = 55.88) profile type were significantly more likely to have higher elevations on General Activity Level than the patients from the three non-normal profile types. Additionally, patients from the CV (*n*= 85, μ = 51.54) profile type were significantly more likely to have higher elevations on General Activity Level relative to patients from the DP (*n*= 366, μ = 48.02) profile type.

Pain category did not demonstrate many significant effects upon the components and scales of the MPI-II. The exceptions to this finding were the Pain Interference Scale scale $F(5, 591) = 2.91$, $p < .05$; the Household Chores scale $F(5, 591) = 3.50$, $p < .01$; and the General Activity Level scale $F(5, 591) = 3.12$, $p < .01$. Further, there were no demonstrated interactions from the MMPI-2 profile type and pain category.

BDI-II. The results of a MANOVA revealed that MMPI-2 profile type had a significant effect on the BDI-II, Hotelling's $T = .26$, $F = 4.26$ (12, 590) $p < .001$.

MANOVA revealed that pain category did not have a significant effect on the BDI-II, Hotelling's $T = .04$, $F = .39$ (20, 786) $p > .05$. Further, there was no significant interaction between profile type and pain category on the BDI-II, Hotelling's $T = .10$, $F = .49$ (40, 786) $p > .05$.

MMPI-2 profile type had a statistically significant effect on the BDI-II Total Score, $F(3, 220) = 15.50$, $p < .001$. Post-hoc analysis revealed that each profile type was significantly different from the others, with patients from the DP group obtaining the highest mean score ($n = 138$, $\mu = 21.93$). Similarly, MMPI-2 profile type had a statistically significant effect on the BDI-II Cognitive component, $F(3,220) = 8.95$, $p < .001$; the Somatic component, $F(3, 220) = 16.00$, $p < .001$; and Suicidal Ideation, $F(3, 220) = 4.38$, $p < .01$. For each of these components of the BDI-II, the DP profile type obtained the highest mean score relative to the other three profile types.

CAGE. The results of a MANOVA revealed that MMPI-2 profile type did not have a significant effect on the CAGE, Hotelling's $T = .06$, $F = .67$ (15, 476) $p > .05$. MANOVA revealed that pain category did not have a significant effect on the CAGE, Hotelling's $T = .09$, $F = .55$ (25, 792) $p > .05$. Further, there was no significant interaction between profile type and pain category on the CAGE, Hotelling's $T = .17$, $F = .61$ (45, 792) $p > .05$.

Comparison of Measures at Post-Treatment and One-Year Follow-Up

Among the pre-treatment sample of patients who had valid and classifiable MMPI-2 profiles, data were collected at post-treatment ($n = 159$) and one-year follow-up ($n = 72$) for patients who had progressed to those collection points. Pearson chi-square analyses were performed on the categorical variables collected in the post-treatment and

one-year follow-up databases to determine if there were any significant differences between the four MMPI profile groups from pre-to post-treatment and from pre-treatment to one-year follow-up, based on the following measures: Vocational Status; MPI-II Coping Style; Completion of Prescribed Treatment; Treatment Compliance; Pain Recurrence; Pending Litigation; and Disability Payments. Repeated measures ANOVAs were performed for the remaining outcome measures and scales, including: total procedures for pain; total number of prescriptions taken for pain; physical (PCS) and mental component scales (MCS) of the SF-36; all subscales from the MPI-II (collected at post-treatment only); the BDI-2; Pain Drawing Analogue; Million Visual Analogue Scale; and Oswestry Pain Disability Questionnaire.

Chi-Square Analyses at Post-Treatment

Vocational Status. A code was entered into the database depending upon each patient's status of retaining work, returning to work, or being unemployed at the time of the post-treatment assessment. For the purposes of analysis, 14 different vocational codes were re-coded into a binomial variable of working or not-working. When examining whether there were differences among MMPI-2 profile groups depending on vocational status, the results of the Pearson chi-square analyses were not significant among the MMPI-2 profile categories, χ^2 (3, n= 125) = 1.10, $p > .05$. Analyses were then performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal. Chi-square analysis results for this comparison were not significant, χ^2 (1, n= 125) = .42, $p > .05$.

MPI-II Coping Style. When examining whether there were differences among MMPI-2 profile groups depending on vocational status, the results of the Pearson chi-square analyses were significant among the MMPI-2 profile categories, χ^2 (15, n= 152) =

28.49, $p < .05$. Analyses were then performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal. Chi-square analysis results for this comparison were not significant, χ^2 (5, n= 152) = 9.59, $p > .05$. In order to determine which MMPI-2 profile type contributed to the prior finding, MPI-II data was collapsed into Adaptive versus All Other Coping Styles for 2x2 chi-square analyses. In a comparison of Normal versus Non-normal MMPI-2 profile type with Adaptive versus All Other MPI-II Coping Styles, the results were not significant, χ^2 (1, n= 152) = .28, $p >$ .05.

Chi-Square Analyses at One-Year Follow-Up

Completion of Prescribed Treatment. When examining whether there were differences among MMPI-2 profile groups depending on whether or not the patient had completed treatment as prescribed, the results of the Pearson chi-square analyses were not significant among the MMPI-2 profile categories, χ^2 (3, n= 138) = 5.14, $p > .05$. Analyses were then performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal. Chi-square analysis results for this comparison were not significant, χ^2 (1, n= 138) = 2.13, $p > .05$.

Vocational Status. A code was entered into the database depending upon each patient's status of retaining work, returning to work, or being unemployed at the time of the one-year follow-up assessment. For the purposes of analysis, 14 different vocational codes were re-coded into a binomial variable of working or not-working. When examining whether there were differences among MMPI-2 profile groups depending on vocational status, the results of the Pearson chi-square analyses were not significant

among the MMPI-2 profile categories, χ^2 (3, n= 72) = 3.58, p > .05. Analyses were then performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal. Chi-square analysis results for this comparison were not significant, χ^2 (1, n= 72) = .04, p > .05.

Pain Recurrence. When examining whether there were differences among MMPI-2 profile groups depending on recurrence of pain by the time of the one-year follow-up assessment, the results of the Pearson chi-square analyses were not significant among the MMPI-2 profile categories, χ^2 (3, n= 68) = 1.97, p > .05. Analyses were then performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal. Chi-square analysis results for this comparison were not significant, χ^2 (1, n= 68) = 1.70, p > .05.

Pending Litigation. When examining whether there were differences among MMPI-2 profile groups depending on whether or not the patient had pending litigation related to their pain by the time of the one-year follow-up assessment, the results of the Pearson chi-square analyses were not significant among the MMPI-2 profile categories, χ^2 (3, n= 66) = 3.32, p > .05. Analyses were then performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal. Chi-square analysis results for this comparison were not significant, χ^2 (1, n= 66) = .70, p > .05.

Disability Payments. When examining whether there were differences among MMPI-2 profile groups depending on whether or not the patient was receiving disability payments by the time of the one-year follow-up assessment, the results of the Pearson chi-square analyses were not significant among the MMPI-2 profile categories, χ^2 (3, n=

65) = 3.69, $p > .05$. Analyses were then performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal. Chi-square analysis results for this comparison were not significant, χ^2 (1, n= 65) = .001, $p > .05$.

MPI-II Coping Style. When examining whether there were differences among MMPI-2 profile groups depending on MPI-II Coping Style by the time of the one-year follow-up assessment, analyses were performed by collapsing the MMPI-2 profile categories into Normal versus Non-normal and MPI-II Coping Styles were collapsed into Adaptive versus All Other. Chi-square analysis results for this comparison were not significant, χ^2 (1, n= 56) = .04, $p > .05$.

Repeated Measures ANCOVAs for Post-Treatment and One-Year Follow-Up

Oswestry. The results of a repeated measures ANCOVA showed that there was not a significant difference in the Oswestry score from pre- to post-treatment, $F(1,103)$ = 1.21, $p > .05$. MMPI-2 profile type did not have a significant effect on Oswestry from pre- to post-treatment, $F(2,103) = 1.40$, $p > .05$. Pain category did not have a significant effect on Oswestry from pre- to post-treatment, $F(4,103) = 1.24$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the Oswestry from pre- to post-treatment, $F(9,103) = .61$, $p > .05$. The covariates of gender and race also showed no significant difference from pre- to post-treatment.

The results of a repeated measures ANCOVA showed that there was not a significant difference in the Oswestry score from pre-treatment to one-year follow-up, $F(1, 35) = 4.02$, $p > .05$. Additionally, MMPI-2 profile type did not have a significant effect on Oswestry from pre-treatment to one-year follow-up, $F(2, 35) = 2.40$, $p > .05$. Also, pain category did not have a significant effect on Oswestry from pre-treatment to

one-year follow-up, $F(4, 35) = 2.44$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the Oswestry from pre-treatment to one-year follow-up, $F(4, 35) = 1.40$, $p > .05$. The covariates of gender and race also showed no significant difference from pre-treatment to one-year follow-up.

Sum of Procedures. The results of a repeated measures ANCOVA showed that there was not a significant difference in the total number of non-surgical procedures from pre- to post-treatment, $F(1, 109) = .648$, $p > .05$. MMPI-2 profile type did not have a significant effect on total number of non-surgical procedures from pre- to post-treatment, $F(3, 109) = .59$, $p > .05$. Pain category did not have a significant effect on total number of non-surgical procedures from pre- to post-treatment, $F(4, 109) = .22$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the total number of non-surgical procedures from pre- to post-treatment, $F(9, 109) = .39$, $p > .05$. The covariates of gender and race also showed no significant difference from pre- to post-treatment.

