SHOULD OBESE PATIENTS BE DENIED REHABILITATION RESOURCES FOR CHRONIC DISABLING OCCUPATIONAL MUSCULOSKELETAL DISORDERS?

APPROVED BY SUPERVISORY COMMITTEE

Robert J. Gatchel, Ph.D.

Martin J. Deschner, Ph.D.

Tom Mayer, M.D.

SHOULD OBESE PATIENTS BE DENIED REHABILITATION RESOURCES FOR CHRONIC DISABLING OCCUPATIONAL MUSCULOSKELETAL DISORDERS?

by

ALEKSANDRA ACESKA

THESIS

Presented to the Faculty of the Graduate School of Biomedical Sciences

The University of Texas Southwestern Medical Center at Dallas

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

The University of Texas Southwestern Medical Center at Dallas

Dallas, Texas
August, 2005

ACKNOWLEDGEMENTS

I can only begin these acknowledgements by thanking my parents, Bob Aceski and Olga Aceska, and my fiancé, Josh Foxwell. Their support and encouragement were of tremendous importance during this process. I am fortunate to have been blessed with wonderful parents who have encouraged and supported me in everything that I do. I am also fortunate to have a future husband who is loving, supportive and who is my best friend.

In addition to my family, my friends in the Dallas area and elsewhere have been of tremendous professional and personal support. I would especially like to thank my classmates Deidre Edwards, Puja Gandhi, and Payal Ravani. They are incredible friends who have served as a source of guidance and support over the last two years. Their friendship and sense of humor were of great importance to me during this time. Thanks also must be extended to Dr. Skye Moffit and Kim Schocket for all the help and support through this process. I look forward to future contact and collaboration.

I owe a great deal of appreciation to my dissertation mentor, Dr. Gatchel. One of the most important decisions that I made in graduate school was to request to train with Dr. Gatchel. Thankfully, he agreed to take me on as one of his students, and as a result I learned so much and had a wonderful experience. I would also like to thank Dr. Tom Mayer and Dr. Martin Deschner for their willingness to serve on my committee. Both Dr. Mayer and Dr. Deschner brought a unique prospective to the project, and allowed me to expand my knowledge in this field. I would also like to thank Dr. Deschner for serving as one of my clinical supervisors, who has helped me further develop my skills.

Finally, I would like to thank the entire professional staff at PRIDE for their assistance in this project. Special thanks goes to Brian Theodore for guiding me through this project.

August, 2005

ABSTRACT

SHOULD OBESE PATIENTS BE DENIED REHABILITATION RESOURCES FOR CHRONIC DISABLING OCCUPATIONAL MUSCULOSKELETAL DISORDERS?

ALEKSANDRA ACESKA, M.S.

The University of Texas Southwestern Medical Center at Dallas, 2005

MARTIN J. DESCHNER, Ph.D.

In the United States, obesity is a rising concern because of its effect on both physical and mental health. More than one-third of Americans are obese, and approximately 1% (5 million people) suffer from clinically severe obesity (Kolotkin, Meter, & Williams, 2001). Little research has been provided on the effect of obesity on functional restoration rehabilitation for work-related chronic musculoskeletal pain patients. The purpose of this study was to determine whether obese individuals are as successful after completing a functional restoration program as those that are of normal weight. Subjects included 3,341 chronic musculoskeletal patients from the Productive Rehabilitation Institute of Dallas for Ergonomics (PRIDE) who were separated in five BMI categories: Normal, Overweight, Obese I, Obese II, and Obese III. For the purposes of this study, the above weight categories were determined by using the body mass index formula: weight in kg/height in m.^{2} These subjects were evaluated on demographic, physical, psychosocial and one-year socioeconomic variables, with respect to the five BMI categories. The results showed some significant differences in terms of age, gender, and race. Injury related variables, however, were found to be nonsignificant. Significant difference was also found in the physical and psychosocial variables, in terms of disability level, physical functioning and pain intensity. Obese subjects were found to have a higher disability level, lower physical functioning, and higher pain intensity, pre- or post-treatment. In contrast, the results also suggest that the Obese III group improved pre- to post-treatment at the same rate as the other groups. Significant differences were also found in work return among the five groups; however, the linear trend analysis was found to be nonsignificant. This means that the Obese III group was not less likely to return to work than any of the other groups. Work retention,

employment status, and hours worked per week did not result in any significant difference among the five groups. It can be concluded from this study that obese individuals are as successful as non obese individuals in returning to normal functioning after functional restoration rehabilitation.

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF APPENDICES

LIST OF ABBREVIATIONS

BMI – Body Mass Index

BDI – Beck Depression Inventory

MVAS – Million Visual Analogue Scale

CHAPTER ONE
Introduction

Obesity is a major health problem in the United States. Data on measured heights and weights indicate that the prevalence of obesity has significantly increased among the U.S. population over the past 30 years (Baskin, Franklin, & Allison, 2005). Between the years 1999 and 2002, it is estimated that more than one-third of American adults are obese, and one in six children and adolescents is overweight (Baskin, Franklin & Allison, 2005; Kolotkin, Meter, & Williams, 2001). Increased prevalence of excessive weight is noted among all ages, gender and racial/ethnic groups; however, discrepancies exist. Obesity has been linked to health problems such as Type II diabetes, coronary heart disease, sleep apnea, certain cancers and musculoskeletal complications. Further, this disease is associated with poor emotional health, as well as lack of productivity.

Musculoskeletal pain is linked to significant impaired functioning. Like obesity, it is associated with disability and economic loss. Risk factors for musculoskeletal pain include age, occupational exposure, psychological factors and physical activity (Peltonen, Lindroos, & Togrgeson, 2003). Up to 85% of the adult workforce will miss time and seek professional care for musculoskeletal pain during the course of their careers (Waddell, 1996; Fordyce, 1995; Nachemson, 1992). An estimated $2 million is spent annually for the diagnosis and care of musculoskeletal trauma. This figure does not include other costs such as vocational training, occupational modifications, legal compensation, and lost worker productivity (Gatchel, Polatin, & Mayer, 1995).

Obesity and overweight status are generally associated with musculoskeletal pain. This combination is often viewed negatively by society, especially related to work productivity. The literature often focuses on the cause and effect relationship between the two. However, there are conflicting conclusions about the association. Little research is provided on functional restoration rehabilitation of obese chronic musculoskeletal pain patients. Some studies have identified obesity as a risk factor for musculoskeletal surgery; however, there is a paucity of research directly evaluating the effect of obesity on chronic musculoskeletal rehabilitation.

It can be assumed that obesity has a negative effect on functional restoration rehabilitation, and that obese individuals are often neglected healthcare for the risk of causing further damage. The following study will evaluate the influence of obesity on functional restoration rehabilitation population. It is our hypothesis that obese individuals will have the same success in terms of socioeconomic, physical and psychosocial variables after rehabilitations as those individuals with normal weight.

CHAPTER TWO
Review of the Literature

Obesity

Obesity is a significant health issue, with its prevalence increasing over the last decade throughout the United States (Marcus, 2004). It is a complex disease that develops from the interaction of genetic, metabolic, social, behavioral, and cultural factors. Obesity has a significant impact on the health, psychosocial well-being, longevity, and quality of life of those affected. More than one-third of Americans are obese [with body mass index (BMI) of greater than 27kg/m^2], and approximately 1% suffer from clinically severe obesity (BMI over 40kg/m^2) (Kolotkin, Meter, & Williams, 2001). A longitudinal study identified obesity (defined as BMI $\geq$ 30 kg/m^2) in 26% of men and 28% of women in their late 30's, with obesity risk increased in African-American women (McTigue, Garrett, & Popkin, 2002). In the United States and other developed countries, obesity is more prevalent in minority groups, low socioeconomic status, and in those with less education. The high prevalence in these groups may be due to the abundance of unhealthy food at a lower cost, and the lack of activity (Kolotkin, Meter, & Williams, 2001).

Throughout the years, research has shown an inverse correlation between obesity and general well-being. Health is defined by the World Health Organization as a state of complete physical, psychological, and social well-being, reflected in the ability to be "confident and positive and able to cope with the ups and downs of life." The literature agrees with the increasing negative impact of obesity on physical and psychosocial "health" (Kolotkin, Meter, & Williams, 2001; Brown, Mishra, Kenardy, & Dobson, 2000; Berke, & Morden, 2000). Problems such as coronary heart disease, Type 2 diabetes, hypertension, osteoarthritis, high cholesterol and musculoskeletal injury are just a few of the health risks associated with obesity. Men and women at even the modest levels of adiposity are at increased risk for morbidity. Estimates of the proportion of deaths caused by these factors range from 14% to 23% of total mortality in the United States (Colditz, 1999). Despite the fact that the literature ties mortality to obesity, some recent studies have disagreed.

Flega, Graunbard, Williamson, and Gail (2005) studied the differences in mortality rates of obese individuals to those of normal weight. Contrary to popular belief, their results suggested that the impact of obesity on mortality may have decreased over time. They attributed this decrease to improvements in public health and medical care. What was even more surprising, the study concluded that people who were overweight but not obese were less likely to die than those who are at "ideal weight" (Flega, Graunbard, Williamson, & Gail, 2005). The Center for Disease Control and Prevention (CDC), however, disputed the results of this study, concluding that the study was flawed. They stated that the obesity epidemic should not be overlooked and its dangers should not be deflated (CDC report, 2005).

