A COMPARISON OF THE MCMI-III AND THE MMPI-2 IN A CHRONIC PAIN POPULATION

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The purpose of the present study was to study the relationship of MCMI-III clinical scales with MMPI-2 clusters in a chronic pain population. Data was obtained through assessment data (N = 242) from the Dallas Spinal Rehabilitation Center (DSRC), that included MMPI-2 and MCMI-III, as well as pre-and post-assessment information (n = 21) and follow-up questionnaires (n = 19). Subjects' age ranged from 18 to 64. Each patient had a primary diagnosis related to a back and/or a cervical injury, a chronic pain diagnosis, and often medical prescription dependency and/or addition. Each has experienced back pain in the lumbar region (L1 to L5) or cervical region (C1 to C7) for an average of 32 months. Patients with thoracic (mid-spine) and carpal tunnel pain were excluded from this study. A multivariate cluster analysis procedure was performed that yielded 3 homogeneous female MMPI-2 clusters and 4 MMPI-2 homogeneous male clusters. Seven multiple regression analyses were performed to determine which MCMI-III clinical scales predicted cluster membership in the MMPI-2 clusters. Results indicated that MCMI-III clinical scales "7" Compulsive, "X" Validity and "C" Borderline were predictors for membership in the male MMPI-2 clusters. Membership in the female MMPI-2 clusters were predicted by MCMI-III clinical scales "4" Histrionic, "T" Drug Dependence and "2A" Avoidant. Nineteen pre-and post-MCMI-IIIs were analyzed for change after participants completed the six-week pain management program. Paired-sample t-tests were performed on these data and revealed that significant change was noted on 10 MCMI-III clinical scales. Follow-up data questionnaires were available on these same individuals. Results from a correlation analysis indicated that patients who reported having supportive relationships with

their spouse and family and a secure source of income report better quality of sleep, better mood, are able to relax and are believe that they are able to manage their pain. Participants who were able to relax and remain calm report better quality of sleep, exercise frequently, report better quality of mood and believe that they will return to work soon. Findings from this study suggest that rather than using the MCMI-III as a diagnostic tool, a more efficient use of this instrument would be to understand maladaptive coping styles that may be present under stressful situations. This study's findings suggest that pain treatment program staff could utilize follow up information, as well as diagnostic information about coping strategies that might appear under stress, to shape interventions. Future research might focus on investigation of factors that predict both improvement and program failure, especially those present at initial intake.

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INTRODUCTION

Chronic, intractable pain is a difficult problem to treat and an enormously frustrating clinical problem, exacting a huge cost in personal suffering, quality of life, and productivity. It promotes huge financial losses to society at large. In the United States, one-third to one-half of the population will seek medical attention for a persistent pain problem at some time in their lives (Chapman & Bonica, 1985; Strang, 1985). Low back pain is the principal diagnosis in 10% of all chronic health conditions, and painful musculoskeletal conditions are the leading cause of functional (i.e., activity) limitation in patients of working age (Anderson, Pope & Frymoyer, 1984; Kelsey, White, Patides & Bisbee, 1979; Steinberg, 1992).

Although most individuals experiencing back pain do not seek medical attention or make major alterations in their activities (Crook, Rideout & Brown, 1994; Reisbord & Greenland, 1995), the number of persons annually who are partially or totally disabled by back pain is estimated as high as 8 million (Bonica, 1990). A review of studies from the 1980s and earlier concluded that chronic back disorders caused the loss of 240 million workdays annually (Chapman & Bonita, 1995). The incidence of back pain is highest in working-age adults between 25 and 55 years old, accounting for about 2% of its national productivity (Cypress, 1993; Harkins, Kwentus & Price, 1994; Steinberg, 1992).

A congressionally mandated Institute of Medicine (IOM) report on pain and disability found that "between 1980 and 1992, estimated total disability expenditures from all sources for members of the population aged 18 to 64 years old more than doubled, from $60.2 billion to $121.5 billion in real 1992 dollars" (Institute of Medicine,

1997, p. 91). The Social Security Disability Insurance program also expanded rapidly over the past 25 years: "Between 1970 and 1995, the number of beneficiaries increased by 480% and the total annual benefits paid under the program increased by 778%. This growth far outstripped the increase in the U.S. adult population, which grew by only 51% during that period, and that of the working population insured for disability under the Social Security Administration, which increased by 135% (Institute of Medicine, 1997, page 38). Back injuries account for approximately 20 – 30% of all Workers' Compensation costs (Edwards, 1993; Snook and Jensen, 1994), and the frequency of claims for back injury has risen more rapidly than for any other injury (Fordyce, 1994; Steinberg, 1992).

On the positive side, most cases of back pain are self-limited; 80-90% of patients recover within two months of seeking medical attention and only 8 to 10% suffer for more than six months with any given episode (Steinberg, 1992; Strang, 1985). However, this latter group represents a significant and costly subgroup of the U.S. labor force. The longer the duration an individual's pain problem lasts, the chances of their returning to work drops drastically (Beals & Hickman, 1992) and the costs in disability payments, litigation and medical expenses rise. About 25% of back injury cases account for about 90% of all medical compensation costs (Snook & Jensen, 1994; Strang, 1995).

These statistics suggest that medical science has not developed an effective treatment for intractable pain. To understand the reasons for the lack of effective treatment, it is necessary to understand the complexity of the problem. Pain is most commonly thought of as a warning signal of tissue injury or disease. This specificity

definition assumes that the amount of pain experienced is roughly proportional to the amount of tissue damage sustained. However, such a purely physiological, dualistic model of pain ("real" = clearly related to tissue damage, "imaginary" = suffering with no clear organic base) is relatively new in the history of pain concepts (Chapman & Bonica, 1985; Ford, 1993; Fordyce, 1986; Pennebaker, 1992). Aristotle and Plato regarded pain as a passion and an emotion, while Biblical references recognize that pain "felt in the body may well arise from misery, sadness or unhappiness" (Merskey, 1980, p. 4). Even our daily language retains an affective conception of pain: "You really hurt me by saying that," or "he is really a pain in the neck."

The past three decades have witnessed a move away from the dichotomous Cartesian model of pain and a return to a multidimensional definition that recognizes affective, cognitive, behavioral and social components, as well as somatosensory aspects of pain (Chapman & Bonica, 1995; Eisenberg, 1987; Ford, 1993; Fordyce, 1986; 1987, Melzack and Wall; 1965; 1983; Pennebaker, 1982; Turk & Flor, 1984). The specificity model was unable to account for the observed absence of pain in certain injury states or for the persistence of pain complaints in the absence of sufficient organic findings. The International Association for the Study of Pain has defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (1986, p 217). This definition removes the relationship between tissue damage and pain, instead emphasizing that pain is a subjective psychological experience, which although the patient must associate it with a somatic sensation, does not necessarily have to result from a physiological stimulus. This

multi-component definition of pain helps in understanding the complexities of chronic pain problems.

Definitions of chronic pain vary, but the term itself implies extended duration. Typically, it is characterized as a persistent problem that is refractory to traditional medical treatment. Pain of six months' duration is the "standard definition" used in the research literature, as this duration is well beyond the expected healing time for most injuries. Studies vary as to the types of pain problems included in the category of chronic pain vary, but most exclude patients with degenerative diseases or cancer, which could cause continuing sensory input from progressive tissue or nerve damage. The definition of chronic pain also includes the patient's experience or complaints of pain that go beyond what might be expected from the known extent of organic involvement. Psychosocial factors must be considered in addition to whatever physiological factors may be contributing to the pain complaints. Pain problems of extended duration involve and affect all aspects of patients' lives (Strang, 1995; Watson, 1982).

Just as the inadequacies of the specificity model led to the development of a multi-factional definition of pain, the inadequacies of traditional medical treatment have led to treatment programs aimed at the multiplicity of physical and psychosocial factors thought to contribute to chronic pain problems. Any assessment or treatment approach must take into consideration the wide variety of factors that have been proposed as influencing pain. For a particular patient, one perspective may be more useful than another in understanding the specific factors causing his or her difficulties. Overall, however, current approaches to the management of chronic pain tend to assume that

effective treatment programs need to incorporate to some degree a multidisciplinary approach based on medical/physiological diagnoses, as well as strategies from many theoretical model, such as classical conditioning and learning theory, social learning and modeling, systems theory, cognitive and information processing, and stress management. Just as the treatment of pain needs to encompass tools from various treatment models, so must the assessment process of the patient prior to treatment (Van Houdenhove, 1986; Turk & Flor, 1986).

Classifying chronic pain patients

Classifying chronic pain has moved far beyond a model of pain as a sensory signal of tissue injury. The enormous complexity of chronic pain must be approached as a psychosocial as well as physiological phenomenon. The chronic pain patient can only be understood when the interaction of affective, cognitive life history, learning and conditioning, social modeling, physiological and psychiatric systems are taken into account. Current pain treatment programs take a pragmatic, eclectic view of the problem and attempt to address as many facets of the chronic pain syndrome as possible (Chapman & Bonica, 1985; Fordyce, 1986; Turk & Flor, 1984).

Adequate classification of chronic pain patients can help to address many of the problems inherent in the complex multidimensional models of chronic pain etiology and approaches to treatment. Two major goals of classification strategies should be to describe the characteristics of the typical pain patient's personality and to describe the differences among pain patients (Keller & Butcher, 1992). The relevance of these typical pain patient descriptions have guided clinicians in discovering the etiologic and

maintaining factors in chronic pain states, in developing general treatment programs that address all these components of chronic pain, and potentially for predicting the development of pain problems premorbidly (Prokop, 1988).

Multidisciplinary treatment approaches have required an enormous financial investment and the involvement of many professionals from diverse backgrounds (Aranoff, 1985). Adequate classification of the constellation of factors contributing to a particular patient's pain problem could potentially cut these costs by accurately predicting who might benefit from such a program (Turk & Flor, 1985). However, even more helpful would be the ability to identify groups of patients with certain factors in common who would respond best to certain treatment components. Research on chronic pain patients has generally conformed to the same uniformity myth (Keisler, 1988) that has pervaded psychotherapy outcome research in general. If subgroups of patients who have certain etiologic or maintaining factors in common could be identified, matching them to an appropriate treatment could simultaneously cut costs and improve outcome statistics.

Many studies have tried to characterize the typical chronic pain patient. Such investigations provide important data needed to hypothesize and test theories of chronic pain etiology and maintenance. The available literature providing demographic descriptions suggests that the average chronic pain patient tends to be high-school-educated, Caucasian, protestant, from lower socioeconomic backgrounds, blue-collar workers engaged in physically demanding, monotonous work. He or she is 25 to 55 years old, was injured on the job, and has insurance compensation available. If married,

his or her marriage is likely to be marked by communication difficulties and unacknowledged conflict; and it is fairly likely that the spouse is having somatic problems as well. The patient is likely to be overweight and a smoker. He or she probably grew up in a large family, within an atmosphere of conflict. The conflict more than likely erupted in physical abuse but was rarely acknowledged or discussed. In addition, one or more family members may have served as models of physical or psychiatric disability. A majority of chronic pain patients have had bouts of illness and disability before the current problem. Previous health problems usually included alcohol abuse (Andersson, 1981; Beals & Hickman, 1972; Craig, 1983; Edwards et al., 1985; Feurerstain, Papciak, & Hoon, 1987; Feuerstein, Sult, & Houle, 1985; Fishbain, Goldberg, Meagher, Steele, & Rosomoff, 1986; France, Krishnan, & Trainor, 1986; Gentry, Shows & Thomas, 1974; Katon, Egan, & Miller, 1985; Klein, Jensen, & Sanderson, 1984; McArthur et al., 1987; Murray, 1982; Steinberg, 1982).

Blumer and Heilbronn (1981, 1982) have described pain patients as hypochondriacal "preoccupied with somatic complaints and disease phobias, anxious and irritable, withdrawing from life problems." Van Houdenhove, (1986) found that a majority of patients in pain management programs have hysterical personality styles (marked denial of psychological problems, inhibition of aggression, attention-seeking, dependent, suggestible, with somatic symptoms serving to resolve emotional conflict and express needs), and alexithymic (concrete, no language for feelings or abstract concepts; interpersonal and emotional expression is in "body language"). They may have assumed adult care taking and work roles early in life, resulting in unmet dependency needs

(Feurestein, et al., 1987). They are often described as suffering from obvious or masked depression, and have manipulated social systems to meet their needs. Typically, chronic pain patients have viewed themselves as helpless and without resources or skills to take control of their lives (Aronoff & Rutrick, 1985; Catchlove et al., 1985; Crown 1980; Engel, 1959; Evans, 1985; Gentry et al., 1984; Murray, 1982; Sternback, 1974.)

Although a variety of measures and observational methods have been used in arriving at the above descriptions, the most widely cited objective assessment device used with chronic pain patients is the Minnesota Multiphasic Personality Inventory (MMPI), a 566-item true-false self-report questionnaire. Items on the MMPI are grouped into scales, which were originally developed in the 1940s to discriminate empirically between groups of patients with various psychiatric diagnoses and a group of normal adults. Raw scores on the scales are transformed into standardized "t-scores," designed to have a mean of 50 and a standard deviation of 10 in the original normative sample. These scores are then plotted on a test profile. While diagnostic systems have changed and interpretive strategies are now based more on profile patterns of scores ("codetypes") and item content than on single scale scores, four validity scales and ten clinical scales have remained in the standard set of MMPI scores reported across studies in a wide variety of patient populations (Dahlstrom, Welsh, & Dahlstrom, 1972; 1975; Graham, 1987; Keller, Butcher, & Slutske, 1990).

Classifying chronic pain patients using the MMPI

The problem of classifying chronic pain patients has been most consistently addressed using the MMPI and MMPI-2. At this point other assessment instruments and approaches have not received enough attention in the literature to provide comparably extensive data. A survey by Hickling, Sison, and Holtz (1995) reported that the MMPI was the most commonly used assessment tool in the pain clinic and used by 78.7% of all clinics. The MMPI has been a major tool in identifying psychological problems in patients with chronic pain.