The results of a repeated measures ANCOVA showed that there was not a significant difference in the total number of non-surgical procedures from pre-treatment to one-year follow-up, $F(1, 41) = .17$, $p > .05$. MMPI-2 profile type did not have a significant effect on total number of non-surgical procedures from pre-treatment to one-year follow-up, $F(2, 41) = 1.02$, $p > .05$. Pain category did not have a significant effect on total number of non-surgical procedures from pre-treatment to one-year follow-up, $F(4, 41) = 1.28$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the total number of non-surgical procedures from pre-

treatment to one-year follow-up, $F(4, 41) = 1.12$, $p > .05$. The covariates of gender and race also showed no significant difference from pre-treatment to one-year follow-up.

Sum of Prescriptions. The results of a repeated measures ANCOVA showed that there was not a significant difference in the total number of different prescriptions for pain from pre- to post-treatment, $F(1, 94) = .18$, $p > .05$. MMPI-2 profile type did not have a significant effect on total number of different prescriptions for pain from pre- to post-treatment, $F(3, 94) = 2.25$, $p > .05$. Pain category did not have a significant effect on total number of different prescriptions for pain from pre- to post-treatment, $F(4, 94) = .86$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the total number of different prescriptions for pain from pre- to post-treatment, $F(9, 94) = 1.50$, $p > .05$. The covariates of gender and race also showed no significant difference from pre- to post-treatment.

The results of a repeated measures ANCOVA showed that there was not a significant difference in the total number of different prescriptions for pain from pre-treatment to one-year follow-up, $F(1, 39) = .32$, $p > .05$. MMPI-2 profile type did not have a significant effect on total number of different prescriptions for pain from pre-treatment to one-year follow-up, $F(2, 39) = .20$, $p > .05$. Pain category did not have a significant effect on total number of different prescriptions for pain from pre-treatment to one-year follow-up, $F(4, 39) = .43$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the total number of different prescriptions for pain from pre-treatment to one-year follow-up, $F(4, 39) = .58$, $p > .05$. The covariates of gender and race also showed no significant difference from pre-treatment to one-year follow-up.

Pain Drawing Analogue. The results of a repeated measures ANCOVA showed that there was not a significant difference in the Pain Drawing Analogue score from pre- to post-treatment, $F(1, 103) = 1.60$, $p > .05$. MMPI-2 profile type did not have a significant effect on Pain Drawing Analogue score from pre- to post-treatment, $F(3, 103) = 2.36$, $p > .05$. Pain category did not have a significant effect on Pain Drawing Analogue score from pre- to post-treatment, $F(4, 103) = .43$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the Pain Drawing Analogue score from pre- to post-treatment, $F(9, 103) = .27$, $p > .05$. The covariates of gender and race also showed no significant difference from pre- to post-treatment.

The results of a repeated measures ANCOVA showed that there was a significant difference in the Pain Drawing Analogue score from pre-treatment to one-year follow-up, $F(1, 38) = 6.61$, $p < .05$. MMPI-2 profile type did not have a significant effect on Pain Drawing Analogue score from pre-treatment to one-year follow-up, $F(2, 38) = .91$, $p > .05$. Pain category did not have a significant effect on Pain Drawing Analogue score from pre-treatment to one-year follow-up, $F(4, 38) = 1.05$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the Pain Drawing Analogue score from pre-treatment to one-year follow-up, $F(4, 35) = 1.39$, $p > .05$. The covariates of gender and race also showed no significant difference from pre-treatment to one-year follow-up.

MVAS. The results of a repeated measures ANOVA showed that there was not a significant difference in the MVAS total score from pre- to post-treatment, $F(1, 94) = 1.12$, $p > .05$. MMPI-2 profile type did not have a significant effect on MVAS total score

from pre- to post-treatment, $F(2, 94) = 2.21$, $p > .05$. Pain category did not have a significant effect on MVAS total score from pre- to post-treatment, $F(4, 94) = .80$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MVAS total score from pre- to post-treatment, $F(8, 94) = .62$, $p > .05$. The covariates of gender and race also showed no significant difference from pre- to post-treatment.

The results of a repeated measures ANCOVA showed that there was a significant difference in the MVAS total score from pre-treatment to one-year follow-up, $F(1, 34) = 11.91$, $p < .01$. MMPI-2 profile type did not have a significant effect on MVAS total score from pre-treatment to one-year follow-up, $F(2, 34) = 1.60$, $p > .05$. Pain category did not have a significant effect on MVAS total score from pre-treatment to one-year follow-up, $F(4, 34) = 3.29$, $p > .05$. However, there was a significant effect from the interaction of MMPI-2 profile type and pain category on the MVAS total score from pre-treatment to one-year follow-up, $F(4, 34) = 3.91$, $p < .05$. The covariates of gender and race also showed no significant difference from pre-treatment to one-year follow-up.

Repeated Measures MANCOVAs

SF-36: PCS. The results of a repeated measures MANCOVA showed that there was not a significant difference in the SF-36 PCS score from pre- to post-treatment, $F(1, 93) = .51$, $p > .05$. MMPI-2 profile type did not have a significant effect on SF-36 PCS score from pre- to post-treatment, $F(3, 93) = 2.27$, $p > .05$. Pain category did not have a significant effect on SF-36 PCS score from pre- to post-treatment, $F(4, 93) = 1.06$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the SF-36 PCS score from pre- to post-treatment, $F(8, 93) = 1.33$, p

> .05. The covariates of gender and race also showed no significant difference from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the SF-36 PCS score from pre-treatment to one-year follow-up, $F(1, 31) = .14$, $p > .05$. MMPI-2 profile type did not have a significant effect on SF-36 PCS score from pre-treatment to one-year follow-up, $F(2, 31) = 1.24$, $p > .05$. Pain category did not have a significant effect on SF-36 PCS score from pre-treatment to one-year follow-up, $F(4, 31) = 1.79$, $p > .05$. There was not a significant effect from the interaction of MMPI-2 profile type and pain category on the SF-36 PCS score from pre-treatment to one-year follow-up, $F(4, 31) = 1.29$, $p > .05$. The covariates of gender and race also showed no significant difference from pre-treatment to one-year follow-up.

SF-36: MCS. The results of a repeated measures MANCOVA showed that there was not a significant difference in the SF-36 MCS score from pre- to post-treatment, $F(1, 93) = 2.16$, $p > .05$. MMPI-2 profile type did not have a significant effect on SF-36 MCS score from pre- to post-treatment, $F(2, 93) = 1.46$, $p > .05$. Pain category did not have a significant effect on SF-36 MCS score from pre- to post-treatment, $F(4, 93) = .31$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the SF-36 MCS score from pre- to post-treatment, $F(8, 93) = .12$, $p > .05$. The covariate of race also showed no significant difference from pre- to post-treatment. The covariate of gender was significant from pre- to post-treatment, $F(1, 93) = 7.36$, $p < .01$, but did not have any interaction upon differences in profile type or pain category.

The results of a repeated measures MANCOVA showed that there was no significant difference in the SF-36 MCS score from pre-treatment to one-year follow-up, $F(1, 31) = .001$, $p > .05$. MMPI-2 profile type did not have a significant effect on SF-36 MCS score from pre-treatment to one-year follow-up, $F(2, 31) = 1.71$, $p > .05$. Pain category did not have a significant effect on SF-36 MCS score from pre-treatment to one-year follow-up, $F(4, 31) = 1.05$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the SF-36 MCS score from pre-treatment to one-year follow-up, $F(4, 31) = 1.41$, $p > .05$. The covariates of gender and race also showed no significant difference from pre-treatment to one-year follow-up.

MPI-II. The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Pain Severity score from pre- to post-treatment, $F(1, 94) = .07$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Pain Severity score from pre- to post-treatment, $F(3, 94) = .57$, $p > .05$. Pain category did not have a significant effect on MPI-II/Pain Severity score from pre- to post-treatment, $F(4, 94) = .33$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Pain Severity score from pre- to post-treatment, $F(9, 94) = .60$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Pain Severity score from pre-treatment to one-year follow-up, $F(1, 25) = .90$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Pain Severity score from pre-treatment to one-year follow-up, $F(2, 25) = .85$, $p > .05$. Pain category did not have a significant effect on MPI-II/Pain Severity score from

pre-treatment to one-year follow-up, $F(4, 25) = 1.33$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Pain Severity score from pre-treatment to one-year follow-up, $F(3, 25) = 1.88$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Pain Interference score from pre- to post-treatment, $F(1, 94) = .91$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Pain Interference score from pre- to post-treatment, $F(3, 94) = .06$, $p > .05$. Pain category did not have a significant effect on MPI-II/Pain Interference score from pre- to post-treatment, $F(4, 94) = .87$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Pain Interference score from pre- to post-treatment, $F(9, 94) = .98$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Pain Interference score from pre-treatment to one-year follow-up, $F(1, 25) = .90$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Pain Interference score from pre-treatment to one-year follow-up, $F(2, 25) = 1.78$, $p > .05$. Pain category did not have a significant effect on MPI-II/Pain Interference score from pre-treatment to one-year follow-up, $F(4, 25) = 1.22$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Pain Interference score from pre-treatment to one-year

follow-up, $F(3, 25) = .10$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Life Control score from pre- to post-treatment, $F(1, 94) = .02$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Life Control score from pre- to post-treatment, $F(3, 94) = .79$, $p > .05$. Pain category did not have a significant effect on MPI-II/Life Control score from pre- to post-treatment, $F(4, 94) = .30$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Life Control score from pre- to post-treatment, $F(9, 94) = .54$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Life Control score from pre-treatment to one-year follow-up, $F(1, 25) = .01$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Life Control score from pre-treatment to one-year follow-up, $F(2, 25) = .88$, $p > .05$. Pain category did not have a significant effect on MPI-II/Life Control score from pre-treatment to one-year follow-up, $F(3, 25) = .81$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Life Control score from pre-treatment to one-year follow-up, $F(3, 25) = .83$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Affective Distress score from pre- to post-treatment,