Obesity has not only become an individual problem, but also a problem of social concern. People who are obese face physical, psychological, and social stigmas. The obsession with body image and the notion of an "ideal look" has brought on eating disorders such as bulimia and anorexia in many individuals struggling with weight. In the United States, as many as 10 million females and 1 million males are fighting a life and death battle with an these eating disorders. Approximately 25 million more are struggling with binge eating disorder (Crowther et al., 1992; Fairburn et al., 1993; Gordon, 1990; Hoek, 1995; Shisslak et al., 1995). The diet and exercise industry is at an all time high, with 25% of American men and 45% of American women on a diet on any given day (Smolak, 1996). Americans spend over $40 billion on dieting and diet-related products each year (Smolak, 1996). The stigma attached to being overweight and obese further drives individuals to take part in risky surgeries.

After failed diets and exercise, obese individuals often resort to surgery to improve their physical health and be more accepted in society. Gastric bypass surgery is one of the newest and most common surgeries that allows individuals with a BMI of above 40 or those who have health complications due to obesity with a BMI of above 35 to live a healthier life (NIH report, 2004). Aside from gastric bypass surgery, many people are also turning to cosmetic surgery procedures, such as liposuction and breast reduction. For some obese individuals, however, the level of risk for these procedures often does not substitute for the physical and psychosocial burden they experience.

The main psychological problem associated with obesity is depression. As mentioned above, obese individuals often struggle with body image, inactivity, and finding a place in society, leading to depression. Overweight and obesity combined afflict almost 65% of Americans (Flegal et al., 2002). Since the prevalence of depression has been estimated at 10% (Kessler et al., 1994), there is a strong probability that the two disorders will occur together by chance. For years, it was assumed that the relationship of depression to obesity in the general population was coincidental. Research in the recent past, however, has uncovered a large number of mediating variables that relate depression and obesity. Studies show that depression influences obesity under some circumstances and obesity influences depression under others (Stunkard, Faith & Allison, 2004). Further discussion of this relationship, however, is beyond the scope of this study.

Additionally, there is a conflict in the literature with regards to the relationship between obesity and psychopathology. In their study, Kolotkin, Meter, and Williams (2001) found that the obese populations manifest no more psychological disturbance than do non-obese populations; however, obese persons who seek treatment in general may be more likely than non-treatment-seeking obese persons to experience psychological disturbances. Along with psychological factors, obese individual struggle to find their place in society. One of the greatest social problems encountered by obese individuals is prejudice and discrimination at work, in public, and interpersonally (Klotkin, Meter, & Williams, 2001). Obese individuals with simulated resumes and interviews are rated as less qualified for jobs and viewed as having poorer work habits, as well as emotional and interpersonal problems (Klesges et. al., 2001).

Health problems associated with obesity bring about costs to both the obese patient and society. Treatment for obesity and diseases directly related to it accounts for 5% to 7% of the total annual health care costs (Berke & Morden, 2000). The direct costs include the costs of diagnosis and necessary treatments needed for the disease. These include hospital stay, nursing homes, medications and physician visits. The costs to society, however, are both direct and indirect, and not only include increased medical expenses, but also loss of productivity in the workplace, disability claims and job discrimination. Wolf and Colditz (1998) estimated 39.2 million workdays lost, 239 million restricted-activity days, and 62.6 million physicians visits attributed to obesity in 1994 in the United States. In addition, cost of lost productivity from obesity in 1995 totaled $99.2 billion (Marcus, 2004). It is estimated that obese subjects are 1.5-1.9 times more likely to take sick leave, and that 12% of obese individuals have disability pensions attributable to obesity, costing $300 million per 1 million in the adult population. Overall, approximately 10% of sick leave and disability pension may be related to obesity and obesity-related conditions (Colditz, 1999). In contrast to other chronic physical conditions, such as asthma, diabetes, and musculoskeletal deformities, obesity often results in negative economic and social consequences (Klotkin, Meter, & Williams, 2001). Early retirement and increased risk of disability pensions add indirect costs that are not included in the estimates of the total cost. Unfortunately, these statistics often place a negative stigma on obese individuals. However, when examined more closely the above studies were correlational, rather than a specific cause/effect relationship.

The definition of obesity can be rather complicated. The World Health Organization has formulated an index for defining obesity which will be used in this study. Known as the body mass index (BMI), it is based on the patient's height in meters and weight in kilograms (Berke & Morden, 2000). This classification is accurate for all patients except those at the extremes of height or muscle mass, where body proportions affect the calculation. The National Institute of Health has stratified patients into different classes of obesity. A BMI of 18.5 to 24.9 is defined as normal; a BMI of 25.0 to 29.9 as overweight; and a BMI of 30 or greater as obese. The present study further separates the obese category into obese (BMI 30.0 – 34.9), very obese (35-39.9), and clinically obese

(≥ 40). A sample of 3,341 work-related chronic musculoskeletal pain patients were classified in the above categories for the purpose of the present study.

Musculoskeletal Pain

Musculoskeletal problems are a major health problem during active life, despite all the efforts put forth into research, information, treatment, and rehabilitation (Hellsing & Bryngelsson, 2000). The 1-year prevalence of musculoskeletal pain is 30-50%; it can last for days, recur, or become chronic. Most predominant during active life, these problems have a major economic effect, but represent only a small proportion of health care (Linton, Hellsing, & Hallden, 1998).

The high prevalence and cost of musculoskeletal pain disability in industrialized countries is well established. It is estimated that $27 billion is spent annually for diagnosis and care of musculoskeletal trauma, and this figure does not include other associated costs such as legal compensation, vocational retraining, occupational modifications, and lost worker productivity (Gatchel, Polatin, & Mayer, 1995). Up to 85% of the adult workforce will miss time and seek professional care for musculoskeletal pain during the course of their careers (Waddell, 1996; Fordyce, 1995; Nachemson, 1992). For most individuals who experience musculoskeletal pain, the symptoms usually subside, allowing work return with little lost time. In a small number of individuals, however, the pain develops into chronic musculoskeletal pain with associated occupational disability (Reid, Haugh, Hazard, & Tripathi, 1997).

Chronic musculoskeletal pain is an “umbrella term” under which chronic pain at any musculoskeletal site (i.e. neck, back, hand, leg, etc) applies. While non-spinal musculoskeletal pain sites are beginning to gain more attention in the literature (Mayer, Gatchel, Polatin, & Evans, 1999), the chronic spinal disorder population and, more specifically, the chronic low back pain population, remains the most extensively studied group of the chronic musculoskeletal pain patients. The reason for this focus is that chronic low back pain is said to be the most expensive benign medical condition in the United States (Mayer, Gatchel, Mayer, Kishino, Keely, & Monney, 1987). Furthermore, it is the second only to the common cold as the greatest single cause of lost work (Gatchel, 1991). For individuals under the age of 45, disability from back pain is more common than any other cause of activity limitation and is second to arthritis in individuals aged 45 to 65 years (Frank, Kerr, & Booker, 1996). Approximately 60-80% of all adults develop back pain; however, only 10% of these individuals progress to chronic low back pain. For the remaining 90%, pain duration is brief and treatment modality used is often irrelevant to the outcome (Atlus and Dayo, 2001). While only 10% of individuals with acute back pain progress to chronic pain, this group is primarily responsible for the majority of the expenses resulting from this condition. Furthermore, of the total cost of low back pain, 80% is attributed to the chronically disabled population (Krause & Ragland, 1994).

Low back pain is a common reason for workers' compensation claims. In the Untied States and Canadian workforce, 1% to 2% will file a workers' compensation claim due to low back disability at some point during their lifetime (MacDonald, Sorock, Volinn, Hashemi, Clancy, & Webster, 1997). Additionally, it is estimated that more than one percent of the work-age population is permanently disabled by chronic low back pain, which spreads the workers' compensation dollar even thinner (Gatchel et al., 1995). In total, an estimated 33% of all health care and insurance costs under workers' compensation are accounted for by occupational low back pain (Anderrson, Pope, Fymoyer, & Snook, 1991).

Although chronic low back pain remains the most extensively studied work-related musculoskeletal spinal condition, other spinal conditions are beginning to receive increased attention in the literature. This is certainly the case for neck (i.e., cervical) pain, which by some is estimated to be more common in clinical practice than is low back pain. It is estimated that neck pain affects the lives of 9-12% of the general population (Marchiori & Henderson, 1996; Wilson, 1991). Of these patients, up to 40% develop a chronic cervical pine disorder, with 8-10% of these patients experiencing severe pain (Miles, Maimaris, Finaly, Barnes, 1988; Pennie & Agambar, 1991).

The rising incidence and cost of upper extremity cumulative trauma disorder, which is another type of work-related musculoskeletal disorder, has also begun to receive increasing attention in the literature. It is expected that it will soon surpass low back disorders as the leading case of disability in United States manufacturing plants (Roughton, 1993). In addition to lost work time, compensation costs for this condition are also high. The compensation costs for these disorders were estimated at $563 million in 1989, and this figure does not take into account other associated expenses such a vocational retraining, lost industrial productivity, and occupational modifications (Vannier & Rose, 1991). As it is with low back pain, the majority of the costs stemming from upper extremity cumulative trauma disorders is from chronically disabled individuals.

While the cost and prevalence of chronic low back pain, chronic cervical spine disorder, and upper extremity cumulative trauma discords have been investigated in the literature, lower extremity pain disorders and other musculoskeletal disorders have not received the same focus. Despite the lack of research attention, it is important to note that these conditions also represent a major socioeconomic problem.

