THE RELATIONSHIP OF ANTIDEPRESSANT USE, DEPRESSION, DEPRESSIVE SYMPTOMATOLOGY AND REPORTED PAIN TO MULTIDISCIPLINARY CHRONIC PAIN TREATMENT OUTCOME MEASURES

by

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(ABSTRACT)

This study was conducted to analyze various objective measures of treatment outcome among patients that participated in a multidisciplinary chronic pain treatment program and to compare these measures to the absence or presence of antidepressant medication, the level of depression, and the quality of pain and depression reported. In addition, this study examined whether there are certain patient characteristics that are related to treatment outcome measures.

Data was collected from the medical records of 232 patients who were admitted to and treated for various chronic pain syndromes at the Lewis-Gale Hospital Pain Center in Salem, Virginia.

Results of the study indicate that when chronic pain patients are subdivided into groups based on antidepressant drug use, depression level, reported quality of pain, and depressive symptomatology, there are distinct and significant differences before treatment when between-group comparisons are made. Within-group comparisons revealed significant differences between pre and post test measures for most groups studied, however, those with the most significant changes in scores included those patients on antidepressant medication, those patients with greater cognitive symptoms of depression, and those patients who were non-depressed. Patient characteristics that were significantly related to outcome included age, gender, duration of pain, employment, workers compensation, and litigation status.

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CHAPTER I

INTRODUCTION

The experience of pain, both acute pain and chronic pain, is influenced by social, cultural, and religious factors as well as the psychological, biological, physiological and chemical components of the individual. Chronic pain has become a primary topic of research due to its impact on health care costs. More than 75 million Americans suffer from chronic, handicapping pain (Tollison, 1987). These individuals have typically suffered through several years of agony, undergone two or more failed surgeries for pain relief, are restricted in their jobs if not totally unable to work, take various and multiple medications for pain, experience chronic sleep disturbance and marital and family dysfunction, suffer depression and emotional distress, and are physically and psychologically depleted (Tollison, 1987). According to Aronoff and McAlary (1989) in the Executive Health Report, chronic pain costs American society in excess of 90 billion dollars annually and accounts for 550-600 million lost work days per year.

It is widely recognized that the majority of chronic pain patients suffer depression. The typical rates of depression in chronic pain patients has been estimated to range from 30 to 100 percent (Turk & Melzack, 1987). Blumer and Heilbronn (1982) attempt to explain the relationship between chronic pain and depression by hypothesizing that chronic pain represents a muted depressive

state in a painprone individual. According to this model, pain and depression are viewed as manifestations of a single, common disease process. Eberhard, Knorring, Nilsson, Sundequist, and Wahlander (1989) suggest that since chronic pain patients often display both symptoms and signs of depression, that chronic pain should be regarded as a form of depression (masked depression, atypical depression) even when symptoms of depressed mood are not overt. Another model that focuses on the relationship between chronic pain and depression was developed by Robert Supernaw (1992). Supernaw refers to his model as the chronic pain-depression complex. Chronic pain can originate from several sources to include trauma, psychogenic origin, malignant or nonmalignant causes, or depression. Depression can result from biochemical abnormalities or as a result of situational dynamics such as in response to organic disease or personal loss-grief. In essence, this model states that chronic pain can trigger depression, and depression can trigger chronic pain.

Eriksson (1989) argues that chronic pain is a common symptom not only in depressed patients but also in those patients suffering from anxiety disorders and that it may be more accurate to regard chronic pain not merely as a symptom of masked depression, but rather as a distinct diagnostic entity belonging to the group of illnesses which respond to antidepressant treatment and which sometimes, but not always, appear in conjunction with depressed mood. Several other studies have evaluated the relationship of chronic pain and depression and estimate that between 70 - 80% of chronic pain patients

could be expected to develop a secondary depression. Researchers in one study found a 21% incidence of major depression and 51% incidence of intermittent depressive illness, totaling 72% (France, Houpt & Skott, 1984). In another study, a 43% incidence of major depression was found, a 13% incidence of minor depression, and a 29% incidence of intermittent depressive illness, totaling 82% (Krishnan, France, Delton, McCann, & Davidson, 1985). A third study found an 80% incidence of all depressions in a chronic pain clinic (Florence, 1983). With such strong evidence as to the prevalence of depression among chronic pain sufferers, it stands to reason that treating the depression pharmacologically should be a major consideration when treating chronic pain.

Antidepressant medications are commonly prescribed for patients with chronic pain. Several studies have investigated the effects of various antidepressant medications in treating chronic pain (Dellemijn & Fields, 1993; Turner & Denny, 1993; Eriksson, 1989; Eberhard et al., 1989; Sindrup, 1993; Onghena & VanHoudenhove, 1992; Orsulak & Waller, 1988; Goodkin & Gullion, 1989; Leijon & Boivia, 1989; Tollison, 1990; Kehoe & Jacisin, 1992). Antidepressants are prescribed for a variety of reasons. These include the belief that the antidepressant medication may have analgesic effects (Orsulak & Waller, 1988), belief that the patient may be depressed (a common concomitant of pain), and belief that help with sleep is needed. Some authors believe that antidepressant medication helps chronic pain indirectly because of its beneficial impact on depression or sleep or both (Stauffer, 1987). Others

believe it has an analgesic effect independent of its antidepressant action (Feinmann, 1985). Eberhard et al. found that patients with chronic pain syndromes responded to treatment with antidepressants regardless of the presence or absence of a coexisting depressive syndrome. In a large study performed by Blumer, Heilbronn, Pedraza, & Pope (1980), consecutive patients from a pain center were included regardless if there was a coexisting syndrome or not. They found that if adequate doses of antidepressant medication were given and if a strict dose regimen was followed, about two thirds of the patients improved. The literature, however, is inconsistent and does not clearly demonstrate that antidepressants are superior to placebos (Turner & Denny, 1993).

Rationale

All of the components of a pain syndrome present opportunities and challenges for specific management and treatment ranging from pharmacotherapies (such as analgesic, antidepressant, and antianxiety medications) to psychotherapies (such as individual, group, and family therapy). When disability and sick role are entrenched, a multidisciplinary pain center may be the comprehensive treatment of choice (Rosenbaum, 1982). The development of the multidisciplinary pain center (MPC) as the state of the art for treatment of chronic pain is based on a holistic philosophy of understanding

chronic pain from all facets of a patients life, ranging from medical and physical conditions to family systems and personality dynamics (Kleinke, 1991). The goal of this comprehensive approach to pain management is to eliminate or reduce pain, medication dependence, and related suffering and disability (Aronoff & McAlary, 1989).

The "average" chronic pain patient treated at one interdisciplinary pain treatment center, for example, is described as a 42 year old male with complaints of lower back pain lasting over three years who is vocationally disabled, has failed to respond to an average of 1.86 surgeries, is taking 1.92 analgesic medications (including narcotics), has consulted an average of 6.8 health care providers, and is clinically depressed (Tollison & Kriegel, 1989). On the basis of such extensive adjustive demands and the failures of the health care system to alleviate the complaints of pain, it is hardly surprising that most chronic pain victims suffer significant emotional difficulties, impairment of integrated functioning, demoralization, depression and global psychosocial impact.

As a result of growing understanding about the prevalence of depression among chronic pain patients, the diagnosis and treatment of depression has become an integral part of the rehabilitation program in multidisciplinary pain centers. However, despite the numerous studies on chronic pain, the relationship between chronic pain and depression, and the use of anti-depressants in treating chronic pain, few studies have focused on the use of

antidepressant medications among depressed and non-depressed patients as it relates to treatment outcome in the clinical setting of a multidisciplinary pain center.

Data on the relation between depression and scores on treatment outcome measures in multidisciplinary pain centers are mixed depending on the methodology used (Kleinke, 1991). Keefe, Wilkins, Cook, Crisson, and Muhlbaier (1986) made comparisons between patients' Beck Depression Inventory (BDI) scores and medical status in predicting pain behaviors and self-reported pain following treatment. Kerns & Haythornthwaite (1988) found no significant differences between one group of depressed chronic pain patients and one group of non-depressed chronic pain patients with regards to self-rated pain in a multidisciplinary treatment clinic. Kleinke (1991) investigated whether the depression-coping strategies used by depressed chronic pain patients influenced treatment outcome in a multidisciplinary treatment clinic. These studies that focus on treatment outcome measures primarily focus on measurements of depression and fail to take into account the medication regimen of the patient.

The basis of this study was to determine if there are differences in treatment outcomes among those chronic pain patients (both depressed and non-depressed) who are treated with various antidepressant medications.

Statement of the Problem

Pain is one of the most common complaints among those seeking health care. For some, the answer is simple and the pain is short-lived. For others, the pain continues well beyond the acute stage and becomes long-term or chronic. The patient, who remains convinced that his trouble must be "right where it hurts", initially finds much sympathy for his suffering from family, friends, and even physicians. In addition to numerous attempts to treat the pain, the patient may undergo various diagnostic procedures and even submit to one or more surgical interventions despite the absence of a mechanical lesion. Ultimately, after various re-examinations and referrals, as it becomes evident that the pain has no neurological pattern and no specific disorder can be made accountable for the pain, the patient will find decreasing sympathy and tolerance from family, friends, and the medical profession. The patient may then be referred to a pain clinic where additional therapeutic procedures are attempted to include nerve blocks, transcutaneous electrical stimulation, acupuncture, hypnosis, relaxation techniques, group therapy, behavior modification, and various pharmacological interventions for pain, sleep, and anxiety (Blumer & Heilbronn, 1982).

The complex nature of chronic pain is not clearly understood. For the patient experiencing chronic pain, the pain presents itself as a major disruption to his or her lifestyle. Often the chronic pain patient becomes restless, irritable, and withdrawn from family and friends (Tollison, 1987). Neurovegetative signs

of depression may appear such as insomnia, weight change, altered concentration, altered level of energy and decreased sexual interest. The chronic pain patient will often report feelings of hopelessness, helplessness, and periods of depression. Treating these patients effectively is one of the most challenging tasks facing primary care physicians today. Frequently patients are told by their physician, "there is nothing more I can do". It is generally at this point they are referred for treatment either for psychological assessment or to a chronic pain clinic.

The question remains, why do some chronic pain patients tend to do better than others in a multidisciplinary pain clinic? The answer may lie in the examination of those patients being referred to multidisciplinary pain clinics for treatment. Examining the quality of pain reported by patients as well as the level and quality of depression reported and the use of antidepressant medication may provide useful information for predicting successful treatment outcome. Examining demographic variables may provide insights as well into the type of patient referred. In addition, by comparing the outcome of treatment among these patients, a profile of the type of chronic pain patient that tends to make better progress emerges. This profile can provide beneficial information not only for those professionals making the referrals, but for those professionals in multidisciplinary pain clinics conducting assessments and developing treatment plans. For many patients that are not referred for treatment, the

mission for a "cure" continues and dependence on the health care system increases raising the cost of health care even higher.

The relationship between chronic pain and depression is well supported in the literature, however, few studies have thoroughly measured the effectiveness of treating the chronic pain patient with antidepressants as it relates to improvements in multidisciplinary treatment outcome. This proposed study will focus on various measures of treatment outcome to include physical capabilities, reported pain levels, muscle relaxation skills and reported depression, and compare these outcomes to the absence or presence of antidepressant medications as a group as well as the quality of pain reported and the level and quality of depression reported.

Purpose Of Study

This study is an ex post facto analysis. The primary purpose of this study is to analyze various objective measures of treatment outcome among patients that participated in a multidisciplinary chronic pain treatment program and to compare these measures to the absence or presence of antidepressant medication, the level of depression, and the quality of pain and depression reported. The secondary purpose of this study was to determine whether there are certain patient characteristics that are related to treatment outcome measures and to utilize this information for profiling those patients who are

appropriate referrals to a multidisciplinary pain clinic and for predicting successful outcome.

Research Questions

1. Are there significant differences in multidisciplinary treatment outcome measures among those chronic pain patients who are taking antidepressant medication and those who are not? Treatment outcome measures will include reported pain level data, physical capabilities data, muscle relaxation data, and reported depression.

2. Is there a significant difference among those patients with moderate to severe levels of reported depression and those with mild to moderate levels of reported depression with respect to treatment outcome measurements?

3. Is there a significant difference between those chronic pain patients with greater somatic-performance symptoms of depression and those patients with more cognitive-affective symptoms of depression on treatment outcome measures?

4. Is there a significant difference between those chronic pain patients utilizing more sensory descriptions of pain and those patients utilizing more affective-evaluative descriptions of pain on treatment outcome measures?

5. Are there significant differences between pre and post test scores on treatment outcome measures among subgroups of subjects regarding

depression level, depressive symptomatology, antidepressant use, and quality of pain reported?

6. Are there demographic and background variables that are significantly related to multidisciplinary chronic pain treatment outcome measures? Demographic variables will include: gender, age, marital status, diagnosis, pain site, worker compensation status, litigation status, employment, and number of treatment days. The purpose is to identify those patient characteristics that are associated with improved treatment outcome.

Limitations of the Study

The results of this study are generalizable only to the population of chronic pain patients who are treated in similar multidisciplinary chronic pain treatment programs with similar program components. The results are not generalizable to all chronic pain patients or to patients participating in other multidisciplinary treatment programs that use different methodologies of treatment and have different program components.

This study is an ex post facto analysis of medical records belonging to those patients who participated in a multidisciplinary treatment program, therefore it is a non-experimental design and should be viewed as such. In non-experimental research, there are significant threats to validity stemming from uncontrolled confounding variables (Pedhazur & Schmelkin, 1991). The

random assignment of subjects is the key for assuring internal validity in research. In ex post facto research, there is no random assignment of research subjects and the non-experimental design of this study makes it impossible to identify and control for the numerous complex variables that may affect the overall results. In this study, the use of analysis of covariance will be used to minimize the threats to internal validity. Analysis of covariance is a blending of regression and analysis of variance, which permits statistical rather than experimental control of variables (Hinkle, 1979). The analysis of covariance consists of determining that a proportion of the variance of the independent variable existed prior to treatment, and that this proportion is eliminated from the final analysis, thus reducing the error variance. The design of this study is also weaker in establishing cause and effect relationships due to the lack of random assignment, therefore, caution should be taken when interpreting these results and applying them to medical or clinical treatment.

Definitions of Terms

Non-depressed patients - patients scoring a 9 or below on the Beck Depression Inventory.

Mild to moderately depressed patients - patients with a score of 10 - 18 on the Beck Depression Inventory.

Moderate to severely depressed patients - patients scoring a 19 or above on the Beck Depression Inventory.

Antidepressant medication - prescription medications that are indicated as antidepressants according to the Physicians Desk Reference (Drug Information Services Group, 1995).

Chronic pain patients - patients admitted to and treated at the Lewis-Gale Hospital Pain Center during the period from January 1990 through December 1994.

Physical capabilities data - objective score calculated from a video-task analysis procedure performed by the physical therapist and occupational therapist of the Lewis-Gale Hospital Pain Center.

Baseline tension levels - an average score of two minute baseline surface electromyography (sEMG) biofeedback scores.

Reported pain level - objective scores obtained from the McGill Pain Questionnaire.

Summary

Health care professionals are increasingly faced with the challenge of diagnosing and treating chronic pain patients who present with complex, sometimes conflicting, symptoms and who appear not to respond to traditional methods of treatment. There are conflicting views among researchers as to the

role depression plays in the progression of chronic pain. Some view the depression as preceding the pain, others view it as secondary to the pain, and still others view depression and pain as one single phenomenon. Regardless, there is a consensus as to the prevalence of depression among this population.