Several attempts have been made to use the MMPI to describe the personality characteristics of low back pain patient in terms of personality characteristics. Most research has classified the treated chronic pain patient population as a homogeneous group whose shared personality characteristics await discovery (Keller & Butcher, 1991). Most personality characteristics are based on MMPI mean profile correlates: The pattern of scale scores found when the MMPIs of a group of patients are averaged together. Studies reporting mean profiles of pain patients show great consistency in reporting one of two similar configural patterns. The first common profile is a "conversion-V"; highest elevations (T scores > 70) on scales Hs and Hy, with a relative absence of elevation on D (Love & Peck, 1987; McGrath & O'Malley, 1986); Murray, 1982; Southwick & White, 1983). This configuration is interpreted as converting personally distressing troubles into

more rational or socially acceptable problems; that is, the person is converting psychological problems into somatic complaints. The emphasis on physical complaints along with the denial of any psychological basis for them makes all members of this group poor candidates for any form of psychological treatment (Greene, 1991, pp. 148-149).

The other common mean profile is characterized by elevations on Hs, Hy, and D known as the "neurotic triad" (Adams, Heilbronn, Silk, Reider, & Blumer, 1981; Beals & Hickman, 1972; Murray, 1982; Sternback, Wolf, Murphy, & Akeson, 1983). This profile is interpreted as emphasizing passive-dependency, low self-esteem, anxiety, avoidance of performance demands, and masked hostility (Snibbe, Peterson, & Sosner, 1980).

Butcher and Tellegen (1978) cautioned that interpretation of MMPI mean profiles is complicated by the content heterogeneity of the standard scales. They suggested analyzing individual item content or subscales to provide a more accurate interpretation of the overall profile. While all studies have found high endorsement of items directly reflecting somatic distress and pain-related disability with chronic pain patients, their findings have differed on the more psychological components of the composite pain patient profile. In other words, there are conflicting personality cluster findings in a chronic pain patient population. For example, Watson (1982) concluded that pain patients are hypochondriacal and depressed, but that item analysis showed little evidence of hysteroid denial, repression, and defensiveness. In contrast, Franz, Paul, Bautz, Choroba, and Hildebrandt (1986) reported that the average pain patient described himself as even more socially competent and self-confident than did normal controls, denied anger and

aggressiveness, and did not possess hypochondriacal tendencies. Other researchers have shown that similar elevations on scales such as Hs and Sc may in fact reflect quite different combinations of item content, suggesting that interpretation in these items may have varied by different patients (McGrath & O'Malley, 1986; Moore, McFall, Kivlahan, & Capestany, 1988; Prokop, 1986). These inconsistent results have reflected the heterogeneity of chronic pain patients. The dilemmas with research addressing the chronic pain personality is that mean profiles and group averages have obscured individual differences and possible pain patient subgroups (Keller & Butcher, 1991). Fordyce (1976) cautioned researchers what the illusion of homogeneity in both patients and treatments. Researchers and clinicians have too often assumed that labeling a person as a chronic pain patient or labeling treatment as cognitive may mean that both patient and treatment have conformed to the typical characteristics of each. In order to move away from obscuring individual differences and the illusion of homogeneity, the MMPI literature has reflected a growing tendency to look beyond group homogeneity. The MMPI literature has reflected a growing tendency to look beyond group averages and concentrate on pattern analysis and subgrouping of pain patient profiles. Several different classification approaches have been identified in attempting to subgroup, and better understand, the chronic pain patient. Some of these approaches have included, but are not limited to, functional versus organic pain and secondary gain compensation status.

The major dichotomy into which researchers have tried to classify patients is functional versus organic pain. Functional has implied that the pain problem has been

caused or maintained by psychosocial factors, whereas organic has assumed a physiologic basis (Keller & Butcher, 1991). Hanvik (1949) first described a method of discriminating functional and organic pain patients on the basis of MMPI profiles. He found that patients classified as functional tended to score higher on scales Hs, Hy, Pt, Sc, and Pd, with the overall profile characterized by a conversion-V pattern of hypochondriasis and hysteria with relatively little depression. Other researchers have reported that functional patients are characterized by elevated profiles, evidence of greater psychopathology, and a conversion-V or neurotic-triad pattern (Freeman, Calsyn, & Louks, 1976; Lair & Trapp, 1962; McCreary, Turner, & Dawson, 1977). However, these researchers and others have cautioned that conversion-V profiles occur in the organic population as well, and the degree of overlap between organic and functional groups made it impossible to use such profiles for individual diagnoses (Adams, Heilbronn, Silk, Reider, & Blumer, 1981; Osborne, 1985). Other researchers, in contrast to Hanvik, have failed to find differences between organic and functional groups even when using mean profiles (Cox, Chapman, & Black, 1978; Hendler, Mollett, Talo, & Levin, 1988; Leavitt, 1985). In general, classification of patients into organic and functional categories has not proven particularly replicable or useful in treatment planning.

Another way to classify patients has been based on evidence of secondary gain as exemplified by studies of compensation status. Elevated pain reports and elevated Hs, D, Hy, and Pd scales on the MMPI have been associated with potential or ongoing insurance compensation or litigation (Beals & Hickman, 1972; Pollack & Grainey, 1984; Shaffer,

Nussbaum, & Little, 1972). However, other investigators have found no differences between compensation claimants and nonclaimants on various measures including reports of pain severity, MMPI patterns, level of psychological disturbance, or treatment outcome (Chapman, Brena, & Bradford, 1981; Mendelson, 1984; Trief & Stein, 1985). Just as with the previous classification schemes discussed, grouping patients by compensation status alone is probably too simplistic to result in reliable, meaningful patient correlates and treatment prognosis.

Although the classification approaches cited above show promise in defining subgroups of patients with shared treatment-relevant characteristics, they were based on preconceived classification schemes with little empirical validation that these characteristics actually form reliable and meaningful patient groups. Given the multifaceted nature of chronic pain problems, it has seemed unlikely that subgrouping patients along single dimensions will lead to more than minimal improvements in the accuracy with which treatment efficacy can be predicted (Keller & Butcher, 1991). One way to address this complexity would be to abandon the search for the chronic pain personality and instead look for subgroups of patients who are similar to each other in their pattern of scores on the MMPI.

Recently, several investigators have employed cluster analysis to explore the complexities in relationships inherent in an entire profile of assessment data, with the hope of discovering empirically which patient characteristics are reliably associated with each other and can be used to classify treatment-relevant subgroups of patients.

Cluster Analysis and the MMPI

Cluster analysis in its broadest definition is "the general logic, formulated as a procedure, by which we objectively group together entities on the basis of their similarities and differences" (Tyron & Bailey, 1970). When the entities to be grouped are variables such as test scores measured across several individuals, the clustering procedure is known as factor analysis. Cluster analysis in its narrower definition is the opposite procedure to factor analysis. It is a method for grouping objects on the basis of the similarity of their patterns of scores across multiple variables. A common example would be the attempt in medicine to group patients by syndromes, different patterns of intercorrelated individual signs and symptoms (Green, 1978; Tryon & Bailey, 1970). Theoretically, cluster analysis differs from other discriminant analysis (also a multivariate method for classifying subjects) because it is not necessary to know the group membership of a few individuals ahead of time, or even how many meaningful subgroups exist. It provides a method for identifying subgroups of patients whose patterns of scores are maximally similar to each other and maximally different from the patterns of subjects in other groups (Norusis, 1985).

There are several methods of performing a cluster analysis. Most studies of chronic pain patients have used a hierarchical clustering procedure. The program starts by treating each individual as a separate cluster and then progressively combines similar individuals into larger and larger clusters, ending with the total sample (Green, 1878; Norusis, 1985; SPSS, 1986; Tryon & Bailey, 1970). Since cluster solutions may vary with the computer program used, similarity measure chosen, and the procedure used to determine the optimal number of clusters, it is important for researchers to describe their

procedure and assumptions carefully (Blashfield, 1980). There is no single correct number of clusters existing in a data set; the researcher must determine the optimal combination of between group difference, within group similarity, and meaningfulness of profile patterns for his or her particular application.

Researchers have performed cluster analyses on both mixed chronic pain and chronic low-back pain populations. Sternbach (1974) was the first to explore conceptually an MMPI cluster analysis. He collected MMPIs on a mixed-pain population at a Veteran's Administration hospital and determined that 4 male clusters were found. Prokop, (1980) replicated Sternbach's (1974) study in other samples of chronic pain patients. Their sample contained patients with multiple pain complaints, ranging from headaches and pain in the extremities to total body pain, but excluded patients with low-back pain alone. The analysis yielded 3 female and 4 male clusters. Armentrout (1982) analyzed MMPIs collected on 240 patients that were being treated at a Veterans Administration hospital. A cluster analysis was performed that yielded 3 male clusters. In 1983, Bernstein performed a hierarchical-group cluster analysis on MMPIs collected on 77 female mixed pain patients in a private clinic. The analysis yielded 5 female clusters. A hierarchical cluster analysis attempts to identify relatively homogeneous groups or cases based on selected characteristics, using an algorithm that starts with each case in a separate cluster, and combines clusters until only one is left (Tabachnick, 2001).

Hart (1984) analyzed MMPIs collected on 70 mixed pain patients being treated at a university hospital, utilizing a K-means cluster analysis yielded 4 male clusters. A k-

means cluster analysis attempts to identify relatively homogeneous groups, based on selected characteristics, using an algorithm that can handle large numbers of cases. However, the algorithm requires you to specify the number of clusters. You are able to specify the initial cluster centers if you know this information. You can select either one or two methods for classifying cases, either updating cluster centers iteratively or classifying only (Tabachnick, 2001).

Costello (1987) performed a weighted average/cosine cluster analysis on 170 MMPIs collected on females with mixed pain being treated at a university clinic, which yielded 3 female clusters. A weighted average/cosine procedure is an agglomerative hierarchical clustering method that uses a cosine, or pattern similarity measure, that constructs proximities matrices while the clustering method averages linkages within groups.

Bombardier, Divine, Jordan, Brooks and Neelon (1993) looked at 548 MMPIs collected on low-back pain patients being treated at a university hospital. A cluster analysis was performed on k-corrected MMPI T-scores using the fastclus procedure from SAS (1985). Fastclus is a cluster optimization technique, which does not assume a hierarchical relationship among clusters and allows relocation of cases throughout the clustering process, which yielded 4 female and 3 male clusters. McGill (1983) performed an h-group cluster analysis on 92 MMPIs collected on low-back pain patients collected at a private clinic, which yielded 4 male and 4 female clusters. Bradley (1984) performed an h-group cluster analysis on 314 MMPIs collected on low-back pain patients at a university hospital, which yielded 4 female and 4 male clusters. McCreary (1985)

performed a k-means cluster analysis on 401 MMPIs collected on low-back pain patients being treated at a university hospital, which yielded 5 female and 4 male clusters.

To date, 3 researchers have performed cluster analysis utilizing MMPI-2 data. Keller and Butcher (1991) performed an SPSS hierarchical cluster analysis on 502 MMPI-2s collected on mixed-pain patients being treated at a pain clinic, which yielded 3 male and 3 female clusters. Riley (1993) performed a hierarchical/agglomerative cluster analysis on 201 MMPI-2s collected at a pain clinic, which yielded 4 mixed clusters. DeBeus (1997) performed a hierarchical cluster analysis on 2051 chronic low-back pain patients being treated at a multidisciplinary pain clinic, which yielded 4 male and 4 female clusters.

Classifying Chronic Pain Using the Millon Clinical Multiaxial Inventory–III (MCMI-III)

The MCMI-III is a revision of the MCMI. The MCMI-III was introduced in August 1994 at the meeting of the American Psychological Association. It is a revision of the MCMI-II (Millon, 1987) and MCMI-I (Millon, 1977), which have become increasingly popular since their introductions. To date, only one MCMI-III cluster analysis study has been completed. Allen, Huntoon and Evans (1999) employed cluster analysis of the MCMI-III personality disorder scales to determine whether there is meaningful heterogeneity within a group of 227 severely traumatized women who were treated in a specialized inpatient program. Their analysis distinguishes 5 clinically meaningful clusters, which were labeled alienated, withdrawn, aggressive, suffering and adaptive. Their study employed Ward's hierarchical cluster analysis on the participants (with squared Euclidian distance as the distance measure).

To date, no study has been cited utilizing the MCMI-III with chronic pain patients, yet the MCMI-III is utilized in the assessment process regularly. It is one of the 25 most popular personality inventories administered in chronic pain programs (Allen, Huntoon & Evans, 1999). Furthermore, no study in the literature compares the MMPI-2 and the MCMI-III in the assessment process.

Purpose of the Study

Adequate assessment of chronic pain patients can help to address many of the problems inherent in the complex multidimensional models of chronic pain etiology and approaches to treatment (Keller and Butcher, 1991). Therefore, it is suggested that two major goals of assessment should be:

(1) To describe the characteristics of the typical pain patient and to understand the average pain-patient personality. Such descriptions have relevance for guiding clinicians in developing general treatment programs that address these components of the chronic pain syndrome.

(2) To describe the differences among pain patients. Adequate assessment of the constellation of factors contributing to a particular client's pain problem could potentially cut these costs by accurately predicting who might benefit from such a program, allowing selection of those patients most likely to show gains. Even more helpful, however, would be the ability to identify groups of patients with certain factors in common that will respond best to certain treatment components. It is possible that matching patients to an appropriate treatment could simultaneously cut costs and improve outcome statistics.

Both of these assessment goals have been most consistently addressed using the Minnesota Multiphasic Personality Inventory (MMPI). At this point other assessment instruments and approaches have not received enough attention in the literature to provide comparably extensive data. Often, pain programs will employ a variety of instruments during the assessment process. The Millon Clinical Multiaxial Inventory Third Edition (MCMI-III) now occupies a central place in assessment tools used. Often, the MMPI-2 and the MCMI-III are given simultaneously during an assessment process; however, to date, no studies have compared these two instruments with pain patients.

As noted in the previous literature review, there have been at least 11 MMPI clustering studies involving pain populations, and three MMPI-2 clustering studies with the same population, over a period of 26 years. Therefore, the present study has examined which MCMI-III subscales predicted cluster membership in the previously reported MMPI-2 clusters. Several hypotheses were developed for this study using correlations between the MCMI-III clinical scales (Millon, 1997) and the MMPI-2 clinical scales.