Theories of Pain

Theories concerning the etiology and treatment of pain have long been topics for heated debate in the medical community. Much of this debate has centered on the role of psychological factors in the experience of pain. The establishment of an artificial distinction between the mind and the body can be followed back to the 17th century and the work of Rene Descartes. Descartes described the pain process as a direct path from the skin to the brain. He proposed that, when a part of the body comes in contact with a stimulus such as a flame, particles are set in motion and transmitted to the brain, where a pain response is being trigged in a manner similar to the disarming of an alarm. When this response is triggered, the individual experiences pain, which in turn invokes some type of pain response (Melzack, 1973). In the 19th century, advances in anatomy and sensory physiology contributed to the continued development of pain theories that reflected only a biomedical model of causation (Turk & Flor, 1999). In 1894, Von Frey put forth the “specificity theory of pain,” which proposed that specific sensory receptors are responsible for the transmission of sensations such as warmth, touch, and pain. As with Dscartes’ theory, only physiological factors were considered in this model, as pain was seen as having specific central and peripheral mechanisms similar to the other bodily senses (Melzack & Wall, 1965). During the same time frame that Von Frey was proposing his theory, Goldshneider postulated a theory labeled the “pattern theory of pain.” Unlike Von Frey, Goldscheider proposed that the experience of pain is the result of nerve impulse patterns that are developed and coded at the peripheral site of stimulation. He proposed that differences in sensation (i.e., pain versus touch) were the result of differences in the patterning and quantity of peripheral nerve-fiber discharges. While differing from the work of Von Frey, this model continued in the tradition of accounting for only physiological factors in the pain perception process (Baum, Gatchel, & Krantz, 1997).

This emphasis on a biomedical model of treatment and understanding of pain continued into the 20^{th} century. However, this view began to shift during the middle part of the century due to the growing awareness that treatments developed out of this model failed to alleviate pain, particularly chronic pain, in many individuals. In 1959, Engel introduced the term "psychogenic pain," which later developed into the "pain-prone disorder." Engel emphasized the importance of psychological factors in the experience of pain and pointed to characteristics that he believed predispose certain individuals to chronic pain. These risk factors included a history of defeat, unsatisfied aggressive impulses, significant guilt, and a propensity to develop pain in response to the experience of a real or imagined loss. During this same time frame, others in the field were beginning to postulate their own sets of psychological, vocational, and cultural variables, which they believed to be part of pain perception. For example, Mersky (1965) hypothesized that chronic pain patients were likely to be individuals in unskilled/semi-skilled labor that had trying lives, and suffered from depression of hypochondriases.

In 1965, Melzack and Wall proposed the "gate control theory of pain" in an attempt to better account for the many diverse factors that contribute to pain perception. Unlike previous models of pain, this theory does not view pain as a result of a direct or "straight-through" transmission of impulses from the skin to the brain. Instead, the central nervous system mechanisms are viewed as providing the physiological basis for the involvement of psychological factors in pain perception. This structure serves to increase and decrease the transmission of nerve impulses from peripheral sites to the central nervous system, and therefore reviews sensory information before evoking the sensation of pain. Psychological variables play a role in this process because factors such as depression, anxiety, attention, and previous experiences influence pain perception by altering the gating of the dorsal horn. This theory is of great importance because it introduced that psychological factors play a role in the pain perception process (Melzack, 1993).

As those in the field began to take notice of the importance of psychological factors in the pain perception process, the role of social factors also began to gain attention. For example, Mechanic (1966; 1972) observed that a patient's response to his/her pain symptoms may be understood as a function of the social ramifications of that behavior. Fordyce (1976) addressed the relationship between social variables and pain through an operant learning framework. He proposed that pain behaviors, such as grimacing during physical activity, are influenced by positive and negative reinforcement from the environment. For example, attention from others might serve as positive reinforcement for pain behavior, while the evasion of undesirable work activities might serve as negative reinforcement for the same behavior. In the case of both types of reinforcement, the individual's pain experience is prolonged by external contingencies of reinforcement.

Turk and Rudy (1987) proposed a biopsychosocial model of pain in order to explain the many factors that contribute to the experience of pain. This model represented a more complex definition of pain by adding social factors to the psychological and physiological components proposed by Melzack and Wall (1965). In total, this multidimensional model takes into account physiological, biological, cognitive, affective, behavioral and social factors in an attempt to provide a framework for understanding the process of pain perception. Furthermore, Turk (1996) notes that "no single factor in isolation --- pathophysiological, psychological, or social – will adequately explain chronic pain status." Despite the different approaches in defining the perception of pain, the important thing to note is the impairment pain can cause.

Chronic Musculoskeletal Pain and Obesity

Obesity, as noted, has a tremendous effect on a person's health, and it can cause multiple physical problems such as musculoskeletal pain. Unfortunately, little research was found regarding the relationship of chronic musculoskeletal pain and obesity. Additionally, work related musculoskeletal injury and obesity has not been represented in the literature. Chronic low back pain is mainly the focus of past research, suggesting conflicting theories on the relationship between obesity and back pain. The reason for this focus, as previously mentioned, is the prevalence of low back pain as compared to other musculoskeletal problem. Past studies suggest that there is confusion between the two, debating whether chronic back pain is a cause or an effect of obesity. Earlier studies have demonstrated a weak relationship between obesity and chronic back pain (Lebou-Yde, 2000). The most significant relationship between obesity and pain has been seen in samples of chronic back patients, with increased disability and decreased quality of life. Fransen et al. (2002) identified obesity (defined by BMI ≥ 30 kg/m^2) as a risk factor for the development of chronic back pain in both men and women following acute injury. Lake, Power and Cole (2000) recognized that the association could reflect different processes, given that back pain may lead to a reduction of physical activity, and thus to increased adiposity; that is, obesity could be a consequence of back pain. The alternate proposition is that obesity could increase the mechanical load on the spine therefore increasing the risk of chronic back pain.

In terms of chronic musculoskeletal pain, several studies have pointed to a direct relationship between excess body weight and functional difficulties in musculoskeletal pain. One such study concluded that subjects who were obese had more problems with work-restricting musculoskeletal pain than the general population (Peltonen, Lindroos, & Torgerson, 2003). Similarly, research focusing on Japanese women demonstrated that the impairment on well-being through musculoskeletal pain and difficulty of daily movements was largely attributed to obesity (Tsuritani, hona, Noborisaka, Ishida, Ishizaki, & Yamada, 2002). In patients with spine disease, functional health status was significantly worse for patients with a higher body mass index. Thus, the physical functioning composite of the Medical Outcomes Survey Short-Form (SF-36) quality of life measure was reduced in obese patients. The obese patients also displayed more severe pain symptoms than the nonobese spine patients. Furthermore, obese patients had more comorbidities and were more likely to be receiving worker's compensation (Fanuele, Abdu, Hanscom, Weinstein, 2002). Similar to the results of Fanuele's study with spine questions, Yancy, Olsen, Hayden, Bosworth and Edelman (2002), identified significant reductions in physical functioning scores in obese individuals when evaluating the SF-36 quality of life domains in outpatients. In addition, they reported an increase in bodily pain in patients with a BMI ≥ 25 kg/m^2. Their study suggested that additional research into the relationship of weight and musculoskeletal pain would be is necessary for the development of a clear picture.

Marcus (2004) also investigated the association between obesity and chronic pain symptoms in a group of mixed treatment-seeking chronic pain patients. In contrast to previous studies, the results indicated that the frequency of pain episodes, pain severity scores, duration of pain, and quality of life did not differ among the weight categories. Several others have found similar results with no relationship between the two, and confirm that this relationship, though possible, is unclear (Toda, Segal, Toda, & Morimoto, Ogawa, 2000).

The present study primarily focuses on obesity and its effect on the functional restoration rehabilitation process of work-related musculoskeletal pain patients. Success will be evaluated by outcomes in physical, psychosocial, and socioeconomic variables for the five different BMI categories. Considering that obesity is a rising medical problem, there has been a paucity of literature on the success of interdisciplinary chronic pain programs in regards to obesity. A number of studies, however, have concentrated on the influence of obesity on musculoskeletal surgeries. Wendelboe, Hegmann, Gren, Alder, White, and Lyon (2004) conducted a study focusing on the association between BMI and surgery for rotator cuff tendonitis. Their results suggest that increasing BMI is a risk factor for successful rotator cuff tendonitis surgery. They also concluded that the apparent risk increases with the degree of obesity. An earlier study hypothesized that obesity is a risk for partial knee and hip replacement and surgical revisions. However, the investigators concluded that, while there is a high association between obesity and hip and knee joint replacement surgeries, obesity did not appear to confer an independent risk for hip or knee revision procedures

(Wendelboe et al., 2003). Further, obese patients following total hip arthroplasty reported a similar satisfaction rate, intra- and postoperative complications, length of hospitality stay and reoperation rates as those with normal weight (Ibrahim, Hobson, Ester, & Power, 2004). As mentioned previously, very little attention to date has been placed on the rehabilitation process of obese individuals with chronic work-related musculoskeletal pain. The present study hopes to further help the understanding of the effect obesity has on functional restoration rehabilitation success.

Functional Restoration

Over the last three to four decades, "pain clinics" geared at treating pain symptomology have grown in popularity. The reason for the development of these clinics was the realization that traditional form of treatment such as pain medication, physical inactivity, and surgery are often ineffective with these patients. In some cases these treatments may even contribute to the individual's continued disability. Medications treat the symptom as opposed to the source of the problem and can become highly addictive. Physical inactivity not only fails to improve chronic pain, but also contributes to continued disability through physical deconditoning. Finally, surgery only affects pain perception in a small percentage of chronic pain patients and, in some, it may actually increase damage and prolong disability (Van Tulder, Koes, &Bouter, 1997). Poor surgical outcomes are especially seen in patients with compensation issues whose response to surgical interventions is influenced by psychosocioeconomic disincentives to recovery (Mayer & Gatchel, 1988; Fordyce, 1985; Beals, 1984). Although pain clinics were established as a response to weaknesses in typical medical approaches, these clinics demonstrate some shortcomings. Most pain clinics use passive approaches to pain management that do not usually address physical deconditioning and inhibition issues. Despite these shortcomings, by recognizing and emphasizing the important role of psychosocial factors in chronic pain, these clinics have made an important contribution to the field of pain management (Mayer, Polatin, & Gatchel, 1999).