$F(1, 94) = .12$, $p > .05$. MMPI-2 profile type had a significant effect on MPI-II/Affective Distress score from pre- to post-treatment, $F(3, 94) = .71$, $p > .05$. Pain category did not have a significant effect on MPI-II/Affective Distress score from pre- to post-treatment, $F(4, 94) = .53$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Affective Distress score from pre- to post-treatment, $F(9, 94) = .63$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Affective Distress score from pre-treatment to one-year follow-up, $F(1, 25) = .002$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Affective Distress score from pre-treatment to one-year follow-up, $F(2, 25) = .18$, $p > .05$. Pain category did not have a significant effect on MPI-II/Affective Distress score from pre-treatment to one-year follow-up, $F(4, 25) = 1.33$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Affective Distress score from pre-treatment to one-year follow-up, $F(3, 25) = .84$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Social Support score from pre- to post-treatment, $F(1, 94) = .01$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Social Support score from pre- to post-treatment, $F(3, 94) = .98$, $p > .05$. Pain category did not have a significant effect on MPI-II/Social Support score from pre- to post-treatment, $F(4, 94) = .57$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2

profile type and pain category on the MPI-II/Social Support score from pre- to post-treatment, $F(9, 94) = .94$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Social Support score from pre-treatment to one-year follow-up, $F(1, 25) = 1.66$, $p > .05$. MMPI-2 profile type had a significant effect on MPI-II/Social Support score from pre-treatment to one-year follow-up, $F(2, 25) = .88$, $p > .05$. Pain category did not have a significant effect on MPI-II/Social Support score from pre-treatment to one-year follow-up, $F(4, 25) = .53$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Social Support score from pre-treatment to one-year follow-up, $F(3, 25) = .19$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Punishing Responses score from pre- to post-treatment, $F(1, 94) = .02$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Punishing Responses score from pre- to post-treatment, $F(3, 94) = .67$, $p > .05$. Pain category did not have a significant effect on MPI-II/Punishing Responses score from pre- to post-treatment, $F(4, 94) = .49$, $p > .05$. However, there was not a significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Punishing Responses score from pre- to post-treatment, $F(9, 94) = 1.66$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Punishing Responses score from pre-treatment to one-year follow-up, $F(1, 25) = .03$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Punishing Responses score from pre-treatment to one-year follow-up, $F(2, 25) = .05$, $p > .05$. Pain category did not have a significant effect on MPI-II/Punishing Responses score from pre-treatment to one-year follow-up, $F(4, 25) = .12$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Punishing Responses score from pre-treatment to one-year follow-up, $F(3, 25) = .32$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Solicitous Responses score from pre- to post-treatment, $F(1, 94) = .32$, $p > .05$. MMPI-2 profile type had a significant effect on MPI-II/Solicitous Responses score from pre- to post-treatment, $F(3, 94) = .27$, $p > .05$. Pain category did not have a significant effect on MPI-II/Solicitous Responses score from pre- to post-treatment, $F(4, 94) = .26$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Solicitous Responses score from pre- to post-treatment, $F(9, 94) = .65$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Solicitous Responses score from pre-treatment to one-year follow-up, $F(1, 25) = 2.19$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Solicitous Responses score from pre-treatment to one-year

follow-up, $F(2, 25) = .65$, $p > .05$. Pain category did not have a significant effect on MPI-II/Solicitous Responses score from pre-treatment to one-year follow-up, $F(4, 25) = .1.14$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Solicitous Responses score from pre-treatment to one-year follow-up, $F(3, 25) = 1.01$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Distracting Responses score from pre- to post-treatment, $F(1, 94) = .68$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Distracting Responses score from pre- to post-treatment, $F(3, 94) = .06$, $p > .05$. Pain category did not have a significant effect on MPI-II/Distracting Responses score from pre- to post-treatment, $F(4, 94) = .26$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Distracting Responses score from pre- to post-treatment, $F(9, 94) = .45$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Distracting Responses score from pre-treatment to one-year follow-up, $F(1, 25) = 1.42$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Distracting Responses score from pre-treatment to one-year follow-up, $F(2, 25) = .46$, $p > .05$. Pain category did not have a significant effect on MPI-II/Distracting Responses score from pre-treatment to one-year follow-up, $F(4, 25) = 2.23$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Distracting Responses score from pre-treatment to

one-year follow-up, $F(3, 25) = .14$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Household Chores score from pre- to post-treatment, $F(1, 94) = .01$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Household Chores score from pre- to post-treatment, $F(3, 94) = 1.01$, $p > .05$. Pain category did not have a significant effect on MPI-II/Household Chores score from pre- to post-treatment, $F(4, 94) = .30$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Household Chores score from pre- to post-treatment, $F(9, 94) = .98$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Household Chores score from pre-treatment to one-year follow-up, $F(1, 25) = 2.20$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Household Chores score from pre-treatment to one-year follow-up, $F(2, 25) = .18$, $p > .05$. Pain category did not have a significant effect on MPI-II/Household Chores score from pre-treatment to one-year follow-up, $F(4, 25) = 1.12$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Household Chores score from pre-treatment to one-year follow-up, $F(3, 25) = 1.35$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Outdoor Work score from pre- to post-treatment, $F(1,$

94) = .16, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Outdoor Work score from pre- to post-treatment, $F(3, 94) = 1.16$, $p > .05$. Pain category did not have a significant effect on MPI-II/Outdoor Work score from pre- to post-treatment, $F(4, 94) = 1.04$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Outdoor Work score from pre- to post-treatment, $F(9, 94) = 1.99$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Outdoor Work score from pre-treatment to one-year follow-up, $F(1, 25) = .28$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Outdoor Work score from pre-treatment to one-year follow-up, $F(2, 25) = .47$, $p > .05$. Pain category did not have a significant effect on MPI-II/Outdoor Work score from pre-treatment to one-year follow-up, $F(4, 25) = .44$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Outdoor Work score from pre-treatment to one-year follow-up, $F(3, 25) = .48$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Activities Away From Home score from pre- to post-treatment, $F(1, 94) = .05$, $p > .05$. MMPI-2 profile type had a significant effect on MPI-II/Activities Away From Home score from pre- to post-treatment, $F(3, 94) = 1.81$, $p > .05$. Pain category did not have a significant effect on MPI-II/Activities Away From Home score from pre- to post-treatment, $F(4, 94) = 1.64$, $p > .05$. Further, there was no

significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Activities Away From Home score from pre- to post-treatment, $F(9, 94) = 2.41$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Activities Away From Home score from pre-treatment to one-year follow-up, $F(1, 25) = .10$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Activities Away From Home score from pre-treatment to one-year follow-up, $F(2, 25) = .87$, $p > .05$. Pain category did not have a significant effect on MPI-II/Activities Away From Home score from pre-treatment to one-year follow-up, $F(4, 25) = .85$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Activities Away From Home score from pre-treatment to one-year follow-up, $F(3, 25) = .70$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Social Activity score from pre- to post-treatment, $F(1, 94) = .32$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Social Activity score from pre- to post-treatment, $F(3, 94) = 2.10$, $p > .05$. Pain category did not have a significant effect on MPI-II/Social Activity score from pre- to post-treatment, $F(4, 94) = .74$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Social Activity score

from pre- to post-treatment, $F(9, 94) = .35$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/Social Activity score from pre-treatment to one-year follow-up, $F(1, 25) = .004$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/Social Activity score from pre-treatment to one-year follow-up, $F(2, 25) = .28$, $p > .05$. Pain category did not have a significant effect on MPI-II/Social Activity score from pre-treatment to one-year follow-up, $F(4, 25) = 1.20$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Social Activity score from pre-treatment to one-year follow-up, $F(3, 25) = .22$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/General Activity Level score from pre- to post-treatment, $F(1, 94) = .01$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/General Activity Level score from pre- to post-treatment, $F(3, 94) = 2.25$, $p > .05$. Pain category did not have a significant effect on MPI-II/General Activity Level score from pre- to post-treatment, $F(4, 94) = .57$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/General Activity Level score from pre- to post-treatment, $F(9, 94) = 1.89$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the MPI-II/General Activity Level score from pre-treatment to one-year follow-up, $F(1, 25) = .05$, $p > .05$. MMPI-2 profile type did not have a significant effect on MPI-II/General Activity Level score from pre-treatment to one-year follow-up, $F(2, 25) = .63$, $p > .05$. Pain category did not have a significant effect on MPI-II/General Activity Level score from pre-treatment to one-year follow-up, $F(4, 25) = .98$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/General Activity Level score from pre-treatment to one-year follow-up, $F(3, 25) = .64$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up.

BDI-II Total. The results of a repeated measures MANCOVA showed that there was not a significant difference in the BDI-II Total score from pre- to post-treatment, $F(1, 111) = .001$, $p > .05$. MMPI-2 profile type did not have a significant effect on BDI-II Total score from pre- to post-treatment, $F(3, 111) = .38$, $p > .05$. Pain category did not have a significant effect on BDI-II Total score from pre- to post-treatment, $F(4, 111) = .23$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the BDI-II Total score from pre- to post-treatment, $F(9, 111) = .66$, $p > .05$. The covariates of gender and race did not have a significant effect from pre- to post-treatment. Similarly, the cognitive and somatic components showed no significant effects from any of the independent variables from pre- to post-treatment.