As cited earlier, previous MMPI-2 cluster analysis studies have produced four clusters. This study used the same four clusters. The first cluster was to have been an MMPI-2-within-normal limits profile (all scores remained under the clinical cut-off of 65). The second cluster was to have contained the MMPI-2 conversion-V profile (*Hs* and *HY* 10 points > *D*). The third cluster was to have produced a neurotic triad elevation. The fourth cluster was to have produced a generally elevated profile. The MMPI-2 cluster members were determined by the algorhythms utilized by Pearson Assessments,

using the three validity scales and ten clinical scales. Males and females were analyzed separately. Statistical Package for the Social Sciences (SPSS) (SPSS, 2001, Ver. 11) was the statistical software used for analysis.

The present study has examined the following 4 hypotheses:

1. Membership in the first MMPI-2 cluster profile (within-normal-limits) was to be predicted by no elevations of any MCMI-III clinical subscale. The dependent variable will be cluster membership on MMPI-2 cluster 1.
2. Cluster membership in the second MMPI-2 cluster profile (conversion-V profile [*Hs* and *HY* 10 points > *D*] and elevations on the *Pt* and *Sc* scales) was to be predicted by elevations on MCMI-III scales *H* (Somatoform), *CC* (Major Depression), *SS* (Thought Disorder), *A* (Anxiety), *3* (Dependent), *B* (Borderline), *D* (Dysthymia), *R* (Post Traumatic Stress Disorder) and *2B* (Depressive).
3. Cluster membership in the third MMPI-2 cluster profile, neurotic triad profile (elevations on *Hs*, *D*, *HY*) was to be predicted by elevations on MCMI-III scales *CC* (Major Depression), *D* (Dysthymia), *H* (Somatoform), and *3* (Dependent), *8B* (Masochistic) and the dependent variable being MMPI-2 cluster number 3.

4. Cluster membership in the fourth MMPI-2 cluster profile (generally elevated profile) was to be predicted by elevations on MCMI-III scales *H* (Somatoform), *D* (Dysthymia), *CC* (Major Depression), *6A* (Antisocial), *SS* (Thought Disorder), *3* (Dependent) and *S* (Schizotypal) with the dependent variable being membership in MMPI-2 cluster number 4.

METHOD

Subjects

Two hundred and forty-two participants were drawn from the assessment data base of the Dallas Spinal Rehabilitation Center (DSRC). DSRC is a multi-disciplinary outpatient rehabilitation center, specializing in physical and behavioral medicine for treatment of back injury and/or failed back surgery. While most DSRC patients have sustained lumbar (low-back) injuries, the program also treats those with cervical injuries (neck). The rehabilitation center is a secondary and tertiary treatment program based in Dallas, Texas. Each patient has a primary diagnosis related to a back and/or a cervical injury and is experiencing in addition, a chronic back pain diagnosis and often medical prescription dependency and addiction. Each has experienced back pain in the lumbar region (L1 to L5) or cervical region (C1 to C7) for more than 32 months. Patients with thoracic (mid-spine) and carpal tunnel pain were excluded from this study.

The sample included 118 females 126 males. Subjects ranged in age from 22 to 68 years old, with a mean age of 45.9 years. The ethnic makeup of the participants

included 127 Caucasians, 54 African Americans, 47 Hispanics and 8 "other." Educational level ranged from 2 to 18 years, with a mean educational level of 11.45 and standard deviation of 2.637. Only those patients who had completed the written portions of the assessment procedures were included.

All clinic patients assessed with the Minnesota Multiphasic Personality Inventory –Second Edition (MMPI-2) and Millon Clinical Multiaxial Inventory – Third Edition (MCMI-III) were able to read and write. They had all given informed consent (Appendix A, B) for their assessment and their participation in the rehabilitation program. The clinic is Health Information Portability and Privacy Act (HIPPA) and CARF compliant.

Procedure

Each patient in this study sample was referred to the clinic by his/her physician. Most have Worker's Compensation patients or private insurance patients who had not recovered satisfactorily from a back or neck injury as described above. Each was interviewed and oriented to the program prior to admission. At admission, each patient was required to complete a set of documents regarding informed consent. Full demographic information was obtained and the medical and health care histories were carefully reviewed. Assessment procedures were fully explained to them at orientation, and all questions were answered. Patients completed another face-to-face intake interview, as well as a set of written assessments. Among the written assessments administered were MMPI-2 and the MCMI-III, which are the focus of this research. The test instruments were given in a testing room under supervision of behavioral medicine staff.

Responses to the MMPI-2 and the MCMI-III were entered into a software scoring package (Pearson) by their assigned DSRC case manager. Other assessment and demographic information was entered into a computerized data collection file for further analysis. Follow-up information was entered into the data base by a behavioral medicine therapist. Client confidentiality was carefully preserved at every step in this process. Client information was transferred into the research data base by a member of the behavioral medicine staff, who is trained in HIPPA compliance regulations. Each patient was assigned a subject number in the research data base to further insure confidentiality and disidentification.

Instruments

The MMPI-2 (Butcher, et al., 1989) is a 567-item true/false self-report questionnaire. The MMPI-2 represents the restandardization of the MMPI that marks the advent of a new era of clinical usage and research of this venerable inventory. Restandardization of the MMPI was needed to provide current norms for the inventory, develop a nationally representative and larger normative sample, provide appropriate representation of ethnic minorities, and update item content where needed (Greene, 2000). The MMPI-2 was standardized on a sample of 2,600 individuals (1138 men and 1462 women) selected to reflect national census (1980 U.S. Census) parameters on age, marital status, ethnicity, and so on (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989). Continuity between the MMPI and the MMPI-2 was maintained because new criterion groups and item derivation procedures were not used on the standard Validity and Clinical scales. Thus, the items on the validity and clinical scales of the MMPI are

essentially unchanged on the MMPI-2 except for the elimination of 13 items based on item content and rewording of 68 items (Green, 2000). One difference between the MMPI and MMPI-2 is the conversion of raw scores into *T*-scores. The MMPI's *T*-scores were developed to be "uniform" by combining the raw scores of the eight clinical sales (*Hs*, *D*, *Hy*, *Pd*, *Pa*, *Pt*, *Sc*, and *Ma*) into a composite distribution, then regressing the component scales against the composite to obtain *T*-score conversion formulas (Tellegen, 1988). Out of this new approach, the "critical" level of elevation has been changed to a *T*-score of 65, appearing to be the optimal point for separating the normative sample from various clinical groups (See Appendices A and B) (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989). The revised *MMPI-2 Manual for Administration, Scoring and Interpretation* (Hathaway and McKinley, 1989) describes the distributions of age, geographic location, ethnic origin, educational attainment, marital status, occupation, and income level in the male and female samples.

The MCMI-III (Millon, 1994) is a self-report measure of personality disorders whose scales underwent a three-step validation model based on a model developed by Loevinger (1957). In the first, theoretical-substantive step items were selected that were consistent with Millon's theoretical framework (Millon, 1990, Millon & Davis, 1996). In the second, internal-structural stage scales were constructed on the basis of high internal consistency and proper overlap with other theoretically congruent personality disorder scales. The third, external-criterion stage, ensured correspondence between the test scale items and a variety of nonscale measures of the trait or syndrome under study. The third stage entails correlating results obtained on preliminary forms of the inventory with

relevant clinical behavior. This latter step indicates that the MCMI should be an important source of data regarding associations between personality disorders, but the first two steps have raised concerns because they indicate the test was slanted in the direction of one theory. In particular, the overlap between theoretically congruent scales is partially due to the use of overlapping items; some items were used in computing scores for more than one personality scale.

The normative sample for the MCMI-III instrument consists of 998 males and females representing a wide variety of diagnoses. The group includes patients seen in independent practices, clinics, mental health centers, residential settings, and hospitals. Because the norms are based on clinical samples, the instrument is not appropriate for use with non-clinical populations.

The MCMI-III the second major revision of the MCMI, is a 175-item True-False inventory with five sets of scales, including (a) 11 personality disorder scales (Schizoid, Avoidant, Depressive, Dependent, Histrionic, Narcissistic, Antisocial, Aggressive, Compulsive, Negativistic, and Masochistic), (b) 3 severe personality disorder scales (Schizotypal, Borderline, and Paranoid), (c) 7 clinical syndrome scales (Anxiety, Somatic, Manic, Dysthymic, Alcohol, Drug, and PTSD), (d) 3 severe syndrome scales (Thought Disorder, Major Depression, and Delusional), and (e) 3 validity scales (Disclosure, Desirability, and Debasement). This latest revision of the MCMI includes 1 new personality disorder scale (Depressive) and 1 new clinical syndrome scale (PTSD), which are both highly relevant to the concerns of this study. The base-rate scores are intended to reflect the likelihood of disorder, and low scores are not intended to be

clinically meaningful, yet we will allow the full range of base-rate scores to enter the data analyses.

The MCMI-III attempts to predict the dichotomous presence or absence of a clinical disorder through the use of base rate scores. Patients with scores over 84 are identified as having the disorder, and those with scores under 85 are seen as not having the disorder. These data allow the use of Bayesian statistics for validity estimates (Retzlaff, 1996). Actual knowledge of the presence or absence of a disorder is unattainable, so clinician judgment is substituted for reality. These hit rate statistics are in addition to and usually more demanding than the traditional convergent and divergent correlation coefficients against other scales of similar construct (Nunnally, 1978).

Statistics

The present study explored four hypotheses. The first hypothesis, membership in the first MMPI-2 cluster profile (within-normal-limits) was to be predicted by no elevations on any MCMI-III clinical subscales and was tested using a multiple regression analysis. The independent variables will be the MCMI-III clinical subscales and the dependent variable was cluster membership in MMPI-2 cluster 1.

The second hypothesis, cluster membership in the second MMPI-2 cluster profile (conversion-V profile [*Hs* and *HY* 10 points > *D*] and elevations on the *Pt* and *Sc* scales) was to be predicted by elevations on MCMI-III scales *H* (Somatoform), *CC* (Major Depression), *SS* (Thought Disorder), *A* (Anxiety), *3* (Dependent), *B* (Borderline), *D* (Dysthymia), *R* (Post Traumatic Stress Disorder) and *2B* (Depressive). This hypothesis

was tested utilizing a multiple regression with the dependent variable being cluster membership in MMPI-2 cluster number 2.

The third hypothesis, cluster membership in the third MMPI-2 cluster profile (neurotic triad profile elevations on *Hs*, *D*, *HY*) was to be predicted by elevations on MCMI-III scales *CC* (Major Depression), *D* (Dysthymia), *H* (Somatoform), and *3* (Dependent), *8B* (Masochistic) and was tested utilizing a multiple regression analysis with the dependent variable of cluster membership in MMPI-2 cluster number 3.

The fourth hypothesis, cluster membership in the fourth MMPI-2 cluster profile (generally elevated profile) was to be predicted by elevations on MCMI-III scales *H* (Somatoform), *D* (Dysthymia), *CC* (Major Depression), *6A* (Antisocial), *SS* (Thought Disorder), *3* (Dependent) and *S* (Schizotypal). Hypothesis four was tested using a multiple regression analysis with the dependent variable being membership in MMPI-2 cluster number 4.

In addition to the above-mentioned research hypothesis, data was analyzed for 19 subjects who completed an MCMI-III at discharge. Paired Samples t-tests were performed on each MCMI-III clinical scale to assess change following treatment. Furthermore, follow-up data from patient questionnaires was collected on these same individuals at discharge and one month following discharge. Correlations of behavioral changes were performed for the purpose of generating future research hypotheses.

Power

Since power (the probability of detecting an effect if one is present) was a concern, a power analysis was conducted to estimate the sample size necessary to detect

an effect of the relationship of the MCMI-III clinical scales and the MMPI-2 clusters. Cohen (1988) has suggested that .80 is a good standard for the minimum power necessary before beginning a study (as cited in Aiken & West, 1991). Using power tables, a sample size of 180 participants was found to be sufficient to detect a small effect ($r = -.15$) with a power = .95.

RESULTS

The purpose of the present study was to examine the predictive value of the Millon Clinical Multiaxial Inventory – Third Edition (MMCI-III) in relationship to Minnesota Multiphasic Personality Inventory – Second Edition (MMPI-2) clusters in a chronic pain population. This study examined four working hypothesis. In addition, 19 pre-and post-MCMI-III profiles and follow-up data on the same subjects at discharge and one-month post discharge were examined for significant post-treatment change.

Descriptive Statistics

Demographic Information

Subjects for this study included 118 females and 126 males. Subjects ranged in age from 22 years old to 68, with a mean age of 45.9 years and standard deviation of 8.95. The ethnic makeup of the participants included 127 Caucasians, 54 African Americans, 47 Hispanics and 8 "other." Educational level ranged from ranged from 2 to 18 years, with a mean educational level of 11.45 and standard deviation of 2.637. Only those patients who have completed the written portions of the assessment procedures were included. In addition to age, sex, ethnicity, and education information no additional medical diagnoses were collected. All participants were assessed with the MMPI-2 and MCMI-III. Participants were able to read and write.

Subjects gave informed consent for their assessment and their participation in the rehabilitation program. The clinic is Health Information Portability and Privacy Act (HIPPA) compliant and Certified through the Certification of Accredited Rehabilitation Facilities (CARF).

Descriptive statistics, including frequencies, means, standard deviations, stem-and-leaf displays, box-whisker plots, skewness, kurtosis, and standard error (*SE*) of skewness and kurtosis were performed on demographic and psychosocial information. Diagnostic statistics investigated the areas of normality, linearity, homoscadicity and heteroscadicity, and checked for the presence of outliers. There were no outliers; however, violations of normality assumptions were found and log transformations were attempted. Overall, the transformations did not significantly change the majority of calculated results and are not reported. Perusal of scatterplots indicated no problems with linearity or heteroscadasticity.

Preliminary analysis indicated that 19 male and two female MCMI-III profiles were completed incorrectly. Therefore, these cases were discarded prior to hypothesis testing.

Male Clusters

The clustering procedure produced 4 homogeneous cluster profiles across the male sample. Please refer to figure 1 for a graphic presentation of the male clustering results. The first male cluster showed elevations on scales *Hs*, *D*, *Hy*, as well as *Pt* and *Sc* (n = 37, 30%). Specifically, *Hs*, *D*, and *Hy* all showed elevations over 80, *Hs* and *Hy* being under 85, and *D* being at 85, *Pt* and *Sc* equaled 75.