Functional restoration (Mayer and Gatchel, 1988) was developed in order to address the difficulties that exist in successful rehabilitation for chronic musculoskeletal pain patients. Functional restoration focuses of function and fitness as oppose to the subjective experience of pain. The reasoning for this focus is that inactivity often develops in chronic pain patients, which in turn leads to physical deconditioning and associated mental deconditioning. These factors interfere with successful rehabilitation, while predisposing the patients to subsequent injuries. In addition, the physical and mental deconditioning contributes to a continued sedentary lifestyle, further establishing the patient in the disabled role (Jordan, 1996). Functional restoration focuses on physical, as well as mental, deconditioning by increasing muscle strength, endurance, and joint mobility through exercise and work conditioning (Hazard et. al. 1991).

One important component of the functional restoration program is the objective evaluation of the patient's functional capabilities. The use of objective measures of strength, endurance, and range of motion, in combination with aggressive physical reconditioning, provide the foundation for the functional restoration approach (Mayer & Gatchel, 1988). This strategy is an important improvement in the field, as assessing the physical condition of chronic musculoskeletal pain patients has long proven a difficult task. Magnetic resonance imaging (MRI), electromyography, and computerized tomography (CT) provide information about structural changes; however, these findings are often different from the patient's self-report of pain or other physical findings. Furthermore, self-reports of pain are subjective and of limited value. In contrast to these methods, the evaluation of physical capabilities utilized in functional restoration allows for an objective measurement of functioning, which is the basis of this treatment approach (Mayer & Gatchel, 1988).

Functional restoration integrates an emphasis on physical conditioning with occupational counseling and a cognitive-behavioral approach to pain management. As mentioned previously, psychological issues typically serve as barriers to rehabilitation for chronic musculoskeletal pain patients. Therefore, comprehensive psychological evaluations, in addition to physical evaluations, are a major component of this type of treatment. Key issues such as returning to work, family difficulties, or psychological disorders are addressed during treatment with the help of the psychosocial evaluation (Jordan, 1996).

Functional restoration is a treatment approach to chronic musculoskeletal patients that combines a quantitatively-directed exercise progression with disability management and psychosocial interventions such as individual and group therapy. This approach is widely researched and indicates high rates of success as measured by important socioeconomic outcome variables such as work return, work retention, re-injury rates, new surgery rates, case settlement status, and additional healthcare utilization (Mayer, Gatchel, Kishino, Keely, Capra, Mayer, Barnett, &Mooney, 1985). Functional restoration has been studies in a variety of treatment centers throughout the world, and although these sites differ greatly in terms of socioeconomic characteristics and workers' compensation systems, the overall effect of functional restoration on outcome measures for chronic musculoskeletal patients has been a consistent finding throughout. Specifically, over 80% of all patients treated return to work within a year following discharge in comparison to non-treatment groups which have a work return rate ranging from 29-41%. Further, comparison groups demonstrate approximately twice the rate of unsettled workers' compensation cases and new surgeries to the site of injury, and five times the rate of visits to a new health care provider following treatment (Mayer et al., 1985; Myer et al., 1987; Hazard et al., 1989).

Although functional restoration has been proven to be a successful treatment modality for chronic musculoskeletal pain patients, little research has focused on specific obesity groups of patients undergoing this treatment. Considering all of the stigmas and risks associated with being overweight and obese, this study will concentrate on examining the success levels of functional restoration rehabilitation in obese versus normal weight patients. Specifically, does increased body mass index have an effect following functional restoration rehabilitation of low back pain patients? This is the central question of this research study. We hypothesize that patients with higher BMI will have the same success as those with normal BMI in aspects of socioeconomic, physical and psychosocial factors.

Hypotheses:

The following hypotheses for this study were proposed:

1. The BMI categories will not differ in terms of basic demographic variables.
2. The subjects in the Obese III category will have a greater history of comorbid health conditions as compared to the other BMI categories.
3. Completion status will not differ among the five BMI categories.

4. The higher BMI categories will have a higher pain rating, as well as disability levels pre- and post-treatment.

5. The five categories will not differ in terms of depression ratings.

6. Those patients in that are overweight or obese will have a lower overall physical score at pre- and post-treatment. However, their physical functioning will increase at the same rate as patients in the normal weight category following functional restoration rehabilitation.

7. Differences will not be found among the five categories in terms of work return and work retention following one-year post-treatment.

8. Employment status (i.e. same/different employer and full/part time work hours) differences will also not be found among the five BMI groups.

9. Finally, the obese patients will not differ from the non-obese patients with respect to post-treatment surgery to the original injury site or health care utilization from a new provider.

CHAPTER THREE
Methodology

Subjects

Subjects in this study consisted of 3,341 patients who consented to, and started, a structured course of treatment at the Productive Rehabilitation Institute of Dallas for Ergonomics (PRIDE), a facility utilizing a functional restoration approach. Patients may or may not have received previous treatment for their current injury, but all were unable to return to work at the time of admission to the treatment program. The subjects ranged in age from 18- 50. The participation criteria that had to be met before entering this treatment program were: (1) more than three months elapsed since a work-related injury; (2) acute conservative care failed or was deemed unnecessary; (3) surgery had not produced relief, resolution, or may not have been an option; (4) severe functional limitations remained; (5) English or Spanish speaking. Subjects in this study included consecutive patients discharged during the period from January 2001 until March 2003. The subjects were divided into five groups according to their Body Mass Index (BMI):

Normal Weight. The 743 patients in this group had a recorded BMI of 0-24.9 kg/m^2 .

Overweight. 1,134 subjects were placed in the overweight category with a BMI between 25 and 29.9 kg/m^2

Obese I. 840 patients met the criteria for this group with a BMI between 30 and 34.9 kg/m^2 .

Obese II. 342 subjects with BMI of 35-39.9 kg/m^2 were placed in this category.

Obese III. 268 subjects with BMI $\geq$ 40 were placed in this category

Procedure

All patients received an initial evaluation consisting of a medical history, physical examination, psychological intake interview, medical case management disability assessment interview, and a quantitative functional capacity evaluation. The treatment consisted of quantitatively-directed exercise progression, supervised by physical and occupational therapists, in conjunction with multimodal disability management, which included individual counseling, group therapeutics, stress management, biofeedback, coping skills training, and education focusing on disability management, vocational reintegration, and future fitness maintenance (Mayer et al., 1985; Mayer et al., 1987).

Demographic information was taken from the intake interviews noted above. At the time of the initial interview, physical and functional capacity measurements were taken, normalized to age, gender, and body weight. The patients' height and weight were measured in order to determine their BMI. The following psychological instruments were administered at the initial interview and prior to the beginning of treatment: the Quantified Pain Drawing, which includes an analog self-report of perceived pain intensity; the Million Visual Analogue Scale (MVAS), which is a visual analog questionnaire of disability; and the Beck Depression Inventory (BDI). In addition, at one year following discharge from the program, subjects were contacted and asked about their health and socioeconomic outcomes using a structured telephone interview.

Instruments and Outcome Measures

PRIDE demographic information assessment. Basic demographic information was collected on all PRIDE patients prior to entry into the program via the various interview and evaluations noted above. Variables collected from this information included the following: age, gender, race, years of education, and area (s) of musculoskeletal injury.

Body mass index measure. Body mass index, or BMI, is the measurement of choice for many physicians and researchers studying obesity. BMI uses a mathematical formula that takes into account both a person's height and weight. BMI equals a person's weight in kilograms, divided by height in meters squared ($BMI=kg/m^2$).

PRIDE medical case management initial evaluation and disability assessment. The medical case management staff at PRIDE conducts a disability assessment interview with each patient prior to his/her entry into the program, and records their findings on a standardized worksheet. This interview covers issues related to workers' compensation case status, financial situation, work history, work status, transferable skills, crisis management, logistical considerations for treatment, and resource planning. The present study utilized the following variables from this assessment: time since injury, pre-treatment case settlement status, legal representation status, net salary at the time of injury, work status at treatment, and length of employment at the job of injury.

The medical case management staff also conducts an additional interview, called the "initial evaluation," during the first week of the program. During this interview, patients are asked the following questions related to work adjustment and future employment: job availability following discharge (yes or no); relationship with employer/supervisor if still employed (positive or negative); desire to return to work for same employer (yes or no); and desire to return to same type of work (yes or no).

PRIDE initial doctor's note. An Initial Doctor's note is generated for all patients presenting for possible treatment at PRIDE. In the present study, the following variables were collected from the Initial Doctor's Note: comorbid health conditions; prior work related injury; prior non work-related injury; current smoking status; and the amount of cigarettes consumed daily by those who smoke.

PRIDE quantitative evaluation of physical functioning. Physical functioning is assessed both before and after completion of the rehabilitation program, and the Cumulative Physical Score is calculated. The Cumulative Physical Score is a weighted, average score that essentially represents the equivalent of a grade-point average of overall physical performance on a variety of functional capacity tests.

Quantified pain drawing (pain intensity). This instrument consists of two separate sections. The first section presents a person, front and back, to the patients and they are to mark the location and severity of his/her pain symptoms. This section of the instrument is scored by superimposing a grid onto the completed figures and then counting the number of squares affected by pain for the torso, extremities, and in total. For the second portion, the subject is asked to rate the severity of his/her pain along a 10 cm line. Cut-off points for interpretation of this score are as follows: less than four indicates “mild pain;” four to six inches “moderate pain;” and scores greater that seven indicate “severe pain.”