The results of a repeated measures MANCOVA showed that there was not a significant difference in the BDI-II Total score from pre-treatment to one-year follow-up, $F(1, 34) = .28$, $p > .05$. MMPI-2 profile type did not have a significant

effect on BDI-II Total score from pre-treatment to one-year follow-up, $F(3, 34) = .05$, $p > .05$. Pain category did not have a significant effect on BDI-II Total score from pre-treatment to one-year follow-up, $F(4, 34) = 1.42$, $p > .05$. Further, there was no significant effect from the interaction of MMPI-2 profile type and pain category on the BDI-II Total score from pre-treatment to one-year follow-up, $F(4, 34) = .85$, $p > .05$. The covariates of gender and race did not have a significant effect from pre-treatment to one-year follow-up. The cognitive and somatic components showed no significant effects from any of the independent variables from pre-treatment to one-year follow-up.

CHAPTER FIVE
Discussion

The initial study by Gatchel, Mayer, and Eddington (2006) demonstrated the usefulness of the MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) for identifying psychopathology in patients with COSD. Specifically, it was revealed that a profile pattern previously recognized in the psychiatric literature as the "Floating Profile" was more predictive of psychopathology and poor treatment outcomes within the COSD cohort than more commonly utilized profile patterns like the Conversion V (elevations on scales one and two, with a diminished scale three) and Neurotic Triad (in which scales one, two, and three are elevated at similar levels). The "Floating Profile" was thus repurposed as the "Disability Profile" for the context of a pain population. In their study examining a sample of patients with a classifiable MMPI-2 profile in a COSD population, Gatchel and colleagues (2006) found more than two-thirds (66.9%) of such profiles were of the DP code type. Additionally, patients with one of the three non-normal MMPI-2 profile types were less likely to retain work one year following treatment, relative to those with the NP (Gatchel, Mayer, & Eddington, 2006). The purpose of the current study was to evaluate the presence of psychiatric disorders as measured with the MMPI-2 at pre-treatment in an interdisciplinary, heterogeneous pain management population. Success within the pain management program was measured by multiple medical and behavioral outcome instruments, including the MBMD. Further, patients' physical diagnoses were restructured into more discreet pain categories in order to examine any differences that may have existed based upon pain typology.

Demographic Variables

The initial population of patients tracked at The Center from January 1998 to May 2007 was 3,558. From this population, 1,997 patients participated in the IDIS or MDBH treatment programs. There were 1,614 patients who completed the MMPI-2 from these two programs. The core sample for this study included 750 patients who completed the MMPI-2, produced a valid profile, and these profiles were then classifiable according to one of four different patterns (NP, DP, CV, and NT). The average patient was a married, Caucasian, female, approximately 51-years-in-age, with a chronic pain condition (> six months), with the average length of pain just under eight years. With regard to individuals who completed the MMPI-2 at intake versus those who did not, patients demonstrated no significant differences on the variables of gender. Race, however, did have a significant affect on patients completing the MMPI-2, a factor that may be attributable to the initial demographics of patients participating in treatment at The Center. Likely because of socioeconomic factors, the treatment population at the Center is more than 70% Caucasian. Similarly, age also had a significant effect on who completed an MMPI-2. Neither age nor gender had a significant effect upon MMPI-2 validity. Race, though, once more demonstrated a significant effect upon whether an MMPI-2 was valid or not. Again, this may be attributed to the predominately Caucasian population being treated at The Center. Similar demographic analyses revealed no statistically significant differences for age, race, or gender when examining the patients who had physical diagnoses in the database (n = 664). The sample appears to be composed of a cohort of primarily chronic pain patients, with heterogeneous pain diagnoses.

Comparison of Measures at Pre-Treatment

One of the goals of this study was to compare the various measures administered at intake in order to determine if there were differences based upon the four MMPI-2 profile patterns, pain category, or if there was an interaction between the profile type and pain category. Pre-treatment analyses revealed several significant differences between the MMPI-2 profile types and demographic variables collected at intake. Women were significantly more likely to obtain one of the three non-normal MMPI-2 profiles than men. Upon further analyses, it was revealed that women were significantly more likely than men to be in the DP group relative to the other profile group (NP, CV, or NT). Also, non-Caucasian patients were more likely to produce a non-normal profile type relative to Caucasian patients. It is unclear what this can be attributed to, though sociocultural and socioeconomic differences may have contributed to this finding. Patients from the DP group were significantly more likely to be unmarried, relative to the other three profile types. One explanation for this may be that the social support often found in a marriage is lacking for many of the individuals from the DP group, and thereby contributes to a lack of specific defense mechanisms. An additional explanation may be that many patients from the DP group may find it more difficult to establish or maintain interpersonal relationships because of the severity of their symptoms.

Socioeconomic and Vocational Variables. Significant differences were also revealed for socioeconomic and vocational variables collected during intake at The Center. Patients in the DP group were significantly more likely to be receiving disability payments, followed by NT, CV, and NP in rank order. Patients from the NP and CV groups were significantly more likely to be employed at the time intake, relative to the

patients from the DP and NT groups. These findings lend support to Gatchel and colleagues' (Gatchel, Mayer, Eddington, 2006) previous findings, in which patients with the normal profile were twice as likely to retain work one year after treatment than the other three code types. Further, as Gatchel and colleagues (2006) also asserted, individuals with a DP profile typically lack any one specific defense mechanism with which to manage life stressors, and thereby experience much severe emotional distress. A similar assertion could be made for NT code type, which has three clinical elevations on the MMPI-2, whereas the DP code type has at least four. Lacking specific defense mechanisms upon which to rely may contribute to individuals not retaining employment or returning to work after an injury. Conversely, a severe injury, requiring disability payment and/or loss of work, may have a more profound impact upon an individual who already has the tendencies to produce a DP or NT code type.

Physiological Self-Report. MMPI-2 profile type was not found to have a significant impact upon pain category group membership. The NT and DP groups had the highest percentages of patients within the 2CP and 3CP pain categories, however, these differences were revealed to be non-significant. Conversely, it was expected that patients from the 2CP and 3CP pain categories would endorse more pathology, as measured by T-scores elevated above 65 on the MMPI-2 at pre-treatment relative to patients with a single pain diagnostic category. This was not found to be the case. Instead it appears that pain category did not have a direct relationship to MMPI-2 profile type as hypothesized. Although not significantly affected by MMPI-2 profile type, duration of pain was significantly affected by category of pain. A small sample of patients from the NPP pain group had the highest mean score for duration of pain, 180.60 months. MMPI-2 profile

type did show significant differences for the physiological self-report measures: PDA, MVAS, and Oswestry. For each of these, patients from the NP code type reported significantly fewer symptoms relative to the patients from the three non-normal code types. Pain category, however, did not affect these scores significantly. Although pain category may have some effect upon physiological measures, it appears that MMPI-2 profile type is an independent factor from pain diagnoses.

Medical Resources Utilization. Patients from the 3CP pain group had the highest mean for non-surgical procedures for pain prior to intake, but MMPI-2 profile type did not affect the number of procedures. Patients with the DP code type reported significantly more healthcare visits in the preceding six months, relative to patients from the other three code types. Pain category, however, did not affect this number. MMPI-2 profile type had a significant effect on the number of different pain prescriptions during pre-treatment. Specifically, patients with the NP code type were prescribed significantly fewer different prescriptions for pain than patients with the three non-normal code types. Similarly, pain category had a significant effect upon the number of different prescriptions for pain at pre-treatment, with patients from the 2CP pain group being prescribed significantly more medications relative to patients from the MSP pain group. There was, however, no interaction between MMPI-2 profile type and pain category upon the number of different prescriptions. It may be that patients with the NP code type on the MMPI-2 are not experiencing pain to the same degree that patients from the three non-normal code types are. It could also be that patients with the three non-normal MMPI-2 code types are more likely to be medication seeking. The patients who have two different categories of pain, as with the 2CP group, may require more medications or different

combinations of medications to treat their pain. These findings are supportive of the hypothesis that patients from the 2CP and 3CP pain groups would have medication requirements for pain treatment and medications needs relative to patients with a single pain category.

Psychosocial Measures. MMPI-2 profile type had a statistically significant effect on every subscale of the SF-36, including the PCS and MCS components. For each scale of the SF-36, lower scores indicate a greater degree of pathology. In the case of the MMPI-2 code types, patients with the NP code type showed the least pathology relative to the three non-normal profile types. Further, on the Role Limitations/Physical, Role Limitations/Emotional, Social Functioning, Mental Health, Energy Fatigue, and MCS components, patients with the CV code type demonstrated significantly higher mean scores (and thereby less endorsed pathology) than patients from the DP group. It makes sense that patients who have the NP code type on the MMPI-2 would endorse less pathology on the SF-36 than patients with the three non-normal code types, and provides a further measure of concurrent validity between the two instruments. Additionally, it is interesting that patients with the CV code type demonstrate less pathology on the SF-36, particularly for components that are strictly mental or emotional in nature. This may be attributed to a lack of insight into psychosocial motivations, and emotional distress being expressed as physical symptoms. Pain category had no significant effect on the scales of the SF-36. However, there was a significant

interaction effect from MMPI-2 code type and pain category on the SF-36/Role Limitations-Physical scale. It was unclear exactly how this interaction played out.