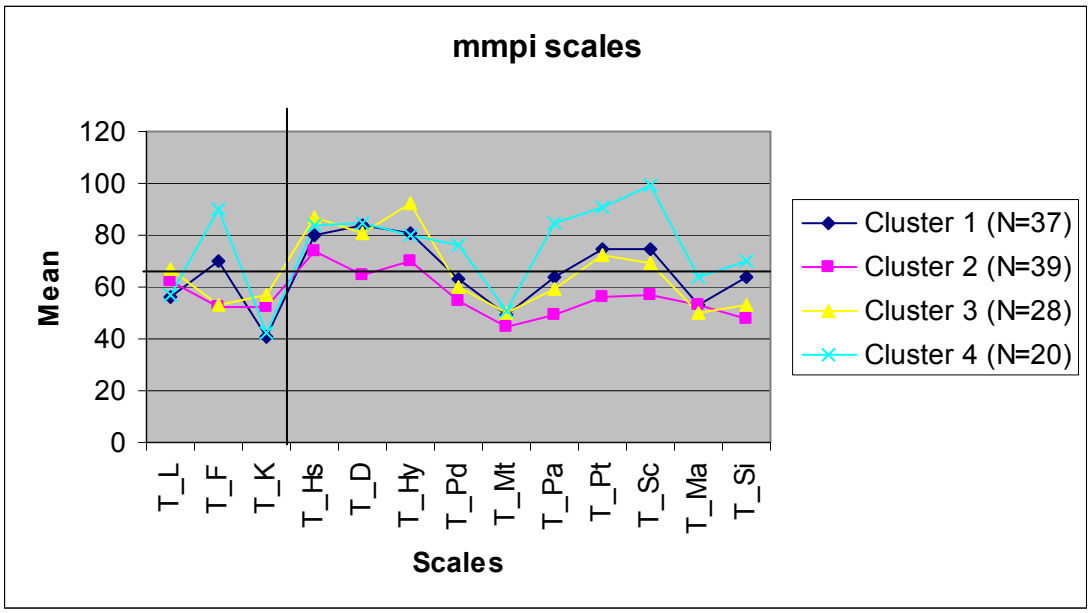
The second male cluster produced slight elevations *Hs* and *Hy*. This cluster profile produced a reduced elevation on the V profile. Specifically, the distance between the *D* scale and *Hs* and *Hy* scales was 5 points but not more than 10 points. All other scales were under the clinical cut-off of 65 (n = 39, 31%).

The third male cluster produced elevations on scales *Hs*, *D*, *Hy* and *Pt*, and a slight elevation on *Sc* (*n* = 28, 23%). This cluster also produced a reduced elevation on the V profile. The distance between the *D* scale and the *Hs* and *Hy* scales was more than 5 points, but not more than 10 points.

The fourth male cluster produced a generally elevated profile (n = 20, 16%). The cluster contained generally elevated scales on *F*, *Hs*, *D*, *Hy*, *Pd*, *Pa*, *Pt*, *Sc* and *Si*. This cluster, as with the second cluster, produced a reduced elevation on the V profile. The fourth cluster had a distance between the *D* scale and the *Hs* and *Hy* scales of 5 points, no more than 10 points. Figure 1 provides a summary of these profiles.

Figure 1

MMPI-2 Male Clusters



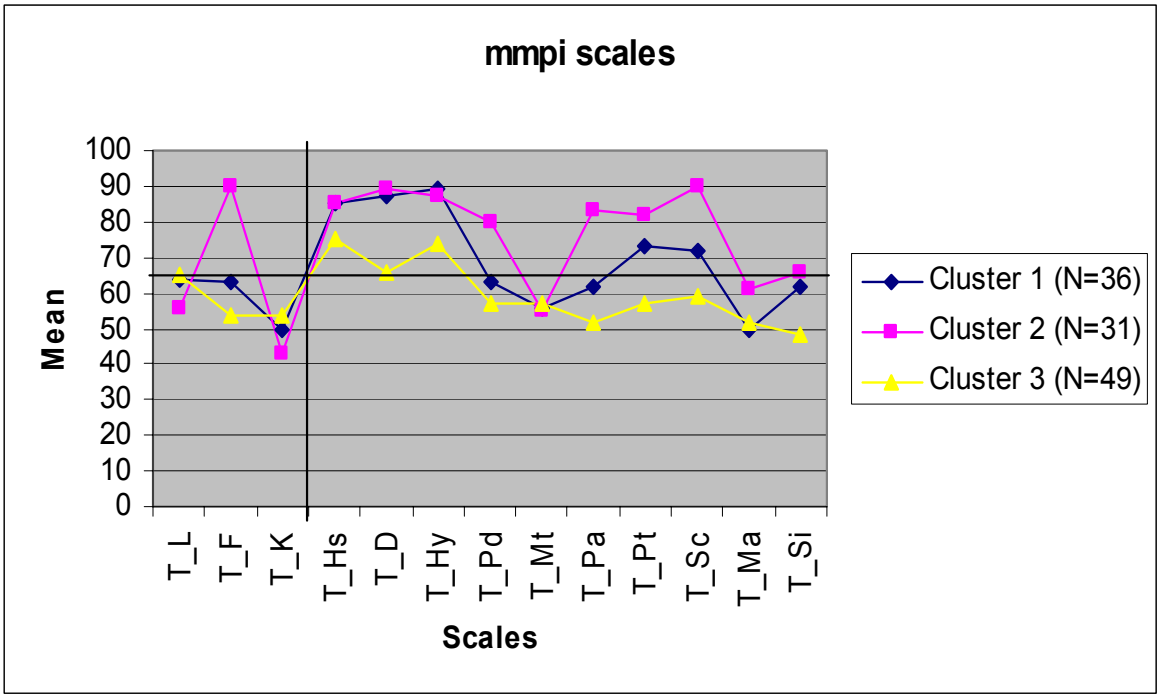
Female Clusters

The clustering procedure yielded three homogeneous female MMPI-2 clusters. We were expecting four distinct clusters; however, upon further examination of individual female MMPI-2 profiles, no within-normal-limits profiles were found. Thus, the within-normal-limits cluster is missing from this female sample. The first female cluster produced slight elevations on *Hs* and *Hy* and a slight elevation on *D* (*n* = 49, 42%). This cluster profile produced a slightly elevated V profile, with the distance between *D* and *Hs* and *Hy* scales were more than 5 and less than 10.

The second cluster profile produced elevations on *F*, *Hs*, *D*, *Hy*, *Pd*, *Pa*, *Pt*, *Sc* and a slight elevation on *Si*. This profile would be characterized as the generally elevated profile (*n* = 31, 27%). The third female cluster profile produced elevations on *Hs*, *D*, *Hy*, *Pt* and *Sc* (*n* = 36, 31%). Figure 2 provides a summary of these profiles.

Figure 2

MMPI-2 Female clusters



Hypothesis Testing

Males and females were analyzed separately. Therefore, this discussion will report on men and women independently. The first hypothesis, membership in the first male MMPI-2 cluster profile (within-normal-limits) will be predicted by no elevations of any MCMI-III clinical subscales was tested using a multiple regression analysis. The independent variables were the MCMI-III clinical subscales and the dependent variable was cluster membership in the male MMPI-2 cluster 1. This hypothesis was not supported by the statistical analysis as shown in Table 1. The regression equation while

not significant as a predictor of cluster membership in MMPI-2 male cluster 1, it did show one individual predictor, MCMI-III *7* Compulsive (F = .917, $\underline{p}$ < .587 (See Appendix D, Supplemental Table 1).

Table 1

Regression summary hypothesis 1 – males

Model Summary

Model	*R*	*R* Square	*Adjusted R Square*	*Std. Error of the Estimate*	*Change Statistics*				
					R Square Change	*F Change*	*df*1	*df*2	Sig. *F* Change
1	.489	.239	-.022	.41715	.239	.917	27	79	.587

ANOVA

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	Sig.
1	Regression	4.309	27	.160	.917	.587
	Residual	13.747	79	.174		
	Total	18.056	106			

a Predictors: (Constant), BR_PP - Delusional Disorder, BR_4 - Histrionic, BR_H - Somatoform, BR_5 - Narcisstic, BR_T - Drug Dependence, BR_7 - Compulsive, BR_D - Dysthymia, BR_N - Bipolar Manic, BR_6B - Sadistic (Agressive), BR_8B - Masochistic (Self-Defeating), BR_3 - Dependent, BR_8A - Negativistic (Passive Aggressive), BR_1 Schizoid, BR - S - Schizotypal, BR_A - Anxiety, BR_CC - Major Depression, BR_R - Post-Traumatic Stress Disorder, BR_X - (Validity?) , BR_SS - Thought Disorder, BR_2A - Avoidant, BR_B Alcohol Dependence, BR - 2B Depressive, BR - Z Deabasement, BR_C - Borderline, BR_P - Paranoid, BR_Y-desirability, BR_6A - Antisocial

b Dependent Variable: MMPI-II Cluster1

The second hypothesis, cluster membership in the second MMPI-2 cluster profile (conversion-V profile [Hs and HY 10 points > D] and elevations on the *Pt* and *Sc* scales) will be predicted by elevations on MCMI-III scales *H* (Somatoform), *CC* (Major Depression), *SS* (Thought Disorder), *A* (Anxiety), *3* (Dependent), *B* (Borderline), *D* (Dysthymia), *R* (Post Traumatic Stress Disorder) and *2B* (Depressive), was tested

utilizing a multiple regression with the dependent variable being cluster membership in MMPI-2 male cluster number 2. This hypothesis was not supported for males as shown in Table 2. The regression equation was significant as a predictor of cluster membership in MMPI-2 male cluster 2 ($F = 1.650$, $p < .045$). Furthermore, it did show one individual predictor, MCMI-III scale *7* Compulsive ($t = -2.347$, $p < .021$). (See Appendix D, Supplemental Table 2)

Table 2

Regression summary hypothesis 2-males

Model Summary

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	Change Statistics				
					R Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.601	.361	.142	.41364	.361	1.650	27	79	.045

ANOVA

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	Sig.
1	Regression	7.623	27	.282	1.650	.045
	Residual	13.517	79	.171		
	Total	21.140	106			

a Predictors: (Constant), BR_PP - Delusional Disorder, BR_4 - Histrionic, BR_H - Somatoform, BR_5 - Narcisstic, BR_T - Drug Dependence, BR_7 - Compulsive, BR_D - Dysthymia, BR_N - Bipolar Manic, BR_6B - Sadistic (Agressive), BR_8B - Masochistic (Self-Defeating), BR_3 - Dependent, BR_8A - Negativistic (Passive Aggressive), BR_1 Schizoid, BR - S - Schizotypal, BR_A - Anxiety, BR_CC - Major Depression, BR_R - Post-Traumatic Stress Disorder, BR_X - (Validity?) , BR_SS - Thought Disorder, BR_2A - Avoidant, BR_B Alcohol Dependence, BR - 2B Depressive, BR - Z Deabasement, BR_C - Borderline, BR_P - Paranoid, BR_Y-desirability, BR_6A - Antisocial

b Dependent Variable: MMPI-II Cluster2

The third hypothesis, cluster membership in the third male MMPI-2 cluster profile (neurotic triad profile elevations on *Hs*, *D*, *HY*) will be predicted by elevations on

MCMI-III scales *CC* (Major Depression), *D* (Dysthymia), *H* (Somatoform), and *3* (Dependent), *8B* (Masochistic) was tested utilizing multiple regression analysis with the dependent variable being cluster membership in MMPI-2 male cluster number 3. The regression equation was not significant as a predictor of cluster membership in MMPI-2 male cluster 3 ($F = 1.456$, $p < .102$) as shown in Table 3. Furthermore, it did show one individual predictor, MCMI-III scale *X* Validity (See Appendix D, Supplemental Table 3).

Table 3

Regression summary hypothesis 3 – males

Model Summary

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	Change Statistics				
					R Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.576	.332	.104	.33016	.332	1.456	27	79	.102

ANOVA

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	Sig.
1	Regression	4.286	27	.159	1.456	.102
	Residual	8.611	79	.109		
	Total	12.897	106			

a Predictors: (Constant), BR_PP - Delusional Disorder, BR_4 - Histrionic, BR_H - Somatoform, BR_5 - Narcisstic, BR_T - Drug Dependence, BR_7 - Compulsive, BR_D - Dysthymia, BR_N - Bipolar Manic, BR_6B - Sadistic (Agressive), BR_8B - Masochistic (Self-Defeating), BR_3 - Dependent, BR_8A - Negativistic (Passive Aggressive), BR_1 Schizoid, BR - S - Schizotypal, BR_A - Anxiety, BR_CC - Major Depression, BR_R - Post-Traumatic Stress Disorder, BR_X - (Validity?) , BR_SS - Thought Disorder, BR_2A - Avoidant, BR_B Alcohol Dependence, BR - 2B Depressive, BR - Z Deabasement, BR_C - Borderline, BR_P - Paranoid, BR_Y-desirability, BR_6A - Antisocial

b Dependent Variable: MMPI-II Cluster3

The fourth hypothesis, cluster membership in the fourth male MMPI-2 cluster profile (generally elevated profile) will be predicted by elevations on MCMI-III scales *H* (Somatoform), *D* (Dysthymia), *CC* (Major Depression), *6A* (Antisocial), *SS* (Thought Disorder), *3* (Dependent) and *S* (Schizotypal) was tested using multiple regression analysis with the dependent variable being membership in MMPI-2 male cluster number 4. This hypothesis was not supported for males. The regression equation was not significant as a predictor of cluster membership in MMPI-2 male cluster 4 ($F = 1.173$, $p < .287$). Furthermore, it did show one individual predictor, MCMI-III *X* Validity. (See Appendix D, Supplemental Table 4)

Table 4

Regression summary hypothesis 4 – males

Model Summary

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	Change Statistics				
					R Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.535	.286	.042	.473	.286	1.173	27	79	.287

ANOVA

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	Sig.
1	Regression	7.093	27	.263	1.173	.287
	Residual	17.692	79	.224		
	Total	24.785	106			

a Predictors: (Constant), BR_PP - Delusional Disorder, BR_4 - Histrionic, BR_H - Somatoform, BR_5 - Narcisstic, BR_T - Drug Dependence, BR_7 - Compulsive, BR_D - Dysthymia, BR_N - Bipolar Manic, BR_6B - Sadistic (Agressive), BR_8B - Masochistic (Self-Defeating), BR_3 - Dependent, BR_8A - Negativistic (Passive Aggressive), BR_1 Schizoid, BR - S - Schizotypal, BR_A - Anxiety, BR_CC - Major Depression, BR_R - Post-Traumatic Stress Disorder, BR_X - (Validity?) , BR_SS - Thought Disorder, BR_2A - Avoidant, BR_B Alcohol Dependence, BR - 2B Depressive, BR - Z Deabasement, BR_C - Borderline, BR_P - Paranoid, BR_Y-desirability, BR_6A - Antisocial

b Dependent Variable: MMPI-II Cluster4

Hypotheses Testing - Females

The first hypothesis, membership in the first female MMPI-2 cluster profile (within-normal-limits) will be predicted by no elevations of any MCMI-III clinical subscales was tested using a multiple regression analysis. The independent variables were the MCMI-III clinical subscales and the dependent variable was cluster membership in MMPI-2 female cluster 1. This hypothesis was not supported in the female sample, as there were no female MMPI-2 profiles without elevations on the clinical scales. Therefore, the "within-normal-limits" profile was missing.

