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The Impact of Stress on Pain and Daily Living in Fibromyalgia

Meredith Brooke Wessner
Cleveland State University

THE IMPACT OF STRESS ON PAIN AND DAILY LIVING IN FIBROMYALGIA

MEREDITH BROOKE WESSNER

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This thesis has been approved

For the department of PSYCHOLOGY

And the College of Graduate Studies by

_____

Richard Rakos, PhD
Thesis Chairperson
Department of Psychology
Cleveland State University

_____

Judith Scheman, PhD
Neurological Center for Pain
Cleveland Clinic Foundation

_____

Michael Horvath, PhD
Department of Psychology
Cleveland State University

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Dr. Richard Rakos, PhD
Department of Psychology, Cleveland State University

Dr. Judith Scheman, PhD
Neurological Center for Pain, Cleveland Clinic Foundation

Dr. Michael Horvath, PhD
Department of Psychology, Cleveland State University

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MEREDITH WESSNER

ABSTRACT

Fibromyalgia (FM) is a condition that is characterized by widespread pain, which occurs in about 2% of the population, and impacts more women than men. This study sought to: 1) determine if stress, pain intensity, and the interference of pain in daily living predict if FM patients are likely to complete the pain rehabilitation program 2) Explore the interrelationship between stress, pain intensity, gender, and the interference of pain in daily living at admission and discharge. This study examined 142 FM patients admitted to the Cleveland Clinic Chronic Pain Rehabilitation Program (CPRP) from January 2007-August 2010 (84.5% female). Logistic regression results suggest the higher the FM patients stress score, the more likely they are to drop out of the pain rehabilitation program, and the higher the FM patients pain intensity the more likely they are to complete the pain rehabilitation program. The interference of pain in daily living was not a significant predictor. Structural Equation Modeling (SEM) results suggest there were no significant difference in gender in FM patients' scores on stress, pain intensity, and the interference of pain in daily living at admission or discharge. SEM Results also indicated stress has a moderately positive relationship to pain intensity, and the interference of pain in daily living at admission and discharge in FM patients. It appears while patients with FM can benefit from treatment in a comprehensive CPRP, FM patients with high levels of stress may benefit from additional stress reduction techniques to help control their levels of stress, pain intensity, and the interference of pain in daily living.

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CHAPTER I

REVIEW OF THE LITERATURE

Chronic pain can be a debilitating disorder, which can impact and severely impair every domain of one's daily life and functioning. According to The American Academy of Pain Management (2003), 57% of Americans report experiencing chronic pain; 62% reported being in pain for more than one year; and 40% stated they were constantly in pain. Giske, Bautz-Holter, Sandivk, and Roe (2009) noted up to 50% of the population experiences chronic pain when it is defined as "pain or discomfort in one or more sites for at least three months" (p. 780).

Chronic pain has become a leading cause for individuals to seek professional health care (Jacobson & Mariano, 2001). Chronic pain has been estimated to cost the United States over $100 billion annually in therapies, lost productivity, unemployment, medication, and other medical expenses (Burgoyne, 2007). A 1982 National Institute of Health publication stressed the severity of chronic pain by stating that "chronic pain is the third largest health problem in the world" (pg. 5). While chronic pain can be a serious health problem, it can also bestow an emotional and economic burden to the individual, their family, and society (Haythorthwaite & Benrud-Larson, 2001; Jones, Edwards, & Gifford, 2007).

In addition to physical pain, disabling chronic pain is often associated with an increase in the likelihood of developing psychological disorders, which can reinforce

disability, changes in mood, and increase the perception of pain (Niv & Devor, 1999). Specifically, disabling chronic pain is often co-morbid with mood disorders as well as sleep disorders (Haythornthwaite & Benrud-Larson, 2001; Niv & Devor 1999; Winfield, 2000). Research by Atkinson, Slater, Patterson, and Grant (1991) found at least one current psychiatric diagnosis is present in 59% of patients with chronic back pain in pain management facilities. Other studies found 33% of patients participating in pain management facilities experience anxiety disorders, and 40 to 60% have a depressive disorder (Banks, & Kerns, 1996; Korff, & Simon, 1996).

1.1 Chronic Pain Defined

The International Association for the Study of Pain (IASP) defines chronic pain as "an unpleasant, subjective sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Merskey & Bogduk, 1994, p.209). Chronic pain has been further defined traditionally as pain that persists beyond the expected time for healing.

Another method used to classify chronic pain is to distinguish whether it is noiceptive or neuropathic pain (Bajawa & Warfield, 2008). The term noiceptive indicates the pain is caused from damage to sensory receptors that respond to stimuli by sending nerve signals through the peripheral nervous system (PNS). Noiceptive pain is usually associated with tissue damage, and can be further subdivided into somatic and visceral pain. Somatic pain arises from tissue damage, and is localized but variable in experience. Visceral pain arises from the viscera and tends to be poorly localized, and experienced as a dull pain (Bajawa & Warfield, 2008).

Neuropathic pain, on the other hand, is caused by abnormal neural activity, and is secondary to disease or injury of the nervous system. This type of pain remains persistent without ongoing disease (Bajwa & Warfield, 2008). Neuropathic pain is subdivided into sympathetic pain, nonsympathetic pain, and central pain. Sympathetic pain is due to a lesion in a peripheral nerve leading to autonomic changes. This type of pain can lead to disorders such as complex regional pain syndrome (Martin & Saleeby, 2007). Nonsympathetic pain is due to damage to a peripheral nerve without any autonomic changes. Finally, central pain arises from damage to the central nervous system. This type of pain often results is disorders such as phantom limb pain (Martin & Saleeby, 2007).

1.2 Acute Pain Defined

Although chronic pain can be a lifelong disease, acute pain lasts for a relatively short period of time and occurs within close proximity to an injury. Acute pain is also often considered to be a protective mechanism for the body (Robinson, 2007). Turk and Okifuji (2001) define acute pain as being "elicited by the injury of the body tissue and activation of noiceptive transducers at the site of local tissue damage…The state of acute pain last for a relatively limited period of time and generally remits when the underlying pathology resolves" (p. 17).

Acute pain is transformed into chronic pain when pain does not subside in a reasonable amount of time. Many external factors are thought to play a part in the transition from acute to chronic pain. Some hypothesized factors that may lead to the transformation from acute to chronic pain include low socioeconomic status, environmental stressors, personality traits, secondary gain, poor coping styles, lack of

social support, poor quality of medical care, and psychological problems (Turk & Okifuji, 2002)

1.3 Chronic Pain and Disability

Pollard (1984) defines pain disability as "the extent to which chronic pain interferes with a person's ability to engage in various life activities" (p. 974). Thus, by definition, disability caused from pain severely limits one's ability to function in daily life activities. Chronic pain is suspected to be a leading cause of loss of productivity in the workplace. In fact, the American Pain Foundation (2006) found there was a 38% rise in chronic pain in the U.S. full-time workforce from 1996 to 2006. In addition, 46% of employees suffering in chronic pain reported their pain often affects their ability to perform their job.

Recent studies have found a significant correlation between self-rated disability and pain intensity. Results indicate that self-rated disability predicts pain intensity, but pain intensity does not predict self-rated level of pain disability (Campbell & Edwards, 2009). In addition, older populations tend to report a significant relationship between pain intensity and subjective pain disability. Interestingly, this relationship is much weaker in younger populations (Campbell, & Edwards, 2009). The lack of a clear relationship between subjective pain disability and pain intensity has led researchers to examine other variables that may mediate the relationship such as depression (Campbell, & Edwards, 2009), anxiety (Holzberg, 1996), stress, self-efficacy, catastrophizing, and family relationships (Keefe, 1999).

1.4 Family Impact

It is important to note that chronic pain does not affect only the individual experiencing pain. Chronic pain also impacts the individual's family emotionally and financially. Family, in this context, does not only include blood relatives, but any individual who provides emotional and material support. Families' responses and actions toward the individual in chronic pain can significantly affect symptomology (Nickel, Tripp, Chuai, et al 2008). Thieme, Rose, Pinkpant, Spies, and Turk (2006) note that anxious responses by family members are positively associated with higher ratings of pain severity, greater disability, and decreased activity level by the pain patient.

Baanders and Heijmans (2007) summarize what family members often experience: frustration, anger, guilt, loss of autonomy, anxiety, fear, financial burdens, insecurity, depression, and impaired quality of life. Families of the individuals also often report feeling controlled by the individual in pain (Burridge, Williams, Yates, Harris, & Ward, 2007). Feelings of resentment and lack of appreciation may also arise from family members who feel obligated to support the individual in pain, while receiving little in return (Nickel et al., 2008).

It is important to note that secondary gain can also be a component of any disease, and may contribute to a family member's reactions to the individual in pain. Examples of secondary gain present in individuals in pain may include, but are not limited to, missing work, gaining sympathy, and/or avoiding responsibilities around the house. Although secondary gain may not be recognized or intentional, such secondary gains may impact those around them such as family members.

Coping strategies and personality traits also appear to have an important role in how families interact and respond to the individual in pain (Baanders, & Heijmans, 2007). Individuals with families who tend to cope by way of denial and repression appear to have a worse prognosis than families who do not exhibit such coping strategies (Baanders & Heijmans, 2007). Additionally, individuals with families that display a high rate of empathy are found to have a higher rate of stress-related illnesses such as ulcers and headaches (Baanders & Heijmans, 2007).

1.5 Fibromyalgia Defined

As previously noted, chronic pain can result in a decreased quality of life for the individual as well as his or her family. In some cases, it can also result in a decreased life span. Individuals with chronic pain who view their pain as incurable and unmanageable have a higher rate of suicide than those who believe it can be reduced or controlled (Giamberardiba, 2008). Fibromyalgia, a condition characterized by widespread pain, has been found to induce symptoms of depression, anxiety, and stress in individuals.

The American College of Rheumatology (1990) has defined fibromyalgia as "a chronic pain condition in which individuals experience pain for a least 3 months in all four body quadrants, along with excess tenderness to manual palpation of at least 11 of 18 muscle-tendon sites and lack tissue abnormalities" (Schweinhardt, Sauro, & Bushnell, 2008). A new diagnostic criterion has been approved by The American College of Rheumatology (2010) to supplement their 1990 definition. This criterion utilizes two specialized scales to help identify cognitive problems and tender points in order to form a more comprehensive diagnosis (Wolfe, et al., 2010). Fibromyalgia is also part of a family of related disorders known as affective spectrum disorder (ASD). ASD

encompasses a number of psychiatric and medical disorders in addition to fibromyalgia, such as general anxiety disorder, major depressive disorder, obsessive-compulsive disorder, posttraumatic stress disorder, irritable bowel syndrome, migraines, and social phobias (Bradley, 2009). Many of these disorders are co-morbid with fibromyalgia patients. Fibromyalgia patients are also suspected be at an increased risk for psychological disorders due to the fact that few treatment long-term treatment options are available to reduce the widespread pain the condition produces (Clauw, 2009).

Since the quest for relief often remains elusive, many patients with fibromyalgia feel helpless, hopeless, demoralized, and depressed (Turk, Audette, Levy, Mackey, & Stanos, 2010). A study by Verbunt, Pernot, and Smeets (2008) noted the impact of fibromyalgia on quality of life was considerable, due to patients' high level of psychological distress. Additionally, it has been hypothesized that levels of distress observed in fibromyalgia patients ultimately influence self-reported pain levels (Giske, Bautz-Holter, Sandivk, & Roe, 2009). A study by Hasset, Cone, Patella, and Sigal (2000) found almost 44% of fibromyalgia patients were moderately to severely depressed, and 34% reported having suicidal ideation within two weeks prior to assessment. In addition, more than 76% stated stress exacerbated their pain.

A comparison of fibromyalgia patients to healthy control subjects, in which both groups were exposed to painful and non-painful stimuli, demonstrated that fibromyalgia patients reported higher levels of pain intensity than controls (Thieme, et al., 2006). Fibromyalgia patients have also been found to use more medication and outpatient services than other chronic pain patients. Not surprisingly, patients with fibromyalgia

spend twice as much money in health care services than does the average health care user (Schweinhardt, et al., 2008).

1.6 Etiology of Symptoms in Fibromyalgia

Despite extensive research, no definitive pathology of fibromyalgia has been identified. Recent studies have suggested that fibromyalgia pain is related to deregulated pain modulation, which results in sensitization of the central nervous system pain pathways (Staud & Spaeth, 2008). This results in a lower pain threshold, and sensory abnormalities to pain.

Early life environmental stressors also appear to play a prominent role in the development of fibromyalgia. Many patients with fibromyalgia report having experienced physical abuse, sexual abuse, hepatitis C, and other pain conditions in childhood (Mclean & Clauw, 2005). For example, Van Houdenhove and Luten (2006), among others, now hypothesize that chronic exposure to physical or psychosocial stressors, along with depression, may contribute to a deregulation of the autonomic nervous system, neuro-endocrine system, immune system, and central pain mechanisms in fibromyalgia patients.

Research has also found a genetic link to fibromyalgia, in which family members of patients are at a significantly higher risk of developing fibromyalgia. A study by Glazer, Cohen, Buskila, Ebstein, Glotser, and Neumann (2009) found that fibromyalgia patients and relatives with fibromyalgia expressed similar symptoms of psychological distress when compared to a healthy control group. A Swedish study of twins reared together reported genetic factors accounted for 50% of the total variance in chronic widespread pain (Schweinhardt, et al., 2008).

Several investigators also believe abnormal biological processes may contribute to the development of fibromyalgia. Neuro-imaging has revealed structural differences between the brains of fibromyalgia patients and those of healthy individuals. Specifically, compared to healthy controls, fibromyalgia patients show more activity in response to pressure, have hyperfusion in various brain regions, and have decreased gray matter density in the thalamus (Schweinhardt, et al 2008). Fibromyalgia patients have also been found to have low levels of cortisol, which may be the cause of heightened sensitivity to pain, resulting in sensitization to touch, heat, cold, chemicals, light, sound, and smell (Staud & Spaeth, 2008; Thieme, et al 2006).

In addition to sensory abnormalities, evidence suggests that fibromyalgia also involves abnormal levels of serotonin and norepinephrine, which are neurotransmitters engodenous to pain inhibitory pathways. Compared to healthy controls, fibromyalgia patients have lower levels of serotonin, norepinephrine, and dopamine, which may contribute to their higher levels of depression and pain (Bradley, 2009). Several studies have also shown that fibromyaglia patients have three times higher concentration of Substance P than normal controls. Substance P is a biological marker for chronic pain, and is associated with the inflammatory and pain processes (Mclean & Clauw, 2005). It should be noted that the directionality of all of these studies remains unknown.