Analyses of Content and Supplementary scales of the MMPI-2 revealed significant differences for the four different code types as well. Patients with the DP code type were significantly more likely to have lower T-scores on Ego Strength relative to patients from the other three code types. Patients with the CV code type were significantly more likely to have higher T-scores on the MacAndrew Alcoholism scale relative to the other three code types. Patients with the DP code type were significantly more likely to acknowledge addiction, as measured with the AAS scale, relative to the other three code types, though patients with the CV code type bore a close second on this measure. Further, patients with the DP code type were more likely to endorse symptoms of suicidal ideation as measured with the DEP4 scale, relative to the other three code types. While none of these outcomes are particularly surprising, it is important to note that patients with the DP code type, who reportedly have no specific defense mechanism (Gatchel, Mayer, & Eddington, 2006) also show more potential for alcohol abuse, substance abuse, and self-harm. Also noteworthy, patients with the CV code type also showed more potential for substance and alcohol use than patients with the NT and NP code types. It may be that patients with the CV code type lack the insight to cope with emotional stressors and turn to substance and alcohol use as a form of self-medication.

Patients from the DP group also endorsed more symptoms of depression when on the BDI-II (a self-report measure) and the HAM-D (a clinician rated measure), relative to the other three MMPI-2 code types. This is not unexpected for patients endorsing several clinical symptoms on the MMPI-2, and may be further indication of the level of distress these individuals are experiencing in there lives. The Cognitive and Somatic Components of the BDI-II, as well as the question concerning suicidal ideation, were endorsed at significantly higher rates for patients from the DP code type. This lends support to the findings from the MMPI-2 measure of suicidal ideation from the DEP4 supplementary scale. A key difference was revealed in comparing the HAM-D to the BDI-II: Patients from the CV code type self-reported fewer symptoms of depression on the BDI-II than was reported with the clinician rated HAM-D. This latter finding once more demonstrated less insight into psychosocial contributions for patients with the CV code type.

MMPI-2 code type had a significant effect on almost every single scale of the MBMD, including those from: Psychiatric Indicators, Coping Styles, Stress Moderators, Treatment Prognostics, and the Management Guide. Patients with the DP code type from the MMPI-2 were most often identified by the MBMD as being significantly more likely to endorse clinical symptoms relative to patients with the NP code type. These symptoms run the gamut from of depression, anxiety, distorted thinking, inconsistent emotional responses, and suspiciousness.

Additionally, patients with the DP code type were characterized by the MBMD as having less effective personality styles in relation to dealing with stress and illness, as in the context of a pain management program. The Coping Style that was the exception in this analysis was the Non-Conforming style, a measure of non-clinical Anti-social personality style. The reason for this finding was unclear. Additionally, patients with NP and CV code types had higher mean scores on the Confident and Sociable coping styles, measures of non-clinical Narcissistic and Histrionic personality styles, respectively. This reason for this finding is also unclear.

With regard to Stress Moderators as measured with the MBMD, patients with non-normal code types on the MMPI-2 demonstrated more deficits with regard to these factors, with the exception of spiritual support. Again, the reason for this exception is unclear. The Treatment Prognostics component of the MBMD demonstrated that patients with the DP code type on the MMPI-2 were more likely to have decompensatory reactions to treatment and have excessive desire for medical resources. Additionally, the Management Guide component for the MBMD demonstrated that patients from the three non-normal MMPI-2 profile groups were more likely to have psychological complications and require pharmacological or behavioral therapy. Findings from comparing the MBMD to the MMPI-2 support the findings of Gatchel, Mayer, and Eddington (2006), when they demonstrated those with the DP code type were 14 times more likely than those

with a normal profile to have an Axis I diagnosis. The analysis of the Coping Styles component of the MBMD, which assesses non-clinical personality styles, showed similar findings to Gatchel and colleagues' (2006) findings of an occurrence of Axis II personality disorder diagnoses for patients with the DP code type at almost five times that of patients with a normal profile. Implications of these findings are that patients with non-normal MMPI-2 code types are more likely to demonstrate complications in the context of pain management, particularly those with the DP code type who make up such a large proportion of this population.

The analysis of the MPI revealed that patients with the three non-normal profiles displayed the higher degrees of pathology compared to patients from the NP group. Noteworthy from these results was the finding that patients with the NP code type displayed higher degrees of functioning relative to the non-normal code types, on the MPI-II scales of: Life Control, Household Chores, Outdoor Activities, Activities Away From Home, and General Activity Level. Again, these findings lend further support Gatchel and colleagues' (2006) findings that patients with the NP code type were twice as likely to retain work one year after treatment than the other three code types, as all of these factors likely contribute to an individual's ability to find, return-to, or retain work following.

Post-Treatment & One-Year Follow-Up Findings

Among the pre-treatment sample of patients who had valid and classifiable MMPI-2 profiles, data were collected at post-treatment (n= 159) and one-year follow-up (n= 72) for patients who had progressed to those collection points. Pearson chi-square

analyses were performed on the categorical variables collected in the post-treatment and one-year follow-up databases to determine if there were any significant differences between the four MMPI profile groups at post-treatment and at one-year follow-up, based on the following measures: vocational status; MPI-II Coping Style; completion of prescribed treatment; treatment compliance; pain recurrence; pending litigation; and disability payments. There were no significant results demonstrated from these analyses. This may be attributed to low statistical power or small sample size, as these same measures do demonstrate differences from their pre-treatment counterparts, thereby indicating treatment effect. However, since none of these findings were significant no conclusions can be drawn until a larger sample size can be analyzed.

Repeated measures ANCOVAs and MANCOVAs were performed for the remaining outcome measures and scales, including: total procedures for pain; total number of prescriptions taken for pain; physical (PCS) and mental component scales (MCS) of the SF-36; all subscales from the MPI-II; the BDI-2; Pain Drawing Analogue; MVAS; and Oswestry Pain Disability Questionnaire. Measures that demonstrated significant differences from pre-to post-treatment included: Oswestry; total non-surgical procedures; number of prescriptions for pain; SF-36 PCS; SF-36 MCS; the scales of the MPI-II; BDI-2; Pain Drawing Analogue; and MVAS. Exceptions to this were the MPI-II subscales for: Social Support; Solicitous Responses; and Household Chores.

MMPI-2 profile type demonstrated no significant effect on most of these measures from pre-to post-treatment. A few significant results were demonstrated for MMPI-2 profile type from pre-to post-treatment. MMPI-2 profile type had a significant effect on total number of non-surgical procedures. MMPI-2 profile type had a significant

effect on MPI-II/Affective Distress score from pre- to post-treatment. MMPI-2 profile type had a significant effect on MPI-II/Solicitous Responses score from pre- to post-treatment. MMPI-2 profile type had a significant effect on MPI-II/Activities Away From Home score from pre- to post-treatment. Pain category demonstrated no significant effect on any outcome measures from pre- to post-treatment. There was a significant effect from the interaction of MMPI-2 profile type and pain category on the MPI-II/Punishing Responses score from pre- to post-treatment. No other interaction effects were demonstrated for MMPI-2 profile type and pain category on any outcome measures from pre- to post-treatment. The sparseness of these results may be attributed to low statistical power or small sample size, as these same measures at post-treatment do demonstrate differences from their pre-treatment counterparts, thereby indicating treatment effect. However, since most of these findings were not significant no definitive conclusions can be drawn until a larger sample size can be analyzed.

Repeated measures ANCOVAs and MANCOVAs were performed for the remaining outcome measures and scales from pre-treatment to one-year follow-up, including: total procedures for pain; total number of prescriptions taken for pain; physical (PCS) and mental component scales (MCS) of the SF-36; all subscales from the MPI-II; the BDI-2; Pain Drawing Analogue; MVAS; and Oswestry Pain Disability Questionnaire. Not all measures demonstrated significant differences from pre-treatment to one-year follow-up, a factor that may be attributed simply to low sample size or to patients returning to baseline a year after treatment. Measures that demonstrated significant differences from pre-treatment to one-year follow-up included: total number of non-

surgical procedures; SF-36 PCS; MPI-II/Pain Severity; MPI-II/Pain Interference; MPI-II/Distracting Responses; Pain Drawing Analogue; and MVAS.

Similar to the pre- to post-treatment analyses, MMPI-2 profile type demonstrated no significant effect on most of these measures from pre-treatment to one-year follow-up. However, a few significant results were demonstrated for MMPI-2 profile type from pre-treatment to one-year follow-up. MMPI-2 profile type had a significant effect on MPI-II/Pain Severity and MPI-II/Social Support scores from pre-treatment to one-year follow-up. Pain category had a significant effect on MVAS total score from pre-treatment to one-year follow-up. There was a significant effect from the interaction of MMPI-2 profile type and pain category on the Oswestry from pre-treatment to one-year follow-up. There was a significant effect from the interaction of MMPI-2 profile type and pain category on the SF-36 PCS score from pre-treatment to one-year follow-up. There was a significant effect from the interaction of MMPI-2 profile type and pain category on the MVAS total score from pre-treatment to one-year follow-up. As with the pre-treatment to post-treatment analyses, the sparseness of these results may be attributed to low statistical power or small sample size, as these same measures at one-year follow-up do demonstrate differences from their pre-treatment counterparts, thereby indicating a treatment effect. However, since most of these findings were not significant no definitive conclusions can be drawn until a larger sample size can be analyzed.

Conclusions

This present study followed up on the prospective study by Gatchel, Mayer, and Eddington (2006) in which they demonstrated the utility of DP code type in predicting diagnostic and treatment outcomes in a COSD population. In that vein, this study

replicated several of the findings from that previous study or provided support for those findings.