The second hypothesis, cluster membership in the first female MMPI-2 cluster profile (conversion-V profile [*Hs* and *HY* 10 points > *D*] and elevations on the *Pt* and *Sc* scales) will be predicted by elevations on MCMI-III scales *H* (Somatoform), *CC* (Major Depression), *SS* (Thought Disorder), *A* (Anxiety), *3* (Dependent), *B* (Borderline), *D* (Dysthymia), *R* (Post Traumatic Stress Disorder) and *2B* (Depressive), was tested utilizing a multiple regression with the dependent variable being cluster membership in female MMPI-2 cluster number 1. This hypothesis was not supported as shown in Table 5. While the regression equation was significant as a predictor of cluster membership in MMPI-2 female cluster 1 ($F = 3.663$, $\underline{p} < .001$); it did not yield an MCMI-III clinical scale that has predictive value for cluster membership in this MMPI-2 female cluster.

Table 5

Regression summary hypothesis 2 – females

Model Summary

Model	*R*	*R* Square	Adjusted *R* Square	*Std. Error of the Estimate*	Change Statistics *R* Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.727	.529	.385	.37218	.529	3.663	27	88	.000

ANOVA

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	Sig.
1	Regression	13.698	27	.507	3.663	.000
	Residual	12.190	88	.139		
	Total	25.888	115			

a Predictors: (Constant), BR_PP Delusional Disorder, BR_X Validity, BR_5 Narcissistic, BR_7 Compulsive, BR_1 Schizoid, BR_T Drug Dependence, BR_H Somatoform, BR - N Bipolar: Manic, BR_B Alcohol Dependence, BR_3 Dependent, BR_6B Sadistic (Aggressive), BR_Z Debasement, BR_R Post-Traumatic Stress Disorder, BR_4 Histrionic, BR_8B Masochistic (Self-Defeating), BR_SS Thought Disorder, BR_A Anxiety, BR_8A Negativstic, BR_2B Depressive, BR_D Dysthymia, BR_P Paranoid, BR_6A Antisocial, BR_S Schizotypal, BR_Y Desirability, BR_C Borderline, BR_2A Avoidant, BR_CC Major Depression

b Dependent Variable: MMPI Cluster I

The third hypothesis, cluster membership in the second female MMPI-2 cluster profile (neurotic triad profile elevations on *Hs*, *D*, *HY*) will be predicted by elevations on MCMI-III scales *CC* (Major Depression), *D* (Dysthymia), *H* (Somatoform), and *3* (Dependent), *8B* (Masochistic), was tested utilizing a stepwise multiple regression analysis with the dependent variable being cluster membership in MMPI-2 cluster number 3. This hypothesis was not supported for females by the analysis as shown in Table 6. The regression equation, while not significant as a predictor of cluster membership in MMPI-2 female cluster 2 ($F = 1.195$, $\underline{p} < .263$), did show two predictors,

MCMI-III *4* Histrionic and MCMI-III *T* Drug Dependence. (See Appendix D, Supplemental Table 6)

Table 6

Regression summary hypothesis 3- females

Model Summary

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	Change Statistics *R* Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.518	.268	.044	.42528	.268	1.195	27	88	.263

ANOVA

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	Sig.
1	Regression	5.834	27	.216	1.195	.263
	Residual	15.916	88	.181		
	Total	21.750	115			

a Predictors: (Constant), BR_PP Delusional Disorder, BR_X Validity, BR_5 Narcissistic, BR_7 Compulsive, BR_1 Schizoid, BR_T Drug Dependence, BR_H Somatoform, BR - N Bipolar: Manic, BR_B Alcohol Dependence, BR_3 Dependent, BR_6B Sadistic (Aggressive), BR_Z Debasement, BR_R Post-Traumatic Stress Disorder, BR_4 Histrionic, BR_8B Masochistic (Self-Defeating), BR_SS Thought Disorder, BR_A Anxiety, BR_8A Negativstic, BR_2B Depressive, BR_D Dysthymia, BR_P Paranoid, BR_6A Antisocial, BR_S Schizotypal, BR_Y Desirability, BR_C Borderline, BR_2A Avoidant, BR_CC Major Depression

b Dependent Variable: MMPI Cluster II

The fourth hypothesis, cluster membership in the third female MMPI-2 cluster profile (generally elevated profile) will be predicted by elevations on MCMI-III scales *H* (Somatoform), *D* (Dysthymia), *CC* (Major Depression), *6A* (Antisocial), *SS* (Thought Disorder), *3* (Dependent) and *S* (Schizotypal) was tested using a multiple regression analysis with the dependent variable being membership in MMPI-2 cluster number 4 for males and three for female MMPI-2 cluster 3. This hypothesis was not supported for females as shown in Table 7. While the regression equation was significant as a

predictor of cluster membership in MMPI-2 female cluster 3 ($F = 1.781$, $p < .023$), it did show two predictors, MCMI-III *4* Histrionic and MCMI-III *2A* Avoidant (See Appendix D, Supplemental Table 7).

Table 7

Regression summary hypothesis 4 – females

Model Summary

Model	*R*	R Square	Adjusted *R* Square	*Std. Error of the Estimate*	Change Statistics				
					R Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.594	.353	.155	.40857	.353	1.781	27	88	.023

ANOVA

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	Sig.
1	Regression	8.026	27	.297	1.781	.023
	Residual	14.690	88	.167		
	Total	22.716	115			

a Predictors: (Constant), BR_PP Delusional Disorder, BR_X Validity, BR_5 Narcissistic, BR_7 Compulsive, BR_1 Schizoid, BR_T Drug Dependence, BR_H Somatoform, BR - N Bipolar: Manic, BR_B Alcohol Dependence, BR_3 Dependent, BR_6B Sadistic (Aggressive), BR_Z Debasement, BR_R Post-Traumatic Stress Disorder, BR_4 Histrionic, BR_8B Masochistic (Self-Defeating), BR_SS Thought Disorder, BR_A Anxiety, BR_8A Negativstic, BR_2B Depressive, BR_D Dysthymia, BR_P Paranoid, BR_6A Antisocial, BR_S Schizotypal, BR_Y Desirability, BR_C Borderline, BR_2A Avoidant, BR_CC Major Depression

b Dependent Variable: MMPI Cluster III

Pre- and Post-Data Analysis

Subjects for post-treatment and follow-up analysis included 21 participants, who completed an MCMI-III at discharge. Subjects included 10 women and 11 men. Subjects ranged in age from 25 to 64, with a mean age of 45.33 and standard deviation of 9.67. The ethnic makeup of the participants included 12 Caucasians, 4 African Americans, 2 Hispanic and 2 "other." All participants had completed the six-week

comprehensive pain management program. All subjects completed the comprehensive assessment process prior to beginning the program.

Paired Samples t-tests to analyze changes in MCMI-III clinical scales were performed. A significant decrease was found in MCMI-III scale *Z* Debasement (M = 12.14, SD = 19.918), $t(20) = 2.794$, $p = .01$ (two-tailed), *2B* Depressive (M = 15.62, SD = 26.170), $t(20) = 2.735$, $p = .01$ (two-tailed), *C* Borderline (M = 12.67, SD = 23.318), $t(20) = 2.489$, $p = .022$ (two-tailed), *H* Somatoform (M = 29.67, SD = 29.145), $t(20) = 4.665$, $p = .000$ (two-tailed), *D* Dysthymia (M = 26.76, SD = 26.329), $t(20) = 4.658$, $p = .000$ (two-tailed), *CC* Major Depression (M = 36.48, SD = 30.795), $t(20) = 5.428$, $p = .000$ (two-tailed), and *PP* Delusional Disorder (M = 17.70, SD = 31.111), $t(20) = 2.544$, $p = .020$ (two-tailed) from initial assessment to discharge. Our analysis also showed significant increases in MCMI-III clinical scales *4* Histrionic (M = -7.19, SD = 15.594), $t(20) = 2.735$, $p = .047$ (two-tailed), *N* Bi-Polar Manic (M = -13.71, SD = 25.058), $t(20) = -2.508$, $p = .21$ (two-tailed) and *T* Drug Dependence(M = -12.10, SD = 25.535), $t(20) = -2.089$, $p = .050$ (two-tailed). Table 8 provides an itemized list of these results.

Additional analyses were conducted on follow-up data. The analyses indicated that women exercise significantly more than men. These activities include aerobic activities (r = .458, p <. 000) and stretching (r = .584, p <. 009). A patient's perception about the quality of their relationships with their spouses or partners and family members is highly correlated with their ability to apply for alternative income sources (r = .575, p<. 010), their perceived level of depression (r = .507, p <.027), the quality of their sleep

(r = .484, p < .023) and their report that they have adequate skills to manage their pain (r = .512, p <.025).

In this sample, the better the reported mood (lower level of depression), the more able the subject was able to seek alternative sources of income (r = .582, p <.018). Reports of good pain management strategies (r = .476, p <.039) was related to decreased levels of worry (r = .602, p <.006). Positive mood and pain management strategies, combined with adequate income was related to exercise levels (r = .490, p <.033), improved sleep (r = .503, p <.028), and improved relationships with family and friends (r = .549, p <.015). The analysis also indicated that if a person believes that they will be able to return to work soon, they would tend to be calm and worry less. These factors are also related to higher quality of sleep (r = .612, p <.005); greater satisfaction with the quality of their relationships (r = .477, p <.039), better mood (r = .791, p <.000) and the ability to manage one's pain (r = .522, p <.022).

Participants with a secure income source from work or disability also reported better mood (r = .509, p <.044), engaging in strength training exercises (r = .509, p <.044), and aerobic exercise (r = .458, p <.048) with less worry and the ability to remain calm (r = .498, p <.030).

Table 8

Paired Samples Test: MCMI-III Clinical Scales Pre and Post Treatment

MCMI-III Clinical Scale	*M*	*SD*	*Std Error Mean*	*t*	*df*	Sig (two-tailed)
Z Debasement	12.14	19.918	4.346	2.794	20	.011
2A Depressive	15.62	26.170	5.711	2.735	20	.013
4 Histrionic	-7.19	15.594	3.403	2.735	20	.047
C Borderline	12.67	23.318	5.088	2.489	20	.022
H Somatoform	29.67	29.145	6.360	4.665	20	.000
N Bi-Polar Manic	-13.71	25.058	5.468	-2.508	20	.021
D Dysthymia	26.76	26.329	5.745	4.658	20	.000
T Drug Dependence	-12.10	25.535	5.790	-2.089	20	.050
CC Major Depression	36.48	30.795	6.720	5.428	20	.000
PP Delusional Disorder	17.70	31.111	6.957	2.544	20	.020

DISCUSSION

The goal of this research project was to explore further the problem of proper assessment of chronic pain patients utilizing standard assessment instruments. Adequate assessment of chronic pain patients can help to address many of the problems inherent in the complex multidimensional models of chronic pain etiology and approaches to treatment (Keller and Butcher, 1991). Proper assessment and referrals of pain patients during the intake process would allow pain programs to modify treatment during a standardized program. Such modifications and tailoring would be a step towards patient treatment compliance, and behavioral changes and adopting new coping strategies. Follow-up data would verify treatment protocols, as well as help program staff modify inadequate interventions.

One way to modify treatment programs and interventions would be to classify patients during the intake process. A cluster analysis is a statistical procedure that classifies a population into separate homogeneous groups. To date (2004), the Minnesota Multiphasic Personality Inventory – Second Edition (MMPI-2) has been utilized in two cluster analysis studies on this population. Nine cluster analysis studies were done with the MMPI on a chronic pain population. Prior to the present study, one cluster analysis study was performed on MMPI-2s from the same program. DeBeus, McManemin and McCoy (1997) investigated 2051 MMPI-2s for cluster solutions of chronic low-back pain patients. The current hypotheses were based on results from the deBeus study, as participants were drawn from the same pain program.

The multivariate clustering procedure utilized in this study to classify MMPI-2 profile subgroups within this male and female sample of chronic pain patients was successful in classifying four male clusters and three female clusters. These clustering procedures did not yield a within-normal-limits profile for females as hypothesized. Upon closer examination, no female MMPI-2 profile without elevations on the clinical scales was found. The closest cluster found that fits a within-normal-limits profile had a modified conversion V. Specifically, this cluster had both *Hs* and *Hy* > *D* by 5 and not 10 points.

Several factors must be considered when speculating on these results. Texas Workers' Compensation Law revisions now limit treatment for injured workers. Pain patients are now referred to pain management programs after other types of treatment fail. The range of time from injury to referral for assessment in the comprehensive pain management program was from 145 days to 18 years, with the average of 2.88 years. The increase in time that patients are now waiting for referrals to pain management programs could possibly be associated with increased stress, psychopathology and dependence on pain medication.

In discussing research hypotheses, we discuss the male MMPI-2 clusters first, as we analyzed men and women separately.

Hypotheses testing – males

Our first hypothesis was that membership in the first male MMPI-2 cluster profile (within-normal-limits) will be predicted by no elevations of any Millon Clinical Multiaxial Inventory – Third Edition (MCMI-III) clinical subscales was tested using a

multiple regression analysis. The independent variables were the MCMI-III clinical subscales and the dependent variable was cluster membership in male MMPI-2 cluster 1. This hypothesis was not supported for men. Our regression procedure did not prove to be significant in predicting membership. We did, however, find one individual predictor, MCMI-III scale *7* compulsive.