Although little is known about the origin of the biological abnormalities and environmental stressors, studies have found several remedies to alleviate some of the pain experienced in fibromyalgia patients. Several studies have found central sensitization can be ameliorated by cognitive-behavioral therapy, sleep improvement, *N*-methyl *D*-aspartate (NMDA) receptor agonists, and anti-seizure medication (Staud & Spaeth,

2008). However, such treatments do not work in all individuals. It has not yet been confirmed as to why such treatments work for some patients and not others.

1.7 Gender and Fibromyalgia

Interestingly, fibromyalgia patients are overwhelmingly female. Approximately 80-90% of fibromyalgia patients are women (Buskilia, Neumann, Alhoashle, & Abu-Shakra 2000). Compared to men, women with fibromyaglia report more pain, in more bodily areas, for a longer duration (Keogh, McCracken, & Eccleston 2004). Although women report more pain, men with fibromyaglia report more severe symptoms, greater decreased physical functioning, and a lower quality of life than women (Buskilia, et al., 2000).

Gender also appears to play a role in predicting outcomes following a multidisciplinary pain management program. Keogh, et al., (2004) found women reported more pain before treatment than men, but reported less pain two years following treatment. However, women were found to report greater life interference due to pain than men (Hooten, Cynthiam, Townsend, & Decker, 2007).

Although it is clear there are distinct gender differences in fibromyalgia patients, little is known of its etiology. Some claim gender differences in fibromyalgia patients are related to variations in coping strategies and emotional responses. Other researchers suspect men are more adversely affected by fibromyalgia, because many are unemployed and thus unable to fulfill society's traditional male role of being the primary financial provider (Buskilia, et al., 2000). Men also tend to hold more manual jobs involving heavy lifting, repetitive motions, and squatting, which may contribute to more severe widespread pain.

1.8 Stress Defined

Stress comes in many forms and affects people of all ages. Many Americans have an overabundance of stress, which has resulted in stress being viewed as a negative experience. However, from a biological point of view, stress can be experienced as neutral, negative, or positive (Suldo, Shaunessy, Thalji, Michalowski, & Shaffer, 2009).

Stress is related to both internal and external factors. Some external factors include the physical environment such as jobs, family, housing, and money. Internal factors determine how an individuals' body is able to respond and deal with any external stress-inducing factors. Internal factors that influence ones response to stress include: nutritional status, overall health, emotional well-being, and sleep (Kimball, 1982). The experience of stress is highly subjective. What constitutes extreme stress for one individual may not be perceived extreme stress by another. Certain factors appear to predict how an individual copes with the effects of stress. Individuals with social support report less stress and have better overall mental health than those without social support (Laurence, Williams, & Eiland, 2009). In addition, those who are poorly nourished, get poor quality of sleep, and are physically sick have been shown to have a reduced ability to handle pressures and stressors of daily living (Meerlo, Sgoifo, & Suchecki, 2008).

There is now evidence that points to abnormal stress responses as contributing to various diseases and conditions. These include: anxiety disorders, depression, high blood pressure, cardiovascular disease, certain gastrointestinal diseases, and even aging (Kamarck, Schwartz, Shiffman, Muldoon, Sutton-Tyrrell, & Janicki, 2005). Negative stress is also suspected to increase the frequency and severity of migraine headaches, episodes of asthma, and fluctuations of blood sugar in diabetics (Björling, 2009).

Overwhelming psychological stress may cause both acute and chronic symptoms of a serious psychiatric illness.

Skinner, Zautra, and Reich (2004) elaborated on the differences between chronic and acute stress. They defined chronic stress as "continuous strains without resolve that occur within our lives, such as low socioeconomic status" (pg. 215). They defined acute stress as, "daily minor events that arise in everyday life, such as having an unexpected expense" (pg. 215). For the purpose of this paper, Stress is defined as "Any difficulty in relaxing, nervous arousal, being easily upset or agitated, easily irritable, overactive, or impatient" (pg. 335) (Lovibond & Lovibond, 1995). This definition of stress comes from the Depression, Anxiety, and Stress scale, which are utilized to measure stress in this study.

1.9 Role of Stress in Chronic Pain and Fibromyalgia

Although the etiology and gender differences observed in fibromyalgia patients are not fully understood, environmental triggers have been identified. Though stress is an unavoidable component of everyday life, ineffective adaptation to life stressors may lead to a vicious cycle of disability and illness. Many fibromyalgia patients are confronted with a variety of stressors related to emotional trauma, physical injury, financial issues, and sexual abuse. Fibromyalgia patients have been shown to often respond inappropriately to stress, causing their symptoms to worsen (Van Houdenhove & Egle, 2004). It is important to note that living with a disorder, such as fibromyalgia, may also serves as an ongoing stressor.

Many fibromyalgia patients report physical and/or emotional stressors present in their life before the onset of chronic widespread pain. Physical stressors in the workplace

along with fluctuations in financial stress have been shown to be associated with greater health complaints and negative affect in fibromyalgia patients (Bradley, 2009). Other stress factors associated with widespread pain involve manual work, monotonous work, dissatisfaction with social support, and working in hot conditions (Bradley, 2009).

It is clear stress plays a role in fibromyalgia; however its impact on the disorder is not clearly understood. Some claim physical and emotional stress lead to the disorder, while others assert the disorder disrupts ones ability to handle stress. One study noted 65% of fibromyalgia patients' perceived stress as an aggravating factor to their disorder (Okifuji & Turk, 2002). A study by Schweinhardt, et al., (2008) concluded,

> "Fibromyalgia may not be a primary disorder of the brain, but a consequence of early life stress or prolonged severe stress, which in turn affects brain modulatory circuitry of pain and emotions in genetically susceptible individuals" (pg. 418).

Support for the hypothesis that fibromyalgia is a stress induced disorder has been noted in a variety of studies. Schweinhardt, et al. (2008) found there are similar central nervous system abnormalities and a comorbidity of fibromyalgia with stress-related disorders, such as chronic fatigue, posttraumatic stress disorder, irritable bowel syndrome, and depression. Daily, Bishop, Russell, and Fletcher (1990) found individuals with fibromyalgia are particularly vulnerable to the negative effects of social stress and daily hassles. Specifically, women with fibromyalgia reported higher levels of stress, poorer emotional and physical health, lower positive affect, a poorer quality of social milieu, and more frequent use of avoidant coping strategies to deal with pain, than did women with chronic osteoarthritis or healthy controls.

Stress may also play a role in the perceived severity of pain associated with fibromyalgia. A study by Davis, Zautra, and Reich (2001) examined the effects of mood and exposure to stress on pain in women with fibromyalgia and osteoarthritis of the knee. Patients were randomly assigned to a negative mood-inducing group or a neutral mood-inducing group. Results indicated that patients from either group placed into the neutral mood induction group did not alter their pain ratings. However, women with fibromyalgia who were placed in the negative mood induction group reported significantly greater pain compared to the osteoarthritis patients (Davis, et al., 2001). In addition, patients with fibromyalgia were particularly vulnerable to the negative effects of social stress, used less effective pain-coping strategies, and experienced more prolonged stress-related increases in pain than did osteoarthritis patients. Many researchers now affirm that these findings suggest negative moods and stress enhance pain intensity in women with fibromyalgia and may alter their sensory perceptions of pain (Van Houdenhove, Egle, & Luyten, 2007).

1.10 Purpose of Study

It is apparent that psychosocial stress is one of many risk factors for developing fibromyalgia. However, the relationship and extent to which stress impacts fibromyalgia patient's pain levels and daily life is still poorly understood. The main purpose of this study was to investigate the relationship of self-reported stress levels on pain severity, and the interference of pain in different areas of daily living in fibromyaglia patients treated at the CC-CPRC. Gender was also investigated to determine its role in the subjective experience of stress and pain. Finally, an analysis of the drop out rate in fibromyalgia patients was conducted to determine if level of stress, pain, and interference

of pain in daily living predicts if fibromyalgia patients will drop out or complete the pain management program at the CC-CPRC.

This study was unique in several factors. First, this study was longitudinal in nature and contained data on fibromyalgia patients participating in an inter-disciplinary chronic pain rehabilitation program. Secondly, multiple variables including pain, stress, gender, and the interference of pain in daily living in fibromyalgia patients were examined simultaneously, eliminating potential compounded error in the measure. Finally, pre and post treatment measures were utilized in the study to determine if the relationship between stress, pain, gender, and interference of pain in daily living changes from admission to discharge in fibromyalgia patients.

The study described here utilized archival data collected from the patient database of CC-CPRP in Cleveland, OH. The CC-CPRP has maintained a database with a wide variety of data on its patients since 1999. This study utilized statistical methods, described below, to examine fibromyalgia patients in the 2007 to 2010 databases, while controlling for confounding variables.

Based on the literature review discussed above, along with anecdotal evidence, it is predicted that fibromyalgia patients with higher stress scores will report their pain intensity as more severe than patients reporting lower stress scores. It is also expected that fibromyalgia patients with high stress scores will report their pain to have a significantly higher interference in their daily living compared to patients with lower stress scores. These predictions are attributed to the studies discussed above which concluded that some fibromyalgia patients are sensitive to stress and perceive stress to make their level of pain increase.

Based on research conducted previously, women are expected to report higher stress and pain scores than men. Finally, it is predicted that individuals with high levels of stress, pain, and interference of pain in daily living will be more likely to drop out of the pain management program than individuals with lower levels of stress, pain, and interference of pain in daily living. Other variables, not included in this study, may play a role in whether or not fibromyalgia patients complete or drop out of pain management program. An analysis of the prediction of stress, pain, and interference of pain in daily living on drop out rates was necessary in order to determine if discontinuation from the pain management program was a potential confounding variable.

CHAPTER II

METHODS

2.1 Participants

The population contained in the database consists of all patients (N=211) seen in the clinic from January 2007 to August 2010 who were diagnosed with fibromyaglia. This population of fibromyalgia patients is distinct in that many participating in the pain rehabilitation program at the Cleveland Clinic is a last resort after trying a variety of alternative methods to deal with or alleviate their pain without success. Therefore the fibromyalgia patients in this study likely represent those with a more severe form of the disorder.

The CC-CPRP database contains information regarding patients' mood, daily functioning, pain intensity, cognitive functioning, demographic variables, and diagnoses. As the CC-CPRP database is extensive and contains data on all patients from admission, discharge, six-months, and one year, no additional data collection was necessary. The average duration of treatment was three to four weeks.

The data culled from the database for the purposes of this study include: demographic information, stress levels, pain intensity, and daily functioning at admission and discharge. After participants with missing data were removed, 142 or 67% of participants remained, of which 85% (N= 120) were female. The large gender difference reflects previous research concluding that fibromyalgia affects more women than men

(Buskilia, Neumann, Alhoashle, & Abu-Shakra, 2000). One participant was removed due to insufficient data in order to run the structural equation modeling (SEM) discussed below. Therefore 141 participants were included in the SEM analyses. The deletion of this participant did not alter the demographic data in this study.

Descriptive statistics revealed that 93% of participants completed the pain management program. The average age of participants in this study was 45 years old. Of the participants in this study, 65 % were married or cohabitating, 21 % were single, and 14 % were divorced or separated. Educational levels varied. 21 % had a high school degree or less, 42 % had some college or an associate's degree, 18 % had a bachelor's degree, and 11 % had a postgraduate degree (e.g. Masters, PhD, MD). In terms of ethnicity, 81% of the participants were White/Caucasian and 19% were classified as a minority. A detailed display of correlations among the variables used in this study can be found in Table 7.

2.2 Measures

Patients voluntarily completed assessments upon admission and discharge to determine their mood, functioning, intelligence, and diagnoses. Clinical staff included Physicians, Psychologists, Fellows, Nurses, and Graduate trainees who collected the information. All procedures conducted in this study were approved by the IRB at the Cleveland Clinic and Cleveland State University (*Appendix A and B*). All data are kept on secure computers at the clinic. Three measures were used in this study: the Depression Anxiety and Stress Scale (*Appendix C*), the Pain Disability Index (*Appendix D*), and patients' self-reported pain intensity (*Appendix E*).

The Depression, Anxiety, and Stress Scale (DASS) developed by Lovibond and Lovibond (1995) is a well-researched and widely accepted self-report clinical assessment, which has been found to be a reliable and valid measure of the constructs it was intended to assess (Anthony, Bielnig, Cox, Enns, & Swinson, 1998; Crawford, & Henry, 2003; Scheman, Janotta, Bena, & Covington, 2007). The DASS is comprised of 42 items, which yields three 14-item subscales that measure levels of depression, anxiety, and stress (Page, Hooke, & Morrison, 2007; Scheman, et al., 2007).

The DASS has been tested in clinical and non-clinical samples. All studies have found good internal consistency with alphas ranging from .84-.97 (Anthony, et al., 1998; Crawford, & Henry, 2003). The DASS is also highly correlated with the Beck Depression Inventory in chronic pain samples (r=. 81) and in non-clinical samples (r= .74) (Anthony et al., 1998; Lovibond, & Lovibond, 1995; Scheman et al., 1998).

For the purposes of this study, the Stress subscale was the only one utilized. The stress subscale scores have a range from 0-36. Stress scores between 0-8 fall in the normal range, 8-13 in the mild range, 13-21 in the moderate range, 21-31 in the severe range, and 31-36 in the extremely severe range. The stress scale is sensitive to levels of chronic non-specific arousal. It assesses difficulty in relaxing, nervous arousal, irritability, over-reacting, and being easily upset or agitated (Lovibond & Lovibond, 1995). Patients completed the DASS upon admission, discharge, six months after discharge, and one year after discharge, but this study only examined admission and discharge DASS scores.

The PDI is a brief 7-item self-report measure that assesses how pain interferes with different areas of daily living. The PDI has been found to have good construct

validity, modest test-retest reliability, and a high degree of internal consistency (Chibnall, & Tait, 1994; Tait, Chibnall, & Krause, 1990). A study by Pollard (1984) found the PDI could discriminate between nine highly disabled and nine minimally disabled patients with chronic low-back pain. These data suggest that the PDI is a valid and reliable measure of how pain interferes with daily living.