Patients with the DP code, as well as those with the CV and NT code types, demonstrated significant impairment and pathology on the majority of measures at intake. Overall, these measures still demonstrated group differences at post-treatment and one-year follow-up for each of the four MMPI-2 code types. What was lacking in this design, however, was a large enough sample size to demonstrate significant effects from pre-treatment to post-treatment and one-year follow-up. In conclusion the MMPI-2 code types demonstrated much utility for identifying pathology and impairment across a number of measures, particularly for patient with the DP code type, during intake at The Center. Pain category did not demonstrate as much utility for identifying pathology and impairment. This latter finding may imply that subjective distress as measured with psychosocial instruments like the MMPI-2, MBMD, or SF-36 is a far more heuristic method for predicting treatment compliance and outcomes than physiological measures alone.

Limitations and Directions for Future Research

As previously noted, this study was unable to replicate several of Gatchel and colleagues' (2006) previous findings for outcome measures at post-treatment and one-year follow-up. It is probable that these findings can be replicated with a sufficient sample size, as was indicated by the results of analyses with all of the pre-treatment data. Future endeavors should focus on post-treatment follow-up in order to increase the sample size for analysis. Additionally, this study was limited by a sample of predominately Caucasian patients who were also able to afford treatment in a private

clinic. This sample in particular consisted of patients who had favorable socioeconomic conditions for participating in interdisciplinary treatment, often covered by private insurance. Because of these conditions, sociocultural issues may have contributed to different results than might be found in more diverse samples at different types of treatment centers. To account for this possibility, it will be necessary to conduct future research in a variety of treatment contexts.

Because this is the first analysis specifically comparing scores on the MMPI-2 with scores on the MBMD in a pain treatment context, further analyses are recommended. Analyses comparing scores on the MBMD to the several other pre-treatment variables included in this study may yield profiles of a similar heuristic value to those identified with the MMPI-2. Comparison of scores on the MBMD from pre-treatment to post-treatment may demonstrate a treatment effect on several of the MBMD's subscales.

Summary

This study replicated Gatchel and colleagues' (2006) groundbreaking work in examining the utility of the "Disability Profile" in evaluating and treating chronic pain. It examined patients in a large heterogeneous pain population. The MMPI-2 profile classifications at pre-treatment were compared with several other measures and accurately identified the presence of psychopathology and impairment in this cohort. These specific MMPI-2 profile classifications were also compared with treatment outcome measures at post-treatment and one-year follow-up with findings that may have been limited by smaller sample size. Additionally, this study was the first of its kind to compare scores from the MMPI-2 with scores on the MBMD (Millon, Antoni, Millon, &

Davis, 2003) in a large, heterogeneous, interdisciplinary pain management cohort and thereby demonstrated validity between these two measures.

MMPI-2 profile classifications at pre-treatment were compared with several other measures and accurately identified the presence of psychopathology and impairment in this cohort. These specific MMPI-2 profile classifications were also compared with treatment outcome measures at post-treatment and one-year follow-up with findings that may have been limited by smaller sample size. Additionally, this study was the first of its kind to compare scores from the MMPI-2 with scores on the MBMD (Millon, Antoni, Millon, & Davis, 2003) in a large, heterogeneous, interdisciplinary pain management cohort and thereby demonstrated validity between these two measures.
It was predicted that patients from all pain categories, who also presented with the NP (normal profile) response pattern on the MMPI-2 at pre-treatment, would be more likely than patients from the three non-normal groups (DP, CV, and NT) combined to have better socioeconomic outcomes (e.g., return-to-work, work retention, etc.) at post-treatment and at one-year following treatment. This was not found to a significant degree due to sample size.

It was expected that patients with the DP response pattern on the MMPI-2 in all pain categories would endorse more pathology on the Millon Behavioral Medicine Diagnostic (MBMD; Millon, Antoni, Millon, & Davis, 2003) at pre-treatment, relative to the other three MMPI-2 categories. Overall, this hypothesis was supported. It was expected that patients with the DP response pattern on the MMPI-2 in all pain categories would have had more individual pain diagnoses. This hypothesis was supported. It was expected that patients with the DP response pattern on the MMPI-2 in all pain categories

would have had more procedures for pain treatment. This was not found to be true, patients from the NT group had the most procedures.

It was expected that patients with the DP response pattern on the MMPI-2 in all pain categories would have greater psychosocial issues (e.g., determined by scores on the SF-36, MPI-II, BDI-2, MVAS, etc.) This was found to be true, even at post this held true between group means were compared. However, effects on these measures were often not significant over time. It was anticipated that DP patients would be more likely than the other three MMPI profile categories to be classified as having more than one pain categorization. For instance, patients with the DP code type would be more likely to be classified as belonging to multiple pain category, as these individuals were expected to have more complications in treatment. This was not found to a significant degree, though the DP group demonstrated more individual diagnoses in comparison to the other three groups and the highest duration of onset in months, though these too were not significant. It was expected that patients in the multiple pain category would endorse more pathology on the MMPI-2 and MBMD at pre-treatment relative to patients with a single pain diagnostic category. It was expected that patients in the multiple pain category would have had more medical requirements (e.g., procedures) for pain treatment and medication needs, and that they would have greater psychosocial issues (as measured with instruments such as the SF-36, Oswestry Disability Questionnaire, MPI-II, BDI-2, MVAS, etc.). Overall, Pain Category did not have a significant impact upon psychosocial measures. Exceptions to this were often located on instruments and outcome measures with a physical component.

APPENDIX A
Figures

FIGURE 1

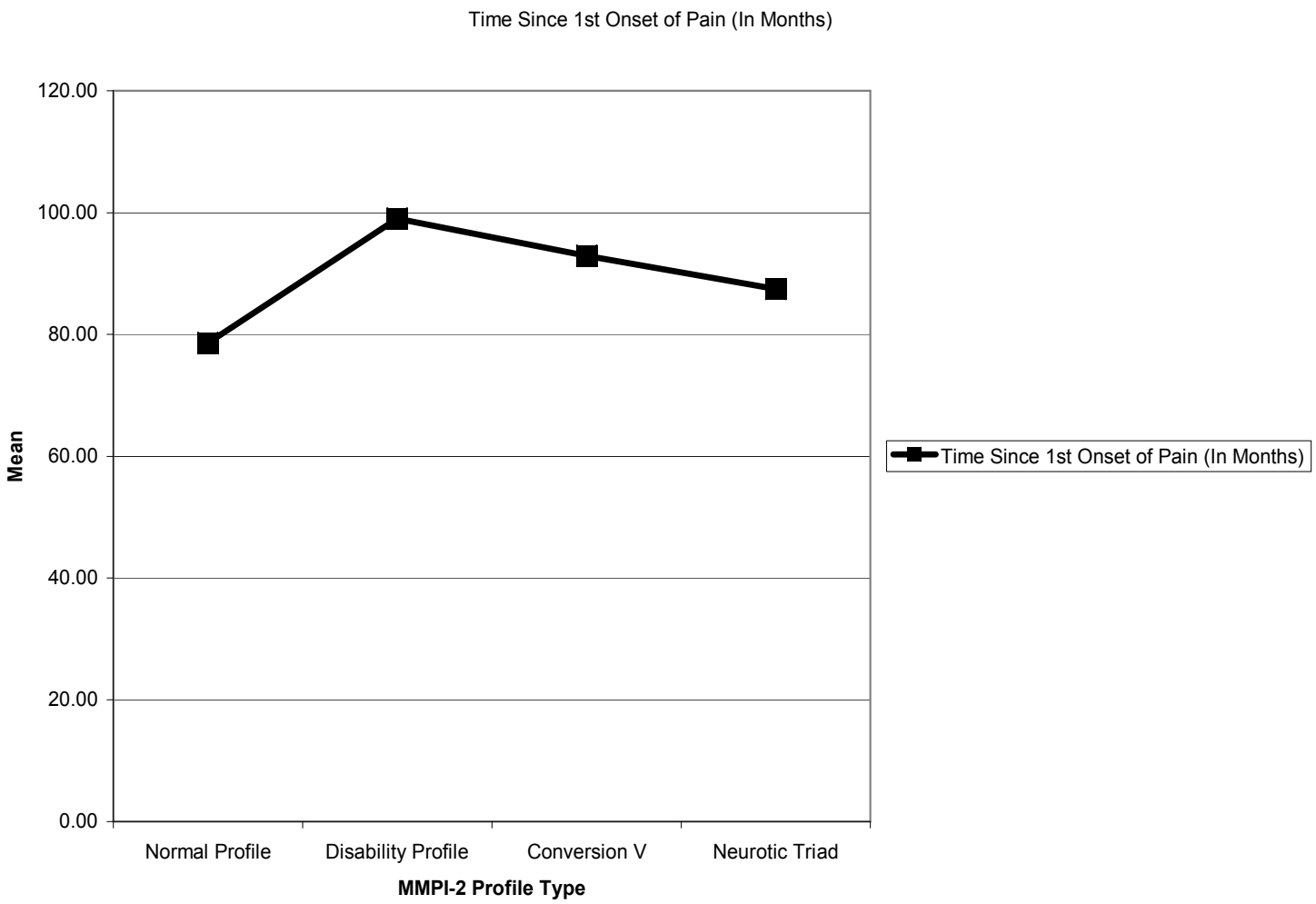

Time Since 1st Onset of Pain (In Months)
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Mean
Normal Profile
Disability Profile
Conversion V
Neurotic Triad
MMPI-2 Profile Type
Time Since 1st Onset of Pain (In Months)