This study was designed to utilize information on a sample of patients diagnosed with chronic pain who were taking antidepressant medication and compare them to those patients who were not taking antidepressant medication to determine if there were significant differences in treatment outcome. In addition, this study also examined the differences in treatment outcome among those who reported mild to moderate levels of depression and those who reported moderate to severe levels of depression, those who reported more cognitive-affective symptoms of depression and those who reported more somatic-performance symptoms of depression, and those who described the quality of their pain utilizing more sensory descriptors and those who described the quality of their pain utilizing more affective-evaluative descriptors. Due to the increased need for effective treatment alternatives for this population, an attempt was made to develop a profile of those patients who progress and benefit most from a multidisciplinary approach to treatment. This profile is intended for the use of making appropriate referrals to multidisciplinary treatment and for predicting improved treatment outcome.

CHAPTER II

REVIEW OF LITERATURE

In this chapter, various theoretical models of chronic pain are considered. The role of depression and the use of antidepressant medication in chronic pain is considered as well. Current literature related to the research variables and literature related to instrumentation is reviewed.

Historical Perspective of Pain

Throughout history, explanations of chronic pain have been given within the framework of various mystical, spiritual, and religious structures. Within the religious framework, pain was often thought of as punishment from God for having committed sin. The word pain is derived from the Latin word "peona", meaning punishment (France & Krishnan, 1988). Various conceptualizations of pain have developed throughout history and date back as far as Aristotle who believed pain to be a negative emotion opposite from pleasure. He also believed that the heart was the center of sensation and that pain was the result of an increase in sensitivity to touch, which was carried by the blood to the heart

(France & Krishnan, 1988). This conceptualization of pain was generally accepted by Western society until Descartes. Descartes' theory stated that the center of sensation was the brain and that pain was transmitted from the skin to the brain by small threads that connected the two (France & Krishnan, 1988). Later, this theory was expanded when specific pain receptors and pain pathways running to and from the brain were identified.

In 1986 the International Association for the Study of Pain published a revised taxonomy of pain terms and proposed the following definition of pain: "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." Haddox (1995) states that there are four salient features of this definition that have clinical utility. First, pain is unpleasant and generally feared and avoided. Second, there is a sensory dimension to pain that involves language rich with descriptions of the qualities and severities of pain. Third, it has an emotional dimension that distinguishes it from all other sensations. And fourth, pain is an experience that is both private and personal. Melzack (1973) states that pain is not a single quantitative experience that can be classified by a specified

intensity or kind of stimulation. Pain, therefore, is a "category of experience" (Melzack, 1973).

The Chronic Pain Patient

As researchers became more and more knowledgeable regarding the mechanisms of pain, a greater interest in the psychological aspects of pain grew. Strong (1988), states that there are two primary components of pain: the original sensation, and an accompanying psychological reaction to and processing of the sensation. He further states that while the receptor mechanism and pathway systems seem to be relatively similar and constant for all individuals, reaction to pain is influenced by past experience, social setting, and psychological factors, all of which account for the wide variability seen in responses to pain.

In Engel's (1959) classical view on pain, he discusses the theoretical and clinical problem of pain. He states that the capacity to experience pain may originally develop from peripherally induced experiences, but that pain invariably becomes a psychological phenomenon no longer requiring a

peripheral stimulation to be provoked in the pain-prone individual. Engel further characterizes pain-prone individuals as showing the following principle features: (a) a prominence of guilt, (b) a history of suffering, defeat, and intolerance of success (masochism), (c) a strong aggressive drive which is not fulfilled, and (d) development of pain upon a loss or a threatened loss. Engel states that the experience of pain serves to attenuate the guilt and shame of the depression and that, indeed, the pain may clearly protect the patient from more intense depression and even suicide.

Black's (1975) characterization of the chronic pain patient is one who has intractable, often multiple pain complaints (for at least 6 months) which is usually incongruent with existing somatogenic problems. Black further notes that patients with this chronic pain syndrome often reveal a history of multiple physician contacts and many nonproductive diagnostic procedures, an excessive preoccupation with the pain problem, an altered behavior pattern with some of the features of depression, anxiety, and neuroticism, and no realistic plans for the distant future.

Pilowsky and Spence (1976), in their analysis of questionnaire findings, give a description of how chronic pain patients present themselves: (a) they

have a hypochondriacal preoccupation, (b) they reject any suggestion that their pain is a result of psychological factors, (c) they frequently describe themselves as being sad or anxious as a result of their pain, (d) they admit that they have difficulty in expressing their feelings, especially those of anger, to other people, (e) and they show definite reluctance to acknowledge any life problems, although some showed evidence of irritability and interpersonal friction.

Blumer and Heilbronn (1982) view chronic pain as a specific psychobiological disorder they identify as a pain-prone disorder. Their theory is based on the evaluation of 900 patients with chronic pain of obscure origin. Following their evaluations, they identified several psychodynamic issues to be characteristic of the pain-prone patient. The patients tend to show all the characteristics of "alexithymia" which is the inability to recognize and verbalize one's feelings. Little emotionality is displayed, unless depressive affect is more openly manifesting itself. Tragic life events are cited in a merely factual manner while all concern focuses on the body parts in pain. Underneath a detached attitude, there is a different set of core issues. Strong needs to be accepted and to depend on others, as well as marked needs to receive affection and to be

cared for, are present. These basic infantile needs had never been acknowledged by the patients. Passive-submissive trends to the extreme of masochism and eagerness to be accepted by others are evident in the extreme nurturing behaviors that are for the sake of the family. Anything socially unacceptable is guilt-provoking and is anxiously concealed and controlled. Hostile-aggressive trends are also denied, other than the needs to depend, to remain passive, and to receive affection. By relentless activity and work performance, the inner security and guilt may be soothed and a certain acceptance gained, but the dilemma sooner or later becomes too painful. After a significant loss or disappointment, regardless of whether there was an injury or not, a shift occurs which has a significant impact on the individual. It transforms the "solid citizen" into an invalid and heightens the same painful dilemma. The needs to depend, to be passive, and to be catered to, which have now asserted themselves, are still unacceptable and the urge to be viewed as a strong and independent individual persists. This explains the enormous need to maintain a physical problem as the culprit, but with the failure of the solid citizen the suffering becomes more manifest (Blumer & Heilbronn, 1982). These researchers go on to say that the lack of a secure inner core, the need to

be accepted by a dominant other, and the conflict of guilt and concealed rage and aggression are characteristic of depressive disorders.

Blumer and Heilbronn (1982) imply that this pain-prone disorder is a unique clinical disorder and is applicable to pain without a discernible physical process as well as to suffering that is out of proportion with a physical disease.

Rosebaum (1982) identifies one problem with a unified concept of pain-prone disorder. He states that the whole may be less than the sum of its parts; that is, the critical task for an evaluating psychiatrist is to identify the components of the patient's condition which are nonorganic and suggest intervention. Rosebaum goes on to say that viewing the pain-prone disorder as a specific biological entity may distract from the necessity to determine the specific components of an individual's pain syndrome such as; unresolved grief with pain beginning after the loss of a parent or spouse with whom the patient had an ambivalent relationship, with a residue of guilt and rage; compensation/litigation with pain reinforced by the expectation of financial reward or as relief from the pressure to work; narcotic addiction with pain as a withdrawal symptom reinforcing further narcotic intake; family dynamics with pain as insurance of attachment, access to special care, or expression of

unacknowledged anger; clinical depressive syndrome coexistent with pain or, in some cases, the cause; Briquets' syndrome or somatization disorder where pain is one symptom among many in a lifelong history of illness behavior; psychogenic pain in patients whose pain is grossly atypical, multifocal, and changeable and whose lives are full of turmoil, were worse before the pain, and are usually borderline personality; and conversion phenomena in the sense of unconscious conflicts expressed or resolved through the symptom of pain.

Theories on the Relation Between Chronic Pain and Depression

Prevalence of Depression in Chronic Pain Syndromes

Prevalence rates of depression in patients with chronic pain have been reported to be three or four times higher than in the general population (Sullivan, Reesor, Mikail, & Fisher, 1992). About 25 percent of patients who exhibit pain associated with chronic physical illness also experience at least moderate depression (Walsh, 1983) and conversely, many patients with

depression complain of pain (Blumer & Heilbronn, 1982; Matthew, Weinman & Mirabi, 1982; von Knorring, Perris, & Eiseman, 1983; Ward, Bloom, & Friedel, 1979). In one of the largest studies, Fishbain, Goldberg, Meagher, Steele, and Rosomoff (1986) examined the prevalence of psychiatric diagnoses in a sample of 283 consecutive chronic (primarily chronic low back) pain referrals to a pain clinic. Fifty-six percent of the entire sample showed evidence of clinically significant depressive symptomatology at the time of interview.

In their review of the literature on the prevalence of chronic pain and depression, Romano and Turner (1985) reported that the incidence of depression in chronic pain populations ranged from 31% to 100% when assessed by clinical diagnosis, and 10% to 100% when self-report measures were used as the criteria.

Using Research Diagnostic Criteria (RDC), Lindsey and Wyckoff (1981) reported that 87% of their chronic pain sample suffered from depression. Krishnan, France, Pelton, McCann, and Davidson (1985) found 79% of chronic pain patients to have either major depression, minor depression, or intermittent depression.

Similarities Between Depression and Chronic Pain

In every language, the word pain, as an opposite to pleasure, denotes both physical and mental hurt or torment. A close link between the state of depression and the experience of bodily pain has been described again and again (Blumer & Heilbronn, 1982). Chronic pain is associated with somatic symptoms similar to those included in the diagnostic criteria for depression. As Turk, Rudy, and Stieg (1987) point out, many of the somatic or vegetative symptoms commonly used to make a diagnosis of depression may also result from a medical illness. These authors make the following comparisons between symptoms commonly seen in the chronic pain patient and the criteria for depression as they are listed in the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III): reduction in activity levels and sedentary life-style are likely to have an affect on weight (criteria 1); the majority of people with chronic pain are taking medication that may lead to sleep abnormalities (criteria 2) and sometimes, following periods of heavy use, psychomotor agitation (criteria 3); many pain patients report restriction of their

physical activities and frequent napping during the day, which may further cause disrupted sleep patterns; loss of interest in pleasurable activities and sexual behavior may be attributable to physical incapacity as well as psychological distress (criteria 4); general deconditioning as a function of incapacity and reduced exercise with subsequent increased feelings of fatigue (criteria 5) are common features of chronic pain patients especially those with low back pain; feelings of self-reproach and guilt are quite common in pain patients (criteria 6) which are understandable in people who may no longer be able to work or fulfill other expected responsibilities and roles; and finally, diminished ability to think or concentrate (criteria 7) may be influenced by some of the analgesic medication prescribed for people with chronic pain syndromes.

In summary, seven of the eight DSM-III criteria for the diagnosis of a major depressive episode are likely to be reported by people with chronic pain, as well as for many other chronic diseases (Turk et al., 1987). Thus, the specific emphasis on neurovegetative signs in the DSM-III classification may be one reason why a high prevalence of depression is reported for chronic pain patients.

Overlap in symptomatology may contribute to the underdiagnosis of depression if overlapping symptoms are systematically attributed to chronic pain (Atkinson, Slater, Patterson, Grant, & Garfin, 1991). These authors state that if clinicians discount symptoms of fatigue and sleep disturbance in their assessment of depressed chronic pain patients, and attribute these symptoms to chronic pain rather than depression, it is possible that major depression may be underdiagnosed.

Underdiagnosis of depression carries the risk of excessive physical intervention and neglect of psychological problems (Williams & Richardson, 1993). Overdiagnosis, by contrast, can lead to inadequate evaluation and treatment of physical problems, overzealous psychiatric intervention and demoralization of patients (Williams & Richardson, 1993).

Among most authors knowledgeable of chronic pain patients, there is a surprising agreement that these patients are depressed (Black, 1975; Fordyce, 1978, Hendler & Fenton, 1979; and Sternbach, 1978). The patients report sleep disturbance changes, decreased libido, irritability, withdrawal of interests, weakening of relationships, weight changes, social withdrawal, and lethargy - all common vegetative signs of depression. While these patients generally

attribute such illness to pain rather than depression, research suggests that as many as 87% of chronic pain patients also suffer depression (Hendler, 1982).

Distinctions Between Depression and Chronic Pain

Depression and chronic pain have been theoretically linked in the literature in two ways: some authors believe that depression is an understandable consequence of having a long-standing debilitating physical disorder (Sternbach, 1974; Atkinson et al., 1991), others have postulated that chronic pain is a depressive disorder itself or a variant of a depressive spectrum disorder (Blumer & Heilbronn, 1982).

In a study conducted by Atkinson et al. (1991), they investigated the occurrence of a diagnosable DSM-III psychiatric syndrome at any point in the life of 100 consecutive male patients attending a general orthopedic clinic at a VA Medical Center who met inclusion criteria for chronic low back pain. They found that 66% of cases of major depression commenced within two years after chronic pain onset. They explored the question of whether pain affects the "natural history" of vulnerability to onset of major depression. Onset of

depression before pain was 41.9% versus 87.5% and onset after pain initiation was 58.1% versus 12.5% for patients versus controls respectively. These researchers conclude that chronic pain appears to alter the natural history of depression onset by increasing the likelihood of onset later in life. In summary, men with chronic low back pain were not at risk premorbidly for depressive syndromes, but had nearly a nine-fold increase in rate of depression after back pain.

According to one model (Romano & Turner, 1985; Roy, Thomas, & Matas, 1984), chronic pain can seriously impair the quality of life of the sufferer, making everyday activities more difficult or unpleasant, and commonly leading to withdrawal from potentially rewarding areas of function such as work, social and leisure pursuits. These adverse consequences may contribute to depressed mood and depressive disorders according to Atkinson et al. (1991) and Brown (1990) which inturn can complicate treatment of pain (Keefe et al., 1986; Dworkin, Richlin, Handlin, & Brand, 1986; Haythornthwaite, Sieber, & Kerns, 1991).

An alternative model suggests that the complaint of pain, in the absence of adequate physical findings or satisfactory diagnosis, may be attributed to

unacknowledged depression (Engel, 1959; Blumer, Heilbronn, & Rosenbaum, 1985). Since patients with chronic pain often report both symptoms of depression as reported by Eberhard (1989) and signs of depression as reported by Feinmann (1985), it has been suggested by Eberhard that chronic pain should be regarded as a form of depression, either masked depression or atypical depression, even when symptoms of depressed mood are not overt.

The depressive symptomatology of the chronic pain patient tends to be viewed by some as the consequence of a physical suffering from which there appears to be no relief. However, Blumer and Heilbronn (1982) report that careful questioning of the patient usually reveals that depressive symptoms came before the pain. These authors state that if we assume that chronic pain is not maintained by any peripheral lesion but by central pain-generating mechanisms, a more conservative view emerges, the view that both the bodily agony and the depressive symptoms are part of a basic mood disorder in pain-prone individuals. They further state that chronic pain is thus viewed as neither primary nor secondary to depression, but a synchronous expression of the mood.