Each of the seven domains of the PDI is rated on a scale ranging from 0 (no disability by pain) to 10 (complete disability by pain) with total scores ranging from 0-70. Each domain consists of one question assessing each of the following: family/home responsibility, recreation, social activity, occupation, sexual behavior, self-care, and life support activity (Tait, Pollard, Margolis, Duckro, & Krause, 1987). Patients completed the PDI upon admission, discharge, six-months after discharge, and one-year after discharge from the program. For the purpose of this study, only admission and discharge PDI scores were used.

Pain intensity was measured using a 1- 10 Likert scale. Patients rated their pain on a scale from 0-10, with 0 being no pain, and 10 being extreme pain and discomfort. This measure has been shown to be effective in determining levels of pain over time (Farrar, Polomano, Berlin, & Strom, 2010). Patients indicated their pain intensity on a daily basis for clinical purposes through only admission and discharge pain intensity scores were utilized in the data analyses.

2.3 Data Analysis

All data analyses were conducted at the CC-CPRP or Cleveland State University. The design utilized in this study was retrospective and used archival data. A Principal Component Analysis was conducted in order to determine the number of factors

contained in the Pain Disability Index at admission and discharge from the pain management program. A test of internal consistency reliability was conducted in order to determine if the Pain Disability Index was a reliable measure at admission and discharge from the pain management program. In addition, between-subjects one-way Analyses of Variance (ANOVA) were conducted to determine if demographic variables were potential covariates.

The relationships between stress, gender, pain intensity, and the interference of pain in daily living at admission and discharge were analyzed using Structural Equation Modeling (SEM). Structural Equation Modeling is a well-established and efficient method for evaluating the dependence relationship among multiple variables simultaneously. It also allows one to correct for unreliability in the measurement of the construct by taking into account the amount of error in each measure (Hair, Black, Babin, & Anderson, 2010). In doing so, SEM examined the interrelationship of stress, gender, pain intensity, and interference of pain in daily living by creating a series of equations, similar to a series of multiple regression equations, but with less compounded error in each measure.

SEM depicts dependence relationships and thus cannot establish causality. However, SEM can treat dependence relationships as causal predictions if evidence of significant nonspurious covariation, temporal sequencing of events from longitudinal data, and theoretical evidence are present (Hair et al., 2010). This study evaluated all of these variables to determine if a hypothesized causal predictive relationship could be made.

Logistic regression was used to determine if stress, pain, and the interference of pain in daily living predict whether fibromyalgia patients will drop out or complete the pain management program at the CC-CPRC. Logistic regression is a well established and efficient method of examining the relationship between one categorical dependent variable (drop out or complete the program) and multiple predictor variables such as stress, pain, pain in daily living (Hair et al., 2010).

Logistic regression is preferred over similar statistical techniques in that it is more robust to the violation of statistical assumptions such as normality and equal variance-covariance matrices across groups (Hair, et al., 2010). Logistic regression is also beneficial in that it can create an equation to predict the probability of completing or dropping out of the pain management program in future fibromyalgia patients at the CC-CPRC.

CHAPTER III

RESULTS

3.1 Factor Analysis

Due to the detailed information on the Pain Disability Index (PDI) available in the database, a factor analysis was conducted to determine how many factors the PDI is comprised of. Factors were retained that accounted for at least 15% more variance than the previous factor with larger variance. Two factors were originally obtained, however the second factor did not increase the variance by at least 15%. Therefore, a single factor was requested to be extracted.

As shown in Table 1, The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) for the admission scores on the Pain Disability Index is high (.794), and the Barlett's Test of Sphericity is significant. A Principal Component Analysis with a Promax rotation identified one factor, accounting for 54.14% of the total variance. This single factor describes the interference of pain in daily living.

Previous studies, which used eigenvalues to determine the number of factors retained, found the PDI to be comprised of two factors. The first factor (59.3% of variance) appeared to assess less obligatory activities. The second factor (14.3% of variance) seemed to assess activities related to daily living and survival (Tait, et. al., 1987).

As shown in Table 2, The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) for the discharge scores on the Pain Disability Index is also high (.880), and the Barlett's Test of Sphericity is significant. A Principal Component Analysis with a Promax rotation identified one factor, accounting for 62.927% of the total variance. This single factor describes the interference of pain in daily living. The identification of a single factor for the Pain Disability Index at admission and discharge indicates the Pain Disability Index is comprised of a single factor, which addresses the interference of pain in daily living.

3.2 Internal Consistency Reliability

As shown in Table 3 and 4, the internal consistency reliability is high. Cronbach's alpha was .748 for admission Pain Disability Index scores and .784 for discharge Pain Disability Index scores. This indicates the Pain Disability Index utilized in this study is reliable measure.

3.3Analyses of Variance (ANOVA) and Correlations

A series of one-way ANOVA's was conducted between demographic variables (gender, education, ethnicity, and marital status) and participant's scores on stress, pain intensity, and the PDI at admission and discharge. A correlation was conducted between age and participants scores on stress, pain intensity, and the PDI at admission and discharge. These analyses were conducted in order to determine if any demographic variables were potential covariates or confounding variables.

As shown in Table 5, there were no statistically significant differences between gender and participants' admission scores on pain intensity (F (1, 140) = .034, p = .854), PDI (F (1, 140) = .006, p = .937), and the stress portion of the DASS (F (1, 140) = 1.657,

p = .200). In addition, there were no statistically significant differences between gender and participants discharge scores on pain intensity (F (1, 140) = .000, p = .987), PDI (F (1, 140) = 2.201, p = .140), and the stress portion of the DASS (F (1, 140) = 2.689, p = .103).

As shown in Table 6, there were no statistically significant differences between marital status and participants' admission scores on pain intensity (F (2, 139) = 2.663, p = .073), PDI (F (2, 139) = .707, p = .495), and the stress portion of the DASS (F (2, 139) = .121, p = .883). In addition, there were no statistically significant differences between marital status and participants discharge scores on pain intensity (F (2, 139) = 2.016, p = .137), and PDI (F (2, 139) = .137, p =.872).

There was a significant difference in marital status on discharge stress scores at the $p < .05$ level [F (2, 139) = 3.294, p = .040]. The Levene's Test of homogeneity was violated. Therefore the Welch and Brown-Forsythe Robust Tests of Equality of Means were used to determine if this ANOVA could be interpreted further. Both tests were at or above the .05 level of significance, indicating the ANOVA could be interpreted. Post hoc comparisons using the Tukey HSD test indicated that the mean score for discharge stress scores for participants who were single (M=12.8) were significantly greater than participants who were married (M=8.0, p= .032).

As shown in Table 7, there were no statistically significant differences between ethnicity and participants admission scores on pain intensity (F (1, 140) = .490, p = .485), PDI (F (1, 140) = .061, p = .805), and the stress portion of the DASS (F (1, 140) = 2.738, p = .100). In addition, there were no statistically significant differences between ethnicity and participants discharge scores on pain intensity (F (1, 140) = 2.189, p = .141).

There was a significant difference in ethnicity on discharge stress scores at the $p < .05$ level [$F (1, 140) = 5.170$, $p = .025$]. The Levene's Test of homogeneity was violated. Therefore the Welch and Brown-Forsythe Robust Tests of Equality of Means were used to determine if this ANOVA could be interpreted further. Both tests were above the .05 level of significance, indicating the ANOVA could be interpreted. Post hoc comparisons using the Tukey HSD test indicated that the mean score for discharge stress scores for participants classified as a minority (M=12.6) were significantly greater than those who were not classified as a minority (M= 8.4). There was also a significant difference in ethnicity on discharge PDI scores at the $p < .05$ level [$F (1, 140) = 8.459$, $p = .004$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for discharge PDI scores in participants' classified as a minority (M= 23.5) were significantly greater and those who were not a minority (M= 16.3).

As shown in Table 8, there were no statistically significant differences between education and participant's admission scores on the PDI (F (4, 137) = 1.294, p = .805). In addition, there were no statistically significant differences between education and participants discharge scores on pain intensity (F (4, 137) = 1.264, p = .287), PDI (F (4, 137) = .092, p = .985), and the stress portion of the DASS (F (4, 137) = .667, p = .616).

There was a significant difference in education on admission pain intensity at the $p < .05$ level [$F (4, 137) = 3.232$, $p = .014$]. The Levene's Test of homogeneity was violated. Therefore the Welch and Brown-Forsythe Robust Tests of Equality of Means were used to determine if this ANOVA could be interpreted further. The Welch test was above the .05 level of significance, indicating the ANOVA could be interpreted. Post hoc comparisons using the Tukey HSD test indicated that the mean score for admission pain

intensity scores for participants' who had a college/an associate's degree (M=6.9) were significantly greater than those with a post graduate degree (M= 5.6, p= .046,). Participants' admission pain intensity scores for those with a bachelor's degree (M= 7.4) were significantly greater than those with a post-graduate degree (M= 5.6, p= .011). Participants' admission pain intensity scores for those with a high school degree (or less) (M= 7.3) were significantly greater than those with a post graduate degree (M= 5.6, p= .014).

There was also a significant difference in education on admission stress portion of the DASS at the p< .05 level [F (2, 139) = 2.8, p = .028]. The Levene's Test of homogeneity was violated. Therefore the Welch and Brown-Forsythe Robust Tests of Equality of Means were used to determine if this ANOVA could be interpreted. The Welch Test was below the .05 level (P=. 005), and the Brown-Forsythe test was at the .05 level (p=. 046). Due to conflicting results, this ANOVA should be interpreted with caution. Post hoc comparisons using the Tukey HSD test indicated that the mean score for admission stress scores in participants with a high school degree (or less) (M= 27.0) was significantly greater those with some college/ an associate's degree (M=19.5, p= .026).

As shown in Table 9, there were no statistically significant correlations at the .05 level between age and participants admission and discharge scores on pain intensity ($r(140) = -.018$, $r(140) = -.067$), PDI ($r(140) = -.142$, $r(140) = .154$), and the stress portion of the DASS ($r(140) = -.076$, $r(140) = -.156$). Therefore age was not a covariate or a confounding variable.

Although covariates were found, none were determined to be confounding variables, because they were not related the predictors utilized in this study. Therefore, for the purposes of this study these covariates were not examined further.

3.4 Chi-Square and Correlations

A series of Chi Square tests was conducted between demographic variables (gender, education, ethnicity, and marital status) and completion rates of participants in the pain rehabilitation program. A correlation was conducted between age and completion rates of participants in the pain rehabilitation program. These analyses were conducted in order to determine if any demographic variables were potential covariates in the logistic regression analyses.

As shown in Table 10-14, there were no statistically significant differences between completion of the pain rehabilitation program and education (χ^2 (4, N = 142) = 1.839, p = .765), gender (χ^2 (1, N = 142) = 0.257, p = . 612), ethnicity (χ^2 (1, N = 142) = 3.023, p = .080), and martial status (χ^2 (2, N = 142) = 0.172, p = .918) at the .05 level. As shown in Table 9 F, a correlation between and participants' age and completion rates in the pain management program (p= .650) was not significant at the .05 level. Therefore no covariates were included in the logistic regression analyses.

3.5 Logistic Regression

The entry method of logistic regression was conducted to test if participants' scores on admission DASS stress, pain intensity, and the PDI could be used in order to predict if patients will complete or drop out of the pain management program. As shown in Table 15, the Omnibus Test of Model Coefficients, which provides the Chi Square Tests, was significant at the .05 level (p= .017). This indicates that the independent

variables improved the predictive power of the null model. In addition, the Hosmer-Lemeshow test was significant above the .05 level (p= .201), which shows the significance of the developed logistic regression models. Therefore, admission scores on DASS stress, pain intensity, and the PDI were related to drop out/completion rates of patients in the pain rehabilitation program.

The model results shown in Table 15 indicate that at 95% confidence level, the null model correctly predicted completion of the pain management program 93% of the time. The null model did not correctly predict if participants would drop out of the pain rehabilitation program. The final logistic regression model did not improve upon the null model, as it also correctly predicted participants would complete the pain rehabilitation program 93% of the time.

Admission scores on stress was the only significant variable in the logistic regression model (p= .017). Results indicate stress has a negative relationship with completion of the pain management program (B=-.100; Exp (B) = .905)The Cox and Snell r-squared was .069, and the Nagelkerke r-squared was .174. These measures indicate the predictive strength in significant variables found. Collectively, they indicate that stress slightly improves the predictability of whether or not fibromyalgia patients complete or drop out the pain program.

Results indicate that for every for every one-unit increase in participants' stress scores, there is a -.10 decrease in logits of completing/dropping out of the pain rehabilitation program, holding all other independent variables constant. In another words, the higher a fibromyalgia patient's stress scores, the more likely he/she is to drop out of the pain rehabilitation program.

Multicollinarity was explored to determine if it may have impacted the results discussed in the original logistic regression. Multicollinarity present in a logistic regression can change the sign of predictor variables and/or change which predictor variables are significant. As shown in Table 16, the correlation between scores on admission stress, pain intensity, and the PDI indicates that the PDI is correlated with admission stress ($r(140) = .349$, $p < .01$), and with admission pain intensity ($r(140) = .212$, $p < .05$). Although these correlations are not high, the PDI was suspected of causing multicollinarity. Therefore, another logistic regression model was conducted which excluded the admission PDI.

As shown in Table 17, the Omnibus Test of Model Coefficients, which provides the Chi Square Tests, was significant at the .05 level (p= .020). In addition, the Hosmer-Lemeshow test was significant above the .05 level (p= .659), which shows the significance of the developed logistic regression models. Collectively, this indicates that the independent variables improve on the predictive power of the null model. Therefore, admission scores on DASS stress and pain intensity are related to completion of the pain rehabilitation program.

The model results shown in Table 17 indicate that at 95% confidence level, the null model correctly predicted completion of the pain rehabilitation program 93% of the time. The null model did not correctly predict if participants' would drop out of the pain rehabilitation program. The logistic regression model did not improve upon the null model. It also correctly predicted all participants' to complete the pain rehabilitation program 93% of the time.

Results indicated that admission scores on stress (p= .035) and pain intensity (p= .033) were significant variables. As found in the previous logistic regression model, stress had a negative correlation with completion of the pain rehabilitation program (B= -.081; Exp (B)= .923). Interestingly, with the PDI excluded from the analyses, pain intensity had a positive correlation with completion of the pain rehabilitation program (B= .437; Exp (B)= 1.548). The Cox and Snell r-squared was .054, and the Nagelkerke r-squared was .134. Collectively, these measures indicate that admission stress and pain intensity slightly improves the predictability of whether or not fibromyalgia patients complete or drop out the pain program.