A brief interpretation of the first male MMPI-2 cluster profile according to Green (2002) might be that as a group, these chronic pain patients are generally honest in their reporting of their current situation. They realize that they cannot solve their current problems themselves. They are concerned about their current physical functioning, acknowledge depression and will, at times, over-report these symptoms in an effort to get others to understand how difficult their current situation is. They have a great deal of anxiety, and will not hesitate to tell others about their difficulties.

As a contrast, the primary characteristic of those with elevations on the MCMI-III (scale *7*) Compulsive, according to Millon's (1997) interpretation is ambivalent orientation, coinciding with the DSM-IV obsessive-compulsive personality disorder. Generally speaking, these individuals have been intimidated and coerced into accepting the demands and judgments imposed on them by others. Their prudent, controlled, and perfectionist ways derive from a conflict between hostility toward others and fear of social disapproval. They resolve this ambivalence by suppressing their resentment and by overconforming and placing high demands on themselves and others. Their disciplined self-restraint serves to control intense, though hidden, oppositional feelings, resulting in an overt passivity and seeming public compliance. Behind their front of

propriety and restraint, however, are intense anger and oppositional feelings that occasionally break through their controls.

A comparison of these two interpretations suggests that Millon's construct of compulsiveness is rooted in a developmental model, where maladaptive coping mechanisms are developed and reinforced through adulthood. As the individual develops cognitively and emotionally, they are unable to be flexible and therefore become rigid and resentful. This construct varies from the MMPI-2. The interpretation of the MMPI-2 cluster suggests that pain patients' over-reporting is an act of desperation or reaction to severe stress. They feel alone, hopeless and not understood. By contrast, Millon's construct and interpretation fits the psychiatric population for which the MCMI-III was normed, and follows strict diagnostic traits. The MMPI-2 cluster has a broader overall interpretation of the subject's current psychological situation, as well as how they are coping with stress. The MCMI-III cluster characteristics amplify maladaptive coping strategies that this group might possess and utilize under extreme stress.

Our second hypothesis, cluster membership in the second MMPI-2 cluster profile (conversion-V profile [*Hs* and *HY* 10 points > *D*] and elevations on the *Pt* and *Sc* scales) to predicted by elevations on MCMI-III scales *H* (Somatoform), *CC* (Major Depression), *SS* (Thought Disorder), *A* (Anxiety), *3* (Dependent), *B* (Borderline), *D* (Dysthymia) *R* (Post Traumatic Stress Disorder) and *2B* (Depressive), was tested utilizing a multiple regression with the dependent variable being cluster membership in male MMPI-2 cluster number 2. This hypothesis was not supported. Our analysis indicated that the regression

is significant as a predictor. In addition, we found the MCMI-III scale *7*, Compulsive, as an individual predictor.

The MMPI-2 interpretation of the second MMPI-2 male cluster group suggests members of this group are putting forth a good effort to communicate their current psychological situation. They may at times be inconsistent with their reporting, as they may exaggerate how bad things are in an attempt to get the interviewer to understand how difficult their current situation is. The predominant clinical picture for these patients is depression and a concern for their current physical level of functioning. They are rather withdrawn and inwardly focused on their physical troubles.

The MCMI-III best predictor for this cluster is *7* Compulsive. As described above, MCMI-III scale *7* reflects the construct of a severe personality disorder that is developmental in nature and maladaptive in day-to-day functioning. The MCMI-III scale *7* does address the inward focus of these men, describing this focus as hidden rage and hostility towards others.

The MCMI-III provides useful clinical information about a patient's coping style under severe stress. In this chronic pain patient population, the predictive value of MCMI-III's scale *7* addresses current repression that patients might be experiencing. The MMPI-2 addresses the inward focus in a different context – that of focus and concern on physical functioning. The MCMI-III scale *7* describes the inward focus as repression of rage and hostility. The MCMI-III scale *7* addresses symptoms that are life-long and enduring, rather than those that are the result of a major life event, such as a

severe work-related injury. In contrast, the MMPI-2 gives information about mood, anxiety and cognitive functioning.

Our third hypothesis, cluster membership in the third MMPI-2 cluster profile (neurotic triad profile elevations on *Hs*, *D*, *HY*) was to be predicted by elevations on MCMI-III scales *CC* (Major Depression), *D* (Dysthymia), *H* (Somatoform), and *3* (Dependent), *8B* (Masochistic). This hypothesis was tested utilizing a multiple regression analysis with the dependent variable being cluster membership in male MMPI-2 cluster number 3. The hypothesis was not supported. The regression was significant and one MCMI-III scale was found to be a predictor, MCMI-III scale *X* Validity.

A brief interpretation of the third MMPI-2 male cluster, according to Greene (2002) suggests that these men appear to be putting forth a good effort in the assessment process and are not exaggerating their current level of distress. Clinically, they are reporting depression and concern for their physical functioning. Their depression and focus on their physical discomfort are predominant in their clinical presentation. Their level of anxiety is not as great as their depression; however, their thinking is impacted by their constant and continuous worry about the future and whether their current situation will resolve positively.

According to Millon (1997) people with an elevated or positive score on the MCMI-III scale *V*, the Validity Index, may mean an invalid profile. MCMI-III scale *V* contains three bizarre or highly improbable items. When two or more of these items are marked "True", the protocol is considered invalid. A score of zero is considered is valid,

and a score of 1 indicates questionable validity. A protocol with a score of 1 should be interpreted with caution.

In comparing these two descriptions, the MMPI-2 looks at a broad range of factors that affect the individual at the time of testing. It addresses the effort an individual makes, their mood, anxiety, cognitive functioning as well as physical difficulties. The MCMI-III is extremely sensitive to carelessness, stress or confusion, and does not offer any clinical information about the patient.

Our fourth hypothesis, cluster membership in the fourth MMPI-2 cluster profile (generally elevated profile) will be predicted by elevations on MCMI-III scales *H* (Somatoform), *D* (Dysthymia), *CC* (Major Depression), *6A* (Antisocial), *SS* (Thought Disorder), *3* (Dependent) and *S* (Schizotypal) was tested using a multiple regression analysis with the dependent variable being membership in the male MMPI-2 cluster number 4. Our regression analysis was not a significant predictor of cluster membership. We did find, one individual predictor MCMI-III scale *C* Borderline.

A brief interpretation for the fourth male MMPI-2 cluster according to Green (2002) suggests that this population over reports their symptoms to the point of incredibility. They do appear, however, to be exaggerating to be believed. They also believe that they do not have psychological resources to solve their problems. Clinically, they are very depressed and overly concerned with their physical functioning. They are experiencing conflict with those that they consider to be authority figures. They may have difficulty following suggestions made by their treatment team. Their thinking is self-focused and they do not trust those around them. Their thinking and worry

contributes to their anxiety, and they may have poor judgment. More than likely, they are impulsive and may appear grandiose.

The MCMI-III predictor for membership in the fourth MMPI-2 male cluster was MCMI-III scale *C* Borderline. Millon (1997) suggests that patients with elevations on the MCMI-III scale *C* have severe personality disorders. They will experience intense endogenous moods with recurring periods of deflection and apathy, often interspersed with spells of anger, anxiety or euphoria. What distinguishes people with elevations on this scale is the dysregulation of affect, seen most clearly in the instability and lability of their moods. Additionally, many have recurring thoughts about self-mutilation and suicide, appear overly preoccupied with securing affection, have difficulty maintaining a clear sense of identity, and display a cognitive-affective ambivalence that is evident in conflicting feelings of rage, love and guilt toward others.

While the MCMI-III provides good information about potential maladaptive coping styles under severe stress, it does not take into account mood and cognitive functioning. The MMPI-2 gives a broader picture of the patients' current level of emotional functioning. The MCMI-III scale *C* identifies the symptoms of severe psychopathology that develops in childhood and is enduring. The MCMI-III scale *C* may not be useful for individuals under severe acute stress. However, extreme caution should be exercised if using the MCMI-III for the sake of formulating a diagnosis in this population.

Hypotheses testing females

Since the multivariate clustering procedure used in this study found three rather than four female clusters, this discussion will refer to female MMPI-2 cluster 1, rather than female MMPI-2 cluster 2; female MMPI-2 cluster 2, rather than female MMPI-2 cluster 3, and female MMPI-2 cluster 3, rather than female MMPI-2 cluster 4.

The first hypothesis was that membership in the first female MMPI-2 cluster profile (within-normal-limits) will be predicted by no elevations of any MCMI-III clinical subscales. This hypothesis was tested using a multiple regression analysis. The independent variables were the MCMI-III clinical subscales and the dependent variable was cluster membership in male MMPI-2 cluster 1. This hypothesis was not supported, as the within-normal-limits profile MMPI-2 cluster was missing in this population sample. Further analysis revealed we learned that all female MMPI-2 profiles had elevations on clinical scales. Perhaps one reason for these elevations is that the length of time since injury averaged 2.88 years. Another consideration would be that this sample had wide range of education levels, and low reading levels could have skewed the clinical profiles.

The second hypothesis, cluster membership in the first female MMPI-2 cluster profile (conversion-V profile [*Hs* and *HY* 10 points > *D*] and elevations on the *Pt* and *Sc* scales) will be predicted by elevations on MCMI-III scales H (Somatoform), CC (Major Depression), *SS* (Thought Disorder), *A* (Anxiety), *3* (Dependent), *B* (Borderline), *D* (Dysthymia) *R* (Post Traumatic Stress Disorder) and *2B* (Depressive), was tested utilizing a multiple regression with the dependent variable being cluster membership in MMPI-2

cluster number 2. The regression proved to be significant as a predictor for cluster membership in the first MMPI-2 female cluster. Our analysis did not yield a MCMI-III clinical scale that serves as a predictor for the first female MMPI-2 cluster.

A brief interpretation according to Green (2002) of the female cluster suggests that these women are honest in their portrayal of their current situation, and are not over exaggerating their concerns and they acknowledge that they lack current resources to solve their problems. Clinically, they are depressed and very concerned about their physical condition. They may speak about their physical problems often and also report a lot of anxiety. They will function well with a group, in that they will talk freely with peers. They are preoccupied with their thinking about their current stressors to the point that they may appear distracted and not pay attention well. Their thinking is impacting their depression and anxiety.

In this cluster, the MMPI-2 looks at a broad picture of psychological picture. The MCMI-III offers no interpretation or clinical scale that serves as a predictor for this cluster. While these instruments are supposed to measure similar traits, the MMPI-2 examines a patient's psychological presentation, while the MCMI-III looks at a patient's current state, which may or may not be a stable picture of the patient's coping styles.

The third hypothesis, cluster membership in the second female MMPI-2 cluster profile (neurotic triad profile elevations on *Hs*, *D*, *HY*) will be predicted by elevations on MCMI-III scales *CC* (Major Depression), *D* (Dysthymia), *H* (Somatoform), and *3* (Dependent), *8B* (Masochistic), was tested utilizing a multiple regression analysis with the dependent variable being cluster membership in female MMPI-2 cluster number 2.

This hypothesis was not supported for females. The regression analysis was not a significant predictor of cluster membership; however, two individual predictors were found: MCMI-III scale *T* Drug Dependent and MCMI-III scale *4* Histrionic for cluster membership in female cluster number 2.

A brief interpretation of the second MMPI-2 female cluster according to Greene (2002) suggests that as a group, this female population tends to exaggerate their current psychological state in the hopes of gaining others' understanding of their stress and struggle. They admit that they are unable to solve their current problems and are seeking help. Clinically, they are depressed about their physical functioning and may become tearful and frustrated. They report a great deal of anxiety, and their thinking is distorted due to their current stress. Their distorted thinking impacts their judgment and they may utilize poor coping strategies in their daily life.

Millon (1997) describes individuals with elevated MCMI-III scale *4* Histrionic as individuals that turn to others, they appear on the surface to be quite dissimilar from their passive counterparts. This difference in overt style arises from their facile and enterprising manipulation of events, through which they maximize the attention and favors they receive and avoid the indifference and disapproval of others. These individuals often exhibit an insatiable if not indiscriminate search for stimulation and affection. Their clever and often artful social behavior gives the appearance of inner confidence and independent self-assurance. Beneath this guise, however, is a fear of genuine autonomy and a need for repeated signs of acceptance and approval. Tribute and

affection must be constantly replenished and are sought from every interpersonal source and in every social context.

The other predictor for the second MMPI-2 female cluster membership is the MCMI-III scale *T* Drug Dependence. Millon describes individuals with elevated MCMI-III scale *T* Drug Dependence scales probably having a current or recent history of drug abuse. They tend to find it difficult to restrain impulses or keep them within conventional social limits, and are unable to manage the personal consequences of this behavior. As the Alcohol Dependence scale, this cluster is composed of many subtle and indirect items. The scale may be useful in identifying individuals who are readily disposed to admit their drug problems.

Comparing Millon's interpretations of members in the female MMPI-2 cluster and MMPI-2 interpretation, two distinct viewpoints emerge. The MMPI-2 considers mood, anxiety, cognitive functioning, physical functioning and stress in their interpretation. The MCMI-III focuses on maladaptive coping strategies that are amplified in stressful situations. In the population sampled in this study, many patients were referred for intake and were taking large amounts of addictive pain medication. More than likely, these patients were uncomfortable by the dose and number of medications that they were taking, and embarrassed by the detoxification process that they were involved in. Furthermore, the MCMI-III does not consider that the coping strategies that are emerging are acute, rather than chronic.

The fourth hypothesis, cluster membership in the third female MMPI-2 cluster profile (generally elevated profile) will be predicted by elevations on MCMI-III scales *H*

(Somatoform), *D* (Dysthymia), *CC* (Major Depression), *6A* (Antisocial), *SS* (Thought Disorder), *3* (Dependent) and *S* (Schizotypal) was tested using a multiple regression analysis with the dependent variable being membership in the male MMPI-2 cluster number 4. The regression analysis was a significant predictor. Two individual predictors were found: MCMI-III scale *2A* Avoidant and MCMI-III scale *4* Histrionic.

The third female cluster did not produce the elevated profile that had been predicted. Most likely, this is because the first and second clusters were both more elevated than expected. As mentioned earlier, examination of individual profiles revealed that that all MMPI-2 female profiles had clinical elevations. A brief interpretation of the female cluster according to Green (2002) suggests that the chronic pain patients in this cluster are slightly inconsistent in their reporting. They may give information that tends to conflict with documented facts. They are also very confident in their ability to solve their current problems. Clinically, they are depressed. They ruminate about their physical problems and will have difficulties with people they consider to be authority figures. Under stress, they may appear impulsive and emotional. They are repressing a great deal of anxiety and concern about their future.