Blumer and Heilbronn (1982) examined the research evidence for considering chronic pain as a specific variant of mood disorder with characteristic clinical and psychological traits. In their study, they demonstrate that chronic pain patients are not merely basically depressed but present with a characteristic clinical syndrome; they tend to complain of continuous pain and are preoccupied with the affected body parts; their inactivity (anergia), inability to enjoy life (anhedonia), insomnia, and despair, while all attributed to pain, represent major signs of depression; they display a marked denial of conflicts ("everything would be fine if it was not for the pain!") together with a rigid need to view themselves and their family relationships in idealized terms (the "solid citizen"); they typically have a premorbid history of hard work and relentless activity (ergomania); their pain may begin at the time when they meet apparent success (masochism); they frequently disclose a family history of depression and alcoholism; they are not in touch with feelings and emotions (alexithymia); and their core needs to be dependent, cared for, and passive (to the extreme of masochism) had never been recognized. Blumer and Heilbronn go on to say that as these needs assert themselves, there is a painful conflict with the rigid image of the ideal self, generating guilt, depression, and a profound need to

implicate a physical problem for the failure. Their syndrome is termed by the authors as the pain-prone disorder. When compared with a control group of patients whose pain can be related to a well-defined somatic disease, such as rheumatoid arthritis, it proves to be a distinct entity with characteristic clinical, psychological, biographical, and genetic traits. They firmly believe that this syndrome meets rigorous criteria for identification as a new psychobiological disorder. The characteristics of anergia, anhedonia, and sleep disorder are highly characteristic traits of depressive disorders, but almost invariably are attributed by the patient to the pain. This is the prime reason, as stated by Blumer and Heilbronn, why the depression remains masked. They contend that the suffering is experienced more bodily than mentally, and that while depressive mood is strongly denied by about one third of the patients, they admit to being in despair, but over the pain rather than a true, underlying depression.

The available data on the aspects of the pain experience which differentiate depressed and non-depressed pain patients is mixed (Haythornthwaite et al., 1991). Some progress has been made in identifying aspects of the pain experience that differentiate depressed and non-depressed

chronic pain patients, however, many inconsistencies remain when results are compared. Demographic variables, such as sex and level of education, and medical history variables, such as duration of pain, type of pain and number of operations, generally have not been found to differentiate these two groups (Haythornthwaite et al., 1991).

Some studies, however, have demonstrated reliable differences between depressed and non-depressed chronic pain patients on a variety of pain-related variables that broadly reflect the experience of pain (Turk et al., 1987). The depressed pain patients reported greater pain intensity, greater interference due to pain, and more pain behaviors. However, depressed pain patients were similar to non-depressed patients in the type of chronic pain experience, their use of medications and their disability due to pain.

The close relationship between chronic pain and depression suggests that some common mechanism may underlie the two phenomena (Sternbach, 1978). Relief from depression is frequently concomitant with relief from pain (Sternbach, 1968; Ward et al., 1979). However, it remains unclear whether the extent to which emotional states may "cause" or promote pain, are a consequence of pain, or are simply correlates of pain.

Antidepressant Effects on Chronic Pain

There seems to be evidence that antidepressant medications are beneficial in the treatment of chronic pain. Onghena and Van Houdenhove (1992) conducted a meta-analysis and found that in the collection of studies examined, the average chronic pain patient receiving an antidepressant is better off than 74% of the chronic pain patients receiving a placebo. In his study on the use of antidepressants in the treatment of chronic pain, Magni (1991) found that the great majority (80%) of the 40 studies reviewed show antidepressants to be superior to placebo in the treatment of chronic pain, in particular in improving pain complaints and symptoms.

Important guidelines for the treatment of chronic pain are generally agreed upon by those with experience in the field (Black, 1975; Sternbach, 1968; and Fordyce, 1978). They stress avoidance of analgesics, de-emphasis of the pain complaints, and gradual increase of activities. Sound behavior management of the chronic pain patient is based on the recognition that treatment must not be aimed at the peripheral source of the pain. Blumer and Heilbronn (1982) emphasize the value of systematic treatment of chronic pain

with antidepressant drugs. They state that traditional psychotherapy requires the verbalization of feelings and is, in general, not useful for this group of alexithymic patients. They further state analgesics and antianxiety agents are contraindicated, provide no sustained relief, are habituating, and tend to exacerbate the depression and the pain. They contend that the antidepressants, on the other hand, are not habituating and that they should be administered as in major depressions, patiently and systematically, promptly increased as tolerated to sufficient doses with substitution of the type of antidepressant as needed, and under careful monitoring of side effects.

The effectiveness of antidepressant medications in patients with chronic pain and depression is not surprising, but research has shown that selected antidepressants may also have therapeutic effects in nondepressed patients with chronic pain (Tollison & Kriegel, 1988). Eberhard et al. (1989) conducted a study to determine if only patients with coexisting pain and depression responded to treatment with antidepressant or if all patients with chronic pain syndromes responded regardless of the presence of depressive symptomatology. The results indicated that patients with chronic pain

syndromes respond to treatment with antidepressants, regardless of the presence or absence of a coexisting depressive syndrome.

In a large study performed by Blumer, Heilbronn, Pedraza, and Pope (1980), consecutive patients from a pain center were included regardless if there was a coexisting depressive syndrome or not. If adequate doses of antidepressants were given and if a strict dose regimen was followed, about two thirds of the patients improved.

The treatment of depression among chronic pain sufferers would be expected to be a major component of the therapeutic management of these patients, however, this does not appear to be the case according to several studies on this topic. There are indications that most depressed chronic pain patients do not receive treatment for depression. In one study of chronic pain patients in 1991, researchers found that patients with documented depression were no more likely to be taking antidepressant medication than were non-depressed patients (Haythornthwaite et al., 1991). Doan and Wadden (1989) reported that depressed chronic pain patients were more likely to be prescribed narcotics than antidepressants. Similarly, Haley, Turner, and Romano (1985),

reported that depressed and non-depressed chronic pain patients did not differ in the sedative and antidepressant medication they were prescribed.

Some studies have found a direct correlation between improvement in depression and improvement in pain symptoms. However, other studies have shown an improvement in pain without an effect on depression, and antidepressants have been shown to be effective even in patients with pain due to organic lesions and without a clinically evident depressive disorder (Magni, 1991). On the basis of the available data, some researchers have argued that certain antidepressant medications seem to have an analgesic action of their own which is not mediated by an antidepressant effect (Magni, 1991). Sindrup (1993) concludes from his own research that the early suggestions of the effects of various antidepressant drugs through their antidepressant effect when they are used in pain treatment can now be rejected for several reasons; first, drugs relieve pain in patients with both depressed and normal mood and second, the effect is achieved faster and at lower plasma drug concentrations than the antidepressant effect.

Multidisciplinary Treatment

Multidisciplinary rehabilitation treatment programs are currently considered to be the treatment of choice for most chronic pain patients according to J. J. Bonica (1980). These programs typically include a variety of treatment disciplines including anesthesiology, neurology/neurosurgery, physiatry, rehabilitation nursing, physical therapy, psychiatry, psychology, and vocational rehabilitation. Descriptions of multidisciplinary rehabilitation programs frequently make reference to the need to address psychosocial factors in the management of chronic pain. Several rehabilitation programs include psychological interventions as an integral component of rehabilitation (Bonica, 1980). The focus of psychological interventions for chronic pain is generally on one or more of the following areas: (1) coping with pain through the use of cognitive-behavioral strategies, (2) psychophysical techniques such as relaxation or biofeedback aimed at reducing tension or anxiety, or (3) reducing pain behavior by modifying reinforcement contingencies in the patients' environment (Fordyce, 1976; Turk, Meichenbaum, & Genest, 1983; Benjamin, 1989).

In 1989, Benjamin (1989) reviewed multidisciplinary pain clinic "packages" and identified nine common psychological components:

1. The identification of specific behavioral goals, such as return to previous or new domestic employment and recreational activities.

2. A signed contract specifying treatment offered and accepted, and mutual commitments.

3. Operant-based activity programs to increase appropriate behaviors and reduce inappropriate pain behaviors (such as verbal complaints, inactivity and inappropriate use of physical treatments).

4. Exercise as a common feature.

5. Liaisons with other involved agencies - medical, social and others - to establish a consistent approach.

6. Marital and/or family therapy to ensure consistency in reinforcement schedules and to resolve associated problems in relationships.

7. Cognitive-behavioral strategies to identify and replace inappropriate thoughts about pain.

8. Relaxation training, sometimes with biofeedback and/or hypnosis to provide a sense of self-control and mastery over pain.

9. Problem-solving, communication skills, assertiveness training, and social skills training.

There are few discussions in the literature specifically addressing the management of depressive symptomatology in depressed chronic pain patients participating in multidisciplinary pain programs. Depressed chronic pain

patients appear to be treated in the same manner as non-depressed patients (Atkinson et al., 1991). However, one study reported on 25 patients with major depressive episodes at the start of a three-week pain program (Kramlinger, Swanson, & Maruto, 1983; Maruto, Vatterott, McHardy, 1989). At the completion of the program, 22 patients (88%) did not have major depression. The intervention in this study was a comprehensive pain program that did not use antidepressants. The same group of researchers more recently reported that in another sample of 100 patients referred to the same program, 54 were depressed by Research Diagnostic Criteria (RDC) at the time of admission. At the end of the program, 98% of those who were depressed were no longer depressed. Again, the treatment was without antidepressant medication. These researchers concluded that appropriate pain management serves as an antidepressant.

Some authors agree that the therapeutic milieu of the multidisciplinary pain center is designed to counteract depression by reinforcing activity, self-responsibility, and self-control (Fordyce, 1976).

Outcome Studies on Chronic Pain Treatment

In the last 15 to 20 years there have been several outcome studies based on the packages referred to by Benjamin (1989) using different treatment methods and assessment techniques, but with rather similar results. One study from the Mayo clinic (Maruto, Swanson, McHardy, 1987), based on a two-and-a-half year follow up of 249 patients, described the overall outcome as "completely successful" for one third and "partly successful" for another third. Another study, based on a 30 month follow up of 70 patients, noted significant and persistent improvements overall for ratings of pain, return to work, and reduction in the use of medication, hospitalization and surgery (Ross, 1987).

In his study and review of several outcome studies, Benjamin (1989) highlighted some important limitations to these studies which included a lack of specified selection criteria, data concerning subjects refusing or dropping out of treatment, comparable no-treatment control groups, standardized assessments, assessments that are of known reliability and validity, the same assessment at each stage (for example at pre- and post-treatment and follow-up), adequate

follow-up period, specified nature of treatment, and assessment of compliance with treatment to name a few.

The role of depression in treatment outcome has been investigated by many researchers. Several studies have identified depression as an important predictor of outcome related to pain reports, pain behavior, medication intake, and the degree to which the pain patient's activities are impaired (Dolce, Crocker, & Doleys, 1986; Haley et al., 1985; Keefe et al., 1986). Other studies have found that improvement in depression ratings are a frequent outcome of cognitive and behavioral approaches to pain management (Turk et al., 1983; Phillips, 1988, Maruta, Vatterot, & McHardy, 1989). Painter, Seres, and Newman (1980) found in their study that depression has definite adverse effects on the outcome of treatment among chronic pain patients in rehabilitation. Similarly, Keefe et al. (1986) and Dworkin et al. (1986) found through their research that depression had a substantial effect on both clinical presentation and treatment response. Likewise, Doan and Wadden (1989) concluded from their study that depression may very well be a predictor of poor treatment outcome. These findings support the hypothesis that depression may be the

more important predictor of the degree to which pain patient's activities are impaired and the amount of gain they receive from multidisciplinary treatment

Instrumentation

Beck Depression Inventory

It has been suggested that the frequent failure to treat depression among chronic pain patients may be the result of failure to detect depression (Dworkin & Gitlin, 1991). For example, patients may focus primarily on physical complaints during medical evaluation and turn attention away from emotional concerns. It has been noted that interventions typically target pain management and are aimed at developing coping strategies and reducing tension, anxiety, and pain behaviors (Sullivan et al., 1992). Routine screening and assessment of depressive symptoms in chronic pain patients may alert the health care professional to the need to treat depression in this population (Bishop, Edgley, Ficher, & Sullivan, 1993). Bishop and his colleagues suggest that routine screening facilitates the early identification and treatment of depression which leads to early intervention. They further state that with early intervention, the

negative impact of depression on the chronic pain experience is decreased and the risk of developing high levels of depression-related disability behavior is reduced.

Depression and depressive symptomatology is not all or none, but rather a matter of degree. There is a spectrum of depression severity ranging from dysphoric mood that is relatively transient and influenced by stressful life events, to a major, clinically significant depressive disorder that involves mood, vegetative signs (e.g., altered appetite, sleep, weight), psychomotor symptoms (e.g., agitation or retardation), psychological symptoms (e.g., social withdrawal, indecisiveness), and cognitive symptoms (e.g., lowered self-esteem, hopelessness, and suicidal ideation) (Turk, Rudy, & Stieg, 1987). When the prevalence of depression among chronic pain patients is reported, Turk et al. (1987) state that it is important to consider how the investigator is using this term, what cutoff points along the continuum are being used as the criteria for establishing the diagnosis of depression, and what the sensitivity and specificity of the criteria are. These authors believe that in the area of chronic pain, it is highly possible that there is an unacceptably high rate of false positives with

regards to the diagnosis of depression due to the complexity of somatic symptoms.

Bishop et al. (1993) researched the utility of self-report measures of depression for chronic low back pain by examining the sensitivity and specificity values of various cut-off scores in this population. Sensitivity refers to the probability that a patient with a diagnosis of major depression will score in the depressed range on a measure of depression, and specificity refers to the probability that a patient who does not have a diagnosis of major depression will score in the non-depressed range on a measure of depression. They found that the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) is well suited for use as a screening device for major depression in patients with chronic low back pain.

The Beck Depression Inventory (BDI) is one of the most widely used clinical self-report tests of depression. The BDI was originally developed by Aaron Beck and his associates in 1961 and was used as a structured interview. It was specifically designed to measure the severity of depression in adolescents and adults already diagnosed with depression. It was later used as a short questionnaire and was revised in 1971. In 1987, Beck, Steere, and

Garbin (1988) developed a manual for instruction on its use. According to Sundberg (1992), the important use of this instrument is to examine information pertaining to the person's experience of pain.

The Beck Depression Inventory has been used to measure mood in many studies of chronic pain patients and other physical illnesses (Beck et al., 1988). It is a self-rated questionnaire consisting of 21 items, for each of which the patient endorses one of a series of statements, rank-ordered by severity of content. Each item is scored from zero for endorsement of a neutral statement (e.g., "I do not feel sad") to 3 for the most severe (e.g., "I am so sad I can't stand it"). The items of the BDI were originally drawn from clinical interviews with depressed patients in treatment, standardized on psychiatric samples, and validated against psychiatrists' ratings resulting in a measure of severity of depression (Williams & Richardson, 1993). This questionnaire has undergone extensive reliability and validation study, and internal consistency assessments of reliability have been high (above 0.9) in most instances (Conoley, 1992).

Beck et al. (1988) suggest in their manual that the BDI has the ability to identify cognitive, affective, vegetative, as well as somatic symptoms, however, these items are not identified as subscales. They refer to only two subscales in

the manual: the cognitive-affective subscale and the somatic-performance subscale.

Turk et al. (1987) tested the hypothesis of whether or not the use of the recommended cut-off scores for the BDI are appropriate when evaluating patients with chronic illness. They removed 6 of the 21 questions from the BDI that had a somatically oriented focus (work disability, sleep disturbance, fatigue, appetite problems, health concerns, and change in sexual patterns) and recomputed BDI scale scores for 150 pain patients. The results indicated that nearly one third of patients who scored in the depression range when the full scale was used did not score in the depression range when somatically oriented items, those items that could as likely result from chronic pain as they could depression, were removed.