FIGURE 2

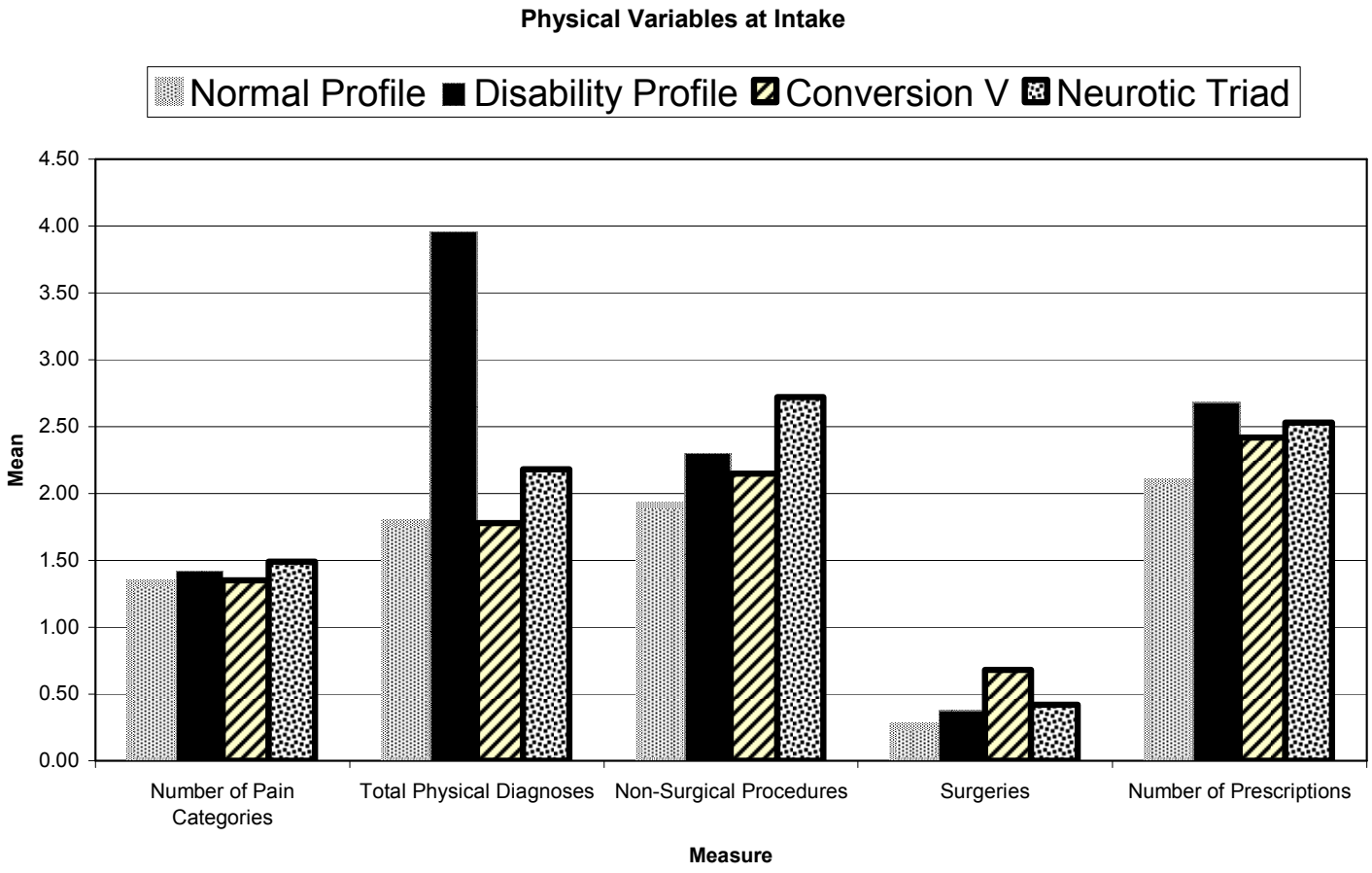

Physical Variables at Intake
Normal Profile
Disability Profile
Conversion V
Neurotic Triad
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Mean
Number of Pain Categories
Total Physical Diagnoses
Non-Surgical Procedures
Surgeries
Number of Prescriptions
Measure

FIGURE 3

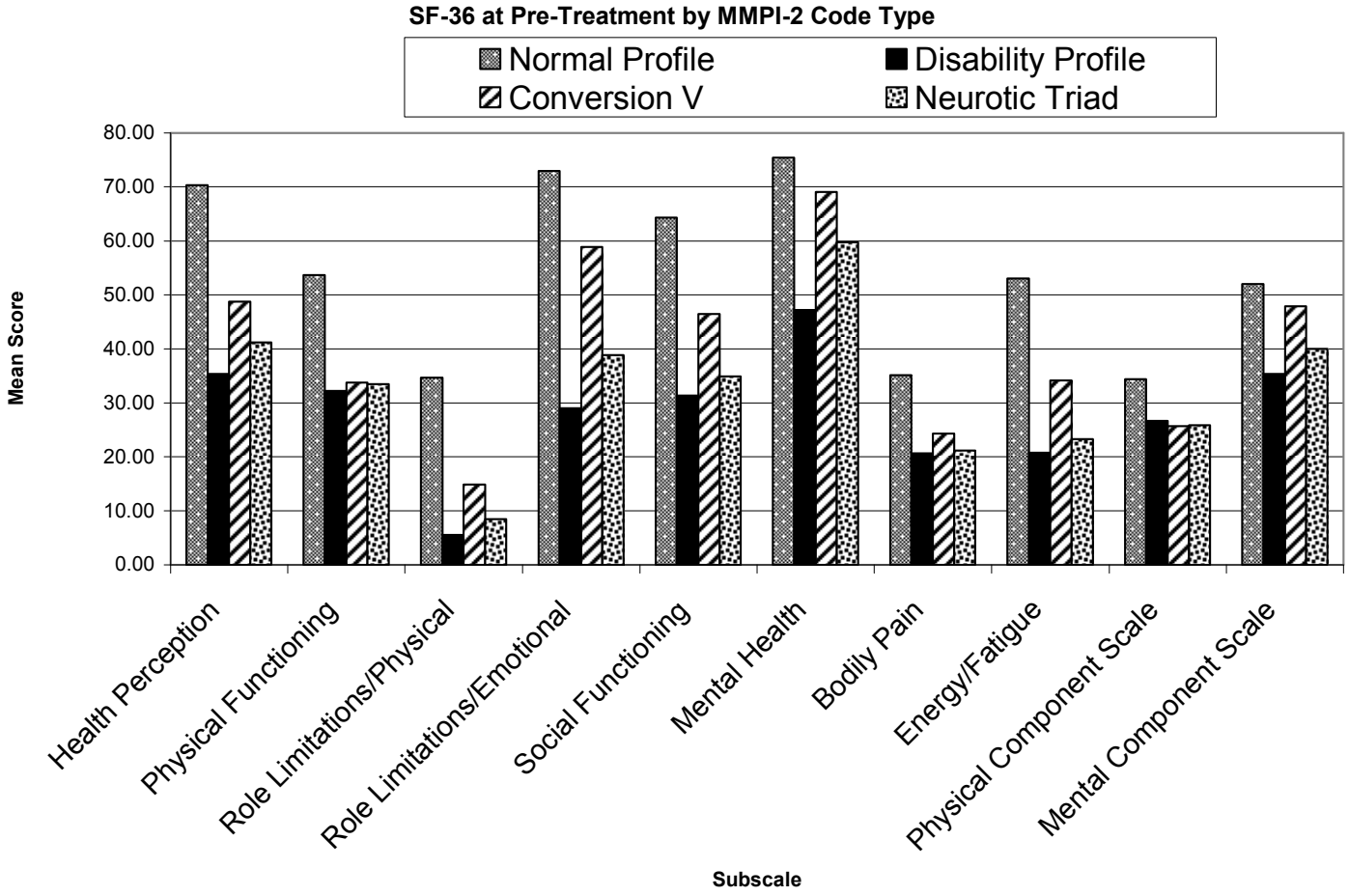
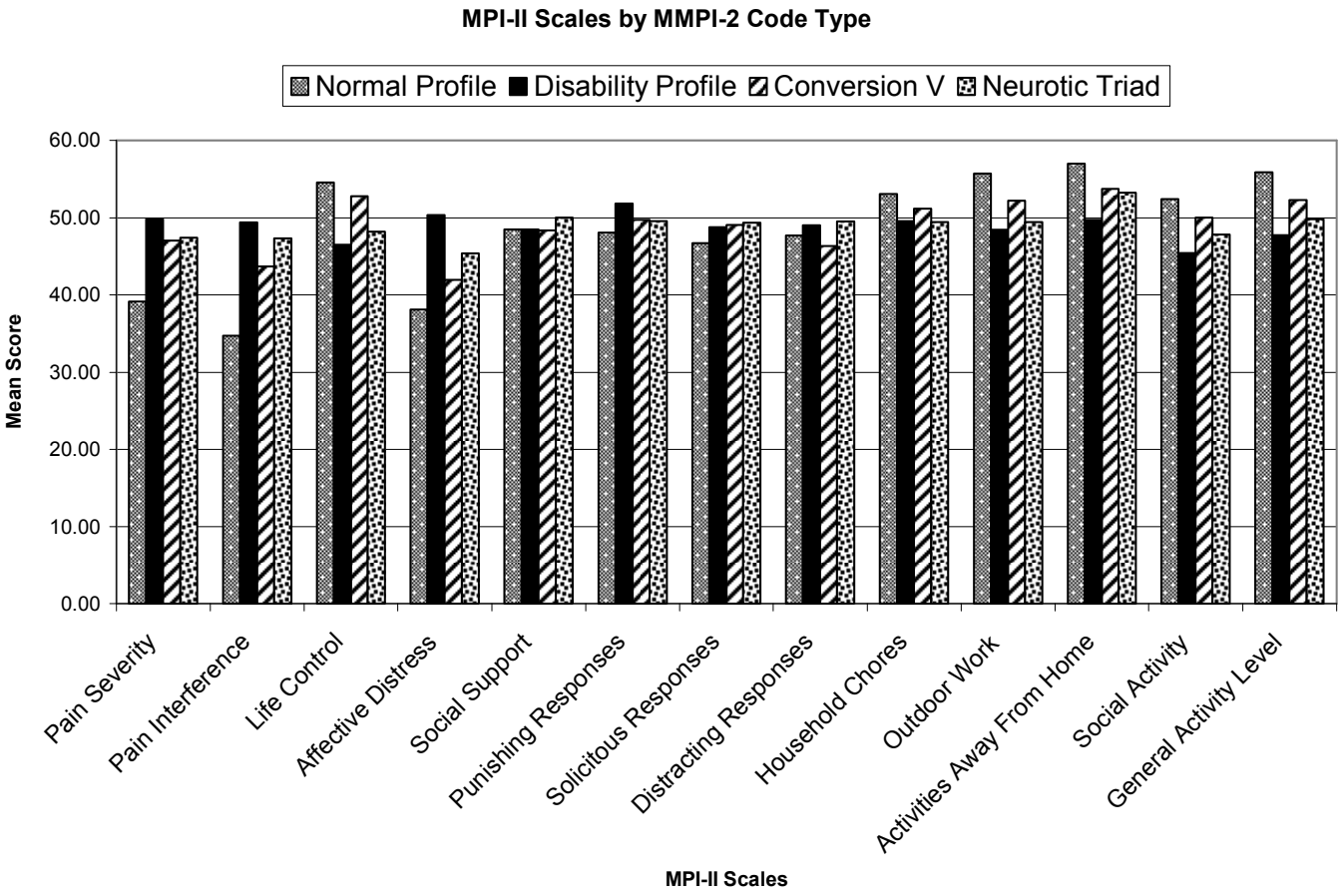