Millon describes individuals with elevations on MCMI-III scale *2A* as individuals who experience few positive reinforcers from themselves or others. They are vigilant and always on guard, ready to distance himself or herself from anxious anticipation of life's painful or negatively reinforcing experiences. Their adaptive strategy reflects a fear and mistrust of others. They maintain a constant vigil to prevent their impulses and their longing for affection from resulting in a repetition of the pain and anguish they have

experienced with others. Only by active withdrawal can they protect themselves. Despite desires to relate, they have learned that it is best to deny these feelings and to keep a good measure of interpersonal distance. The other predictor, MCMI-III scale *4* Histrionic, seems to contrast these individuals. Millon describes individuals with elevations on the MCMI-III scale *4* as individuals that turn to others frequently for approval. They appear on the surface to be quite dissimilar from their passive counterparts. This difference in overt style arises from their facile and enterprising manipulation of events, through which they maximize the attention and favors of others. These individuals often exhibit an insatiable if not indiscriminate search for stimulation and affection. Their clever and often artful social behavior gives the appearance of inner confidence and independent self-assurance. Beneath this guise, however, is a fear of genuine autonomy and a need for repeated signs of acceptance and approval. Tribute and affection must be constantly replenished and are sought from every interpersonal source and in every social context.

The MMPI-2 interpretation does address the impulsivity and emotionality that this group may possess. The MMPI-2 also utilizes factors such as cognitive functioning, mood, anxiety, as well as the effort the individuals put forth in the testing process. The MCMI-III, by contrast, examines a small piece of these individuals' lives. Specifically, the MCMI-III highlights maladaptive coping strategies characteristically utilized by individuals in extreme stress. The MMPI-2 addresses the isolation that persons with this cluster profile experiences, and the cognitive ruminative process that accompanies their loneliness. The MCMI-III offers a contrasting viewpoint, in that the isolation that these

individuals seek is the result of a long developmental process. The MCMI-III interpretation appears to be rather limited for this cluster, as this test's clinical scope does not take into account individuals who are coping with an acquired medical condition.

Using this chronic pain population, some of the regression procedures used in this study provided significant predictors of MMPI-s cluster membership: MCMI-III scale *7* Compulsive; MCMI-III scale *X* Validity; MCMI-III scale *C* Borderline; MCMI-III scale *T* Drug Dependent and MCMI-III scale *4* Histrionic. The MCMI-III scales appear to be sensitive to individuals who are under stress. Furthermore, the MCMI-III gives only information concerning maladaptive coping styles that emerge under severe stress. The MCMI-III did not highlight mood, cognitive functioning, anxiety or physiological concerns that were apparent on the MMPI-2. When interpreting the MCMI-III in a chronic pain population, it is imperative that one not use the clinical information to formulate a diagnosis. Perhaps a more useful way to incorporate the MCMI-III in the treatment planning process would be to use the information provided about maladaptive coping strategies and incorporate those findings in stress management training.

This study also looked at a small sample of follow-up data. Twenty-one pre and post MCMI-III protocols were available, as well as follow-data. All 21 subjects had completed the six-week comprehensive pain management program. While the sample is very small, it provides useful information for future research. Significant decreases were found on 7 clinical MCMI-III scales. Increases were found in three scales. Two of the subjects had a history of primary addiction. When these subjects were removed and the t-tests were re-run on the MCMI-III clinical scales, results showed decreases on scale

scores. The information from these results suggests that future research include pre-post data with a larger population. This examination also suggests that the MCMI-III is sensitive to stress and change. Therefore, interpretation of the MCMI-III at intake should be done with extreme caution, as patients may improve during the course of treatment. In addition, patients who have a history of addiction may need to address their addiction prior to entering a cognitively based treatment program.

Additional analyses were conducted on follow-up data. The sample size for this portion of the study was small. The results provide useful information for treatment planning, outcome measures and to generate ideas for future research. Findings from this study might suggest that when designing a treatment plan, case managers for chronic pain patients should verify that a patient is receiving a source of income, as this directly affects their quality of sleep, relationships, and mood. Equally important would be to teach patients new and adaptive coping strategies that can be utilized in their pain management. Sobel (1995) reported that when patients are taught to be an interactive part of their treatment team, increases in program adherence, quality of life and functioning are noted.

Limitations

This study was limited in that follow-up data and pre- and post-assessment data was not available for all subjects. The subject pool was limited to injured workers in the Texas Workers' Compensation system. However, this study was unique in that we were able to look at a population that might not have been studied, because of the increased

length of time from injury to program intake, and to look at the potential that this time increase may have had on a patient's psychological condition.

This study makes a case for the development of special norms to be used with pain patients. The study highlights the value of follow-up information that was both subjective and objective. These results suggest that rather than being just a diagnostic tool; the MCMI-III provides meaningful information about maladaptive coping strategies that arise under acute stress. This quality was illustrated by the changes found in the pre- and post-program assessment analysis. This study's findings suggest that pain treatment program staff could utilize follow up information, as well as diagnostic information about coping strategies that might appear under stress, to shape interventions. Future research might focus on discriminate analyses to investigate factors that predict both improvement and program failure.

APPENDIX A

Dallas Spinal Rehabilitation Center
Pain Management Post-Program Questionnaire

Name: Social Security Number:

Date of Birth: Injury Date: Discharge Date:

Gender:
Section 2. Home Exercise Status (please circle the indicated level of activity)

1. I stretch Never 2 times/week 3 times/week 4 times/week daily

2. I perform stabilization
   Exercises Never 2 times/week 3 times/week 4 times/week daily

3. I perform strengthening
   Activities Never 2 times/week 3 times/week 4 times/week daily

4. I do some form of aerobic
   Exercise (Bike Treadmill, stairmaster)
   Never 2 times/week 3 times/week 4 times/week daily

Section 3 – Quality of Life Status

1. My present level of depression (feelings of hopelessness)
   Severe Very Bad Moderate Slight Non-existent

2. My present level of anxiety (worry and concern)
   Severe Very Bad Moderate Slight Non-existent

3. Right now, my quality of sleep is
   Very Poor Poor Fair-good/bad nights Good Excellent

4. Right now, the quality of relationships I have with my family and friends is

Very Poor Poor Fair-good/bad times Good Excellent

5. My ability to manage my pain is

Very Poor Poor Fair Good Excellent

Section 3: Work Status

Are you Working? Yes No

If not, how soon do you expect to return to work?
3 months 6 months 1 year 2 years Never

APPENDIX B

DALLAS SPINAL REHABILITATION CENTER, INC.
CONSENT FOR CARE AND TREATMENT

I, the undersigned, do hereby agree and give my consent for Dallas Spinal Rehabilitation Center to furnish medical care and treatment to _____ considered necessary and proper in diagnosing or treating their physical and mental condition.

Patient/Guardian_____ Date_____

BENEFIT ASSIGNMENT/RELEASE OF INFORMATION

I, hereby assign all medical and/or surgical benefits to include major medical benefits to which I am entitled, including Medicare, private insurance and any other health plans to Dallas Spinal Rehabilitation Center. A photocopy of this assignment is to be considered as valid as the original. I, hereby authorize said assignee to release all information necessary, including Medical Records, to secure payment.

Patient/Guardian _____ Date_____

FINANCIAL POLICY STATEMENT

It is our policy to bill your insurance carrier as a courtesy to you, although you are responsible for the entire bill when the services are rendered. We require that arrangements for payment of your estimated share be made today. If your insurance carrier does not remit payment within 60 days, the balance will be due in full from you. If any payment is subsequently made by your insurance carrier in excess of the balance of your account, we will promptly refund the credit.

If any payment is made directly to you for services billed by us, you recognize an obligation to properly remit same to Dallas Spinal Rehabilitation Center.

The above does not apply for those patients that are considered Worker's Compensation. However, be advised as a Compensation patient that you may be held responsible for your charges in the event your Claim is controverted.

I understand and agree that if I fail to make any of the payments for which I am responsible in a timely manner, after such default and upon referral to a collection agency or attorney by Dallas Spinal Rehabilitation Center, I will be responsible for all costs of collecting monies owed, including court costs, collection agency fees and attorney fees.

ESTIMATED INSURANCE BENEFITS

_____

_____

Estimated patient payment % _____

Arrangements for payment of patient's share _____
_____

NOTE: Estimated coverage information is provided as a courtesy to our patients, but is not intended to release them from total responsibility for their account balance.

The above information has been read and explained to me. I UNDERSTAND MY RESPONSIBILITY FOR THE PAYMENT OF MY ACCOUNT.

Patient or Responsible Party	**Date**
Dallas Spinal Rehabilitation Center Representative	**Date**

APPENDIX C

DISCLOSURE AND CONSENT FORM FOR BEHAVIORAL MEDICINE SERVICES AND RESEARCH

This disclosure is not meant to be scary or alarming. It is an explanation, required by law, to make me better informed so that I may give, withhold, or terminate my consent to treatment offered by the Clinic.

In regard to the psychological testing, therapy and biofeedback services, I understand that during the course of injury, illness, or other stressors, many patients develop pain, depression, anxiety, sleep disturbances and other conditions. The tests being administered are designed to help the treatment team understand the complexities of my situation and to identify if I might benefit from treatment for chronic pain and other conditions.

I understand that psychological test results are maintained in a confidential file. The therapists and support staff have been instructed on the need to keep all information regarding these materials confidential. Reports summarizing my test results and treatment are generated. This information will only be released with my consent or that of a legal guardian. The exceptions to this include if I am a minor child in treatment, if it is determined that I may be a threat to myself (suicidal) or a threat of harm to others, or if there is reason to suspect abuse of a child.

I do authorize this healthcare provider to release my report to the insurance company, the referring physician, and clinical medical records for use by treatment staff. Raw test data is released only with permission of the patient or in response to a subpoena. Though strong efforts are made to keep the information confidential, I realize that the treatment team can not be held responsible for misuse of this information by those to whom it is released.

Testing report preparation, psychotherapy, and biofeedback services are supervised by a licensed psychologist, but may be performed by Master's Degree therapists. I understand that the data may also be used in research, but that my name or any identifying information will be removed from published materials and that my rights to privacy will be respected. I understand that I will be encouraged to ask questions or voice concerns about my treatment. I understand that I can choose to stop my testing procedures at any time. I recognize, however, that this material enhances the treatment team's ability to not only provide treatment, but to make appropriate referrals should this treatment setting not prove to be adequate to meet my needs.

Patient Signature:_____ Date: _____

APPENDIX D

Supplemental Table 1

Coefficients summary for hypothesis 1 – males

Coefficients

Model		Unstandardized Coefficients *B*	*Std. Error*	Standardized Coefficients *Beta*	*t*	Sig.
1	(Constant)	.974	.476		2.048	.044
	BR_X - (Validity?)	2.798E-03	.003	.185	.827	.411
	BR_Y-desirability	-3.424E-03	.006	-.159	-.604	.548
	BR - Z Deabasement	8.342E-03	.005	.401	1.726	.088
	BR_1 Schizoid	-3.396E-03	.003	-.180	-1.028	.307
	BR_2A - Avoidant	-1.475E-03	.003	-.106	-.512	.610
	BR - 2B Depressive	1.498E-03	.003	.108	.466	.642
	BR_3 - Dependent	-7.715E-04	.003	-.050	-.273	.785
	BR_4 - Histrionic	7.323E-05	.005	.003	.014	.989
	BR_5 - Narcisstic	1.720E-03	.004	.079	.461	.646
	BR_6A - Antisocial	2.697E-03	.005	.155	.550	.584
	BR_6B - Sadistic (Agressive)	-8.137E-04	.003	-.049	-.239	.811
	BR_7 - Compulsive	8.502E-03	.004	.368	2.128	.036*
	BR_8A - Negativistic (Passive Aggressive)	-3.727E-04	.003	-.025	-.116	.908
	BR_8B - Masochistic (Self-Defeating)	-1.044E-03	.003	-.076	-.347	.730
	BR - S - Schizotypal	5.834E-04	.003	.039	.196	.845
	BR_C - Borderline	-5.389E-03	.004	-.340	-1.408	.163
	BR_P - Paranoid	1.490E-05	.003	.001	.004	.996
	BR_A - Anxiety	-4.674E-03	.003	-.375	-1.832	.071
	BR_H - Somatoform	1.782E-03	.003	.102	.645	.521
	BR_N - Bipolar Manic	1.187E-03	.003	.071	.415	.679
	BR_D - Dysthymia	-1.184E-03	.003	-.076	-.406	.686
	BR_B Alcohol Dependence	3.182E-03	.003	.226	.998	.321
	BR_T - Drug Dependence	-3.205E-04	.004	-.020	-.087	.931
	BR_R - Post-Traumatic Stress Disorder	3.766E-04	.003	.024	.112	.911
	BR_SS - Thought Disorder	6.224E-03	.003	.388	1.943	.056
	BR_CC - Major Depression	-7.377E-04	.004	-.038	-.196	.845
	BR_PP - Delusional Disorder	8.591E-04	.003	.066	.295	.769