Williams and Richardson (1993) found that 71.7% of chronic pain patients scored at or above the threshold of 13 which is recommended by Turner and Romano (1984) for identifying depression in chronic pain patients. From their study, they found that patients suffering from persistent pain have a marked tendency to report problems in areas of work, sleep, fatigue, health concerns, irritability, and dissatisfaction with daily life. However, they found that

the overall endorsement of items having a cognitive or affective depressive content was considerably lower than those items endorsed having a somatic content. This study lends weight to the theory that the total BDI score may create an exaggerated impression of the cognitive and affective disturbance in patients with significant physical or medical problems due to the high number of somatic items endorsed. Williams and Richardson (1993) suggest that when pain patients are being assessed, somatic items should be scored separately and their contribution to the total score appreciated.

Geisser, Gaskin, Robinson, and Greene (1993) conducted a path analysis on the relationship of depression and somatic focus in chronic pain patients using the Beck Depression Inventory and the McGill Pain Questionnaire. Their study revealed that depression was directly related to the affective and evaluative aspects of patient's clinical pain while the relationship between depression and the sensory pain experience was mediated by somatic focus.

After reviewing the use of self-report instruments that assess depression, such as the Beck Depression Inventory, Kendall, Hollon, Beck, Hammon, and Ingram (1987) reported their concern over the tendency to rely upon self-report

measures when studying depression. They cautioned that careful diagnostic procedures are necessary in order to identify depression that is not confounded by other psychopathology and emphasized the need to employ multiple methods for assessment. At issue is the extent to which high scores on the BDI indicate clinical depression and not the depressed mood of another psychopathological state. As Kendall and his associates indicate, structured interviews and diagnostic criteria have the benefit of identifying chronic pain patients whose complaints of depression are clinically significant and not of a transient nature and allowing comparison of findings across studies.

In summary, the Beck Depression Inventory has been highly investigated and is supported for its reliability and validity, however, it becomes evident through these research studies that it is not a valuable tool for diagnostic purposes, but instead is useful as a measure of depression severity.

McGill Pain Questionnaire

Pain is generally thought to be a sensory experience, yet it also has a very unpleasant, affective quality as well. Pain can be overwhelming, disruptive

to thought, attention, and behavior, and it can motivate the sufferer into behavior that is aimed at stopping the pain as quickly as possible. To consider only the sensory features of pain and ignore its motivational-affective properties is to look at only part of the problem (Melzack, 1989). Even the concept of pain as a perception, with full recognition of past experience, attention, and other cognitive influences, still neglects the motivational dimension.

Due to the subjective nature of the pain experience, objectively measuring pain becomes a difficult task. Historically, methods used for measuring pain are methods that view the pain as a single, unique quality that varies only in intensity (Beecher, 1959). These methods include the use of verbal rating scales (e.g. mild, moderate, severe), numerical rating scales (1 - 100), and visual analog scales.

Some research has been specifically designed to specify the qualities of pain (Melzack & Torgerson, 1971). Melzack and Torgerson conducted a two-part study in 1971. Part one involved asking physicians and university graduates to classify 102 words, obtained from the clinical literature, into small groups that describe different aspects of the pain experience. On the basis of their data, the words were categorized into three major classes: (1) words that

describe the sensory qualities of the experience in terms of temporal, spatial, pressure, thermal, and other properties, (2) words that describe affective qualities in terms of tension, fear, and autonomic properties, and (3) evaluative words that describe the subjective overall intensity of the total pain experience.

The second part of Melzack and Torgerson's study was designed to determine the pain intensities implied by the words within each subclass. Subjects were asked to assign intensity values to each word using a numerical scale ranging from least pain to worst pain. The results of this study indicated that there were several words within each subclass that had the same relative intensity. In addition, the positions of the words relative to one another were fairly consistent across all three major classes. The outcome of this study culminated into a pain assessment tool referred to as the McGill Pain Questionnaire (Melzack, 1975).

The McGill Pain Questionnaire (MPQ) consists of twenty groups of single word pain descriptors with the words in each group increasing in rank order intensity. The sum of the rank values for each descriptor based on its position in the word set results in a score called the Pain Rating Index (PRI). The MPQ also consists of several subscales: the sensory PRI (S-PRI), the affective PRI

(A-PRI), the evaluative PRI (E-PRI), the miscellaneous PRI, present pain intensity, and number of words circled (Melzack, 1975).

In a study on depression and the mediation of chronic pain, Dufton (1990) explored a series of questionnaires completed by 123 chronic pain patients which included the McGill Pain Questionnaire. He subdivided the sensory pain rating index (S-PRI) into two groups: those descriptive of pain mediated by the paleospinothalamic tract (PSTT) and those descriptive of pain mediated by the neospinothalamic tract (NSTT). PSTT-mediated pain is described as tonal, dull, burning, and diffuse, whereas NSTT-mediated pain, in contrast, is described as phasic, sharp, and localized (Dufton, 1990). Dufton found that the psychological distress displayed by the chronic pain patients was related to the use of PSTT sensory adjectives, but not to the use of NSTT sensory adjectives.

In a similar study on psychobiological markers in coexisting pain and depression, Ward, Bloom, and Dworkin (1982) suggested that depression may be more closely associated with sensory words descriptive of paleospinothalamic tract (PSTT)-mediated pain. Ward et al. indicate that if there is a biochemical link between depression and PSTT-mediated pain, then

there should be a relationship between self-reported depression and the use of words describing PSTT-mediated pain versus neospinothalamic (NSTT)-mediated pain. Theoretically, according to Ward et al., antidepressants may relieve both pain associated with depression and pain mediated by the PSTT.

Several studies have been conducted to test the reliability and validity of the McGill Pain Questionnaire (Reading, Everitt, & Stedmere, 1982; Love, Loeboeuf, & Crisp, 1989; Reading, 1989; Turk, Rudy, & Salovey, 1985). These studies are fairly consistent in demonstrating test-retest reliability as well as the validity of the three dimensional (sensory, affective, and evaluative) framework of the McGill Pain Questionnaire. However, Turk et al. (1985) found high intercorrelations (.64 - .81) among the three dimensions and concludes, therefore, that they are not distinct or discriminatory and should not be separate scores. Melzack and Katz (1992) argue that high intercorrelations among psychological variables do not mean that they are all alike and can be lumped into a single variable such as intensity, but rather, certain biological and psychological variables can co-vary to a high degree yet represent distinct, discriminable entities. For the purposes of this study, the McGill Pain

Questionnaire scores will be subdivided into two groups to reflect the sensory and the affective-evaluative dimensions of chronic pain.

Video Task Analysis

Much of the research in chronic pain lies in the areas of mood (such as depression or anxiety), medications (such as analgesics and antidepressants), and treatment modalities (such as physical therapy, psychotherapy, and biofeedback). However, few studies focus on the display of overt pain behaviors as a measure of dysfunction. Keefe et al. (1986) conducted a study on pain behaviors such as body posturing and facial expression to determine if these behaviors were reflective of depression. They categorized the pain behaviors into five different categories which were as follows: (1) guarding, which referred to abnormally stiff, interrupted, or rigid movement while walking or moving from one position to another, (2) bracing, which referred to the stationery position in which a fully extended limb supports and maintains an abnormal distribution of weight, (3) rubbing, which included touching, rubbing, or holding the affected area of pain for a minimum of three seconds, (4)

grimacing, which referred to the obvious facial expression of pain, including furrowed brow, narrowed eyes, tightened lips, corners of mouth pulled back, and clenched teeth, and (5) sighing, which referred to the obvious exaggerated exhalation of air usually accompanied by shoulders first rising and then falling. Keefe et al. (1986) objectively recorded these behaviors during functional activities such as walking, standing or reclining and during medical examinations. A composite score for total pain behavior was calculated for each patient based on the number of occurrences of each of the pain behavior categories per ten minute observation period.

The researchers in this study found that pain behaviors correlated significantly with ratings of pain made by patients and that pain behaviors are more frequent in patients with positive physical findings. They also found pain behaviors to be related to general severity of depression. Based on their findings, Keefe et al. (1986) suggest that depression and physical findings are both important factors when evaluating the clinical significance of pain and pain behavior. They did, however, state that psychological factors (such as somatization or more serious psychopathology), environmental variables (such as living with a solicitous spouse), and historical variables (such as early

childhood experiences with pain or illness), may well affect the display of pain behavior and be important determinants of pain behavior patterns.

One of the primary goals for any health care professional treating chronic pain is to alleviate dysfunction. In order for the treating professional to do this, interventions must be directed toward specific goals. Specific goals cannot be established unless the professional is fully cognizant of the capabilities, limitations, and potential of the client. Such factors can only be determined on the basis of a thorough collection and interpretation of client information.

Various evaluation techniques are used to examine the extent to which a chronic pain patient suffers. These techniques are used not only to design and initiate treatment programs, but they are also used to determine the extent of patient progress.

At the Lewis-Gale Hospital Pain Center in Salem, Virginia, the physical therapist and occupational therapist have developed an assessment tool utilizing video tape recording procedures for evaluating functional capabilities in the chronic pain patient. This assessment tool is referred to as the video-task analysis and is designed not only for evaluating physical function, but for

developing treatment goals, for patient education, and for measuring patient progress.

Research on the use of video for recording and evaluating physical function is virtually non-existent. The literature primarily focuses on specific tools such as the goniometer and dynamometer used for assessing the quantity and quality of certain physical movements (Rush, 1994; Ottenbacher, 1994; Mayer, 1991; Youdas, Carey, & Garrett, 1991).

The video task analysis (VTA) evaluates various aspects of the patient's physical capabilities such as posture, balance, ambulation, mobility, gait, body mechanics, and activities of daily living (ADL) skills. Each of these behaviors are videotaped, analyzed by visual estimation, and objectively scored by the physical therapist and the occupational therapist. Each patient receives a composite VTA score following the assessment upon admission and at discharge. In addition to evaluating the patient's physical capabilities, observation of pain behaviors such as grimacing, guarding, and bracing are also noted. For the purpose of this study, the VTA scores are included as a variable that reflects one component of treatment outcome.

Biofeedback Utilizing Surface Electromyography

Biofeedback is a treatment technique designed to train the individual to improve their health by learning to regulate certain physiological functions otherwise believed to be involuntarily controlled (Schwartz, 1995). Health care professionals from several disciplines in many major medical centers treat a wide range of disorders using a variety of biofeedback therapies. The instrumentation most frequently used in the biofeedback field is surface electromyography (sEMG) according to Schwartz (1995). Basmajian (1989) states that electromyography instrumentation grew out of the studies of neuromuscular and spinal cord functions. Physicians' use of electromyography in diagnosing neuromuscular disorder is many decades old (Schwartz, 1995). As early as 1934, research appeared that voluntary, conscious control of individual motor unit potentials was possible (Smith, 1934). Marinacci and Horande (1960) added case reports of the potential value of displaying EMG signals to assist patients in neuromuscular re-education. Basmajian (1963) also reported on the control of single motor units. Such research was important

in the development of applied biofeedback and was instrumental in giving EMG biofeedback solid support among researchers and clinicians.

The use of biofeedback for pain management has been in existence for more than two decades. Turk, Meichenbaum, and Genest (1983) stress that the experience of chronic pain is a conglomerate of the patient's attitudes and beliefs about the origin, appropriate management, and expected future of pain and suffering. It has been suggested by Grezsiak and Ciccone (1988) that learning to self-regulate a physiologic mechanism can profoundly influence one's thoughts, feelings, and resultant pain-associated behavior. These authors state, "We believe that self-control involves the alteration of one's belief about the nature and meaning of one's symptoms".

The evidence that relaxation training is effective in the management of chronic pain has become substantial over the past ten to fifteen years. Various types of relaxation procedures have been explored and developed: progressive relaxation (Jacobson, 1938), autogenic training (Luthe, 1969), meditation (Hirai, 1974), and the modified transcendental meditation developed by Benson (1975). Budzynski, Stoyva and Peffer (1980) state, however, that simply reading a book about these methods is not enough to assure mastery of

them. Much more is involved than merely giving the verbal instruction to "relax". In addition, how does either patient or therapist know when or if a relaxed condition has been achieved?

Surface electromyography (sEMG) is one answer to this question. With sEMG biofeedback, muscle tension is monitored by measuring the electrical energy given off by muscle fibers. A sEMG device gives readings in microvolts which is a unit of electrical pressure that corresponds well to muscle tension (Schwartz, 1995).

In biofeedback training, the therapist is able to document measurement of muscle tension and determine whether sEMG activity has decreased or not. If muscle tension remains high, sEMG biofeedback can be used to shape the patient's response in the proper direction. In this way, biofeedback techniques standardize relaxation training and make it more reliable. In fact, Budzynski et al. (1980) have developed criteria for what constitutes a relaxed condition.

Johnson and Hockersmith (1977) conducted a study on the therapeutic use of surface electromyography in chronic back pain. They investigated the effects of sEMG biofeedback in 510 patients with chronic low back pain. They propose that therapeutic sEMG biofeedback is an effective, non-threatening

way to demonstrate certain aspects of the body that are generally not in the patient's awareness and that by teaching the patient effective muscle relaxation and demonstrating the importance of "quiet time", the patient learns to control their pain. The results of their study indicated that patients generally achieved a significant reduction of baseline sEMG levels with improved perception of control and decreased perception of pain. Johnson and Hockersmith concluded that sEMG biofeedback is effective in initiating the therapeutic process, enhancing other modalities, and objectively monitoring therapeutic progress.

Summary

Based on the current literature, there is substantial support for the existence of depression among chronic pain patients and the dilemma that faces the treating health care professional in making sound therapeutic decisions regarding treatment for these individuals. The complexities of chronic pain compound the problem even more. There are various models and

theoretical perspectives that attempt to explain the phenomena of chronic pain and yet it continues to be one of the most costly health care problems today.

This chapter focused on the literature as it relates to chronic pain in general, the characteristics of a chronic pain patient, theories that link chronic pain with depression, and theories that make distinctions between chronic pain and depression. In addition, research findings on the use of antidepressant medication with chronic pain patients was discussed. In terms of treatment for chronic pain, multidisciplinary pain centers are typically the setting with outcome-based philosophies. Current literature pertaining to multidisciplinary pain centers and outcome studies were reviewed. Finally, the literature related to the instrumentation procedures used in this study were reviewed as well.

CHAPTER III

METHODOLOGY

This chapter focuses on the methodology and procedures used for this study. Areas of discussion will include (a) the research design including research questions and hypotheses, (b) the subjects used in this study, (c) the research instrumentation, (d) the data collection process, and (e) the procedures for data analysis.

Research Design

This study is an ex post facto analysis of several variables related to treatment outcomes among patients that participated in a multidisciplinary chronic pain treatment program. Data were collected from the medical records of approximately 200 patients who were admitted to and treated for various chronic pain syndromes at the Lewis-Gale Hospital Pain Center in Salem, Virginia. The primary purpose of this study was to determine if there are significant differences in treatment outcome between those chronic pain

patients who are taking antidepressant medication and those patients who are not taking antidepressant medication. In addition, this study also examined the differences in treatment outcome among those who reported mild to moderate levels of depression and those who reported moderate to severe levels of depression, those who reported more cognitive-affective symptoms of depression and those who reported more somatic-performance symptoms of depression, and those who described the quality of their pain utilizing more sensory descriptors and those who described the quality of their pain utilizing more affective-evaluative descriptors. Treatment outcomes were measured by various measures and included; (a) reported depression, (b) physical capabilities data, (c) self-reported pain data, and (d) muscle relaxation data. The pre test scores on these measures were used as the covariate to control for the differences in initial scores among patients. Although patients may be on different types of antidepressant medication and on different doses, for the purposes of this research, all subjects were grouped into one category of antidepressant medication use. The secondary purpose of this study was to determine if there are certain characteristics among chronic pain patients that are related to treatment outcomes.