SF-36 at Pre-Treatment by MMPI-2 Code Type
Normal Profile
Disability Profile
Conversion V
Neurotic Triad
Mean Score
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Health Perception
Physical Functioning
Role Limitations/Physical
Role Limitations/Emotional
Social Functioning
Mental Health
Bodily Pain
Energy/Fatigue
Physical Component Scale
Mental Component Scale
Subscale

FIGURE 4


MPI-II Scales by MMPI-2 Code Type
Normal Profile
Disability Profile
Conversion V
Neurotic Triad
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Mean Score
Pain Severity
Pain Interference
Life Control
Affective Distress
Social Support
Punishing Responses
Solicitous Responses
Distracting Responses
Household Chores
Outdoor Work
Activities Away From Home
Social Activity
General Activity Level
MPI-II Scales

APPENDIX B
Tables

Table 1. Demographic Variables for Initial Intake Population

Variables	(*n*=3,586)
Age-Mean	52.01
Range in Years	12-98
Gender (%)	
Male	1,295 (36.1)
Female	2,278 (63.5)
Race (%)	
Caucasian	2,624 (73.2)
African American	374 (10.4)
Hispanic	148 (4.1)
Asian	49 (1.4)
Other	39 (1.1)
Marital Status (%)	
Single	447(12.5)
Married	1,965(54.8)
Living with significant other	94(2.6)
Divorced or separated	448(12.5)
Spouse Deceased	193(5.4)
Duration of Pain in Months	
Mean	85.25
Median	36.00
Range	1-846
Status of Pain Condition (%)	
Acute (< 3 Months)	124 (3.4)
Sub-Acute (3-6 Months)	242 (6.8)
Chronic (> 6 Months)	2,779 (77.7)
Pending Litigation (%)	
Yes	358 (10.0)
No	2,580 (71.9)
Disability Payments (%)	
Yes	785 (21.9)
No	2,287 (63.8)
Track Assignment (%)	
Interdisciplinary	1,676 (46.7)
Medical/Behavioral	335 (9.3)
Other	1,558 (43.5)

Table 2. Demographic Variables for Interdisciplinary Sample

Variables	(*n* = 755)
Age-Mean	50.91
Range in Years	18-91
Gender (%)	
Male	266 (35.2)
Female	489 (64.8)
Race (%)	
Caucasian	623 (82.5)
African American	70 (9.3)
Hispanic	28 (3.7)
Asian	5 (.7)
Other	4 (.5)
Marital Status (%)	
Single	99(13.1)
Married	448(59.3)
Living with significant other	24(3.2)
Divorced or separated	107(14.2)
Spouse Deceased	38(5.0)
Duration of Pain in Months	
Mean	95.51
Median	48.00
Range	1-846
Status of Pain Condition (%)	
Acute (< 3 Months)	16 (2.1)
Sub-Acute (3-6 Months)	53 (7.0)
Chronic (> 6 Months)	646 (85.6)
Pending Litigation (%)	
Yes	98 (13.0)
No	588 (77.9)
Disability Payments (%)	
Yes	202 (26.8)
No	497 (65.8)
Track Assignment (%)	
Interdisciplinary	673 (89.1)
Medical/Behavioral	82 (10.9)

Table 3. Number of Patients by MMPI-2 Profile Type and Pain Category

Variables	
MMPI-2 Profile Type (%)	(*n* = 755)
Disability Profile (DP)	467 (61.9)
Conversion V (CV)	118 (15.6)
Neurotic Triad (NT)	78 (10.3)
Normal Profile (NP)	92 (12.2)
Pain Category (%)	(*n* = 668)
Musculoskeletal Pain	280 (41.9)
Neuropathic Pain	7 (1.0)
Headache Pain	22 (3.3)
Visceral Pain	63 (9.4)
Fibromyalgia	30 (4.5)
Multiple Pain Categories	266 (39.8)

TABLE 4. Pre-Treatment ANOVA Table : Intake Demographics byMMPI-2 Profile

Variables	*F*	*df*	*p*
Time (in months) Since First Onset of Pain	1.67	(3, 600)	.172
Sum of Pain Categories	.03	(3, 667)	.994
Total (Individual) Physical Diagnoses	.79	(3, 667)	.503
Total (Non-Surgical) Procedures Prior to Intake	4.07	(3, 662)	.007
Total Surgeries Prior to Intake	.16	(3, 652)	.925
Number of Different Prescriptions for Pain	.87	(3, 632)	.456
Pain Drawing Analogue	1.84	(3, 597)	.138
Million Visual Analog Scale (MVAS)	12.41	(3, 582)	.000
Oswestry Pain Disability Questionnaire	6.19	(3, 573)	.000
Number of Healthcare Visits (Last 6 Months)	1.26	(3, 506)	.288
Number of ER Visits (Last 6 Months)	.09	(3, 532)	.968

Table 5. MANOVA Results: Beck Depression Inventory-2 by MMPI-2 Profile Type

Variables		*F*	*df*	*p*
Multivariate Results				
Hotelling's *T*	.260	4.26	(12, 590)	.000
Univariate Results				
BDI-2 Total Score		15.50	(3, 219)	.000
BDI-2 Cognitive component		8.95	(3, 219)	.000
BDI-2 Somatic component		16.00	(3, 219)	.000
BDI-2 Suicidal Ideation		4.38	(3, 219)	.005

Table 6. Pre-Treatment MANOVA Table: MBMD Scales by MMPI-2 Profile Type

Variables		*F*	*df*	*P*
Hotelling's *T*:	1.30	2.59	(87, 521)	.000
MBMD Anxiety/Tension (AA)		8.17	(3, 221)	.000
MBMD Depression (BB)		28.60	(3, 221)	.000
MBMD Cognitive Dysfunction (CC)		10.68	(3, 221)	.000
MBMD Emotional Lability (DD)		7.41	(3, 221)	.000
MBMD Guardedness (EE)		4.68	(3, 221)	.004
MBMD Introversive Style (1)		10.95	(3, 221)	.000
MBMD Inhibited Style (2A)		11.40	(3, 221)	.000
MBMD Dejected Style (2B)		12.01	(3, 221)	.000
MBMD Cooperative Style (3)		4.20	(3, 221)	.007
MBMD Sociable Style (4)		4.91	(3, 221)	.003
MBMD Confident Style (5)		10.84	(3, 221)	.000
MBMD Nonconforming Style (6A)		.34	(3, 221)	.795
MBMD Forceful Style (6B)		1.27	(3, 221)	.286
MBMD Respectful Style (7)		2.18	(3, 221)	.091
MBMD Oppositional Style (8A)		10.20	(3, 221)	.000
MBMD Denigrated Style (8B)		6.98	(3, 221)	.000
MBMD Illness Apprehension (A)		5.10	(3, 221)	.002
MBMD Functional Deficits (B)		14.40	(3, 221)	.000
MBMD Pain Sensitivity (C)		6.05	(3, 221)	.001
MBMD Social Isolation (D)		6.31	(3, 221)	.000
MBMD Future Pessimism (E)		14.06	(3, 251)	.000
MBMD Spiritual Absence (F)		1.55	(3, 221)	.203
MBMD Interventional Fragility (G)		5.83	(3, 221)	.001
MBMD Medication Abuse (H)		.27	(3, 221)	.844
MBMD Information Discomfort (I)		.66	(3, 221)	.579
MBMD Utilization Excess (J)		5.00	(3, 221)	.002
MBMD Problematic Compliance (K)		.44	(3, 221)	.724
MBMD Adjustment Difficulties (L)		8.27	(3, 221)	.000
MBMD Psych Referral (M)		12.49	(3, 221)	.000

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VITAE

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