Results also indicate that for every for every one-unit increase in fibromyalgia patient's stress score, there is a -.081 decrease in logits of completing of the pain rehabilitation program, holding all other independent variables constant. In addition, for every one-unit increase in participant's pain intensity scores, there is a .437 increase in logits of completing of the pain rehabilitation program.

Therefore, fibromyalgia patients with high admission stress scores and low admission pain intensity scores were likely to drop out of the pain management program. Fibromyalgia patients with low admission stress scores and high admission pain intensity were likely to complete the pain management program. The PDI was not a significant predictor in determining if fibromyalgia patients will complete or drop out of the pain management program.

3.6 Structural Equation Modeling

Four structural equation models (SEM) were conducted in Amos using maximum likelihood estimation. This study used a modeling development strategy in SEM to

determine the interrelationship of stress, pain intensity, gender, and the interference of pain in daily living at admission and discharge in fibromyalgia patients.

Model fit was evaluated using multiple indices including the chi-squared goodness-of-fit test. Goodness-of-fit measures indicate how well a specified model reproduces the covariance matrix among the indictor variables. Chi-square is a standard test, but is not recommended as a single guide to model adequacy, because it is sensitive to sample size, non-normality of data, and captures small inconsequential differences between a model and the data (Hair et. al. 2010). Adjunct goodness-of-fit indices included the comparative fit index (CFI), tucker lewis index (TLI), normed fit index (NFI), goodness-of-fit index (GFI), and adjusted goodness of fit index (AGFI), in which a score greater than .90 indicated an acceptable model fit.

Badness-of-fit, which determines larger values to represent a poor model fit, was assessed using the root mean square of approximation (RMSEA). For RMSEA a score of .05 was considered a good fit, .08 a fair fit, and .10 a marginal fit (Hair et. al. 2010). For all models, paths were fixed to a variance of one. In addition, each measurement of error was also fixed to a variance of one.

The first SEM examined the interrelationship of stress, pain intensity, gender, and the interference of pain in daily living in fibromyalgia patients at admission (see Figure 1, Table 18). Minimum identification was achieved. This indicates there were enough degrees of freedom to estimate all free parameters. Therefore, the model could be interpreted.

Modification indices were used to improve the predictive ability of the model. Covariance was added between the error in self-care (E6) and life-support (E7) of the

PDI. Self-care activities include tasks related to personal maintenance and independent living skills. Life-support activities include tasks related eating, sleeping, and breathing. A significant correlation .398 (p= .001) was found between theses variables. It also made theoretical sense that these two items would be correlated for a variety of reasons. First, both are measures of pain at admission. Second, they are both components of the PDI. Third, both measure how pain impacts similar aspects of daily living relating to surviving independently on daily basis.

The predicted dependant path from gender to admission stress (p= .178) and pain intensity (p=. 884) was not significant, indicating gender was not correlated to admission stress and pain intensity in fibromyalgia patients. The predicted dependant path from admission stress to pain intensity was significant (p= .010) with a correlation of .214. The predicted dependant path from admission stress to the PDI was also significant (p= .002) with a correlation of .283.

Overall, results of this model indicated a Chi- square (33, N= 141, p=. 002), CFI= .926, TLI= .899, and RMSEA= .079. Collectively, this indicates a modest model fit. Admission stress scores showed a positive dependant relationship with pain intensity and the PDI in fibromyalgia patients. However, gender should to be removed from the model since it is not significantly related to admission stress and pain.

The second SEM examined the interrelationship of stress, pain intensity, gender, and the interference of pain in daily living in fibromyalgia patients at discharge (see Figure 2, Table 19). Minimum identification was achieved. This indicates there were enough degrees of freedom to estimate all free parameters and the model could be interpreted.

Modification indices were used to improve the predictive ability of the model. Covariance was again added between the error in self-care (E6) and life-support (E7) of the PDI. A significant correlation of .266 (p= .004) was found between these variables. A covariance was also added from the error in the discharge PDI (pdipsi) and the error in discharge pain intensity (pain error). A significant correlation of .456 (p=. 001) was found between these variables. It made theoretical sense that pain intensity and the PDI would be correlated regardless of stress levels. Since both are measures of pain at discharge, it makes sense that they would be correlated to each other.

The predicted dependant path from gender to discharge stress (p= .103) and pain intensity (p=. 320) was not significant. This indicates gender was not correlated with discharge stress and pain intensity in fibromyalgia patients. The predicted dependant path from discharge stress to pain intensity was significant (p= .001) with a correlation of .329. The predicted dependant path from discharge stress to the PDI was also significant (p= .001) with a correlation of .391.

Overall results of this model indicated a Chi- square (32, N= 141, p=. 001), CFI= .995, TLI= .931, and RMSEA= .084. Collectively, this indicates a modest model fit. However, gender should to be removed from the model since it is not significantly related to discharge stress and pain. Results indicate discharge stress has a positive dependant relationship with discharge pain intensity and the PDI.

The third SEM examined the interrelationship of stress, pain intensity, and the interference of pain in daily living in fibromyalgia patients at admission (see Figure 3, Table 20). Minimum identification was achieved. This indicates there were more unique

covariance and covariance terms than parameters to be estimated, and the model could be interpreted.

Modification indices were used to improve the predictive ability of the model. Covariance was added between the error in self-care (E6) and life-support (E7) of the PDI. A significant correlation of .399 (p= .001) was found between these variables. It again made theoretical sense that these items would be correlated, since they both measure pain in daily living.

The predicted dependant path from admission stress to pain intensity was significant (p= .010) with a positive correlation of .213. The predicted dependant path from admission stress to the PDI was also significant (p= .012) with a positive correlation of .288. Overall, results of this model indicated a Chi- square (26, N= 141, p=. 002), CFI= .934, TLI= .909, GFI= .925, AGFI= .871, and RMSEA= .083. Collectively, this indicates a modest model fit. Results indicate admission stress has a positive dependant relationship with admission pain intensity and the PDI in fibromyalgia patients.

The final SEM examined the interrelationship of stress, pain intensity, and the interference of pain in daily living in fibromyalgia patients at discharge (see Figure 4, Table 21). Minimum identification was achieved. This indicates there were more unique covariance and covariance terms than parameters to be estimated, and the model could be interpreted.

Modification indices were used to improve the predictive ability of the model. Covariance was again added between the error in self-care (E6) and life-support (E7) of the PDI. A significant positive correlation of .265 (p= .004) was found between these variables. A covariance was also added from the error in the discharge PDI (pdipsi) and

the error in discharge pain intensity (pain error). A significant positive correlation of .452 (p=. 001) was found between these variables. It made theoretical sense that these items would be correlated with each other regardless of ones stress level, since they both measure pain in daily functioning.

The predicted dependant path from discharge stress to pain intensity was significant (p= .001) with a correlation of .320. The predicted dependant path from discharge stress to the PDI was also significant (p= .001) with a correlation of .395. Overall, results of this model indicated a Chi- square (27, N= 141, p=. 001), CFI= .969, TLI= .955, and RMSEA= .076. Collectively, this indicates a modest model fit. Results indicate a positive dependant relationship between discharge stress and discharge pain intensity and the PDI in fibromyalgia patients'.

CHAPTER IV

DISCUSSION

The results of this study suggest a range of conclusions. The PDI was found to be a reliable measure of the interference of pain in daily living. This concurs with previous research conducted on the PDI. This also ensures that the results found in this study using the PDI were accurate.

Although no confounding variables were determined to be present in this study, significant differences in groups were found among demographic variables and admission/discharge scores on stress, pain intensity, and the PDI. Of particular interest to this study was that there were no significant differences in gender in relation to fibromyalgia patients' scores on stress, pain intensity, and the interference of pain in daily living at admission or at discharge. These findings do not support the hypothesis that females will experience more pain and stress than males, and stand in contrast to previous research studies, which found subjective ratings of pain to be higher in females (Keogh, McCracken, & Eccleston 2004; Buskilia, et al., 2000; Hooten, Cynthiam, Townsend, & Decker, 2007).

Stress and pain intensity were found to significantly predict if fibromyalgia patients would complete the pain rehabilitation program. However, stress and pain intensity did not help with the accuracy of predicting if fibromyalgia patients will drop out or complete the program, because the completion rate was already at 93%.

Interestingly, the PDI was not found to be a predictor, contrary to the hypothesis that fibromyalgia patients with higher PDI scores would be more likely to drop out of the pain rehabilitation program.

The findings suggest that the higher the fibromyalgia patients stress score, the more likely they are to drop out of the pain rehabilitation program. Therefore, the lower the fibromyalgia patients admission stress score, the more likely they are to complete the pain rehabilitation program. This conclusion confirms the hypothesis that fibromyalgia patients' with higher stress scores would be more likely to drop out of the pain rehabilitation program compared to those with lower stress scores.

The hypothesis that the higher the fibromyalgia patients' pain intensity the more likely they would be to drop out of the pain rehabilitation program, was not supported by the results of this study. Interestingly, the higher the fibromyalgia patients admission pain intensity score, the more likely they are to complete the pain management program. Therefore, the lower the fibromyalgia patients' admission pain intensity score, the less likely they are to complete the pain management program.

One explanation for this finding is related to the time commitment of the pain rehabilitation program at the Cleveland Clinic. Patients are required to participate actively in the pain rehabilitation program from 7:30am-5pm for three to four weeks. Therefore, fibromyalgia patients' with low admission pain intensity scores may feel the pain rehabilitation program is an inefficient use of their time. The overall results suggest fibromyalgia patients' with high admission stress scores and low pain intensity scores are at a high risk of dropping out of the pain rehabilitation program.

Results from the Structural Equation Modeling (SEM) did not support the hypothesis that gender would have a positive relationship to stress and pain intensity in fibromyalgia patients. Interestingly, there was no significant relationship between these variables. However, SEM results did confirm the hypothesis that stress has a positive relationship to pain intensity and the PDI at admission and discharge in fibromyalgia patients.

Of the four SEM models run, two were useful in making meaningful interpretations. The first was the SEM model which examined the interrelationship of admission scores on stress, pain intensity, and the PDI in fibromyalgia patients (model 1). The second was the model that examined the interrelationship of discharge scores on stress, pain intensity, and the PDI in fibromyalgia patients (model 2). In both models, various dependant relationships were found.

Results from model 1 showed a moderately positive dependant relationship of admission stress to the PDI and pain intensity in fibromyalgia patients. This indicates that as fibromyalgia patients' admission stress scores increase, their scores on the PDI and pain intensity also increase. Results from model 2 also showed a moderately positive dependant relationship from discharge stress to the PDI and pain intensity in fibromyalgia patients. This indicates as fibromyalgia patients' discharge stress scores increase, their scores on the PDI and pain intensity also increase.

Collectively, these results suggest attention should be given to fibromyalgia patients who report severe stress and low pain intensity at admission to increase retention rates. Fibromyalgia patients with high levels of stress may benefit from an additional emphasis on stress reduction techniques, and skills to help them effectively manage pain.

It should be noted that many components of the pain rehabilitation program address stress directly or indirectly and include, cognitive behavioral therapy, biofeedback, and exercise. Therefore, Fibromyalgia patients with high levels of stress may benefit from extra time in these treatment options.

Various significant differences between groups were found, but not evaluated further due to the purpose of this study. Future studies may want to explore how differences in marital status impact discharge stress scores in fibromyalgia patients. Research may also want to explore how differences in educational levels impact admission pain intensity and stress scores in fibromyalgia patients.

In addition, future investigations may want to further explore the gender differences in fibromyalgia patients. Although this study found gender to have no significant relationship with pain intensity or stress at admission or discharge, previous studies have found pain intensity to be higher in females than males. One possible explanation for the conflicting results may be due to the limited number of males utilized in this study. Another explanation for the conflicting results may be because this study did not exclude participants if they had other co-morbid disorders. In addition, this study did not discriminate between patients who had fibromyalgia as a primary diagnosis verses a secondary diagnoses. Therefore, future studies may want to explore gender differences using a bigger sample size, including more men, and comparing different groups of fibromyalgia patients depending on whether they have fibromyalgia as a primary diagnoses, secondary diagnoses, and whether or not they have other co-morbid disorders.

Finally, future studies may want to further explore the relationship between pain intensity and the PDI in fibromyalgia patients. It is possible that there are other variables

relating to the PDI and pain intensity other than stress. Future studies could investigate how substance abuse, thinking styles, and personality characteristics impact the PDI and pain intensity in fibromyalgia patients.

There are several limitations to this study, which should be kept in mind when interpreting the results. First no causal conclusions could be made. All of the results were correlational in nature. Second, there was a high rate of missing data, particularly in the discharge stress scores for which 19% of the data were missing. It is not known if this is due to a non-response bias, or if the data were stored in another location at the Cleveland Clinic. A third limitation of this study was that many of the fibromyalgia patients had additional co-morbid disorders. Future studies may want to compare fibromyalgia patients with and without co-morbid disorders in order to determine if these groups experience pain intensity, stress, and the interference of pain differently.

Further limitations to this study are that stress was assessed by the DASS, which measures stress in a limited way. Therefore, the results of this study may not generalize to all fibromyalgia patients who experience stress. Future studies may use a measure for stress that defines it in a broader manner.

It should also be noted that many of the questions on the DASS that assess stress might actually be capturing symptoms of withdrawal. This is because patients entering the program with substance abuse to pain medication are weaned off such drugs. This study did not discriminate between fibromyalgia patients with and without substance abuse problems. Future studies may want to explore if there are differences in thinking styles, personality characteristics, stress, pain intensity, and the PDI in fibromyalgia patients with and without a substance abuse problem.

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APPENDIX

Appendix A: IRB Approval

Cleveland State University

Office of Sponsored Programs and Research
Institutional Review Board (IRB)

Memorandum

To: Richard Rakos Principal Investigator or Advisor
Psychology

From: Rich Piiparinen, GA
Office of Sponsored Programs & Research

Date: July 21, 2010

Re: Results of IRB Review of your project number: 29131-RAK-HS
Co-Principal Investigator or Student:
Entitled: The impact of stress on pain severity and daily living in patients with chronic fibromyalgia

The IRB has reviewed and approved your application for the above named project, under the category noted below. Approval for use of human subjects in this research is for one year from today. If your study extends beyond this approval period, you must again contact this office to initiate an annual review of this research. ***This approval expires at 11:59 pm on 7/11/2011.***

By accepting this decision, you agree to notify the IRB of: (1) any additions to or changes in procedures for your study that modify the subjects' risk in any way; and (2) any events that affect that safety or well-being of subjects.