The following research questions will be addressed in this study:

1. Are there significant differences in multidisciplinary treatment outcome measures among those chronic pain patients who are taking antidepressant medication and those who are not?
2. Is there a significant difference among those patients with moderate to severe levels of reported depression and those with mild to moderate levels of reported depression with respect to treatment outcome measurements?
3. Is there a significant difference between those chronic pain patients with greater somatic-performance symptoms of depression and those patients with more cognitive-affective symptoms of depression on treatment outcome measures?
4. Is there a significant difference between those chronic pain patients utilizing more sensory descriptions of pain and those patients utilizing more affective-evaluative descriptions of pain on treatment outcome measures?
5. Are there significant differences between pre and post test scores on treatment outcome measures among subgroups of subjects regarding depression level, depressive symptomatology, antidepressant use, and quality of pain reported?

6. Are there demographic and background variables that are significantly related to multidisciplinary chronic pain treatment outcome measures?

The specific hypotheses that relate to each of these research questions are as follows:

1. There is a significant difference in treatment outcome measures among patients diagnosed with chronic pain who are taking antidepressant medication and those patients who are not taking antidepressant medication.
2. There is a significant difference in measures of treatment outcome among chronic pain patients with moderate to severe levels of reported depression and those with mild to moderate levels of reported depression.
3. There is a significant difference in measures of treatment outcome among chronic pain patients who have greater cognitive-affective symptoms of depression and those patients who have greater somatic-performance symptoms of depression.

4. Chronic pain patients who describe the quality of their pain utilizing more sensory adjective words demonstrate significantly more improvement in treatment outcome measures than those patients who describe the quality of their pain utilizing more affective-evaluative adjective words.

5. There are significant differences between pre and post test scores on outcome measures among subgroups of subjects regarding depression level, depressive symptomatology, antidepressant use, and quality of pain reported.

6. There are significant demographic and background similarities among those chronic pain patients who demonstrate greater improvement in multidisciplinary treatment outcome measures.

Participants

The subjects used for this study were chronic pain patients who were admitted to and treated at the Lewis-Gale Hospital Pain Center in Salem, Virginia during the time period from January 1990 through December 1994.

These patients all have various chronic pain syndromes and are diagnosed as such. The complete multidisciplinary program involves approximately 20 days and/or four weeks of treatment. The first week of treatment is primarily focused on thorough evaluation and assessment while the second week of treatment focuses on the introduction of various techniques designed to meet individual treatment goals. The third and fourth week of treatment focuses primarily on treatment and progress toward specific treatment goals. Those patients having received only the first one to two weeks or less of the program would not likely have benefited fully from treatment, therefore, a supplementary analysis will be performed to compare number of treatment days with treatment outcome.

Instrumentation

Four different data-gathering instruments were used for evaluating patients both before treatment and after treatment. These instruments include the Beck Depression Inventory (Beck, 1972), a video-task analysis of physical capabilities, The McGill Pain Questionnaire (Melzack, 1975), and sEMG biofeedback. Each of the patients admitted to the pain treatment program were

video-taped by the physical therapist and occupational therapist as part of a pre-screening procedure prior to being admitted. Upon admission, patients were asked to complete a Beck Depression Inventory and the McGill Pain Questionnaire. A biofeedback assessment utilizing sEMG instrumentation was conducted on each patient upon admission as well. Each of these instrumentation procedures will be discussed in this section.

Beck Depression Inventory

Each patient admitted to the pain treatment program is instructed to complete a Beck Depression Inventory (BDI) upon admission and at discharge. Beck (1972) suggests the following general guidelines to be used with patients when assessing depression: scores of 0 to 9 are within normal range, 10 to 18 are considered mild-moderate depression, 19 to 29 are considered moderate-severe depression, and scores of 30 and above are considered extremely severe depression. These guidelines will be utilized for dividing the sample into 3 groups of self-reported depression data: (1) scores below 10 will be grouped as non-depressed patients, (2) scores of 10 to 18 will be grouped as

mild - moderately depressed patients, and (3) scores of 19 and above will be grouped as moderate - severely depressed patients. In addition, the scores of each patient within these three groups will be subdivided by the two subscales discussed by Beck et al. (1988) in the instruction manual; the cognitive-affective subscale and the somatic-performance subscale. Therefore, each patient will receive three self-reported depression scores; a cognitive-affective score, a somatic-performance score, and a total BDI score.

Video-task Analysis

Each patient referred to the pain treatment program is video-taped prior to admission as part of a pre-screening procedure to determine the extent to which physical capabilities are limited due to pain. The patient is instructed to participate in a series of physical tasks which focus on the areas of posture, balance, ambulation, mobility, gait, body mechanics, and activities of daily living (ADL) skills. The video tape is then objectively scored using a numerical scale. The physical therapist and the occupational therapist analyze each task by

visual estimation and assign a 0, 1, or 2 depending on the quality of the movement (e.g., with or without pain behaviors) and quantity of movement (e.g., range of motion). The number "0" is given when the movement is considered to be extremely problematic with significant overt pain behaviors and significantly deviated from normal ranges of movement. The number "1" is given when the movement is somewhat problematic with moderate overt pain behaviors and slightly deviated from normal ranges of movement. The number "2" is given when the movement is within normal limits with no overt pain behaviors and is within normal ranges of movement. There are 40 tasks included in the video task analysis with a total possible score of 250. It should be noted that this physical capabilities assessment tool has only been used at this particular treatment center and is not being used elsewhere. The physical therapist and the occupational therapist of the pain treatment program are the developers of this physical capabilities assessment tool and were the only two therapists to administer the procedure to patients being evaluated for this particular program.

McGill Pain Questionnaire

Each patient admitted to the pain center is instructed to complete a McGill Pain Questionnaire (MPQ) upon admission and at discharge. Melzack and Casey, (1968) suggest that there are three major psychological dimensions of pain: sensory-discriminative, motivational-affective, and cognitive-evaluative. They suggest that each of these dimensions are driven by different systems in the brain and greatly influence the overt responses of the sufferer and how the pain is characterized by the sufferer. To expand upon this theory, the self-reported pain level data derived from the MPQ in this study will be divided into two sets of scores per patient, the sensory adjective scores and the affective-evaluative adjective scores, to determine the relationship between treatment outcome and sensory aspects of pain.

Surface Electromyography Biofeedback

Biofeedback and self-regulation skills training is a component of treatment for each patient admitted to the pain treatment program. Generalized

muscle relaxation is a primary focus of treatment. Muscle tension levels are measured with the use of a J & J M57 sEMG biofeedback instrument. Each patient is instructed to participate in a guided relaxation exercise while muscle tension levels are monitored on the frontalis (forehead) of the patient. This assessment of muscle tension levels is conducted both at admission and at discharge. Only the baseline data which consists of two 1 minute intervals for each administration will be used for the purpose of this study.

Data Collection

The medical records of each patient admitted to and treated at the Lewis-Gale Pain Center from January 1990 through December 1994 were surveyed. The data from these records were collected and recorded on the data report form and entered into a computer data file. The data were analyzed using the SPSS statistical computer software program. See Appendix A for a copy of the data report form.

Data Analysis

Four separate statistical analyses were performed:

1. Descriptive statistics were computed to describe the data with regards to measures of central tendency (mean, mode, and median) and measures of variability (standard deviation scores and variance scores). The percentages and frequency counts in different categories were computed to examine the data.

2. Analysis of covariance was conducted for four groups of subjects using pre test scores as the covariate. These four groups included; (1) antidepressant drug use group, (2) depression level group, (3) depressive symptomatology group, and (4) pain quality reported group. Analysis of covariance is a method of analysis used to compare the means in different groups controlling for variability that may be due to one or more of the variables, or covariates (Howell, 1992). By controlling for initial differences in pre test scores, the error term is reduced and a more precise test of the original hypotheses is possible.

3. Dependent t tests were computed across four different measures of treatment outcome to include reported pain, reported depression, physical capabilities, and relaxation skills. Mean scores for both pre and post tests will be used. Dependent t tests are generally performed when the same set of subjects are tested across two or more trials to determine the differences in their two mean scores (Howell, 1992). The following subgroups will be analyzed across the four measures of treatment outcome mentioned above:

(1) patients taking antidepressant medication.

(2) patients not taking antidepressant medication.

(3) patients who are mild to moderately depressed.

(4) patients who are moderate to severely depressed.

(5) patients who report greater cognitive-affective symptoms of depression.

(6) patients who report greater somatic-performance symptoms of depression.

(7) patients who describe the quality of their pain utilizing more sensory adjectives.

(8) patient who describe the quality of their pain utilizing more affective-evaluative adjectives.

In addition, the effect size was computed for each set of pre and post mean scores to determine the degree of change in pre test and post test scores. The effect size is a measure of the degree to which two mean scores differ in terms of the standard deviation of the parent population (Howell, 1992). These effect sizes were compared between groups.

4. Multiple regression analysis was performed to examine the relationship between certain demographic/background variables and treatment outcome measures. The outcome variables were regressed on some of the demographic and background variables to determine if certain patient characteristics were significantly related to outcome measures.

CHAPTER IV

RESULTS OF THE STUDY

This chapter presents the findings of the study. The findings include relevant demographic data about the sample and scores on pre and post test measures.

The primary purpose of this study is to describe the relationship between antidepressant drug use and multidisciplinary treatment outcome among chronic pain patients. In addition, other variables were analyzed to determine their relevancy to treatment outcome as well. These variables included depression levels, depressive symptomatology, and reported pain levels. The secondary purpose of this study was to determine the relationship of certain characteristics and demographic variables to the outcome of chronic pain treatment.

Between Group Comparisons

The sample for this study consisted of 232 patients (142 females - 61.2%, 90 males - 38.8%) admitted to a multidisciplinary pain treatment center for chronic pain. The average age for these patients was 44. Average duration of

pain was 41.4 months and the average number of treatment days was 15.9.

Several subgroups of this sample were analyzed to identify any significant differences in treatment outcome measures between groups. Treatment outcome measures included objective tests for reported depression, reported pain, measures of physical capability, and muscle relaxation. The Beck Depression Inventory was used to measure depression levels, the McGill Pain Questionnaire was used to measure reported pain, a video task analysis procedure was used to measure physical capabilities, and surface electromyography was used to measure muscle relaxation. All tests were administered both before and after treatment.

Pre and post test measures were compared across four groups with each group containing two subgroups; (1) antidepressant group and no antidepressant group, (2) mild to moderate depression and moderate to severe depression, (3) greater cognitive-affective symptoms of depression and greater somatic-performance symptoms of depression, and (4) greater sensory descriptors of pain and greater affective-evaluative descriptors of pain. An analysis of covariance was used to determine if there were significant differences in treatment outcome measures between the two subgroups within

each group. A significant difference was found to exist between those patients with mild to moderate depression and those with moderate to severe depression with regards to their reported pain level on the post McGill Pain Questionnaire when controlling for pre test scores ($p = .011$). As demonstrated in Table 1, those patients with mild to moderate depression had an average score of 27.76 on the McGill post test, whereas those patients with moderate to severe depression had an average post score of 47.94 indicating a significantly higher score and reflecting more abnormal pain complaints.

All other analyses indicated no significant differences in treatment outcome measures between the subgroups as indicated in Tables 2, 3, and 4. It was noted, however, that there were significant differences reported in all pretest scores consistently across all subgroups. Since these differences are serious in all pretest measures, the subgroups appear to be distinct and different groups with significant differences between the groups when they start treatment. Thus, it makes sense to examine these subgroups separately to determine if treatment outcomes or post tests were significantly different from their pretest scores within each group. All post test measures were

administered after an average of 16 treatment days. Dependent t-tests were carried out on all pre and post test scores within each subgroup.

Table 1. **Mean Scores on Treatment Outcome Measures by Depression Level**

TREATMENT OUTCOME MEASURE	MILD to MODERATE	MODERATE to SEVERE	f ratio	*p value
Beck Depression Inventory	n/a	n/a	n/a	n/a
McGill Pain Questionnaire	27.76	47.94	6.792	.011
Video Task Analysis	207.02	195.81	1.657	.202
Surface EMG Biofeedback	5.97	6.27	.534	.468

*$p < .05$

Table 2. **Mean Scores on Treatment Outcome Measures by Antidepressant Group**

TREATMENT OUTCOME MEASURE	ANTIDEPRESSANT	NO ANTIDEPRESSANT	f ratio	*p value
Beck Depression Inventory	14.75	10.58	.026	.871
McGill Pain Questionnaire	30.41	24.24	.728	.395
Video Task Analysis	204.25	205.29	1.562	.213
Surface EMG Biofeedback	5.53	5.77	.001	.971

*p < .05

Table 3. **Mean Scores on Treatment Outcome Measures by Depressive Symptomatology**

TREATMENT OUTCOME MEASURE	COGNITIVE-AFFECTIVE SYMPTOMS	SOMATIC-PERFORMANCE SYMPTOMS	f ratio	*p value
Beck Depression Inventory	14.04	12.76	1.81	.671
McGill Pain Questionnaire	25.00	27.84	.121	.729
Video Task Analysis	211.79	205.23	.137	.712
Surface EMG Biofeedback	6.73	5.84	2.922	.090

*$p < .05$

Table 4. **Mean Scores on Treatment Outcome Measures by Reported Pain**

TREATMENT OUTCOME MEASURE	AFFECTIVE-EVALUATIVE PAIN	SENSORY PAIN	f ratio	*p value
Beck Depression Inventory	16.09	11.59	1.885	.172
McGill Pain Questionnaire	n/a	n/a	n/a	n/a
Video Task Analysis	199.81	209.89	2.119	.148
Surface EMG Biofeedback	6.33	5.77	.424	.517

*$p < .05$

Within Group Comparisons

No Antidepressant Group

1. **Beck Depression Inventory (BDI) scores**:

Subjects who were not taking an antidepressant had an average BDI pre score of 12.97 (x pre = 12.97). The average post BDI score for this group was 10.67 (x post = 10.67). A dependent t-test was carried out to assess if there was a significant difference between pre BDI and post BDI scores. The dependent t-test was significant (t = -2.64, p = .010). There was a statistically significant difference in BDI pre and post test scores among those subjects not on antidepressant medication.

An effect size was computed using the following formula:

$$d \text{ (effect)} = \frac{x \text{ pre} - x \text{ post}}{s \text{ pooled}}$$

The purpose for computing the effect size was to examine the magnitude of change in BDI scores. The interpretation of effect as small, medium, and large

was based on Cohen's (1988) guidelines in which he defines three levels of effect (d):

Effect size	d	Percentage of Overlap
small	.20	85
medium	.50	67
large	.80	53

The effect size for the BDI pre and post test scores within the no antidepressant group was .29 which is a small effect. Therefore, it can be interpreted that the mean difference between the pre and post test scores is about three tenths of a standard deviation. The magnitude of this difference will be considered small.

2. **McGill Pain Questionnaire scores:**

Subjects who were not taking antidepressant medication had an average McGill pre score of 30.65 (x pre = 30.65). The average post McGill scores were 24.24 (x post = 24.24). A dependent t-test was carried out to assess if there was a significant difference between pre McGill scores and post McGill scores. The dependent t-test was significant (t = -2.59, p = .012). There was a statistically significant difference in McGill pre and post test scores. The effect size was computed using the formula given above and was determined to be small (d = .29). Therefore, there was a statistical difference in pre and post

test scores on the McGill Pain Questionnaire among those subjects not taking an antidepressant, and the magnitude of this difference will be considered small.