a Dependent Variable: MMPI-II Cluster1

* $p < .05$

Supplemental Table 2

Coefficients summary for hypothesis 2 – males

Coefficients

Model		Unstandardized Coefficients *B*	*Std. Error*	Standardized Coefficients *Beta*	t	Sig.
1	(Constant)	2.720	.472		5.768	.000
	BR_X - (Validity?)	6.050E-03	.003	.370	1.803	.075
	BR_Y-desirability	-3.947E-03	.006	-.170	-.702	.485
	BR - Z Deabasement	-5.974E-04	.005	-.027	-.125	.901
	BR_1 Schizoid	3.586E-03	.003	.176	1.094	.277
	BR_2A - Avoidant	2.554E-03	.003	.170	.893	.374
	BR - 2B Depressive	-3.555E-03	.003	-.236	-1.116	.268
	BR_3 - Dependent	-3.231E-03	.003	-.193	-1.155	.252
	BR_4 – Histrionic	3.805E-03	.005	.162	.710	.480
	BR_5 – Narcisstic	-4.799E-03	.004	-.204	-1.297	.199
	BR_6A - Antisocial	-7.831E-03	.005	-.415	-1.609	.112
	BR_6B – Sadistic (Aggressive)	3.277E-03	.003	.181	.972	.334
	BR_7 – Compulsive	-9.296E-03	.004	-.372	-2.347	.021*
	BR_8A – Negativistic (Passive Aggressive)	-2.610E-03	.003	-.164	-.821	.414
	BR_8B – Masochistic (Self-Defeating)	1.904E-03	.003	.129	.638	.525
	BR - S - Schizotypal	-5.318E-03	.003	-.330	-1.803	.075
	BR_C – Borderline	-7.336E-03	.004	-.428	-1.933	.057
	BR_P – Paranoid	-2.479E-03	.003	-.162	-.754	.453
	BR_A – Anxiety	2.412E-03	.003	.179	.953	.343
	BR_H – Somatoform	1.870E-03	.003	.099	.682	.497
	BR_N - Bipolar Manic	2.208E-03	.003	.122	.778	.439
	BR_D – Dysthymia	-1.461E-03	.003	-.087	-.506	.615
	BR_B Alcohol Dependence	1.338E-03	.003	.088	.423	.673
	BR_T - Drug Dependence	6.705E-03	.004	.383	1.829	.071
	BR_R - Post-Traumatic Stress Disorder	-1.090E-03	.003	-.065	-.327	.745
	BR_SS - Thought Disorder	4.538E-04	.003	.026	.143	.887
	BR_CC - Major Depression	-2.433E-03	.004	-.117	-.650	.517
	BR_PP - Delusional Disorder	2.864E-03	.003	.203	.991	.325

a Dependent Variable: MMPI-II Cluster2

$p < .05$

Supplemental Table 3

Coefficients summary hypothesis 3 – males

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
		B	*Std. Error*	*Beta*		
1	(Constant)	1.843	.376		4.898	.000
	BR_X - (Validity?)	-8.005E-03	.003	-.626	-2.988	.004**
	BR_Y-desirability	4.817E-03	.004	.265	1.073	.286
	BR - Z Deabasement	-3.147E-03	.004	-.179	-.823	.413
	BR_1 Schizoid	6.543E-04	.003	.041	.250	.803
	BR_2A - Avoidant	-3.937E-04	.002	-.034	-.172	.863
	BR - 2B Depressive	1.047E-03	.003	.089	.412	.682
	BR_3 - Dependent	3.323E-03	.002	.254	1.488	.141
	BR_4 – Histrionic	-6.146E-03	.004	-.336	-1.437	.155
	BR_5 – Narcisstic	3.976E-03	.003	.216	1.346	.182
	BR_6A - Antisocial	2.344E-03	.004	.159	.604	.548
	BR_6B - Sadistic (Aggressive)	-1.965E-03	.003	-.139	-.731	.467
	BR_7 – Compulsive	2.588E-03	.003	.133	.818	.416
	BR_8A - Negativistic (Passive Aggressive)	1.883E-03	.003	.152	.742	.460
	BR_8B - Masochistic (Self-Defeating)	-2.438E-03	.002	-.211	-1.023	.309
	BR - S - Schizotypal	3.409E-03	.002	.271	1.448	.152
	BR_C – Borderline	2.890E-03	.003	.216	.954	.343
	BR_P – Paranoid	1.928E-03	.003	.162	.734	.465
	BR_A – Anxiety	-2.408E-04	.002	-.023	-.119	.905
	BR_H – Somatoform	-8.513E-04	.002	-.058	-.389	.698
	BR_N - Bipolar Manic	-1.995E-03	.002	-.141	-.880	.381
	BR_D – Dysthymia	1.266E-03	.002	.096	.549	.585
	BR_B Alcohol Dependence	-1.035E-03	.003	-.087	-.410	.683
	BR_T - Drug Dependence	-2.822E-03	.003	-.206	-.964	.338
	BR_R - Post-Traumatic Stress Disorder	7.273E-04	.003	.055	.273	.785
	BR_SS - Thought Disorder	-4.316E-03	.003	-.318	-1.702	.093
	BR_CC - Major Depression	2.587E-03	.003	.159	.866	.389
	BR_PP - Delusional Disorder	-3.433E-03	.002	-.311	-1.488	.141

a Dependent Variable: MMPI-II Cluster3

**$\underline{p}$ < .001

Supplemental Table 4

Coefficients summary hypothesis 4 - males

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
		B	*Std. Error*	*Beta*		
1	(Constant)	1.172	.539		2.173	.033
	BR_X - (Validity?)	-1.235E-03	.004	-.070	-.322	.749
	BR_Y-desirability	2.352E-03	.006	.093	.366	.716
	BR – Z Deabasement	-1.873E-03	.005	-.077	-.342	.734
	BR_1 Schizoid	-4.850E-04	.004	-.022	-.129	.897
	BR_2A - Avoidant	-5.201E-04	.003	-.032	-.159	.874
	BR - 2B Depressive	1.420E-03	.004	.087	.390	.698
	BR_3 - Dependent	5.006E-04	.003	.028	.156	.876
	BR_4 - Histrionic	4.660E-03	.006	.184	.760	.449
	BR_5 - Narcisstic	-1.435E-03	.004	-.056	-.339	.736
	BR_6A - Antisocial	4.974E-03	.006	.244	.894	.374
	BR_6B - Sadistic (Agressive)	-4.531E-04	.004	-.023	-.118	.907
	BR_7 - Compulsive	-8.807E-04	.005	-.033	-.194	.846
	BR_8A - Negativistic (Passive Aggressive)	2.340E-04	.004	.014	.064	.949
	BR_8B - Masochistic (Self-Defeating)	1.593E-03	.003	.100	.467	.642
	BR – S - Schizotypal	2.027E-03	.003	.116	.601	.550
	BR_C - Borderline	1.019E-02	.004	.548	2.346	.022*
	BR_P - Paranoid	1.204E-03	.004	.073	.320	.750
	BR_A - Anxiety	2.842E-03	.003	.194	.982	.329
	BR_H - Somatoform	-2.505E-03	.003	-.122	-.799	.427
	BR_N – Bipolar Manic	-1.825E-03	.003	-.093	-.562	.576
	BR_D - Dysthymia	9.029E-04	.003	.050	.273	.785
	BR_B Alcohol Dependence	-3.886E-03	.004	-.236	-1.074	.286
	BR_T - Drug Dependence	-4.835E-03	.004	-.255	-1.153	.252
	BR_R - Post-Traumatic Stress Disorder	-1.443E-03	.004	-.079	-.378	.706
	BR_SS - Thought Disorder	-2.037E-03	.004	-.108	-.561	.577
	BR_CC - Major Depression	5.043E-04	.004	.022	.118	.907
	BR_PP - Delusional Disorder	-7.167E-04	.003	-.047	-.217	.829

a Dependent Variable: MMPI-II Cluster4

* = $\underline{p} < .05$

Supplemental Table 5

Coefficients summary hypothesis 2 - females

Coefficients

Model		Unstandardized Coefficients *B*	*Std. Error*	Standardized Coefficients *Beta*	*t*	Sig.
1	(Constant)	1.400	.415		3.377	.001
	BR_X Validity	-3.918E-03	.002	-.240	-1.578	.118
	BR_Y Desirability	-2.999E-03	.004	-.135	-.760	.449
	BR_Z Debasement	1.848E-03	.006	.062	.322	.748
	BR_1 Schizoid	1.017E-03	.003	.050	.388	.699
	BR_2A Avoidant	-1.184E-03	.003	-.070	-.366	.715
	BR_2B Depressive	-2.639E-03	.003	-.164	-1.025	.308
	BR_3 Dependent	-2.981E-03	.002	-.163	-1.255	.213
	BR_4 Histrionic	-1.169E-04	.003	-.007	-.038	.970
	BR_5 Narcissistic	-3.506E-03	.003	-.159	-1.175	.243
	BR_6A Antisocial	1.237E-03	.003	.066	.381	.704
	BR_6B Sadistic (Aggressive)	2.791E-04	.003	.014	.111	.912
	BR_7 Compulsive	1.824E-04	.003	.008	.061	.952
	BR_8A Negativstic	1.158E-03	.003	.063	.367	.714
	BR_8B Masochistic (Self-Defeating)	2.515E-03	.002	.173	1.117	.267
	BR_S Schizotypal	3.996E-03	.003	.211	1.217	.227
	BR_C Borderline	9.679E-04	.003	.057	.290	.773
	BR_P Paranoid	-1.612E-03	.003	-.103	-.620	.537
	BR_A Anxiety	1.258E-03	.002	.087	.556	.580
	BR_H Somatoform	3.614E-04	.003	.019	.135	.893
	BR - N Bipolar: Manic	5.466E-04	.002	.030	.222	.825
	BR_D Dysthymia	1.520E-03	.003	.091	.571	.569
	BR_B Alcohol Dependence	2.728E-03	.002	.164	1.150	.253
	BR_T Drug Dependence	-2.675E-03	.002	-.152	-1.168	.246
	BR_R Post-Traumatic Stress Disorder	-1.282E-04	.003	-.007	-.050	.960
	BR_SS Thought Disorder	4.135E-03	.003	.217	1.285	.202
	BR_CC Major Depression	3.155E-03	.004	.165	.816	.417
	BR_PP Delusional Disorder	-1.554E-03	.002	-.107	-.725	.470

a Dependent Variable: MMPI Cluster I

Supplemental Table 6

Coefficients summary for hypothesis 3- females

Coefficients

Model		Unstandardized Coefficients *B*	*Std. Error*	Standardized Coefficients Beta	*t*	Sig.
1	(Constant)	2.430	.474		5.130	.000
	BR_X Validity	2.862E-03	.003	.191	1.009	.316
	BR_Y Desirability	5.143E-03	.005	.252	1.141	.257
	BR_Z Debasement	-2.222E-03	.007	-.081	-.339	.735
	BR_1 Schizoid	-2.930E-03	.003	-.158	-.978	.331
	BR_2A Avoidant	-4.621E-03	.004	-.299	-1.250	.215
	BR_2B Depressive	2.364E-03	.003	.160	.803	.424
	BR_3 Dependent	2.989E-03	.003	.178	1.101	.274
	BR_4 Histrionic	-8.557E-03	.004	-.527	-2.436	.017*
	BR_5 Narcissistic	1.299E-03	.003	.064	.381	.704
	BR_6A Antisocial	-6.349E-03	.004	-.368	-1.710	.091
	BR_6B Sadistic (Aggressive)	-4.301E-04	.003	-.023	-.149	.882
	BR_7 Compulsive	-2.796E-03	.003	-.142	-.816	.417
	BR_8A Negativstic	-1.708E-03	.004	-.102	-.474	.637
	BR_8B Masochistic (Self-Defeating)	2.049E-03	.003	.154	.797	.428
	BR_S Schizotypal	-5.972E-03	.004	-.344	-1.591	.115
	BR_C Borderline	-8.002E-04	.004	-.051	-.210	.834
	BR_P Paranoid	4.273E-04	.003	.030	.144	.886
	BR_A Anxiety	3.065E-03	.003	.231	1.185	.239
	BR_H Somatoform	-2.972E-05	.003	-.002	-.010	.992
	BR - N Bipolar: Manic	3.683E-03	.003	.217	1.311	.193
	BR_D Dysthymia	-5.888E-04	.003	-.038	-.194	.847
	BR_B Alcohol Dependence	1.480E-03	.003	.097	.546	.586
	BR_T Drug Dependence	6.493E-03	.003	.403	2.481	.015*
	BR_R Post-Traumatic Stress Disorder	-5.711E-04	.003	-.036	-.194	.847
	BR_SS Thought Disorder	-5.005E-03	.004	-.287	-1.361	.177
	BR_CC Major Depression	-1.034E-03	.004	-.059	-.234	.815
	BR_PP Delusional Disorder	7.825E-04	.002	.059	.320	.750

a Dependent Variable: MMPI Cluster II

* = p < .05

Supplemental Table 7

*Coefficients summary hypothesis 4 - female*s

Coefficients

Model		Unstandardized Coefficients *B*	*Std. Error*	Standardized Coefficients *Beta*	*t*	Sig.
1	(Constant)	.962	.455		2.113	.037
	BR_X Validity	5.065E-03	.003	.332	1.858	.066
	BR_Y Desirability	-1.746E-03	.004	-.084	-.403	.688
	BR_Z Debasement	5.877E-03	.006	.209	.934	.353
	BR_1 Schizoid	1.350E-03	.003	.071	.469	.640
	BR_2A Avoidant	7.169E-03	.004	.453	2.018	.047*
	BR_2B Depressive	-9.544E-04	.003	-.063	-.338	.736
	BR_3 Dependent	-1.693E-03	.003	-.099	-.649	.518
	BR_4 Histrionic	9.838E-03	.003	.593	2.915	.005*
	BR_5 Narcissistic	-2.472E-04	.003	-.012	-.075	.940
	BR_6A Antisocial	3.103E-03	.004	.176	.870	.387
	BR_6B Sadistic (Aggressive)	5.024E-04	.003	.027	.182	.856
	BR_7 Compulsive	3.444E-03	.003	.171	1.046	.298
	BR_8A Negativstic	6.868E-04	.003	.040	.198	.843
	BR_8B Masochistic (Self-Defeating)	-2.331E-03	.002	-.172	-.944	.348
	BR_S Schizotypal	-1.180E-03	.004	-.067	-.327	.744
	BR_C Borderline	-9.278E-04	.004	-.058	-.253	.801
	BR_P Paranoid	-4.505E-04	.003	-.031	-.158	.875
	BR_A Anxiety	-3.679E-03	.002	-.271	-1.481	.142
	BR_H Somatoform	-7.987E-04	.003	-.045	-.273	.786
	BR - N Bipolar: Manic	-1.687E-03	.003	-.097	-.625	.534
	BR_D Dysthymia	-2.118E-04	.003	-.013	-.073	.942
	BR_B Alcohol Dependence	6.577E-04	.003	.042	.253	.801
	BR_T Drug Dependence	-3.645E-03	.003	-.222	-1.450	.151
	BR_R Post-Traumatic Stress Disorder	3.981E-04	.003	.025	.141	.888
	BR_SS Thought Disorder	-1.405E-03	.004	-.079	-.398	.692
	BR_CC Major Depression	-5.435E-03	.004	-.304	-1.281	.204
	BR_PP Delusional Disorder	2.335E-03	.002	.172	.993	.324

a Dependent Variable: MMPI Cluster III

$\underline{p} < .05$

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