Million Visual Analogue Scale. The MVAS is a self-reported measure developed by Million, Hall, Haavik-Nilsen, Jayson, and Baker (1981). The MVAS was validated by correlating subjects’ responses to the measure with the findings of clinicians. The measure consists of 15 questions pertaining to pain perception and subjective disability. For each question, the subject indicates his/her response to the question by choosing a point on a line representing a range of possible answers from 0 to 10. The total score is the sum of the subject's responses to the 15 items. The original cut-off points for interpretation of total score were as follows: < 39 (mildly disabling pain); 40-48 (moderately disabling pain); and > 85 (severely disabling pain). However, a recent study by Anagnostis et al. (2003) utilized the following extended cut-off points in order to better account for the wide range of scores found in chronic pain populations: 0 (no reported disability); 1-40 (mild disability); (41-70) moderate disability; (71-100) severe disability; (101-130) very severe disability; and extreme disability (131-150).

Beck Depression Inventory (BDI). The BDI is a self-report instrument consisting of 21 items related to physical and emotional symptoms of depression. This measure, which was developed by Beck, Wark, Mendelson, Mock, & Erbaugh (1961), is currently among the most frequently utilized self-rating scales world-wide for measuring depression. Well over 2,000 empirical studies concerning the BDI have been published (Richter, Werner, Heerlein, Kraus, & Sauer, 1998). An individual's performance on the BDI results in a total score. Beck, Steer, and Garbin (1988) suggested the following cutoff criteria in order to interpret this score: <10 for absence of depression; 10-18 for mild to moderate depression; 19-29 for moderate to severe depression; and >29 for severe depression.

The BDI was originally developed in an effort to offer a reliable and valid measure of the presence and/or severity of depression (Beck et al., 1961). Scientific investigation of the BDI has established that its psychometric properties are indeed sound. Beck, Steer, and Garbin (1988) conducted a meta-analysis of 25 studies focusing on the internal consistency of the BDI and found a correlation coefficient of .81 for nonpsychiatric patients. The same research group reviewed 10 studies that addressed the test-retest reliability of the BDI, and found coefficients ranging from .60 to .83 for nonpsychiatric patients. With respect to validity, Beck et al. (1988) reviewed 35 studies that reported correlation coefficient between the BDI and a measure of depression, and found a mean correlation coefficient coefficient of .60 for nonpsychiatric patients. More specifically, the BDI displayed acceptable concurrent validity with both the MMPI Depression Scale (.76) and the HAM-D (.73).

Of special importance for the purpose of this study is that BDI has been established as valid instrument for the measurement of depression in chronic pain patients (Geisser, Roth, & Robinson, 1997; Novy, Nelson, Berry, & Averill, 1995; Romamo &Turner, 1985; Turner & Romano, 1984). However, it must be noted that some in the field have recommended a modified use of the BDI with this population (Wesley, Gatchel, Garofalo, & Polatin, 1999; Geisser et al. 1997). The rationale for this modification is the finding that BDI items that focus on the more somatic aspects of depression can be confounded by pain symptomology (Wsley, Gatchel, Polatin, Kinney, & Mayer, 1991).

PRIDE one-year socioeconomic outcome interview. The PRIDE One-Year Interview is a structured telephone interview that consists of seven general questions regarding post-treatment medical status and work return outcome (Prescott, Mayer & Gatchel, 2000). This interview is conducted at one-year post-discharge, and the following specific outcome variables are collected: post-treatment surgeries to the original area of injury; post-treatment health care utilization from a new provider; recurrent injuries; case settlement status; return to work (defined as returning to work for any amount of time after discharge from the PRIDE program); and work retention (defined as working at the time of the follow-up interview).

Summary of Design

The current study was designated to evaluate demographics, physical, and psychosocial characteristics, as well as one-year socioeconomic outcomes, in groups with various BMI levels. Each of the groups --normal weight, overweight, obese I, obese II and obese III, clinically obese-- were compared before and after functional restoration rehabilitation using the above measures. For analysis using categorical data, the chi-square statistic was used along with the Mantal-Hanzel linear association statistic. When the chi-square was calculated with a 2 x 2 contingency table, odds ratios were also calculated. Continuous data were analyzed using Analysis of Variance (ANOVA). The univariate general linear model was applied to examine linear trends for the continuous data. For all analyses conducted in the present study, statistical significance was set at the .05 level.

Statistical Analysis

Demographic Variables. The obese categories were compared using chi-square analyses on race, gender, legal representation, and comorbid health conditions (diabetes, hypertension, cardiovascular conditions, gastrointestinal conditions, and cancer), time since injury, musculoskeletal area of injury, and legal representations status. ANOVA was used with age and length of disability in months.

Psychosocial Variables. ANOVA were conducted to compare the various BMI categories on the following: Quantified Pain Drawing-Pain Intensity (pre- and post-treatment), MVAS (pre- and post-treatment) and BDI (pre- and post-treatment).

Physical Variables. The association between the BMI categories and a composite physical performance variable, the Cumulative Physical Score, was assessed using ANOVA. This variable allows for the assessment of a variety of physical factors with one score. Pre- and post-treatment scores were analyzed for those subjects that completed the program.

One-Year Socioeconomic and Health Outcome Variables. Chi-square analyses were used to compare the five BMI categories on post-treatment surgery to the treated area, health care utilization, work return, work retention, return to same employer, return to different employer, and return to part or full-time work. Odds ratio were also compared between the Normal and Obese III groups.

CHAPTER FOUR
Results

DEMOGRAPHIC VARIABLES

Tables 1 through 13, which are located in Appendix A, detail the results of all performed statistical analyses. These tables were included to serve as a brief reference of the findings of this study. For all analyses, statistical significance was set at the .05 level.

The following chapter is divided into two sections of demographic variables: Basic/Health Variables and Injury-Related Variables.

Basic Demographic/Health Variables

Table 1 details the basic demographic variables for the five BMI groups, and Table 2 contains the statistical analyses of each of these variables. These analyses revealed significant differences among the five groups with regard to age. The results indicate that the mean ages for all groups were as follows: 41.1 for the Normal group, 42.2 for the Overweight, 43.7 for the Obese I, 44.1 for the Obese II, and 41.36 for the Obese III, $\underline{F}(4, 2825) = 4.6$, $\underline{p} \leq .01$. Linear trends, however, were not significant. A significant difference was also found in gender:

with normal BMI category being composed of 53.9% male and 46.1% female; the overweight category being 65.6% male and 34.4% female; obese I 58.0% male and 42.0% female; obese II 49.8% male and 50.2% female; and obese III being 35.1% male and 64.9% female. Thus, the Obese III group contained more females than males. However, the overweight category contained more males than females as compared to the other BMI categories, $\underline{X}^2$ (4)=81.9, $\underline{p} \leq .01$, linear $p \leq .01$. Statistical significance was also found for some of the different ethnicities. The biggest difference was found in the African American samples, with 13.4% of individuals falling in the Normal category and 26.2% in the Obese III category, $\underline{X}^2$ (12)=71.7, $p \leq .01$, linear $p \leq .01$.

The presence of a comorbid health condition was assessed by combining the five categories of comorbid health conditions utilized in this study (i.e., diabetes, cardiovascular conditions, hypertension, gastrointestinal conditions, and cancer), with a sixth category that included general prevalence for all comorbid conditions including, asthma, hyperthyroidism, etc. When this variable was examined, a significant difference was not found. With respect to specific conditions, the Obese III group (24.7%) had a significantly higher rate of hypertension (excluding other cardiovascular conditions) when compared to the Normal BMI category (15.8%), $\underline{X}^2$(1)=3.7, OR=1.8 (.983, 3.119), $\underline{p}$=.05. When cancer was examined, the Obese III category was 1.7 times more likely to have cancer than the Normal category, $\underline{X}^2$(1)=.152, OR= 1.7 (.144, 17.95), $\underline{p}$=.697. No significant differences were found among the groups with regard to diabetes, cardiovascular conditions, and gastrointestinal conditions.

Significant difference was also not found when analyzing the completion status of the functional restoration program among the five groups. Percentages of 86.1% of the Normal, 86.2% of the Overweight, 84.8% of the Obese I, 83.9% of the Obese II and 84.0% of the Obese III group completed the program.

Pre-Treatment Injury-Related Variables

Table 5 details the injury-related demographic variables examined in this study, while Table 6 includes the statistical analyses of these variables. To compare the types of musculoskeletal injuries found in the five groups, the following categorizations were utilized: lumbar and combination (if lumbar was present as one of the injury complaints), lower extremities, and other non-lumbar. Significance in those with a lumber and combination injury was not found with respect to the different BMI categories. However, a significant linear trend across the BMI categories was found in the lumbar and combination musculoskeletal area of injury with respect to these categories. 57.9% of Normal, 58.3% of the Overweight group, 52.6% of Obese I, 53.4% of Obese II and 52.0% of the Obese III category have an injury in the lumbar musculoskeletal area, $\underline{X}^2$ (4)= 8.5, linear $\underline{p}$=.015. The patients who had lower extremity pain did not show a significant difference percentage wise across the different BMI categories. Finally, frequency of one type of musculoskeletal injury was not found more readily in the obese categories than the normal.

Length of disability was also examined and the results pointed to no significance among all five categories. The mean length of disability was as follows: 12.72 for the Normal group, 12.13 for the Overweight, 12.88 for Obese I, 13.55 for Obese II and 11.59 for the Obese III category, $\underline{F}(4, 1192) = .431$. The final variable of the demographic information was legal representation pre-treatment. No significant difference was found in percent of legal representation between the BMI categories.