3. **Video Task Analysis (VTA) scores:**

Subjects who were not on antidepressant medication had an average VTA pre score of 149.31 (x pre = 149.31). The average post VTA score was 206.98 (x post = 206.98). The dependent t-test was significant (t = 19.45, p = .000). The effect size was computed as 2.14 (d = 2.14). There was a statistically significant difference in pre and post test scores on the video task analysis. The mean difference between the pre and post test scores is about two standard deviations. The magnitude of this difference will be considered large.

4. **Surface Electromyography (sEMG) scores:**

Subjects who were not taking antidepressant medication had an average sEMG pre score of 8.15 (x pre = 8.15) and a post score of 5.82 (x post = 5.82). The dependent t-test was significant (t = -3.81, p = .000). The effect size was computed as .50 (d = .50). There was a statistically significant difference in

sEMG pre and post test scores and the magnitude of this difference will be considered a medium difference.

Antidepressant Group

1. **Beck Depression Inventory (BDI) scores:**

Subjects who were taking an antidepressant medication had an average BDI pre score of 20.89 (x pre = 20.89). The average post BDI score was 15.10 (x post = 15.10). A dependent t-test was performed to determine if there was a significant difference between pre and post BDI scores. The dependent t-test was significant (t = -4.25, p. = .000). The effect size was computed as .56 (d = .56). There was a statistically significant difference between BDI pre and post scores among those subjects taking antidepressant medication. The magnitude of this difference will be considered medium.

2. **McGill Pain Questionnaire scores:**

Subjects who were taking antidepressant medication had an average McGill pre score of 37.16 (x pre = 37.16) and an average McGill post score of 30.50 (x post = 30.50). The dependent t-test was significant (t = -2.14, p = .037). The effect size was computed as .28 (d = .28). There was a statistically significant difference in pre and post test scores on the McGill Pain

Questionnaire among those subjects taking antidepressant medication. The magnitude of this difference will be considered medium.

3. **Video Task Analysis (VTA) scores:**

Subjects who were taking an antidepressant medication had an average VTA pre score of 139.75 (x pre = 139.75) and an average post score of 205.91(x post = 205.91). The dependent t-test was significant (t = 22.60, p = .000). The effect size was computed as 2.89 (d = 2.89). There was a statistically significant difference between pre and post test scores on the video task analysis among those subjects taking antidepressant medication. The mean difference between the pre and post test scores is nearly three standard deviations. The magnitude of this difference will be considered large.

4. **Surface Electromyography (sEMG) scores:**

Subjects who were taking antidepressant medication had an average sEMG score of 7.02 (x pre = 7.02) and an average post score of 5.53 (x post = 5.53). The dependent t-test was significant (t = -2.23, p = .031). The effect size was computed as .32 (d = .32). There was a statistically significant difference in sEMG pre and post test scores among those subjects taking

antidepressant medication. The magnitude of this difference will be considered medium.

Comparison of No Antidepressant and Antidepressant Groups

As shown in Table 5, the magnitude of difference between pre and post test scores for both the no antidepressant group and the antidepressant group were very similar for the McGill Pain Questionnaire (.29 and .28), however for the other multidisciplinary treatment outcome measures, effect sizes varied. Those subjects on antidepressant medication had a larger effect size for both the Beck Depression Inventory, (.56 as compared to .29 for those subjects who were not on antidepressant medication), and the video task analysis, (2.89 as compared to 2.14 for those subjects who were not on antidepressant medication). Those subjects not on antidepressant medication, however, had a larger effect size for surface electromyography which measures muscle relaxation skill (.50 as compared to .32 for those subjects who were taking antidepressant medication).

Table 5. **Comparison of No Antidepressant Group and Antidepressant Group Across Four Treatment Outcome Variables**

	NO ANTIDEPRESSANT				ANTIDEPRESSANT			
TREATMENT OUTCOME	**pre**	**post**	**d**	***p**	**pre**	**post**	**d**	***p**
BDI	12.97	10.67	.29	.010	20.89	15.10	.56	.000
MCGILL	30.65	24.24	.29	.012	37.16	30.50	.28	.037
VIDEO TASK	149.31	206.98	2.14	.000	139.75	205.91	2.89	.000
sEMG	8.15	5.82	.50	.000	7.02	5.53	.32	.031

*$p < .05$

Greater Cognitive Depressive Symptomatology Group

1. **Beck Depression Inventory (BDI) scores:**

Subjects who reported greater cognitive symptoms of depression on the Beck Depression Inventory had an average total BDI pre score of 24.11 (x pre = 24.11) and a total BDI post score of 15.81 (x post = 15.81). The dependent t-test was significant (t = -4.56, p = .000) indicating that there was a statistically significant difference in BDI pre and post test scores among those subjects with greater cognitive symptoms of depression. The effect size was computed as .87. The mean difference between the pre and post test scores is nearly nine tenths of a standard deviation. The magnitude of this difference will considered large.

2. **McGill Pain Questionnaire scores:**

Subjects who reported greater cognitive symptoms of depression on the Beck Depression Inventory had an average McGill pre score of 39.46 (x pre = 39.46) and an average McGill post score of 33.53 (x post = 33.53). The dependent t-test was not significant (t = -1.38, p = .179). There was not a statistically significant difference between pre and post McGill scores among those subjects reporting greater cognitive symptoms of depression.

3. **Video Task Analysis (VTA) scores:**

Subjects who reported greater cognitive symptoms of depression on the Beck Depression Inventory had an average VTA pre score of 144.57 (x pre = 144.57) and an average VTA post score of 206.80 (x post = 206.80). The dependent t-test was significant (t = 10.80, p = .000). The effect size was computed as 2.11 (d = 2.11). There was a statistically significant difference between pre and post test scores on the VTA among those subjects reporting greater cognitive symptoms of depression. The mean difference between pre and post test scores is greater than two standard deviations. The magnitude of this difference will be considered large.

4. **Surface Electromyography (sEMG) scores:**

Subjects reporting greater cognitive symptoms of depression on the Beck Depression Inventory had an average sEMG pre score of 6.75 (x pre = 6.75) and an average post score of 5.33 (x post = 5.33). The dependent t-test was not significant (t = -1.89, p = .072). There was not a statistically significant difference in sEMG pre and post scores among those subjects with greater cognitive symptoms of depression.

Greater Somatic-Performance Depressive Symptomatology Group

1. **Beck Depression Inventory (BDI) scores**:

Subjects who reported greater somatic-performance symptoms of depression on the Beck Depression Inventory had an average total BDI score of 14.74 (x pre = 14.74) and an average total BDI score of 12.14 (x post = 12.14). The dependent t-test carried out on these two mean scores was significant (t = -3.31, p .001) indicating a statistically significant difference between pre and post BDI scores among those subjects who reported greater somatic-performance symptoms of depression. The effect size computed was .29 (d = .29). The magnitude of this difference will be considered medium.

2. **McGill Pain Questionnaire scores:**

Subjects reporting greater somatic-performance symptoms of depression had an average McGill pre score of 30.83 (x pre = 30.83) and an average post McGill score of 25.52 (x post = 25.52). A dependent t-test computed on these two mean scores reflected a significant difference between pre and post McGill scores (t = -2.53, p = .013). The effect size computed was .23 (d = .23). There is a statistically significant difference in pre and post scores on the McGill Pain Questionnaire among those subjects reporting greater somatic-performance

symptoms of depression. The magnitude of this difference will be considered medium.

3. **Video Task Analysis (VTA) scores:**

Subjects reporting greater somatic-performance symptoms of depression had an average VTA pre score of 144.57 (x pre = 144.57) and an average VTA post score of 204.33 (x post = 204.33). A dependent t-test on these two mean scores indicated a significant difference (t = 26.59, p = .000). The effect size computed was 2.35 (d = 2.35). There was a statistically significant difference in VTA pre and post scores among those subjects who reported greater somatic-performance symptoms of depression. The mean difference between pre and post test scores is greater than two standard deviations. The magnitude of this difference will be considered large.

4. **Surface Electromyography (sEMG) scores:**

Subjects who reported greater somatic-performance symptoms of depression had an average sEMG pre score of 8.15 (x pre = 8.15) and an average sEMG post score of 6.10 (x post = 6.10). A dependent t-test was computed to determine if there was a significant difference between pre sEMG scores and post sEMG scores. The dependent t-test was significant (t = -3.86,

p = .000). The effect size computed was .41 (d = .41). There was a statistically significant difference between pre and post sEMG scores among those subjects who reported greater somatic-performance symptoms of depression. The magnitude of this difference will be considered medium.

Comparison of Depressive Symptomatology Groups

As indicated in Table 6, those subjects with greater cognitive symptoms of depression had a larger magnitude of change only on the Beck Depression Inventory where the effect size was .87 as compared to .29 for those subjects having more somatic-performance symptoms of depression. This same subgroup, however, showed no significant change between pre and post scores on the McGill Pain Questionnaire or the surface electromyography. On the pre and post test scores for the video task analysis, those subjects having more somatic-performance symptoms of depression had a greater magnitude of change (2.35) than those subjects with more cognitive symptoms (2.11).

Table 6. **Comparison of Depressive Symptomatology Groups**

	COGNITIVE SYMPTOMS				SOMATIC SYMPTOMS			
TREATMENT OUTCOME	pre	post	d	*p	pre	post	d	*p
BDI	24.11	15.81	.87	.000	14.74	12.14	.29	.001
MCGILL	39.46	33.53	none	.179	30.83	25.52	.23	.013
VIDEO TASK	144.57	206.80	2.11	.000	144.57	204.33	2.35	.000
sEMG	6.75	5.33	none	.072	8.15	6.10	.41	.000

*$p < .05$

Greater Affective-Evaluative Pain Reported Group

1. **Beck Depression Inventory (BDI) scores:**

Subjects who reported their pain utilizing more affective-evaluative descriptors of pain on the McGill Pain Questionnaire had an average BDI pre score of 18.94 (x pre = 18.94) and an average BDI post score of 14.10 (x post = 14.10). The dependent t-test was significant (t = -3.44, p = .001). . The effect size computed was .44 (d = .44). There was a statistically significant difference between pre and post scores on the Beck Depression Inventory among those subjects who utilized more affective descriptors when describing their pain. The magnitude of this difference will be considered medium.

2. **McGill Pain Questionnaire scores:**

Subjects who reported greater affective-evaluative pain on the McGill Pain Questionnaire had an average total McGill pre score of 35.56 (x pre = 35.56) and an average total McGill post score of 30.72 (x post = 30.72). The dependent t-test was significant (t = -2.06, p = .044). The effect size computed was .26 (d = .26). There was a statistically significant difference between pre and post scores on the McGill Pain Questionnaire among those subjects who

described their pain utilizing more affective descriptors of pain. The magnitude of this difference will be considered medium.

3. **Video Task Analysis (VTA) scores:**

Subjects reporting more affective-evaluative pain had an average VTA pre score of 147.01 (x pre = 147.01) and an average VTA post score of 207.70 (x post = 207.70). The dependent t-test was significant (t = 20.28, p = .000) indicating a statistically significant difference between pre and post VTA scores among those subjects who describe their pain utilizing more affective descriptors of pain. The effect size computed was 2.59 (d = 2.59). The mean difference between pre and post test scores is greater than two standard deviations. The magnitude of this difference will be considered large.

4. **Surface Electromyography (sEMG) scores:**

Subjects who reported their pain utilizing more affective-evaluative descriptors had an average sEMG pre score of 7.50 (x pre = 7.50) and an average post sEMG score of 6.00 (x post = 6.00). A dependent t-test computed on these two mean scores was significant (t = -2.55, p = .014). The effect size computed was a .48 (d = .48). There was a statistically significant difference between pre and post sEMG scores among those subjects utilizing

more affective descriptors of pain. The magnitude of this difference will be considered medium.

Greater Sensory Pain Reported Group

1. **Beck Depression Inventory (BDI) scores:**

Subjects who described their pain utilizing more sensory descriptors of pain had an average BDI pre score of 14.57 (x pre = 14.57) and an average BDI post score of 11.72 (x post = 11.72). The dependent t-test was significant (t = -3.50, p = .001). The effect size computed was .36 (d = .36). There is a statistically significant difference between pre and post BDI scores among those subjects who describe their pain utilizing more sensory descriptors of pain on the McGill Pain Questionnaire. The magnitude of this difference will be considered medium.

2. **McGill Pain Questionnaire scores:**

Subjects who reported more sensory descriptors when describing their pain had an average total McGill pre score of 31.97 (x pre = 31.97) and an average total McGill post score of 26.10 (x post = 26.10). The dependent t-test was significant (t = -2.25, p = .027). The effect size computed was .23 (d = .23). There is a statistically significant difference between pre and post McGill scores

among those subjects who described their pain utilizing more sensory descriptors of pain. The magnitude of this difference will be considered medium.

3. **Video Task Analysis (VTA) scores:**

Subjects who described their pain utilizing more sensory descriptors of pain had an average VTA pre score of 143.01 (x pre = 143.01) and an average VTA post score of 204.82 (x post = 204.82). A dependent t-test on these two mean scores was computed and showed significance (t = 23.13, p = .000). The effect size computed was 2.31 (d = 2.31). There was a statistically significant difference of more than two standard deviations between pre and post VTA scores among those subjects who described their pain utilizing more sensory descriptors of pain on the McGill Pain Questionnaire. The magnitude of this difference will be considered large.

4. **Surface Electromyography (sEMG) scores:**

Subjects who reported greater sensory pain on the McGill Pain Questionnaire had an average sEMG pre score of 8.05 (x pre = 8.05) and an average post sEMG score of 5.64 (x post = 5.64). The dependent t-test was significant (t = -3.97, p = .000). The effect size computed was .48 (d = .48).

There was a statistically significant difference in pre and post sEMG scores among those subjects who described their pain utilizing more sensory descriptors of pain. The magnitude of difference will be considered medium.

Comparison of Reported Pain Groups

As shown in Table 7, the magnitude of change between pre and post test scores for subjects reporting more affective-evaluative descriptors of pain and subjects reporting more sensory descriptors of pain were similar for all four treatment outcome variables. The subjects with greater affective-evaluative pain had only slightly higher effect sizes for the Beck Depression Inventory, the McGill Pain Questionnaire, and the video task analysis. However, those subjects with more sensory pain had slightly higher effect sizes for surface electromyography scores.

Table 7. **Comparison of Reported Pain Groups**

	AFFECTIVE/EVALUATIVE				SENSORY			
TREATMENT OUTCOME	pre	post	d	*p	pre	post	d	*p
BDI	18.94	14.10	.44	.001	14.57	11.72	.36	.001
MCGILL	35.56	30.72	.26	.044	31.97	26.10	.23	.027
VIDEO TASK	147.01	207.70	2.59	.000	143.01	204.82	2.31	.000
SEMG	7.50	6.00	.36	.014	8.05	5.64	.48	.000

*p < .05

Non-depressed Group (BDI score = 0 - 9)

1. **Beck Depression Inventory (BDI) scores:**

Subjects who scored between 0 and 9 on the Beck Depression Inventory (non-depressed) prior to treatment had an average BDI pre score of 6.00 (x pre = 6.00) and an average BDI post score of 7.54 (x post = 7.54). The dependent t-test computed on these two means indicated no significant difference ($t = 1.85$, $p = .071$). There was not a statistically significant difference between pre and post BDI scores among those subjects who were considered non-depressed.