Thank you for your efforts to maintain compliance with the federal regulations for the protection of human subjects.

Approval Category: **Date: 7/12/2010**

_ Exempt Status: Project is exempt from further review under CFR 46.101:

_x_ Expedited: 8

cc: Project file

Mailing Address: 2121 Euclid Avenue, PH-3rd Floor • Cleveland, Ohio 44115-2214
Campus Location: Parker Hannifin Hall • 2258 Euclid Avenue • Cleveland, Ohio
(216) 687-3630 • Fax (216) 687-9382

Appendix B: Cleveland Clinic IRB Approval

September 30, 2010

TO: Judith Scheman - Baumann, Ph.D. / C21

RE: IRB 5645: REGISTRY: The Chronic Pain Rehabilitation Program Outcome

Dear Dr. Scheman - Baumann:

Your response received on September 28, 2010 satisfies the conditional approval that was given during the prior IRB expedited review on September 27, 2010. This action was reviewed under the expedited review process on September 29, 2010 and will be reported to the full IRB. Your study renewal is now fully **approved** for the period of September 29, 2010 to September 26, 2011.

Your are required to conduct this research in accordance with the Registry and Database Research Application dated September 17, 2002 including the two Patient Letters, the 6 Month & 12 Month Follow-Up Surveys, the DASS, the addition of Sara Davin and Meredith Wessner and the deletion of Elizabeth Cascarilla, Danica Liu, Stephanie Burns and Sara Micalos as co-investigators.

Attached is a copy of the Patient Letter approved for the period of September 29, 2010 to September 26, 2011. Note: if you have extra copies of the previous Patient Letter, they are now outdated and need to be discarded and replaced with this current IRB stamp-approved version.

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

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

Investigators must conduct the research in accordance with the approved protocol. Any changes or amendments must be reported and approved by the IRB prior to implementation. Any study deviations and unanticipated problems, including adverse events that are unexpected and related or possibly related to the research intervention must be promptly reported to the IRB in accordance with timeframes and procedures provided in IRB Policy #60: Adverse Event Reporting and IRB Policy #70: Reporting Unanticipated Problems.

Sincerely,

Daniel Beyer, M.S., MHA, CIP
Executive Director, IRB and Human Research Protections

DB:sr Attachments (Patient Letters)

EXPIRATION DATE: September 26, 2011

Appendix C: DASS

DASS *Name:*
Date:

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

The rating scale is as follows:

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

1	I found myself getting upset by quite trivial things	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I just couldn't seem to get going	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I had a feeling of shakiness (eg, legs going to give way)	0	1	2	3
8	I found it difficult to relax	0	1	2	3
9	I found myself in situations that made me so anxious I was most relieved when they ended	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting upset rather easily	0	1	2	3
12	I felt that I was using a lot of nervous energy	0	1	2	3
13	I felt sad and depressed	0	1	2	3
14	I found myself getting impatient when I was delayed in any way (eg, elevators, traffic lights, being kept waiting)	0	1	2	3
15	I had a feeling of faintness	0	1	2	3
16	I felt that I had lost interest in just about everything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I perspired noticeably (eg, hands sweaty) in the absence of high temperatures or physical exertion	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life wasn't worthwhile	0	1	2	3

Reminder of rating scale:

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

22	I found it hard to wind down	0	1	2	3
23	I had difficulty in swallowing	0	1	2	3
24	I couldn't seem to get any enjoyment out of the things I did	0	1	2	3
25	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
26	I felt down-hearted and blue	0	1	2	3
27	I found that I was very irritable	0	1	2	3
28	I felt I was close to panic	0	1	2	3
29	I found it hard to calm down after something upset me	0	1	2	3
30	I feared that I would be "thrown" by some trivial but unfamiliar task	0	1	2	3
31	I was unable to become enthusiastic about anything	0	1	2	3
32	I found it difficult to tolerate interruptions to what I was doing	0	1	2	3
33	I was in a state of nervous tension	0	1	2	3
34	I felt I was pretty worthless	0	1	2	3
35	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
36	I felt terrified	0	1	2	3
37	I could see nothing in the future to be hopeful about	0	1	2	3
38	I felt that life was meaningless	0	1	2	3
39	I found myself getting agitated	0	1	2	3
40	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
41	I experienced trembling (eg, in the hands)	0	1	2	3
42	I found it difficult to work up the initiative to do things	0	1	2	3

Questions measuring Stress: 1, 6, 8, 11, 12, 14, 18, 22, 27, 29, 32, 33, 35, 39

Appendix D: PDI

Pain Disability Index Sheet

Pain Disability Index: The rating scales below are designed to measure the degree to which aspects of your life are disrupted by chronic pain. In other words, we would like to know how much pain is preventing you from doing what you would normally do or from doing it as well as you normally would. Respond to each category indicating the overall impact of pain in your life, not just when pain is at its worst.

For each of the 7 categories of life activity listed, please circle the number on the scale that describes the level of disability you typically experience. A score of 0 means no disability at all, and a score of 10 signifies that all of the activities in which you would normally be involved have been totally disrupted or prevented by your pain.

Family/Home Responsibilities: This category refers to activities of the home or family. It includes chores or duties performed around the house (e.g. yard work) and errands or favors for other family members (e.g. driving the children to school).
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Recreation: This disability includes hobbies, sports, and other similar leisure time activities.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Social Activity: This category refers to activities, which involve participation with friends and acquaintances other than family members. It includes parties, theater, concerts, dining out, and other social functions.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Occupation: This category refers to activities that are part of or directly related to one's job. This includes non-paying jobs as well, such as that of a housewife or volunteer.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Sexual Behavior: This category refers to the frequency and quality of one's sex life.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Self Care: This category includes activities, which involve personal maintenance and independent daily living (e.g. taking a shower, driving, getting dressed, etc.)
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Life-Support Activities: This category refers to basic life supporting behaviors such as eating, sleeping and breathing.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Signature_____ Please Print_____

Date _____

Appendix E: Pain Intensity

Please rate your usual level of pain on a scale of 0 to 10.

0 1 2 3 4 5 6 7 8 9 10

0-No pain
10- The worst possible pain you can imagine

Appendix F: Tables and Figures

Table 1: Factor Analysis-Admission PDI

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.794
Bartlett's Test of Sphericity	Approx. Chi-Square	649.426
	Df	28
	Sig.	.000

Communalities

	Initial	Extraction
Admission Total PDI score (sum of all PDI domains = 0-70)	1.000	.905
Pain on Family life on Admission	1.000	.609
Pain on Recreation on admission	1.000	.661
Pain on Social life on admission	1.000	.711
Pain on Work at admission	1.000	.523
Pain on Sexual life on admission	1.000	.209
Pain on Self Care on admission	1.000	.474
Pain on life support on admission	1.000	.239

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.331	54.140	54.140	4.331	54.140	54.140
2	1.085	13.557	67.697			
3	.886	11.078	78.774			
dimension 4	.551	6.883	85.657			
0 5	.418	5.227	90.884			
6	.390	4.877	95.762			
7	.246	3.070	98.832			
8	.093	1.168	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Admission Total PDI score (sum of all PDI domains = 0-70)	.952
Pain on Family life on Admission	.780
Pain on Recreation on admission	.813
Pain on Social life on admission	.843
Pain on Work at admission	.723
Pain on Sexual life on admission	.457
Pain on Self Care on admission	.689
Pain on life support on admission	.488

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Table 2: Factor Analysis- Discharge PDI

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.880
Bartlett's Test of Sphericity	Approx. Chi-Square	856.646
	Df	28
	Sig.	.000

Communalities

	Initial	Extraction
Discharge Total PDI score (sum of all PDI domains = 0-70)	1.000	.911
Pain on Family Life at discharge	1.000	.801
Pain on Recreation at discharge	1.000	.800
Pain on Social life at discharge	1.000	.799
Pain on Work at discharge	1.000	.659
Pain on sexual at discharge	1.000	.309
Pain on self care at discharge	1.000	.494
pain on life support at discharge	1.000	.341

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component		Initial Eigenvalues			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
dimension 0	1	5.114	63.927	63.927	5.114	63.927	63.927
	2	.924	11.545	75.473			
	3	.731	9.134	84.606			
	4	.489	6.114	90.720			
	5	.260	3.245	93.965			
	6	.212	2.644	96.609			
	7	.176	2.196	98.805			
	8	.096	1.195	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Discharge Total PDI score (sum of all PDI domains = 0-70)	.954
Pain on Family Life at discharge	.895
Pain on Recreation at discharge	.894
Pain on Social life at discharge	.894
Pain on Work at discharge	.812
Pain on sexual at discharge	.556
Pain on self care at discharge	.703
pain on life support at discharge	.584

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Table 3: Internal Consistency Reliability of PDI: Admission

Case Processing Summary

		N	%
Cases	Valid	141	99.3
	Excluded[a]	1	.7
	Total	142	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.748	.868	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Admission Total PDI score (sum of all PDI domains = 0-70)	44.6028	133.791	.936	.879	.780
Pain on Family life on Admission	82.6631	469.262	.682	.538	.724
Pain on Recreation on admission	82.1879	463.245	.706	.637	.719
Pain on Social life on admission	82.8688	444.006	.753	.673	.705
Pain on Work at admission	82.0248	452.955	.606	.545	.716
Pain on Sexual life on admission	83.2482	453.820	.431	.411	.728
Pain on Self Care on admission	84.8723	451.869	.632	.484	.714
Pain on life support on admission	85.0496	457.548	.444	.438	.728

Table 4: Internal Consistency Reliability: Discharge PDI

Case Processing Summary

		N	%
Cases	Valid	137	96.5
	Excluded[a]	5	3.5
	Total	142	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.784	.913	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Discharge Total PDI score (sum of all PDI domains = 0-70)	18.2810	155.878	.937	.880	.870
pain on life support at discharge	34.7993	516.572	.517	.397	.771
Pain on self care at discharge	34.4891	506.943	.644	.528	.763
Pain on sexual at discharge	33.0255	493.634	.521	.417	.763
Pain on Work at discharge	32.6204	483.605	.741	.681	.748
Pain on Social life at discharge	33.5036	482.061	.841	.752	.744
Pain on Recreation at discharge	33.0146	488.206	.834	.773	.748
Pain on Family Life at discharge	33.1095	494.863	.840	.751	.752

Table 5: Analysis of Variance (ANOVA) For Gender

Test of Homogeneity of Variances

Admission pain intensity and gender

Levene Statistic	df1	df2	Sig.
.627	1	140	.430

ANOVA

Admission pain intensity and gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.098	1	.098	.034	.854
Within Groups	403.439	140	2.882		
Total	403.537	141			

ANOVA

Discharge Pain Intensity and gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.002	1	.002	.000	.987
Within Groups	842.118	140	6.015		
Total	842.120	141			

Test of Homogeneity of Variances

Discharge Pain Intensity and gender

Levene Statistic	df1	df2	Sig.
1.868	1	140	.174

ANOVA

admission dass stress and gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	191.099	1	191.099	1.657	.200
Within Groups	16147.830	140	115.342		
Total	16338.930	141			

Test of Homogeneity of Variances

admission dass stress and gender

Levene Statistic	df1	df2	Sig.
.134	1	140	.715

ANOVA

Discharge Stress and gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	198.392	1	198.392	2.689	.103
Within Groups	10327.467	140	73.768		
Total	10525.859	141			

Test of Homogeneity of Variances

Discharge Stress and gender

Levene Statistic	df1	df2	Sig.
.134	1	140	.715

ANOVA

Admission Total PDI score and gender (sum of all PDI domains = 0-70)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.855	1	.855	.006	.937
Within Groups	19216.955	140	137.264		
Total	19217.810	141			

Test of Homogeneity of Variances

Admission Total PDI score and gender (sum of all PDI domains = 0-70)

Levene Statistic	df1	df2	Sig.
.138	1	140	.711

ANOVA

Discharge Total PDI score and gender (sum of all PDI domains = 0-70)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	305.404	1	305.404	2.201	.140
Within Groups	19427.758	140	138.770		
Total	19733.162	141			

Test of Homogeneity of Variances

Discharge Total PDI score and gender (sum of all PDI domains = 0-70)

Levene Statistic	df1	df2	Sig.
.298	1	140	.586

Table 6: ANOVA's for Marital Status

ANOVA

Admission pain intensity and marital status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.890	2	7.445	2.663	.073
Within Groups	388.647	139	2.796		
Total	403.537	141			

Test of Homogeneity of Variances

Admission pain intensity and marital status

Levene Statistic	df1	df2	Sig.
1.075	2	139	.344

ANOVA

Discharge Pain Intensity and marital status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	23.733	2	11.867	2.016	.137
Within Groups	818.386	139	5.888		
Total	842.120	141			

Test of Homogeneity of Variances

Discharge Pain Intensity and marital status

Levene Statistic	df1	df2	Sig.
.708	2	139	.494

ANOVA

admission dass stress and marital status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.504	2	14.252	.121	.886
Within Groups	16310.425	139	117.341		
Total	16338.930	141			

Test of Homogeneity of Variances

admission dass stress and marital status

Levene Statistic	df1	df2	Sig.
.158	2	139	.854

ANOVA

Discharge Stress and marital status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	476.290	2	238.145	3.294	.040
Within Groups	10049.569	139	72.299		
Total	10525.859	141			

Test of Homogeneity of Variances

Discharge Stress and marital status

Levene Statistic	df1	df2	Sig.
6.991	2	139	.001

Robust Tests of Equality of Means

Discharge Stress and marital status

	Statistic[a]	df1	df2	Sig.
Welch	2.087	2	47.182	.135
Brown-Forsythe	3.214	2	57.107	.048

a. Asymptotically F distributed.

Multiple Comparisons

Discharge Stress and marital status

Tukey HSD

(I) marital status		(J) marital status		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
dimension2	single	dimension3	married	4.54928*	1.78769	.032	.3141	8.7845
			separated	4.11667	2.45457	.218	-1.6984	9.9318
	married	dimension3	single	-4.54928*	1.78769	.032	-8.7845	-.3141
			separated	-.43261	2.09781	.977	-5.4025	4.5373
	separated	dimension3	single	-4.11667	2.45457	.218	-9.9318	1.6984
			married	.43261	2.09781	.977	-4.5373	5.4025

*. The mean difference is significant at the 0.05 level.