CHAPTER FIVE
Results

PSYCHOSOCIAL VARIABLES

This chapter presents the results of analyses that focused on the relationship between psychosocial factors and BMI categories before treatment and after completion of the functional restoration program. This chapter is divided into the following sections: Pain and Disability measures, and Depression Measures.

Pain and Disability Measures

This section includes analyses of the Quantified Pain Drawing (Pain Intensity) and the MVAS. The Pain Intensity and MVAS were administered to program completers before entering treatment and upon discharge.

Quantified Pain Drawing (Pain Intensity). Statistical analyses of the Quantified Pain Drawing (Pain Intensity) are presented in Table 8. Significance among the BMI categories was not found in the pre-treatment variable; however, significance was found in pain intensity level post functional restoration rehabilitation, with mean scores of 4.49 for the Normal category, 5.05 for the Overweight, 5.32 for the Obese I , 5.36 for the Obese II, and 4.74 for the Obese

III group, $F(4, 2648) = 2.475$, $p = .042$. This suggests that the higher BMI categories are more likely to experience higher pain intensity, post- treatment, than the normal weight levels. Contrary to typical expectations, however, the Obese III category had a lower pain intensity rating than the other obese groups. Furthermore, the pain level of those in the Obese III category was comparable to the Normal group.

MVAS. As noted previously, the MVAS is a measure of functional disability that includes questions regarding an individual's ability to perform activities of daily living. Statistical analyses for the MVAS are located in the Table 9. In this study, as the BMI levels increased, a higher rating of disability was endorsed before entering the program $F(4, 2761) = 6.9$, $p \leq .01$, linear association $p \leq .01$ (with mean scores of 85.44 for the Normal category, 89.36 for Overweight, 90.65 for Obese I, 92.49 for Obese II and 93.90 for the Obese III categories). Significance was also found in post treatment disability rating among the groups, with mean scores of 57.98 for Normal, 63.36 for Overweight, 63.55 for Obese I, 64.71 for Obese II, and 61.36 for the Obese III category, $F(4, 2644) = 4.0$, $p \leq .01$. These results suggest that, although a significant difference was found in the post-treatment disability rating, the significance is not attributed to increased disability with increase BMI levels (i.e. there was no linear trend).

Depression Measure

BDI. As displayed in Table 10, a significantly higher mean depression score was found as the BMI levels increased $\underline{F}(4, 2761)=2.5$, $\underline{p}=.044$, linear $\underline{p}=.005$ in pre program entry. However, statistical significance was not found post-treatment $\underline{F}(4, 2638)=1.6$. At pre-program entry, the mean BDI score ranged in the "Mild to Moderate" range, with the Normal mean (15.70), Overweight (15.94), Obese I (16.80), Obese II (16.75), and Obese III (17.76). However, mean BDI scores significantly decreased across all categories post functional restoration rehabilitation, with mean scores of: Normal (8.69), Overweight (8.98), Obese I (9.69), Obese II (9.55), and Obese III (8.57) falling in the Mild range of depression

CHAPTER SIX
Results

PHYSICAL VARIABLES

In this study, level of physical functioning was investigated by means of the Cumulative Physical Score, which allows for the assessment of a wide variety of physical factors with one variable. This variable is calculated at pre- and post-treatment by combining the results of performance on measures of strength, endurance, range of motion, perceived disability, and self-report of pain. All functional capacity measurements are normalized to gender, age, and body weight. As noted previously, the Cumulative Physical Score represents a "grade point average" of physical functioning by producing a single representative value. In both pre- and post-treatment calculations, the Cumulative Physical score decreased as the BMI groups increased. Thus, statistical significance was found pre- treatment with the Normal group (43.33), Overweight (43.17), Obese I (40.16), Obese II (40.51), and Obese III (38.08), $\underline{F}(4, 2804)= 6.8$, $\underline{p} \leq .01$, linear association $\underline{p} \leq .01$. Similar results were found post-treatment, with mean scores of 75.97 for the Normal category, 75.71 for the Overweight, 74.69 for Obese I, 74.68 for Obese II and 71.67 for the Obese III category, $F(4, 2655)=2.7$, $\underline{p}=.031$, linear association $\underline{p}=.002$.

CHAPTER SEVEN

Results

ONE-YEAR SOCIOECONOMIC OUTCOME VARIABLES

This chapter presents analyses that explored the relationship between the BMI categories and post-treatment socioeconomic outcome variables. These variables, which were assessed via a structured clinical interview at one-year following treatment, include a variety of important measures of treatment success.

As noted previously, the total sample size for this study was 3,341, which includes 757 from the Normal group, 1134 from the Overweight group, 840 from the Obese I group, 342 from the Obese II, and 268 from the Obesity III. Multiple attempts were made to contact all patients at one year; however, it was not possible to collect outcomes for every individual. Partial outcome data were, however, collected for subjects who completed the program.

This chapter is divided into the following five sections: Post-Treatment Medical/Surgery Care and Post-Treatment Work Status. Statistical data pertaining to these variables are located in Table 12 and 13. Table 12 details the one-year outcome variables that were addressed in this study, while Table 13 contains the statistical analyses of these variables.

Post-treatment Medical/Surgery Care

Post-treatment medical utilization was examined through analyses of post-treatment surgery to the original area of injury and health care utilizations from a new provider. Significant differences were not found among the five groups with respect to post-treatment surgery, with 3.0% of the Normal group having undergone a post-treatment surgery to the original musculoskeletal area of injury, 2.8% of the Overweight group, 4.1% of the Obese I, 3.3% of the Obese II and 1.5% of the Obese III group, $\underline{X}^2$ (4)=4.2.

Health care utilization from a new provider is defined as visits to providers that occur in addition to scheduled and planned visits with the physician(s) treating the musculoskeletal condition. This variable is considered an important socioeconomic outcome for reasons of cost, and also because it serves as an indicator of patients' post-treatment health status (and/or perception of health status). In this study, 22.8% of the Normal group, 23.8% of the Overweight group, 23.9% of the Obese I, 27.8% of the Obese II and 26.0% of the Obese III sought health care services from a new provider at one year. A statistically significant difference among the BMI categories was not found. This was further broken down in examining the odds ratios between the Normal and Obese III groups, which resulted in no significance OR=1.2 (.821, 1.731).

Post-Treatment Work Status

An especially important outcome of functional restoration is post-treatment work status. In this study, differences in the post-treatment work-status outcomes of the five groups were addressed in several ways, the first of which being in terms of work return and work retention. With respect to work return, the five groups differed slightly, with 90.4% of the Normal, 89.5% of the Overweight, 88.7% of the Obese I, 83.4% of the Obese II, and 87.6% of the Obese III group having worked during the year following treatment in the program, $\underline{X}^2$ (4)=10.7, $\underline{p}$=.036, linear association $\underline{p}$= .013. However, when the two extreme categories were compared, Normal and Obese III, one group was not significantly more likely to return to work, $\underline{X}^2$ (1)=1.425, OR=1.3(.830, 2.151).

The five groups also did not differ in terms of work retention, with 84.1% of the Normal, 84.1% of the Overweight, 83.4% of the Obese I, 79.9% of the Obese II, and 82.2% of the Obese III maintaining their jobs.

Post-treatment work status was further explored by examining the work situations that patients in each of the five groups entered into during the year following discharge from functional restoration treatment. As with work return and work retention, differences among the five groups were not found on these extended work-status variables. When compared, the BMI categories did not significantly vary in respect to keeping the same employer or having a different employer. Percentages of 52.5% of the Normal, 54.2% of Overweight, 45.7% of the Obese I, 56.2% of the Obese II and 48.3% of the Obese III group retained the same employer. Similarly, the difference of those who had a new employer was not significant across the categories with, 47.5% of the Normal, 45.8% of the Overweight, 54.3% of the Obese I, 43.8% of the Obese II group, and 51.7% of the Obese III group.

A final analysis of work status involved examining how the groups differed at one-year with respect to the amount of hours per week spent working. Significant differences were not found among the BMI categories, with 83.4% of the Normal, 84.4% of the Overweight, 79.3% of the Obese I, 86.5% of the Obese II, and 82.3% of the Obese III having returned to fulltime employment for 40 or more hours a week; and 16.6% of Normal, 15.6% of the Overweight, 20.7% of the Obese I, 13.5% of the Obese II, and 17.7% of the Obese III group returned to part-time employment, $\underline{X}^2$ (4)=7.2

CHAPTER EIGHT
Discussion

As noted in Chapter 4, a tabular summary of all the findings from this study can be found in Tables 1 through 12. These four tables can be used as a brief reference while reviewing this chapter.

Demographic Variables

Several differences were found among the BMI categories with respect to the demographic variables. Hypotheses 1 through 3 pertain to predictions made regarding the relationship among the five categories and various demographic variables. Each of these hypotheses will be discussed more fully in the sections that follow.

Basic Demographic/Health Variables. While no linear trends were found in terms of age, gender differences were seen in the Obese III category, with a higher percentage of females having a BMI of 40 kg/cm^2 and above. Significance was also found in the race category within the African American group. Of the African American patients, a higher percentage fell in the Obesity III group. Although the difference was significant, no clear explanation for its occurrence is evident.