2. **McGill Pain Questionnaire scores:**

Non-depressed subjects had an average McGill pre score of 27.12 (x pre = 27.12) and an average McGill post score of 20.68 (x post = 20.68). The dependent t-test indicated no significant difference between these two means ($t = -1.96$, $p = .057$). There was not a significant difference between pre and post McGill scores among those subjects who scored between 0 and 9 on the Beck Depression Inventory prior to treatment.

3. **Video Task Analysis (VTA) scores:**

Non-depressed subjects had an average VTA pre score of 148.42 (x pre = 148.42) and an average VTA post score of 205.95 (x post = 205.95). The dependent t-test computed on these means indicated a significant difference ($t = 16.53$, $p = .000$). The effect size computed was 2.55 ($d = 2.55$). There was a statistically significant of more than two standard deviations between pre and post VTA scores among those subjects categorized as non-depressed. The magnitude of this difference will be considered as large.

4. **Surface Electromyography (sEMG) scores:**

Non-depressed subjects had an average sEMG pre score of 8.45 (x pre = 8.45) and an average sEMG post score of 5.32 (x post = 5.32). A dependent t-test computed on these means indicated a significant difference between pre and post scores ($t = -3.99$, $p = .000$). The effect size computed was .75 ($d = .75$). There was a statistically significant difference between pre and post sEMG scores among the non-depressed subjects. The magnitude of difference will be considered large.

Mild to Moderate Depression Group (BDI score = 10-18)

1. **Beck Depression Inventory (BDI) scores:**

Subjects who scored between 10 and 18 on the Beck Depression Inventory prior to treatment (mild to moderately depressed) had an average BDI pre score of 14.07 (x pre = 14.07) and an average BDI post score of 12.16 (x post = 12.16). A dependent t-test computed on these two means indicated a significant difference between pre and post scores ($t = -2.41$, $p = .019$). The effect size computed was .29 ($d = .29$). There was a statistically significant difference between pre and post BDI scores among those subjects who were mild to moderately depressed. The magnitude of this difference will be considered medium.

2. **Mc Gill Pain Questionnaire scores:**

Mild to moderately depressed subjects had an average McGill pre score of 29.98 (x pre = 29.98) and an average McGill post score of 26.98 (x post = 26.98). The dependent t-test computed on these means indicated no significant difference between pre and post scores ($t = -1.01$, $p = .314$). There was not a significant difference between pre and post McGill scores among those subjects who were mild to moderately depressed.

3. **Video Task Analysis (VTA) scores:**

Mild to moderately depressed subjects had an average VTA pre score of 144.25 (x pre = 144.25) and an average VTA post score of 204.42 (x post = 204.42). The dependent t-test was significant (t = 18.46, p = .000). The effect size computed was 2.27 (d = 2.27). There was a statistically significant difference of more than two standard deviations between pre and post VTA scores among those subjects who were mild to moderately depressed. The magnitude of difference between these scores will be considered large.

4. **Surface Electromyography (sEMG) scores:**

Mild to moderately depressed subjects had an average sEMG pre score of 6.23 (x pre = 6.23) and an average sEMG post score (x post = 7.28). The dependent t-test computed on these two was not significant (t = -1.60, p = .115). There was not a statistically significant difference between pre and post sEMG scores among those subjects who were mild to moderately depressed.

Moderate to Severely Depressed Group (BDI = 19 or higher)

1. **Beck Depression Inventory (BDI) scores:**

Subjects who scored a 19 or higher on the Beck Depression Inventory prior to treatment (moderate to severe) had an average BDI pre score of 28.08 (x pre = 28.08) and an average BDI post score 17.69 (x post = 17.69). The dependent t-test was significant (t = -7.18, p = .000). The effect size computed was 1.02 (d = 1.02). There was a statistically significant difference of approximately one standard deviation between pre and post BDI scores among those subjects who were moderately to severely depressed. The magnitude of difference will be considered large.

2. **McGill Pain Questionnaire scores:**

Moderate to severely depressed subjects had an average McGill pre score of 41.64 (x pre = 41.64) and an average McGill post score of 34.31 (x post = 34.31). The dependent t-test was significant (t = -2.25, p = .030). The effect size computed was a .33 (d = .33). There was a statistically significant difference of about three tenths of a standard deviation between pre and post McGill scores among those subjects who were moderately to severely depressed. The magnitude of difference will be considered medium.

3. **Video Task Analysis (VTA) scores:**

Subjects who were moderately to severely depressed had an average VTA pre score of 142.72 (x pre = 142.72) and an average VTA post score of 206.14 (x post = 206.14). The dependent t-test was significant (t =16.79, p = .000). The effect size computed was 2.28 (d = 2.28). There was a statistically significant difference of more than two standard deviations between pre and post VTA scores among those subjects who were moderately to severely depressed. The magnitude of difference between these scores will be considered large.

4. **Surface Electromyography (sEMG) scores:**

Subjects who were moderately to severely depressed had an average sEMG pre score of 8.33 (x pre = 8.33) and an average sEMG post score of 5.60 (x post = 5.60). The dependent t-test on these two means was significant (t = -3.34, p = .002). The effect size computed was .56 (d = .56). There was a statistically significant difference between pre and post sEMG scores among those subjects who were moderately to severely depressed. The magnitude of difference will be considered medium.

Comparison of Depression Level Groups

Table 8 shows those subjects who scored between 0 and 9 on the Beck Depression Inventory and were categorized as non-depressed did not demonstrate a significant difference between pre and post scores on the McGill Pain Questionnaire or the Beck Depression Inventory, however, the magnitude of change between pre and post scores on the surface electromyography (.75) and the video task analysis (2.55) were greater than for the mild to moderately depressed subjects and the moderate to severely depressed subjects on the same treatment outcome variables.

Table 8. **Pre and Post Test Scores for Non-Depressed Subjects**

	NON-DEPRESSED			
TREATMENT OUTCOME	**pre**	**post**	**d**	***p**
BDI	6.00	7.54	none	.071
MCGILL	27.12	20.68	none	.057
VIDEO TASK	148.42	205.95	2.55	.000
sEMG	8.45	5.32	.75	.000

*$p < .05$

Those subjects scoring between 10 and 18 on the Beck Depression Inventory and categorized as mild to moderately depressed did not demonstrate a significant difference between pre and post scores on the McGill Pain Questionnaire or the surface electromyography as shown in Table 9. The magnitude of change on the Beck Depression Inventory was medium(.29), however, on the video task analysis, the effect size was very similar to those subjects with moderate to severe depression (2.27 compared to 2.28 respectively).

Table 9. **Pre and Post Test Scores for Mildly to Moderately Depressed Subjects**

	MILDLY to MODERATELY DEPRESSED			
TREATMENT OUTCOME	**pre**	**post**	**d**	***p**
BDI	14.07	12.16	.29	.019
MCGILL	29.98	26.98	none	.314
VIDEO TASK	144.25	204.42	2.27	.000
sEMG	7.28	6.23	none	.115

*$p < .05$

Table 10 shows those subjects scoring a 19 or higher on the Beck Depression Inventory demonstrated a greater magnitude of change for both the Beck Depression Inventory and the video task analysis. The magnitude of change in pre and post McGill Pain Questionnaire scores was .33 (medium) as compared to the non-significant differences on this variable for the non-depressed and mild to moderately depressed.

Table 10. **Pre and Post Test Scores for Moderately to Severely Depressed Subjects**

	MODERATELY TO SEVERELY DEPRESSED			
TREATMENT OUTCOME	**pre**	**post**	**d**	***p**
BDI	28.08	17.69	1.02	.000
MCGILL	41.64	34.31	.33	.030
VIDEO TASK	142.72	206.14	2.28	.000
sEMG	8.33	5.60	.56	.002

*$p < .05$

Demographic Comparisons

Each of the four treatment outcome measures (Beck Depression Inventory, McGill Pain Questionnaire, Video Task Analysis, and Surface Electromyography) were regressed on eight demographic variables which included age, gender, marital status, employment status, number of treatment days, litigation status, duration of pain, and worker compensation status, to determine if certain patient characteristics are significantly related to treatment outcome.

Beck Depression Inventory (BDI)

When post scores for the BDI were regressed on the eight demographic/ background variables using stepwise regression to see which variables are related to BDI post, age was the only variable to be significant. The t value for age was -3.399 ($p = .0009$). These results suggest that older people are likely to have lower BDI post scores.

McGill Pain Questionnaire

When the post scores for the McGill Pain Questionnaire were regressed on the eight demographic/background variables using a stepwise regression,

litigation status, duration of pain and employment status were all significant. The t value for litigation status was 2.518 (p = .0129), the t value for duration of pain was -2.265 (p = .0250), and the t value for employment status was -2.038 (p = .0433). These results suggest that people who are either considering litigation or are actively involved in litigation are likely to have higher McGill Pain Questionnaire scores, people who have been in pain longer (the pain duration was measured in number of months and ranged from 4 months to 25 years) are likely to have lower McGill scores and people who are unemployed are likely to have higher McGill scores.

Video Task Analysis (VTA):

When VTA post scores were regressed on the eight demographic/ background variables to see which variables are related, workers compensation status and age were found to be significant. The t value for workers compensation was -3.221 (p = .0016) and the t value for age was -3.205 (p = .0016). These results suggest that people who are receiving workers compensation are more likely to have lower scores on the video task analysis and people who are older are also more likely to have lower VTA post scores. Lower VTA scores reflect lower physical capability.

Surface Electromyography (sEMG):

When sEMG post scores were regressed on the eight demographic/ background variables using a stepwise regression, gender was the only variable found to be significant. The t value for gender was 2.385 ($p = .0188$). These results suggest that women are more likely to have higher sEMG scores than men.

Comparison Summary:

To summarize, it seems that older people with chronic pain are more likely to be less depressed yet less physically capable than younger chronic pain patients. People who are receiving workers compensation for a work-related injury are more likely to demonstrate diminished physical capability as well. In addition, it seems that chronic pain patients who are considering or are actively involved in litigation , are unemployed, and have had a shorter duration of pain, are more likely to score higher on the McGill Pain Questionnaire reflecting more abnormal illness behavior. On sEMG biofeedback post measures, men had lower scores than women indicating a better ability to engage in muscle relaxation.

CHAPTER V

SUMMARY, CONCLUSIONS AND DISCUSSION, AND RECOMMENDATIONS

Chronic pain has increasingly become a challenge for those in the medical field who are faced with treating the various disorders that result in chronic pain. The complex relationship between chronic pain and depression along with the multitude of influencing factors such as the chemical, biological, and psychological components of the individual as well as the cultural, social and religious factors, all serve to further magnify the difficult task of treating chronic pain. The Multidisciplinary Pain Center has become the most widely recognized setting for chronic pain treatment. The review of the literature revealed various models and theoretical perspectives that attempt to explain the phenomena of chronic pain. Despite the increasing dilemma that faces the treating health care professional in making sound therapeutic decisions regarding treatment for these individuals, there has been very little research investigating effective multidisciplinary treatment outcome.

Summary

The primary purpose of this study was to examine various objective measures of treatment outcome among patients that participated in a multidisciplinary chronic pain treatment program. The relationship between treatment outcome and various other factors to include antidepressant drug use, level of depression, quality of pain reported and quality of depression are reported. The secondary purpose of the study was to determine if there are certain patient characteristics that are related to treatment outcome measures and to utilize this information for profiling those patients who are appropriate referrals to a multidisciplinary pain treatment program and would be most likely to improve.

Results of the study indicate that when chronic pain patients are subdivided into groups based on antidepressant drug use, depression level, reported quality of pain, and depressive symptomatology, there are distinct and significant differences before treatment when making between group comparisons, therefore, making these comparisons does not accurately reflect which group demonstrates greater treatment outcome. When with-in group

comparisons were made, however, the outcome of multidisciplinary pain treatment was found to be significantly related to several factors.

In general, all subgroups demonstrated improvement from pre to post scores on all four treatment outcome variables with the one exception of non-depressed patients having a slightly (but non-significant) higher score on the Beck Depression Inventory following treatment.

In the antidepressant drug use group, those patients on antidepressant medications demonstrated a greater improvement in treatment outcome on measures of depression and physical capability. In the depressive symptomatology group, those patients with more cognitive symptoms of depression had greater improvement in treatment outcome on measures of overall depression, whereas those patients with greater somatic symptoms of depression had greater improvement on physical capability. There did not appear to be a difference between those patients who described more of a sensory dimension of pain and those patients who described more of an affective-evaluative dimension of pain. These results indicate that the dimension of pain experienced does not have relevance as to the outcome of multidisciplinary chronic pain treatment.

In the depression level group, the non-depressed patients demonstrated a greater improvement in treatment outcome on both muscle relaxation and physical capability whereas the more severely depressed patients demonstrated a significant improvement in their overall depression scores following treatment. By comparison, the mild to moderately depressed patients did not demonstrate greater improvement.

Of the four treatment outcome variables, the video task analysis which measured treatment outcome had the most significant improvements from pre to post test. These results are logical given that the primary focus of treatment for the patients included in this study was physical therapy. On average, these patients spent a greater amount of treatment time participating in a physical therapy treatment regimen.

When comparing demographic/background variables to treatment outcome, several characteristics were found to be related. Older patients were less depressed, those patients with shorter duration of pain, patients who were unemployed, and patients involved in litigation reported more pain, older patients and those patients on worker's compensation were less physically capable, and women had greater difficulty with muscle relaxation. It appears

that men with a longer duration of pain who are employed and not on worker's compensation or involved in litigation would be the profile of a patient most likely to demonstrate improvement in multidisciplinary chronic pain treatment.

Conclusions and Discussion

Research Question 1

The first research question is "Are there significant differences in multidisciplinary treatment outcome measures among those chronic pain patients who are taking antidepressant medication and those who are not?" When the post test scores for the four treatment outcome measures were compared between those patients who were taking antidepressant medications and those patients who were not, there were no significant differences between these two groups. Post scores were similar on all four outcome measures for both groups. All post scores, however, did indicate improvement from pre test scores and all pre test scores were significantly different. It was determined from these results that the two groups (antidepressant and no antidepressant) were clearly distinct and different groups to begin with, therefore, comparing these two distinct and different groups to each other does not serve to demonstrate that one group has greater outcome of treatment than the other.

The fact that these two groups are clearly distinct from each other before treatment gives evidence to the fact that each group may have different needs in treatment. Those patients who were on antidepressant medications had higher scores on all treatment measures both before and after treatment indicating that as a group they were generally more depressed, reported more pain, and were more physically dysfunctional. They did demonstrate better scores on surface electromyography (sEMG) biofeedback, however, these scores were not significantly different from the no antidepressant group.

Research Question 2

The second research question is "Is there a significant difference among those patients with moderate to severe levels of reported depression and those with mild to moderate levels of reported depression with respect to treatment outcome measurements?" When comparing post scores on all four treatment outcome measures between those patients with mild to moderate depression and those patients with moderate to severe depression, it was determined that there was a significant difference between these two groups with respect to how they describe the quality of their pain. Those patients with greater depression also had greater abnormal pain complaints. This finding is in contrast to the

study conducted by Kerns and Haythornthwaite (1988) that found no significant difference in self reported pain between depressed and non-depressed chronic pain patients. Conversely, it supports the theory that depression and chronic pain are interrelated and that there is a close link between the state of depression and the experience of bodily pain as described by Blumer and Heilbronn (1982). This finding is also consistent with Turk's et al (1987) research in which they found that depressed patients reported greater pain intensity, greater interference due to pain, and more pain behavior.