ANOVA

Admission Total PDI score and marital status (sum of all PDI domains = 0-70)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	193.641	2	96.821	.707	.495
Within Groups	19024.169	139	136.865		
Total	19217.810	141			

Test of Homogeneity of Variances

Admission Total PDI score and marital status (sum of all PDI domains = 0-70)

Levene Statistic	df1	df2	Sig.
.577	2	139	.563

ANOVA

Discharge Total PDI score and marital status (sum of all PDI domains = 0-70)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	38.876	2	19.438	.137	.872
Within Groups	19694.286	139	141.686		
Total	19733.162	141			

Test of Homogeneity of Variances

Discharge Total PDI score and marital status (sum of all PDI domains = 0-70)

Levene Statistic	df1	df2	Sig.
1.332	2	139	.267

Table 7: ANOVA's for Ethnicity

ANOVA

Admission pain intensity and ethnicity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.407	1	1.407	.490	.485
Within Groups	402.130	140	2.872		
Total	403.537	141			

Test of Homogeneity of Variances

Admission pain intensity and ethnicity

Levene Statistic	df1	df2	Sig.
1.091	1	140	.298

ANOVA

Discharge Pain Intensity and ethnicity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.966	1	12.966	2.189	.141
Within Groups	829.154	140	5.923		
Total	842.120	141			

Test of Homogeneity of Variances

Discharge Pain Intensity and ethnicity

Levene Statistic	df1	df2	Sig.
.185	1	140	.668

ANOVA

admission dass stress and ethnicity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	313.451	1	313.451	2.738	.100
Within Groups	16025.479	140	114.468		
Total	16338.930	141			

Test of Homogeneity of Variances

admission dass stress and ethnicity

Levene Statistic	df1	df2	Sig.
.806	1	140	.371

ANOVA

Discharge Stress and ethnicity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	374.854	1	374.854	5.170	.025
Within Groups	10151.005	140	72.507		
Total	10525.859	141			

Test of Homogeneity of Variances

Discharge Stress and ethnicity

Levene Statistic	Df1	df2	Sig.
5.697	1	140	.018

Robust Tests of Equality of Means

Discharge Stress and ethnicity

	Statistic[a]	df1	df2	Sig.
Welch	3.777	1	33.702	.060
Brown-Forsythe	3.777	1	33.702	.060

a. Asymptotically F distributed.

ANOVA

Admission Total PDI score and ethnicity (sum of all PDI domains = 0-70)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.370	1	8.370	.061	.805
Within Groups	19209.440	140	137.210		
Total	19217.810	141			

Test of Homogeneity of Variances

Admission Total PDI score and ethnicity (sum of all PDI domains = 0-70)

Levene Statistic	Df1	df2	Sig.
.934	1	140	.335

ANOVA

Discharge Total PDI score and ethnicity (sum of all PDI domains = 0-70)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1124.334	1	1124.334	8.459	.004
Within Groups	18608.828	140	132.920		
Total	19733.162	141			

Test of Homogeneity of Variances

Discharge Total PDI score and ethnicity (sum of all PDI domains = 0-70)

Levene Statistic	df1	df2	Sig.
.123	1	140	.726

Table 8: ANOVA's for Education

ANOVA

Admission pain intensity and education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	34.795	4	8.699	3.232	.014
Within Groups	368.742	137	2.692		
Total	403.537	141			

Test of Homogeneity of Variances

Admission pain intensity and education

Levene Statistic	df1	df2	Sig.
3.068	4	137	.019

Robust Tests of Equality of Means

Admission pain intensity and education

	Statistic[a]	df1	df2	Sig.
Welch	2.261	4	40.855	.079
Brown-Forsythe	2.679	4	53.040	.041

a. Asymptotically F distributed.

Multiple Comparisons

Admission pain intensity and education

Tukey HSD

(I) educational level	(J) educational level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Highschool or Below	Some College/Associates	.34167	.36685	.884	-.6725	1.3558
	Bachelors degree	-.10000	.44427	.999	-1.3282	1.1282
	Post Graduate	1.66667*	.51880	.014	.2325	3.1009
	Prefer not to respond/Unknown	.42500	.56037	.942	-1.1241	1.9741
Some College/Associates	Highschool or Below	-.34167	.36685	.884	-1.3558	.6725
	Bachelors degree	-.44167	.39054	.790	-1.5213	.6380
	Post Graduate	1.32500*	.47360	.046	.0158	2.6342
	Prefer not to respond/Unknown	.08333	.51880	1.000	-1.3509	1.5175
Bachelors degree	Highschool or Below	.10000	.44427	.999	-1.1282	1.3282
	Some College/Associates	.44167	.39054	.790	-.6380	1.5213
	Post Graduate	1.76667*	.53582	.011	.2854	3.2479
	Prefer not to respond/Unknown	.52500	.57616	.892	-1.0678	2.1178
Post Graduate	Highschool or Below	-1.66667*	.51880	.014	-3.1009	-.2325
	Some College/Associates	-1.32500*	.47360	.046	-2.6342	-.0158
	Bachelors degree	-1.76667*	.53582	.011	-3.2479	-.2854
	Prefer not to respond/Unknown	-1.24167	.63540	.294	-2.9982	.5149
Prefer not to respond/Unknown	Highschool or Below	-.42500	.56037	.942	-1.9741	1.1241
	Some College/Associates	-.08333	.51880	1.000	-1.5175	1.3509
	Bachelors degree	-.52500	.57616	.892	-2.1178	1.0678
	Post Graduate	1.24167	.63540	.294	-.5149	2.9982

*. The mean difference is significant at the 0.05 level.

ANOVA

Discharge Pain Intensity and education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	29.980	4	7.495	1.264	.287
Within Groups	812.140	137	5.928		
Total	842.120	141			

Test of Homogeneity of Variances

Discharge Pain Intensity and education

Levene Statistic	df1	df2	Sig.
.706	4	137	.589

ANOVA

admission dass stress and education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1235.680	4	308.920	2.802	.028
Within Groups	15103.250	137	110.243		
Total	16338.930	141			

Test of Homogeneity of Variances

admission dass stress and education

Levene Statistic	df1	df2	Sig.
2.971	4	137	.022

Robust Tests of Equality of Means

admission dass stress and education

	Statistic[a]	df1	df2	Sig.
Welch	4.291	4	41.123	.005
Brown-Forsythe	2.573	4	66.020	.046

a. Asymptotically F distributed.

Multiple Comparisons

admission dass stress and education

Tukey HSD

(I) educational level	(J) educational level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Highschool or Below	Some College/Associates	7.05000*	2.34779	.026	.5597	13.5403
	Bachelors degree	5.80000	2.84332	.253	-2.0602	13.6602
	Post Graduate	6.13333	3.32028	.351	-3.0454	15.3121
	Prefer not to respond/Unknown	9.33333	3.58631	.075	-.5808	19.2475
Some College/Associates	Highschool or Below	-7.05000*	2.34779	.026	-13.5403	-.5597
	Bachelors degree	-1.25000	2.49942	.987	-8.1595	5.6595
	Post Graduate	-.91667	3.03099	.998	-9.2957	7.4623
	Prefer not to respond/Unknown	2.28333	3.32028	.959	-6.8954	11.4621
Bachelors degree	Highschool or Below	-5.80000	2.84332	.253	-13.6602	2.0602
	Some College/Associates	1.25000	2.49942	.987	-5.6595	8.1595
	Post Graduate	.33333	3.42917	1.000	-9.1464	9.8131
	Prefer not to respond/Unknown	3.53333	3.68736	.873	-6.6602	13.7268
Post Graduate	Highschool or Below	-6.13333	3.32028	.351	-15.3121	3.0454
	Some College/Associates	.91667	3.03099	.998	-7.4623	9.2957
	Bachelors degree	-.33333	3.42917	1.000	-9.8131	9.1464
	Prefer not to respond/Unknown	3.20000	4.06650	.934	-8.0416	14.4416
Prefer not to respond/Unknown	Highschool or Below	-9.33333	3.58631	.075	-19.2475	.5808
	Some College/Associates	-2.28333	3.32028	.959	-11.4621	6.8954
	Bachelors degree	-3.53333	3.68736	.873	-13.7268	6.6602
	Post Graduate	-3.20000	4.06650	.934	-14.4416	8.0416

*. The mean difference is significant at the 0.05 level.

ANOVA

Discharge Stress and education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	201.009	4	50.252	.667	.616
Within Groups	10324.850	137	75.364		
Total	10525.859	141			

Test of Homogeneity of Variances

Discharge Stress and education

Levene Statistic	df1	df2	Sig.
1.983	4	137	.101

Robust Tests of Equality of Means

Discharge Stress and education

	Statistic[a]	df1	df2	Sig.
Welch	1.144	4	47.121	.348
Brown-Forsythe	.807	4	97.993	.524

a. Asymptotically F distributed.

ANOVA

Admission Total PDI score and education (sum of all PDI domains = 0-70)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	699.443	4	174.861	1.294	.276
Within Groups	18518.367	137	135.171		
Total	19217.810	141			

Test of Homogeneity of Variances

Admission Total PDI score and education (sum of all PDI domains = 0-70)

Levene Statistic	df1	df2	Sig.
.891	4	137	.471

ANOVA

Discharge Total PDI score and education (sum of all PDI domains = 0-70)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	52.852	4	13.213	.092	.985
Within Groups	19680.310	137	143.652		
Total	19733.162	141			

Test of Homogeneity of Variances

Discharge Total PDI score and education (sum of all PDI domains = 0-70)

Levene Statistic	df1	df2	Sig.
.641	4	137	.634

Table 9: Correlation of Age with Variables in Study

Pearson Correlations N=142, ** correlation is significant at the .01 level (2-tailed), * correlation is significant at the .05 level (2-tailed)

	Patient's Age	Admission pain intensity	Discharge Pain Intensity	DASS Stress	admission das stress	Admission Total PDI score (sum of all PDI domains = 0-70)	Discharge Total PDI score (sum of all PDI domains = 0-70)
Patient's Age	1	-.018	-.067	-.156	-.076	-.142	.154
		.827	.427	.063	.367	.092	.067
Admission pain intensity	-.018	1	.221**	.011	.199*	.212*	.089
	.827		.008	.900	.017	.011	.295
Discharge Pain Intensity	-.067	.221**	1	.321**	.142	.098	.516**
	.427	.008		.000	.092	.247	.000
DASS Stress	-.156	.011	.321**	1	.362**	.117	.397**
	.063	.900	.000		.000	.166	.000
admission das stress	-.076	.199*	.142	.362**	1	.349**	.122
	.367	.017	.092	.000		.000	.147
Admission Total PDI score (sum of all PDI domains = 0-70)	-.142	.212*	.098	.117	.349**	1	.069
	.092	.011	.247	.166	.000		.412
Discharge Total PDI score (sum of all PDI domains = 0-70)	.154	.089	.516**	.397**	.122	.069	1
	.067	.295	.000	.000	.147	.412	

Table 10: Chi-Sqaure for Covariates with Education

Chi-Square Tests for Completing the Program and Education

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.839	4	.765
Likelihood Ratio	2.702	4	.609
Linear-by-Linear Association	1.434	1	.231
N of Valid Cases	142		

Table 11: Chi-Sqaure for covariates with Gender

Chi-Square Tests for Completing the Program and Gender

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.257	1	.612		
Continuity Correction	.003	1	.957		
Likelihood Ratio	.285	1	.593		
Fisher's Exact Test				1.000	.517
Linear-by-Linear Association	.255	1	.614		
N of Valid Cases	142				

Table 12: Chi-Square for Covariates with Ethnicity

Chi-Square Tests for Completing the Program and Ethnicity

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.023	1	.082		
Continuity Correction	1.747	1	.186		
Likelihood Ratio	2.533	1	.111		
Fisher's Exact Test				.099	.099
Linear-by-Linear Association	3.001	1	.083		
N of Valid Cases	142				

Table 13: Chi-Sqaure to Identify Covariates with Marital Status

Chi-Square Tests for Completing the Program and Marital Status

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.172	2	.918
Likelihood Ratio	.185	2	.912
Linear-by-Linear Association	.041	1	.840
N of Valid Cases	142		

Table 14: Correlation with Age and Completion of the Program

Correlations

		Patient's Age	completed the program
Patient's Age	Pearson Correlation	1	.038
	Sig. (2-tailed)		.650
	N	142	142
completed the program	Pearson Correlation	.038	1
	Sig. (2-tailed)	.650	
	N	142	142

Correlations

		completed the program	Admission pain intensity	admission das stress	Admission Total PDI score (sum of all PDI domains = 0-70)
completed the program	Pearson Correlation	1	.141	-.147	.094
	Sig. (2-tailed)		.095	.080	.264
	N	142	142	142	142
Admission pain intensity	Pearson Correlation	.141	1	.199*	.212*
	Sig. (2-tailed)	.095		.017	.011
	N	142	142	142	142
admission das stress	Pearson Correlation	-.147	.199*	1	.349**
	Sig. (2-tailed)	.080	.017		.000
	N	142	142	142	142
Admission Total PDI score (sum of all PDI domains = 0-70)	Pearson Correlation	.094	.212*	.349**	1
	Sig. (2-tailed)	.264	.011	.000	
	N	142	142	142	142

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 15: Original Logistic Regression

Block 0: Beginning Block

Classification Table[a,b]

Observed			Predicted		
			completed the program		Percentage Correct
			.00	1.00	
Step 0	completed the program	.00	0	10	.0
		1.00	0	132	100.0
	Overall Percentage				93.0

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	2.580	.328	61.887	1	.000	13.200

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	10.220	3	.017
	Block	10.220	3	.017
	Model	10.220	3	.017

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	62.123[a]	.069	.174

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	11.016	8	.201

Classification Table[a]

Observed			Predicted		
			completed the program		Percentage
			.00	1.00	Correct
Step 1	completed the program	.00	0	10	.0
		1.00	0	132	100.0
	Overall Percentage				93.0

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	painint1	.387	.209	3.440	1	.064	1.472
	stresstot1	-.100	.042	5.687	1	.017	.905
	pdi1	.047	.030	2.444	1	.118	1.048
	Constant	.429	1.587	.073	1	.787	1.536

a. Variable(s) entered on step 1: painint1, stresstot1, pdi1.