Several interesting findings were uncovered when the relationship between comorbid health conditions were examined. When compared across the BMI categories, significant differences were not found within the specific comorbid conditions. However, when the Normal group was compared to the Obese III group, it was found that the Obese III group was more at risk for hypertension. More specifically, the Obese III group was 1.8 times more likely to experience hypertension and 1.7 times more likely to have cancer than the Normal group. These findings partially supported Hypothesis 2, which predicted that the Obese III group, would have a higher rate of comorbid conditions. The obesity literature supports these findings, stating that obesity is often linked to diabetes, cardiovascular conditions, hypertension, some cancers and other related comorbid conditions (Must, et. al., 1999, Colditz, 1999). However, the issue of the dangers of obesity on overall health has recently become a great focus of debate. A study by Flegal, et al. (2005) stated that the dangers and impact of obesity on mortality caused by the above medical problems has decreased over time. They attributed this decrease to improvements in public health and medical care. According to the Center for Disease Control and Prevention, however, the above mentioned study was found to be flawed and the dangers of obesity with respect to these conditions and mortality was understated (CDC, 2005). A detailed analysis of these comorbid conditions is beyond the scope of this present study and, although the importance and dangers of these conditions should not be minimized, the focus of this study is to understand the difference in functional restoration program success for obese individuals versus non-obese individuals with work-related musculoskeletal injuries.

Pre-Treatment Injury-Related Variable. Interestingly, when exploring the area of injury among the five groups, the results were other than what would be expected. The literature has pointed to conflicting findings between the relationship of musculoskeletal problems in the lumber and lower extremity areas in obese individuals (Toda, Segal, Toda, & Morimoto, Ogawa, 2000). The findings of this particular study, however, demonstrated that obese individuals are not significantly more likely to have an injury to the lumbar or lower extremity region. Significance was also not found in any other musculoskeletal areas of injury.

Length of disability was also evaluated among the five BMI categories. The findings suggest that extremely obese individuals again did not differ in the length of disability. Along with these variables, legal representation pre-treatment was also found to be not significant among the five BMI categories.

Another element of the basic demographic variables involved examining the program completion rates for the five BMI categories. The results revealed that differences were not found among any of the five groups in terms of completing the functional restoration program. More specifically, those subjects that are in the extreme weight categories had as much success finishing the program as those that were in the normal ranges. Although there are many risk factors for program non-completion, such as psychosocial factors, obesity did not appear to be one such risk.

Psychosocial Variables

In the present study, the relationship between BMI categories and psychological factors was addressed by means of self-report instruments. The discussion of findings related to the assessed psychological variables is divided into the following sections: Pain and Disability, and Depression Measures.

Pain and Disability. The differences found among the five groups on pre-treatment measures of pain and disability partially supports Hypothesis 4. Subjects in the higher BMI categories did not have a higher pain intensity than those with a Normal BMI. However, differences were found in heightened disability among the five groups. The major difference was noted between the Normal and Obese III category at pre-treatment, and between the Normal and Obese II category at post-treatment. It can be determined from these results that even though obesity, as supported by the literature, is often associated with disability (Weil, et. al, 2002), the success of functional restoration rehabilitation is not determined by increasing BMI levels. More specifically, the Obese III group did not display a higher mean disability rating post-treatment than the remaining BMI categories.

Depression Measure. When depressive symptoms were examined, difference in pre-treatment was again found among the BMI categories, with the most significant difference between the Normal and Obese III category. It has been found in the literature that increased obesity is often associated with higher levels of depression in terms of body-image, inactivity and social acceptance (Klotkin, Meter, & Williams, 2001; Marcus, 2004). The results, however, also indicated no significant differences among the BMI categories with respect to depression at post-treatment. The overall depression means were found to be lower post-treatment when compared to pre-treatment. As noted earlier, the treatment program consisted of not only physical aspects, but individual counseling, group therapeutics, stress management and coping skills training (Mayer et al., 1985; Mayer et al., 1987). These treatments are most likely responsible for the reduction in depression scores among all groups at post-treatment. According to the above findings, it can be again determined that individuals in the higher BMI categories were as successful as those in the Normal group after completing the functional restoration program in terms of depression.

Physical Variables

As measured by the Cumulative Physical Score, the higher BMI group subjects displayed a lower level of pre-treatment physical performance when compared to the Normal group subjects. This finding provides support for Hypothesis 6 and indicates that individuals who have a higher BMI rating are more physically deconditioned at the beginning of treatment. In addition to being more deconditioned, it is also likely that these patients are less likely to exert themselves physically pre-treatment. As it can be suspected, past studies have found that obese individual are less likely to be physically active and more likely to have limited physical functioning (Kolotkin, Meter, & Williams, 2001; Brown, Mishra, Kenardy, & Dobson, 2000; Berke, & Morden, 2000).

When compared, the higher BMI categories had lower physical functioning scores post-treatment as well. However, when compared to pre-treatment, the Obese II and III greatly improved their physical functioning score. This finding indicates that, for patients who continue the completion of the program, elements of treatment such as physical therapies are helpful for all BMI categories. Therefore, it should be noted that obese individuals have the ability to improve physically after a functional restoration program as well as individuals who are normal weight. Thus, treatment should be considered and not denied for obese individuals with chronic musculoskeletal pain in fear of further physical complications.

One-Year Socioeconomic Outcomes Variables

The important group of variables pertains to patients' functioning following discharge from the treatment program. In the present study, the results among the five groups were striking, with all five groups displaying similar outcomes. These findings support Hypotheses 8, 9 and lend partial support to Hypothesis 7.

Post-treatment Medical Care/Surgery. The relationship among the different BMI levels and post-treatment medical care/surgery was explored by examining the rate of patients who underwent surgery to the original area of injury, as well as the rate of individuals who received health care service from a new provider. Findings regarding these variables support Hypothesis 9. In the present study, similar rates of the Normal group underwent surgery to the original area of injury, relative to the other BMI categories. It has been found that patients who complete functional restoration treatment are six times less likely to undergo surgery to the original area of injury at one-year than are patients who do not complete the program (Mayer et al., 1985; Mayer et al., 1987; Gatchel et al., 1999). Considering that all participants in the present study completed the program, differences were not found among the groups with respect to weight levels. It can therefore be concluded that obese individuals are just as likely to have post-treatment surgery as those who are of normal weight.

The five study groups also did not differ in their post-treatment utilization of health care from new providers, with 22.8% of the Normal group, 23.8% of the Overweight, 23.9% of the Obese I, 27.8% of the Obese II and 26.0% of the Obese III group utilizing these services. It can be concluded from these findings that a functional restoration program can be as successful for normal as well as obese individual and post-treatment health care utilization is just as likely in non-obese individuals as it is in obese patients.

Post-Treatment Work Status. Work status at one-year is one of the most important functional restoration outcome variables, as it serves as an objective indicator of the degree of disability that remains following discharge from the program. The results found in this study indicate that there was only a slight significance in work return status among the five obese categories. However, the Obese III category had a higher work return rate (87.6%) as compared to the Obese II (83.4%). In addition, the Obese III category did not significantly differ in work return when directly compared to the Normal category. This indicates that the most clinically obese patients are not at a higher risk for returning to normal functioning in terms of returning to work. Remaining at the same job was also found to be non significant across the five BMI categories. Thus, it can be concluded that obese individuals were as likely to retain the same job as those in the normal weight groups.

The modified work variables show similar results, with no significant difference among the five BMI categories. Significant differences were not found in terms of retaining the same employer and seeking new employment, as well as the amount of hours per week the subjects worked at one-year following completion of the program. These results further support the hypotheses that obese individuals are likely to have the same results after completing a functional restoration program.

The above results place an emphasis on the lack of differences between obese and non-obese individuals in terms of functional restoration rehabilitation. Where obesity has been found to be a risk factor for many medical and psychological conditions, successful functional restoration for work-related musculoskeletal injury is not one such area of risk.

CHAPTER NINE
Conclusions and Recommendations

The present study represents the first large-scale, comprehensive examination of functional restoration of obese patients with work related chronic musculoskeletal pain. This study, which included the advantage of a large sample of the different BMI categories, was one of the few studies that has examined the success rate of obese versus non-obese individuals in interdisciplinary programs. Overall, the major purpose of the study was to establish an opportunity for obese patients who may be discouraged from seeking health care for their musculoskeletal conditions. It also examined any risk factors for functional restoration rehabilitation for the obese patients. The following chapter will summarize the major findings, address the limitations of the study, and point to direction for future research.

Summary of Findings

Although findings were divided into more specific sections when previously considered, they will now be broken down into two major groups. The first consists of pre-treatment and psychosocial variables, while the second includes one-year post-treatment outcomes. Together, these two areas paint a vivid picture of the findings between the normal and obese patients.

The pre-treatment variables that were considered in this study included those related to basic demographic/health factors, injury history and unresolved litigation status. In addition, psychosocial factors were considered, which were clearly related to previous findings with respect to obesity.

Turning to the basic demographics, several differences were found among the groups with respect to these variables. Females were generally found to have a higher rate of obesity than males, especially the Obese III category. The Obese III group, as expected, also showed higher levels of hypertension and cancer than the Normal category. These findings appear to indicate that obesity is a risk factor for the presence of a comorbid health condition. In history, as previously mentioned, obesity has been known to contribute to vascular disease, such as elevated cholesterol, hypertension, diabetes and some cancers (Wendelboe, et al., 2004).

Several factors related to the current work-related injury were considered. The five groups did not differ in terms of the area of musculoskeletal injury or length of disability due to the injury. More specifically, those patients who were in the higher BMI categories were not at a higher risk for a lumbar or lower extremity injury. Likewise, for litigation-related variables, the five groups did not differ in terms of legal representation.