There were no other significant differences found on post test measures between the mild to moderately depression and the moderate to severely depressed patients. Post scores on physical capability and muscle relaxation were similar. Again, it was noted that all pre test scores were significantly different to begin with which indicates a clear and distinct difference between these two groups before treatment. Those patients with greater depression had higher scores on most treatment measures both before and after treatment indicating that as a group they not only were more depressed but they also generally reported more pain and were more physically dysfunctional. Muscle

relaxation scores were initially better for those with greater depression, however, their scores did not improve following treatment.

Research Question 3

The third research question is "Is there a significant difference between those chronic pain patients with greater somatic-performance symptoms of depression and those patients with more cognitive-affective symptoms of depression on treatment outcome measures?" When the post test scores for the four treatment outcome measures were compared between those patients with greater somatic-performance symptoms of depression and those patients with greater cognitive-affective symptoms of depression, there were no significant differences between these two groups. All post test scores, however, did indicate improvement from pre test scores with one exception. Those patients with greater cognitive-affective symptoms of depression did not improve in their muscle relaxation skills. All pre test scores, however, were significantly different, again indicating that these two groups are distinct and different groups. Comparing these groups to each other does not clearly demonstrate that one group has better outcome of treatment than another. Those patients

with greater somatic-performance symptoms of depression reported more pain and demonstrated greater physical dysfunction.

These findings are congruent with Turk (1987) and his associates who believe that there is an unacceptably high rate of false positives among chronic pain patients with regards to the diagnosis of depression due to the complexity of somatic symptoms. The somatic symptoms, which include difficulties with work, sleep, fatigue, appetite, health concerns, irritability, and dissatisfaction with daily life could as likely result from chronic pain as they could from depression. Therefore, it stands to reason that those patients with greater somatic-performance symptoms of depression would also have greater dysfunction in the areas that are most reflective of chronic pain; self-reported pain and physical capability. In addition, those patients with greater somatic-performance symptoms of depression also had lower total Beck Depression Inventory (BDI) scores which lends weight to William's and Richardson's (1993) theory based on their study of assessing depression among chronic pain patients. Their theory states that the total BDI score may create an exaggerated impression of the cognitive and affective disturbance in patients with chronic pain due to the high number of somatic symptoms reported.

The findings from this study indicate that there indeed may be a false impression of depression given by those who experience somatic symptoms in association with their chronic pain. As a result, it may be necessary to implement multiple methods of assessment in order to accurately identify clinical depression as opposed to the depressed mood of another psychopathological state.

Research Question 4

The fourth research question is "Is there a significant difference between those chronic pain patients utilizing more sensory descriptions of pain and those patients utilizing more affective-evaluative descriptions of pain on treatment outcome measures?" When the post test scores for the four treatment outcome measures were compared between those patients who describe the quality of their pain utilizing more sensory descriptive adjectives and those patients who describe the quality of their pain utilizing more affective-evaluative descriptors, there were not significant differences between these two groups. Post test scores were similar on all four outcome measures, however, those patients with greater affective-evaluative scores had pre and post test scores that were consistently higher with the exception of scores for muscle relaxation

in which these scores were only slightly higher for the sensory pain group. These results indicate that the affective-evaluative group had greater overall dysfunction.

As in previous analyses between the other subgroups, the pre test scores in this subgroup (sensory group and affective-evaluative group) are significantly different. The significance of this difference in pre test scores provides evidence that these two groups are distinct and different groups to begin with. These results are consistent with the claims made by Melzack and Katz (1992) that the McGill Pain Questionnaire has discriminant validity. They found in their research that there are distinct differences between people with sensory dimensions of pain and those with affective-evaluative dimensions of pain. The analysis procedure used in this study to compare these two groups was not designed to compare two groups with such serious differences before treatment, therefore the non-significant results on post test measures is not an accurate reflection of between-group comparisons.

Research Question 5

When analyzing the difference between pre and post test scores within each subgroup, the amount of change that occurred for each patient during treatment was examined. Each subgroup will be addressed separately.

Antidepressant and No Antidepressant Group

Those patients who were taking antidepressant medication demonstrated significant differences between pre and post scores on all four treatment outcome measures, however, changes in BDI scores and Video Task Analysis (VTA) scores were greater than for those patients not taking antidepressant medication reflecting a greater improvement in both depression and physical capability. Those patients not taking antidepressant medication also demonstrated significant differences between pre and post scores, however, greater improvements were noted in this group on muscle relaxation skill. The differences between pre and post scores on the McGill Pain Questionnaire for both groups were similar indicating that antidepressant medication may not have an effect on the quality of pain experienced by the chronic pain patient.

Depressive Symptomatology Group

Those patients who reported greater cognitive symptoms of depression demonstrated significant improvement in both depression scores and physical capability scores whereas those patients who reported greater somatic-performance symptoms of depression demonstrated significant improvement in all four areas of treatment outcome reflecting a decrease in depression, reported pain, and physical dysfunction as well as an increased ability to engage in muscle relaxation. These results are consistent with Turk's et al (1987) theory that somatic-performance symptoms of depression experienced by chronic pain patients may very well be attributable to the psychopathology of chronic pain and not necessarily attributable to a clinical depression. Therefore, it would make sense that those patients with somatic-performance symptoms of depression due to chronic pain would show significant improvement in overall depression when other areas of chronic pain treatment improve.

Pain Reported Group

Those patients who describe the quality of their pain utilizing more affective-evaluative descriptors demonstrated significant improvements from pre

to post testing on all four measures of treatment outcome reflecting significant decreases in depression, reported pain, physical dysfunction, and muscle tension. These improvements were greater with respect to depression, reported pain, and physical capability than those changes that were demonstrated on pre and post testing by patients who describe the quality of their pain utilizing more sensory descriptors. These patients demonstrated significant improvements across all four treatment outcome measures as well, however, their scores reflected greater improvement in muscle relaxation skill. These results indicate that those patients who experience their pain more in terms of tension, fear, and autonomic properties that are part of the pain experience and who describe the subjective overall intensity of the pain experience on a range from annoying to excruciating, do benefit from multidisciplinary pain treatment more than those patients who describe a sensory dimension of pain experience. These patients experience their pain more in terms of temporal, spatial, pressure, thermal, and other properties. The findings in this study that demonstrate greater improvement among the sensory group of patients with regards to muscle relaxation make sense when given the fact that sEMG

biofeedback engages the patient in physical awareness and controlling unpleasant physical sensations such as rapid heart beat and muscle tension.

Depression Level Group

Those patients who scored below 10 on the Beck Depression Inventory (BDI) and were considered non-depressed, demonstrated significant differences between pre and post test scores for both physical capability and muscle relaxation. Differences between pre and post test scores for depression and reported pain were not significant, however, these scores were relatively low to begin with and remained low following treatment. The improvements noted in physical capability scores and muscle relaxation scores for these patients reflect the acquisition of skills involving physical control without the influence of depressed mood.

Those patients who were mild to moderately depressed showed significant improvements in their overall depression scores and physical capability scores reflecting decreased depression and decreased physical dysfunction. However, no significant improvement were noted in their reported level of pain or their ability to engage in muscle relaxation.

Those patients who were moderately to severely depressed showed significant improvements in all areas of treatment. Most notable was the improvement from pre to post depression scores. Post scores reflected an improvement from moderate to severely depressed down to mildly to moderately depressed. Reported pain, physical capability, and muscle relaxation scores all significantly improved as well.

Given the high prevalence of depression among chronic pain patients as indicated in the research literature (Hendler, 1982; Blumer & Heilbronn, 1982; Black, 1975; Fordyce, 1978; and Sternbach, 1978), the results of this study which indicate that multidisciplinary treatment decreases depression among chronic pain patients are impressive. By contrast, Doan and Wadden (1989) concluded from their study that depression may very well be a predictor of poor treatment outcome. The results from this study indicate that the more severely depressed patients make significant gain in treatment outcome across all four measures. This is consistent with the research of Kramlinger et al (1983) and Maruto et al (1989) who concluded that appropriate pain management serves as an antidepressant.

Research Question 6

The sixth research question is "Are there demographic and background variables that are significantly related to multidisciplinary chronic pain treatment outcome measures?" When multidisciplinary treatment outcome scores were examined using demographic and background variables of the subjects in a regression analysis in this study, some significant relationships were indicated.

On the Beck Depression Inventory, age was significantly related to these outcome scores in that older people were more likely to be less depressed and/or younger people were more likely to be more depressed (the ages in this study ranged from 18 to 78). This finding may be related to the fact that older people are more likely to have chronic pain stemming from a chronic illness such as arthritis or degenerative disease where the duration of pain is longer and the psychological adjustment period has been longer, they have had more time to adjust to having chronic pain. The younger patients typically have chronic pain stemming from an acute injury related either to a work-related accident or a motor vehicle accident in which there may be anger, blame, and/or guilt associated with the pain which would consequently affect mood.

On the McGill Pain Questionnaire, there were three variables that were significantly correlated with treatment outcome; litigation status, employment status, and duration of pain. Those patients who were either considering or were actively involved in a litigation process due to their injury were more likely to report greater pain levels. The issue of secondary gain is evident here in that those who have to prove a case of physical and mental disability, have to remain invested in maintaining a certain level of dysfunction in order to "win" their case and validate their pain. It is interesting to note, however, that this characteristic was not significantly related to post scores on the video task analysis which measures physical capability. Since the McGill Pain Questionnaire is a self-report measure of pain, it would seem that those patients in litigation report a greater dysfunction of pain than that which is objectively measured through the use of video. For example, a subject may describe their pain as "excruciating" yet be able to demonstrate appropriate body mechanics.

Those patients who were unemployed were also more likely to report greater pain levels. This finding may be related to the motivation level of the person who is unemployed and unable to maintain employment. The

secondary gain of remaining in pain in order to avoid employment may play a role.

The third variable that was significantly correlated with the McGill Pain Questionnaire was pain duration. Those patients who reported a longer duration of pain were more likely to report less pain. Pain duration ranged from 4 months to 25 years. Since pain duration was highly correlated with age, those patients with a longer duration of pain were generally older. As mentioned above, the older patients have had more time to adjust to the pain. Those patients with a longer duration of pain have most likely made gradual lifestyle changes in order to cope with the pain whereas those patients with a shorter duration of pain have not adjusted as well, have not made the necessary lifestyle changes, and may be dealing with the emotions of anger, blame, resentment and guilt stemming from an injury that may possibly have been prevented.

On the Video Task Analysis (VTA), worker compensation status was significantly correlated in that those patients who were receiving worker's compensation for a work-related injury demonstrated greater physical dysfunction on the video task analysis post test. Again, the issue of secondary

gain is considered. Those patients who are participating in multidisciplinary pain treatment for the purpose of returning to the work site where they were injured may have a stronger motivation to stay out of work where there is less responsibility, less stress, and less of a risk of re-injury. Age was also significantly correlated in that older people had lower physical capability on post score measures. Since the nature of this test is to assess physical function, it is reasonable that older people would not score as high as those who are younger.

On the surface electromyography (sEMG) scores, gender was the only variable that significantly correlated with muscle relaxation skill. Men were better able to relax their muscles than women. This is a surprising result given the nature of women as generally being more open to alternative methods of pain management. However, considering the possibility that women might become more actively involved in the process of relaxing due to their openness to this particular method of pain management, these results may be indicative of their efforts becoming self-defeating. In the process of relaxation, trying too hard can produce opposite effects. Whereas the men may not be generally as interested or invested in the process of relaxation and are more passive during

the process of relaxation which in turn would result in lower muscle tension levels.

Recommendations

The relationship between multidisciplinary chronic pain treatment outcome and various factors to include depression, antidepressant drug use, depressive symptomatology, and muscle relaxation has been explored by this research.

It is recommended to those health care professionals who work with chronic pain related issues that they thoroughly understand the complexities of this illness in order to provide effective treatment. Depression is so intricately interwoven with chronic pain that a complete and thorough assessment of depression must preclude treatment. The Beck Depression Inventory is a useful tool for determining the severity of depression, however, clinical interviews as well as other additional assessment tools may be necessary to accurately diagnose and differentiate between clinical depression and depression stemming from other psychopathology. It is recommended that in future studies examining depression among those who suffer from chronic pain, the researchers segregate groups according to depressive symptomatology to

determine who benefits more from chronic pain treatment. This type of research would also allow for a clearer distinction between depression types and how these different types of depression relate to chronic pain and chronic pain treatment.

The use of antidepressant medication should be a major consideration in planning treatment for chronic pain patients. Since depression and chronic pain are so closely related, it would be difficult to treat one without having an effect on the other when both coexist. Studies to determine who should be on antidepressant medication and who should not is recommended as well as what types of antidepressant medication are most effective. Determining the need for antidepressant medication as a treatment for chronic pain is a challenge faced by many treating physicians. Research is needed in the area of making this assessment and the effectiveness of using different assessment tools such as the Beck Depression Inventory, the clinical interview, and symptom checklists.

When making referrals to a multidisciplinary pain center, health care professionals should consider those patient characteristics that may prevent successful treatment outcome. It would be helpful to identify the secondary

gains experienced by the patient to provide some insight into the patients motivation toward treatment. Research into the effectiveness of using assessment tools designed for measuring motivation among chronic pain patients is recommended as well as analyzing the role of motivation in treatment and how it relates to treatment outcome.

The current literature is lacking in research on multidisciplinary treatment outcome studies for chronic pain. This study was an attempt to identify those factors that influence treatment outcome, however, there is a tremendous need to explore further those factors that determine successful outcome for chronic pain. Through the use of controlled studies with random assignment of patients, a more precise determination of successful outcome can be made. Therefore, a major recommendation as a result of this research is to conduct a study in which initial differences in groups are controlled and predictions for successful outcome are made.

There is also a need to determine the long term effects of chronic pain treatment. The time lapse between treatment and follow-up studies is important to consider when evaluating the impact of treatment and possible carry-over effects. A one year follow-up post intensive multidisciplinary chronic pain

treatment may be affected by the emotional effects of a "one year anniversary" of treatment . The patient may realize that a year has past and possibly some personal as well as medical goals have not been achieved. Having reached a one year mark, the patient is likely to re-evaluate those areas that continue to need improvement. Likewise, the patient may have progressed in some areas that otherwise may not be noticeable on a daily basis, but noticeable only when compared to the previous year. At a five year follow-up post treatment, the "anniversary" is less likely to have an impact and it is hoped that by this time the patient has returned to a relatively normal lifestyle with much less dysfunction as a result of pain. Intense follow-up studies at various intervals following treatment (i.e. one year and five years) is recommended.

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APPENDIX A

DATA COLLECTION FORM **SS#**_____

Gender M F **AGE** ____ **RACE** ____ **DX** _____

WC yes no **LIT** yes no **EMP** yes no **M D S W Sep**

Date of neuro exam _____ Antidepressants as of this date: mg:

_____ _____

_____ _____

_____ _____

Date of admission _____ Antidepressants as of this date: mg:

_____ _____

_____ _____

_____ _____

Qualify for antidepressant group? yes no

Duration of pain _____

Total # of tx days _____

	PRE	POST	F/UP
VTA SCORES			
BDI SCORES COG/AFF			
SOM/PER			
TOTAL			
MPQ SCORES SENSORY			
AFF/EVA			
TOTAL			
sEMG DATA			

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