Table 16: Multicollinearity in the Original Logistic Regression

Correlations

		completed the program	Admission pain intensity	admission das stress	Admission Total PDI score (sum of all PDI domains = 0-70)
completed the program	Pearson Correlation	1	.141	-.147	.094
	Sig. (2-tailed)		.095	.080	.264
	N	142	142	142	142
Admission pain intensity	Pearson Correlation	.141	1	.199*	.212*
	Sig. (2-tailed)	.095		.017	.011
	N	142	142	142	142
admission das stress	Pearson Correlation	-.147	.199*	1	.349**
	Sig. (2-tailed)	.080	.017		.000
	N	142	142	142	142
Admission Total PDI score (sum of all PDI domains = 0-70)	Pearson Correlation	.094	.212*	.349**	1
	Sig. (2-tailed)	.264	.011	.000	
	N	142	142	142	142

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 17: Modified Logistic Regression

Block 0: Beginning Block

Classification Table[a,b]

Observed			Predicted		
			completed the program		Percentage
			.00	1.00	Correct
Step 0	completed the program	.00	0	10	.0
		1.00	0	132	100.0
	Overall Percentage				93.0

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	2.580	.328	61.887	1	.000	13.200

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	7.834	2	.020
	Block	7.834	2	.020
	Model	7.834	2	.020

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	64.509[a]	.054	.134

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	5.899	8	.659

Classification Table[a]

Observed			Predicted		
			completed the program		Percentage
			.00	1.00	Correct
Step 1	completed the program	.00	0	10	.0
		1.00	0	132	100.0
	Overall Percentage				93.0

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	painint1	.437	.205	4.520	1	.033	1.548
	stresstot1	-.081	.038	4.433	1	.035	.923
	Constant	1.686	1.348	1.565	1	.211	5.397

a. Variable(s) entered on step 1: painint1, stresstot1.

Table 18: Structural Equation Modeling: Admission

Result (Default model)

Minimum was achieved
Chi-square = 61.549
Degrees of freedom = 33
Probability level = .002

Regression Weights: (Group number 1 - Default model) *=.001**

			Estimate	S.E.	C.R.	P	Label
stresstot1	<---	gender	3.332	2.475	1.346	.178	
PDI Admission	<---	stresstot1	.034	.011	3.163	.002	
PainFamHome1	<---	PDI Admission	1.000				
PainRec1	<---	PDI Admission	1.256	.134	9.353	***	
PainSocial1	<---	PDI Admission	1.575	.168	9.394	***	
PainWork1	<---	PDI Admission	1.373	.177	7.762	***	
PainSexual1	<---	PDI Admission	.853	.229	3.718	***	
PainSelfCare1	<---	PDI Admission	1.033	.174	5.956	***	
PainLifeSupport1	<---	PDI Admission	.785	.214	3.668	***	
painint1	<---	stresstot1	.034	.013	2.579	.010	
painint1	<---	gender	-.056	.386	-.145	.884	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
stresstot1	<---	gender	.113
PDI Admission	<---	stresstot1	.283
PainFamHome1	<---	PDI Admission	.724
PainRec1	<---	PDI Admission	.846
PainSocial1	<---	PDI Admission	.851
PainWork1	<---	PDI Admission	.694
PainSexual1	<---	PDI Admission	.333
PainSelfCare1	<---	PDI Admission	.533
PainLifeSupport1	<---	PDI Admission	.330
painint1	<---	stresstot1	.214
painint1	<---	gender	-.012

Covariances: (Group number 1 - Default model) *= .001**

	Estimate	S.E.	C.R.	P	Label
E6 <--> E7	2.301	.559	4.117	***	

Correlations: (Group number 1 - Default model)

	Estimate
E6 <--> E7	.389

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.857	.806	.928	.899	.926
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.079	.047	.109	.065
Independence model	.248	.227	.269	.000

Table 19: Structural Equation Modeling: Discharge

Result (Default model)

Minimum was achieved

Chi-square = 63.688
Degrees of freedom = 32
Probability level = .001

Regression Weights: (Group number 1 - Default model) *= .001**

			Estimate	S.E.	C.R.	P	Label
stresstotd	<---	gender	3.252	1.993	1.632	.103	
PDI discharge	<---	stresstotd	.082	.017	4.752	***	
PainFam2	<---	PDI discharge	1.000				
PainRec2	<---	PDI discharge	1.075	.069	15.671	***	
PainSocial2	<---	PDI discharge	1.127	.074	15.149	***	
PainWork2	<---	PDI discharge	1.100	.095	11.624	***	
PainSexual2	<---	PDI discharge	.790	.133	5.957	***	
PainSelfcare2	<---	PDI discharge	.752	.092	8.200	***	
PainLifeSupport2	<---	PDI discharge	.578	.090	6.442	***	
painint2	<---	stresstotd	.093	.023	4.092	***	
painint2	<---	gender	-.485	.488	-.993	.320	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
stresstotd	<---	gender	.137
PDI discharge	<---	stresstotd	.391
PainFam2	<---	PDI discharge	.897
PainRec2	<---	PDI discharge	.895
PainSocial2	<---	PDI discharge	.880
PainWork2	<---	PDI discharge	.768
PainSexual2	<---	PDI discharge	.476
PainSelfcare2	<---	PDI discharge	.611
PainLifeSupport2	<---	PDI discharge	.508
painint2	<---	stresstotd	.329
painint2	<---	gender	-.072

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
PainE	<-->	PDIpsi	1.751	.375	4.670	***	
E6	<-->	E7	.830	.284	2.919	.004	

Correlations: (Group number 1 - Default model)

			Estimate
PainE	<-->	PDIpsi	.456
E6	<-->	E7	.266

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.908	.871	.952	.931	.951
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.084	.053	.114	.036
Independence model	.321	.300	.342	.000

Table 20: Structural Equation Modeling: Admission without Gender

Result (Default model)

Minimum was achieved
Chi-square = 51.233
Degrees of freedom = 26

Probability level = .002

Regression Weights: (Group number 1 - Default model) *= .001**

			Estimate	S.E.	C.R.	P	Label
pdi	<---	stresstot1	.026	.011	2.507	.012	
PainLifeSupport1	<---	pdi	1.000				
PainSelfCare1	<---	pdi	1.317	.318	4.141	***	
PainSexual1	<---	pdi	1.087	.394	2.759	.006	
PainWork1	<---	pdi	1.750	.481	3.636	***	
PainSocial1	<---	pdi	2.006	.532	3.770	***	
PainRec1	<---	pdi	1.600	.425	3.767	***	
PainFamHome1	<---	pdi	1.274	.347	3.668	***	
painint1	<---	stresstot1	.034	.013	2.579	.010	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
pdi	<---	stresstot1	.283
PainLifeSupport1	<---	pdi	.330
PainSelfCare1	<---	pdi	.533
PainSexual1	<---	pdi	.333
PainWork1	<---	pdi	.694
PainSocial1	<---	pdi	.851
PainRec1	<---	pdi	.846
PainFamHome1	<---	pdi	.724
painint1	<---	stresstot1	.213

Covariances: (Group number 1 - Default model) *= .001**

			Estimate	S.E.	C.R.	P	Label
e7	<-->	e6	2.301	.559	4.117	***	

Correlations: (Group number 1 - Default model)

			Estimate
E7	<-->	e6	.389

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.878	.831	.936	.909	.934
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	1.435	.925	.871	.535
Saturated model	.000	1.000		
Independence model	3.053	.502	.378	.402

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.083	.049	.117	.055
Independence model	.276	.253	.300	.000

Table 21: Structural Equation Modeling: Discharge without Gender

Result (Default model)
Minimum was achieved
Chi-square = 44.975
Degrees of freedom = 25

Probability level = .008

Regression Weights: (Group number 1 - Default model) ***= .001

			Estimate	S.E.	C.R.	P	Label
PDI Discharge	<---	stresstotd	.082	.017	4.753	***	
PainFam2	<---	PDI Discharge	1.000				
PainRec2	<---	PDI Discharge	1.074	.069	15.670	***	
PainSocial2	<---	PDI Discharge	1.127	.074	15.156	***	
PainWork2	<---	PDI Discharge	1.100	.095	11.636	***	
PainSexual2	<---	PDI Discharge	.788	.133	5.945	***	
PainSelfcare2	<---	PDI Discharge	.752	.092	8.206	***	
PainLifeSupport2	<---	PDI Discharge	.578	.090	6.447	***	
painint2	<---	stresstotd	.090	.023	3.996	***	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
PDI Discharge	<---	stresstotd	.391
PainFam2	<---	PDI Discharge	.897
PainRec2	<---	PDI Discharge	.894
PainSocial2	<---	PDI Discharge	.880
PainWork2	<---	PDI Discharge	.768
PainSexual2	<---	PDI Discharge	.475
PainSelfcare2	<---	PDI Discharge	.612
PainLifeSupport2	<---	PDI Discharge	.508
painint2	<---	stresstotd	.320

Covariances: (Group number 1 - Default model) ***= .001

			Estimate	S.E.	C.R.	P	Label
Painpsi	<-->	PDIpsi	1.735	.375	4.630	***	
E6	<-->	E7	.828	.284	2.916	.004	

Correlations: (Group number 1 - Default model)

			Estimate
Painpsi	<-->	PDIpsi	.451
E6	<-->	E7	.265

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.933	.904	.969	.955	.969
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.076	.038	.111	.117
Independence model	.355	.332	.379	.000

Table 22: Correlations of Independent and Dependant Variables

Correlations: N= 142, Person Correlation sig. (2-tailed) ** sig at the .01 level * sig at the .05 level

	Patient's Age	completed the program	marital status	gender	racial/ethnic background	educational level
Patient's Age	1	.040	.301**	.161	-.010	.059
		.634	.000	.056	.904	.485
completed the program	.040	1	.017	.043	-.146	.101
	.634		.841	.615	.083	.232
marital status	.301**	.017	1	.080	-.039	.009
	.000	.841		.345	.644	.914
gender	.161	.043	.080	1	-.060	-.009
	.056	.615	.345		.478	.920
racial/ethnic background	-.010	-.146	-.039	-.060	1	-.071
	.904	.083	.644	.478		.400
educational level	.059	.101	.009	-.009	-.071	1
	.485	.232	.914	.920	.400	

Correlations: N=142, Person Correlation sig. (2-tailed) ** sig at the .01 level * sig at the .05 level

	Admissinon pain intensity	Discharge Pain Intensity	admission dass dep total	admission dass stress	Admission Total PDI score (sum of all PDI domains = 0-70)	Discharge Total PDI score (sum of all PDI domains = 0-70)
Admissinon pain intensity	1	.217** .010	.219** .009	.213* .011	.218** .009	.086 .312
Discharge Pain Intensity	.217** .010	1	.144 .089	.149 .077	.101 .234	.515** .000
admission dass dep total	.219** .009	.144 .089	1	.720** .000	.402** .000	.100 .237
admission das stress	.213* .011	.149 .077	.720** .000	1	.346** .000	.127 .133
Admission Total PDI score (sum of all PDI domains = 0-70)	.218** .009	.101 .234	.402** .000	.346** .000	1	.071 .402
Discharge Total PDI score (sum of all PDI domains = 0-70)	.086 .312	.515** .000	.100 .237	.127 .133	.071 .402	1

Correlations N=142, Person Correlation sig. (2-tailed) ** sig at the .01 level * sig at the .05 level

	completed the program	Patient's Age	marital status	gender	racial/ethnic background	educational level	Admission pain intensity
completed the program	1	.040 .634	.017 .841	.043 .615	-.146 .083	.101 .232	.144 .089
Patient's Age	.040 .634	1	.301** .000	.161 .056	-.010 .904	.059 .485	-.027 .753
Marital status	.017 .841	.301** .000	1	.080 .345	-.039 .644	.009 .914	.106 .210
gender	.043 .615	.161 .056	.080 .345	1	-.060 .478	-.009 .920	.012 .886
racial/ethnic background	-.146 .083	-.010 .904	-.039 .644	-.060 .478	1	-.071 .400	.055 .514
educational level	.101 .232	.059 .485	.009 .914	-.009 .920	-.071 .400	1	-.153 .069
Admissinon pain intensity	.144 .089	-.027 .753	.106 .210	.012 .886	.055 .514	-.153 .069	1

Correlations N=142, Person Correlation sig. (2-tailed) ** sig at the .01 level * sig at the .05 level

	completed the program	Patient's Age	marital status	gender	racial/ethnic background	educational level	Discharge Pain Intensity
completed the program	1	.040 .634	.017 .841	.043 .615	-.146 .083	.101 .232	-.010 .904
Patient's Age	.040 .634	1	.301** .000	.161 .056	-.010 .904	.059 .485	-.072 .396
marital status	.017 .841	.301** .000	1	.080 .345	-.039 .644	.009 .914	.102 .231
Gender	.043 .615	.161 .056	.080 .345	1	-.060 .478	-.009 .920	-.003 .969
racial/ethnic background	-.146 .083	-.010 .904	-.039 .644	-.060 .478	1	-.071 .400	.122 .149
educational level	.101 .232	.059 .485	.009 .914	-.009 .920	-.071 .400	1	-.018 .835
Discharge Pain Intensity	-.010 .904	-.072 .396	.102 .231	-.003 .969	.122 .149	-.018 .835	1

Correlations N=142, Person Correlation sig. (2-tailed) ** sig at the .01 level * sig at the .05 level

	completed the program	Patient's Age	marital status	gender	racial/ethnic background	educational level	admission dass stress
completed the program	1	.040 .634	.017 .841	.043 .615	-.146 .083	.101 .232	-.151 .074
Patient's Age	.040 .634	1	.301** .000	.161 .056	-.010 .904	.059 .485	-.068 .426
marital status	.017 .841	.301** .000	1	.080 .345	-.039 .644	.009 .914	.057 .504
Gender	.043 .615	.161 .056	.080 .345	1	-.060 .478	-.009 .920	.113 .182
racial/ethnic background	-.146 .083	-.010 .904	-.039 .644	-.060 .478	1	-.071 .400	.144 .088
educational level	.101 .232	.059 .485	.009 .914	-.009 .920	-.071 .400	1	-.184* .029
admission das stress	-.151 .074	-.068 .426	.057 .504	.113 .182	.144 .088	-.184* .029	1

Correlations N=142, Person Correlation sig. (2-tailed) ** sig at the .01 level * sig at the .05 level

	completed the program	Patient's Age	marital status	gender	racial/ethnic background	educational level	DASS Stress
completed the program	1	.040 .634	.017 .841	.043 .615	-.146 .083	.101 .232	-.101 .235
Patient's Age	.040 .634	1	.301** .000	.161 .056	-.010 .904	.059 .485	-.159 .060
marital status	.017 .841	.301** .000	1	.080 .345	-.039 .644	.009 .914	-.168* .047
Gender	.043 .615	.161 .056	.080 .345	1	-.060 .478	-.009 .920	.137 .106
racial/ethnic background	-.146 .083	-.010 .904	-.039 .644	-.060 .478	1	-.071 .400	.188* .026
educational level	.101 .232	.059 .485	.009 .914	-.009 .920	-.071 .400	1	-.106 .211
DASS Stress	-.101 .235	-.159 .060	-.168* .047	.137 .106	.188* .026	-.106 .211	1

Correlations N=142, Person Correlation sig. (2-tailed) ** sig at the .01 level * sig at the .05 level

	completed the program	Patient's Age	marital status	gender	racial/ethnic background	educational level	Admission Total PDI score (sum of all PDI domains = 0-70)
completed the program	1	.040 .634	.017 .841	.043 .615	-.146 .083	.101 .232	.093 .271
Patient's Age	.040 .634	1	.301** .000	.161 .056	-.010 .904	.059 .485	-.138 .102
marital status	.017 .841	.301** .000	1	.080 .345	-.039 .644	.009 .914	.064 .453
gender	.043 .615	.161 .056	.080 .345	1	-.060 .478	-.009 .920	.008 .920
racial/ethnic background	-.146 .083	-.010 .904	-.039 .644	-.060 .478	1	-.071 .400	.023 .787
educational level	.101 .232	.059 .485	.009 .914	-.009 .920	-.071 .400	1	-.145 .086
Admission Total PDI score (sum of all PDI domains = 0-70)	.093 .271	-.138 .102	.064 .453	.008 .920	.023 .787	-.145 .086	1

Correlations N=142, Person Correlation sig. (2-tailed) ** sig at the .01 level * sig at the .05 level

	completed the program	Patient's Age	marital status	gender	racial/ethnic background	educational level	Discharge Total PDI score (sum of all PDI domains = 0-70)
completed the program	1	.040 .634	.017 .841	.043 .615	-.146 .083	.101 .232	-.153 .070
Patient's Age	.040 .634	1	.301** .000	.161 .056	-.010 .904	.059 .485	.152 .072
marital status	.017 .841	.301** .000	1	.080 .345	-.039 .644	.009 .914	-.043 .610
gender	.043 .615	.161 .056	.080 .345	1	-.060 .478	-.009 .920	.123 .145
racial/ethnic background	-.146 .083	-.010 .904	-.039 .644	-.060 .478	1	-.071 .400	.238** .005
educational level	.101 .232	.059 .485	.009 .914	-.009 .920	-.071 .400	1	-.009 .917
Discharge Total PDI score (sum of all PDI domains = 0-70)	-.153 .070	.152 .072	-.043 .610	.123 .145	.238** .005	-.009 .917	1

Figure 1: Structural Equation Modeling Admission

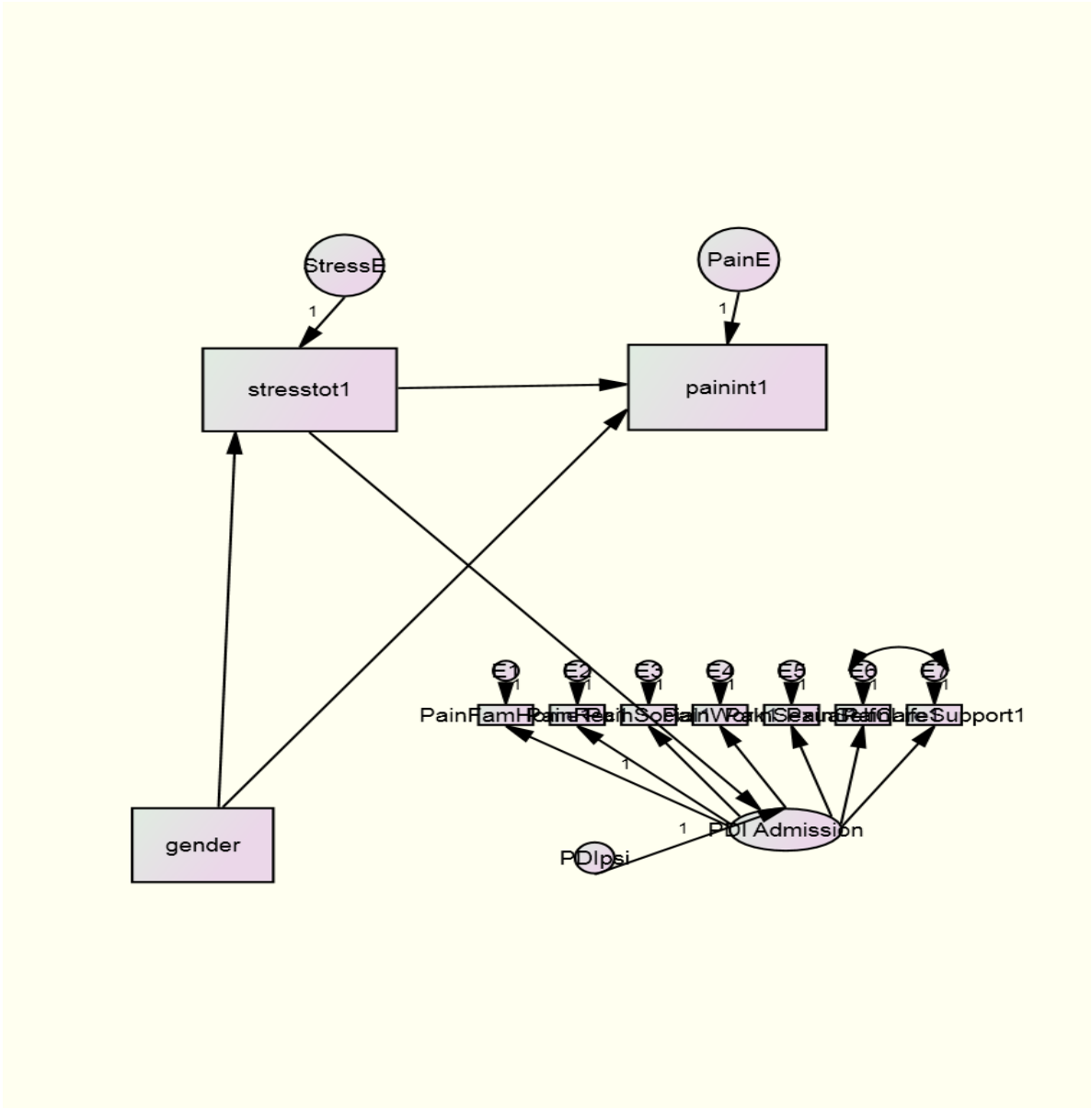

Figure 2: Structural Equation Modeling Discharge

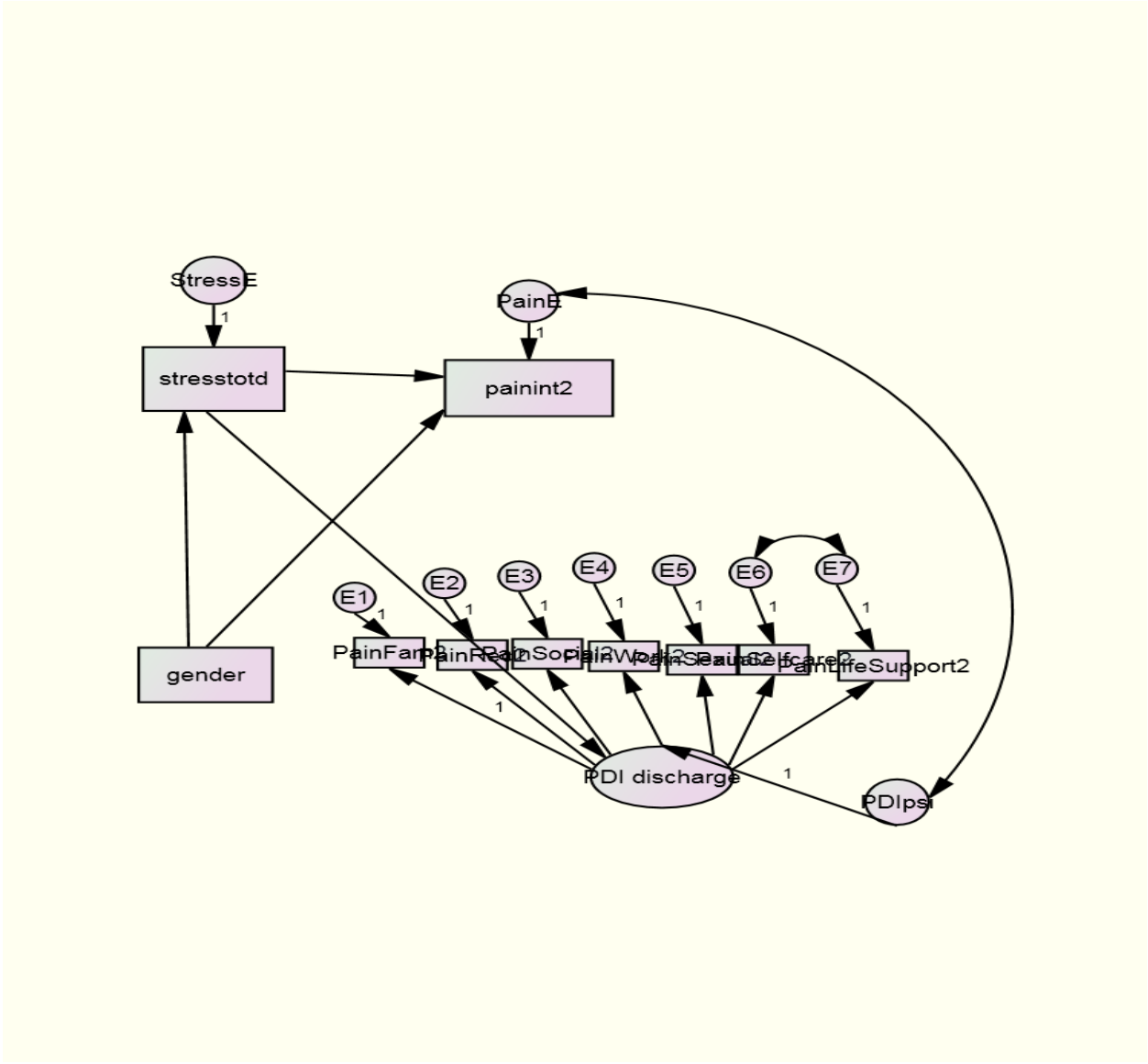

Figure 3: Structural Equation Modeling Admission without Gender

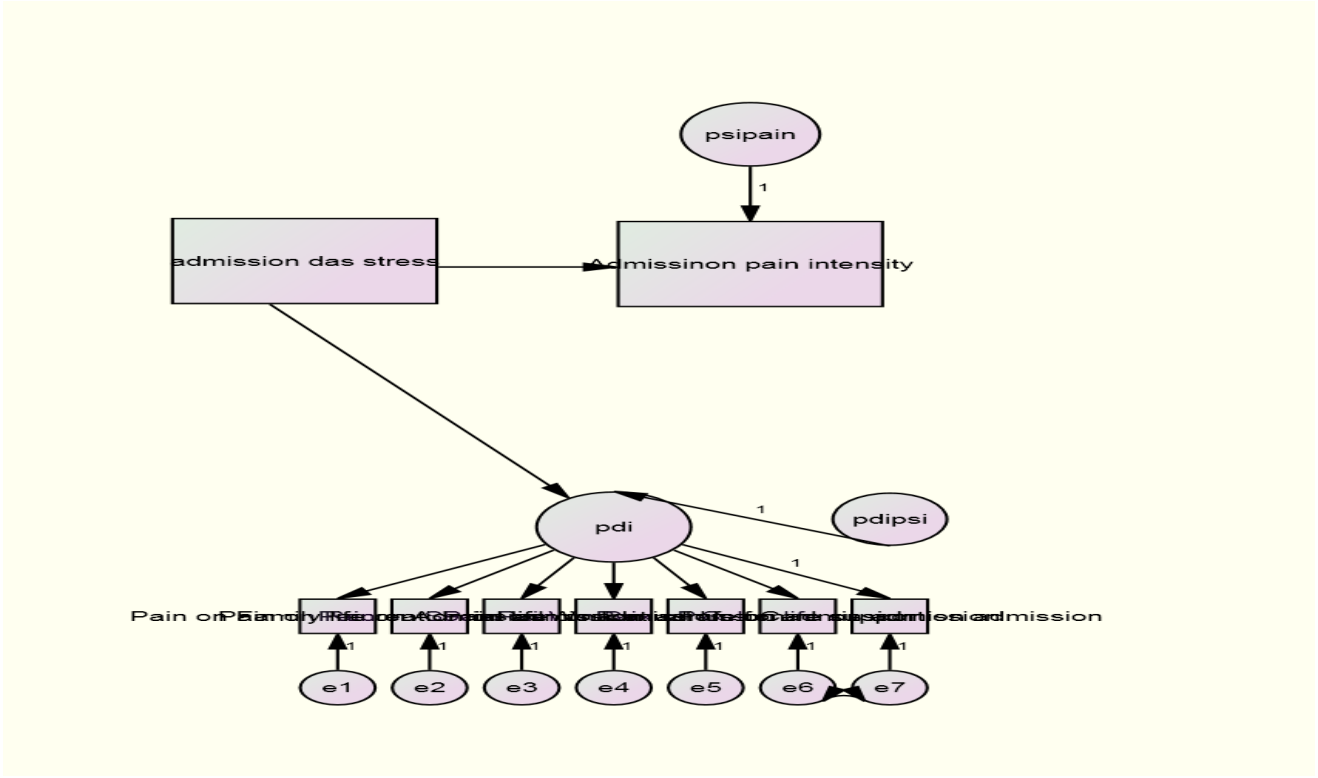

Figure 4: Structural Equation Modeling Discharge without Gender