Regarding psychosocial factors, some differences were observed at pre-treatment in terms of depressions and disability rating. Those in the Obese III category had a higher depression and disability ratings at pre-treatment than those in the Normal category. However, the findings suggest that the higher BMI categories improved at the same rate as those in the normal BMI range at post-treatment. The Cumulative Physical Score was also used to asses physical functioning at pre- and post-treatment. This score is a weighted, average score that represents the equivalent of a grade-point average of overall physical performance on a variety of functional capacity tests. In the present study, the higher obesity categories displayed lower physical scores both at pre- and post-treatment. It can be concluded from these results that obese individuals are at a higher risk for physical deconditioning. It should be noted, however, that the obese patients' Cumulative Physical Score improved at the same rate as the patients who were in the Normal category. This further supports the success of individuals with varying weights in a functional restoration program where physical therapy and restoration are a major focus.

The most striking findings of this study are those of the one-year outcome results. These variables further emphasize the lack of difference among the five BMI categories. When post treatment health care utilization from a new provider and post-treatment surgery to the original area of injury were examined, differences were not found among the groups. This means that obese individuals are not more likely to need further health care or surgery after completing the program as those individuals that are not obese.

Findings regarding work status, which represents one of the most important outcomes of functional restoration treatment, are of particular note. Again, when compared the patients in the clinically obese group, Obese III patients, were just as likely to return to work after treatment. The higher obesity categories were also equally capable of retaining their jobs, keeping the same employer and working full-time, 40 hours per week.

Taken together, these findings speak volumes regarding the post-treatment functioning in patients who fall into various BMI categories. Based on the results of this study, patients with higher BMI scores utilize the same amount of health care services, have equal rates of post-treatment surgeries, and have good work return/retention outcomes as those patients with lower BMI scores.

Overall, this study clearly indicates that these groups are indeed not different in terms of response to functional restoration. It should be emphasized that as program completers, all of the five BMI categories have the same success rate following treatment. Although many stigmas are associated with obesity, functional restoration outcomes for musculoskeletal injuries should not be included.

Limitations of the Present Study

Several possible limitations of this study should be noted. The general findings of the current study represent a potential limitation, as a specific group of patients was investigated. Indeed, patients presenting for functional restoration treatment at the site utilized for this study consisted solely of those who suffered a work-related injury, who did not respond to primary or secondary rehabilitation, and who continued to experience pain and subsequent disability for more than three months following injury. While some generalizations from this research can be made to other types of patients undergoing tertiary rehabilitation, the makeup of this sample is likely to be somewhat different from that found in pain management facilities that serve other types of chronic pain patient populations (i.e., patients with non-work related injuries).

Another limitation lies in terms of the patients' weight and weight categories. It was unfortunately not known if the weight measured at pre-treatment was the patient's weight pre- or post-injury. This, then, presents some different issues with respect to the variables utilized in this study.

Directions for Future Study

A major advantage of a broad "first look" endeavor such as the current study is that, while a large number of findings are established, numerous possibilities for future research are also introduced. In fact, the findings of a large study such as this can serve as an excellent start for a variety of other more focused studies. Specifically, future research may look more specifically at the different musculoskeletal areas in order to determine if the results of the present study are consistent with those found in the different groups. The focus of this study was more general in looking at all musculoskeletal injuries; thus specific areas were not examined. Similarly, because of the difference in weight distribution between males and females, a focus on musculoskeletal injury and weight in gender may be enlightening. With the vast developments in surgery, such as breast reduction, gastric bypass surgery or liposuction, examining if these methods of fat reduction would make a difference on the amount of pressure placed on some of the musculoskeletal areas would be of great importance.

Another direction may be taken in exploring weight loss during the functional restoration process. More specifically, determining if weight loss has any effect on socioeconomic outcomes of the program can further be used to specify the effects of obesity. Along the same lines, determining if weight gain since injury affects pre-treatment or outcome variables may also be examined. Finally, due to the lack of research in this area, patients from this program should be compared to those of other programs in which the injury does not result from a work-related incident.

APPENDIX A

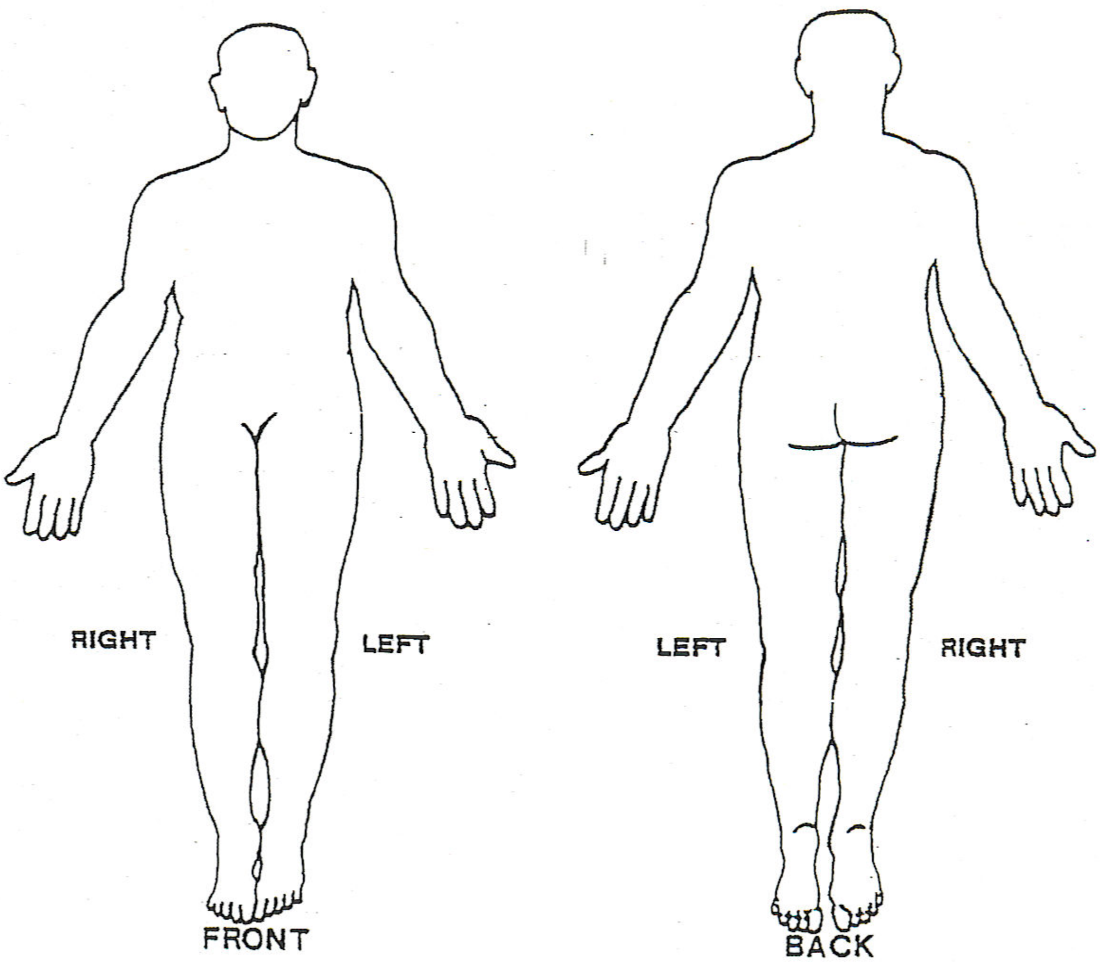
Rev. 4/23/2004

Name: ______________________ Date: ______________

DALLAS PAIN DRAWING GRID ASSESSMENT

THINKING ABOUT ALL YOUR PAIN IN THE LAST 7 DAYS:

Mark the location of your pain on the body outlines.



Indicate how bad your pain is today.

NO PAIN | — | — | — | — | — | WORST POSSIBLE PAIN

BECK INVENTORY

Name____ Date____________________

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the PAST WEEK, INCLUDING TODAY! Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. **Be sure to read all the statements in each group before making your choice.**

1
0 I do not feel sad.
1 I feel sad.
2 I am sad all the time and I can't snap out of it.
3 I am so sad or unhappy that I can't stand it.

2
0 I am not particularly discouraged about the future.
1 I feel discouraged about the future.
2 I feel I have nothing to look forward to.
3 I feel that the future is hopeless and that things cannot improve.

3
0 I do not feel like a failure.
1 I feel I have failed more than the average person.
2 As I look back on my life, all I can see is a lot of failures.
3 I feel I am a complete failure as a person.

4
0 I get as much satisfaction out of things as I used to.
1 I don't enjoy things the way I used to.
2 I don't get real satisfaction out of anything anymore.
3 I am dissatisfied or bored with everything.

5
0 I don't feel particularly guilty.
1 I feel guilty a good part of the time.
2 I feel quite guilty most of the time.
3 I feel guilty all of the time.

6
0 I don't feel I am being punished.
1 I feel I may be punished.
2 I expect to be punished.
3 I feel I am being punished.

7
0 I don't feel disappointed in myself.
1 I am disappointed in myself.
2 I am disgusted with myself.
3 I hate myself.

8
0 I don't feel I am any worse than anybody else.
1 I am critical of myself for my weaknesses or mistakes.
2 I blame myself all the time for my faults.
3 I blame myself for everything bad that happens.

9
0 I don't have any thoughts of killing myself.
1 I have thoughts of killing myself, but I would not carry them out.
2 I would like to kill myself.
3 I would kill myself if I had the chance.

10
0 I don't cry any more than usual.
1 I cry more now than I used to.
2 I cry all the time now.
3 I used to be able to cry, but now I can't cry even though I want to.

11
0 I am no more irritated now than I ever am.
1 I get annoyed or irritated more easily than I used to.
2 I feel irritated all the time now.
3 I don't get irritated at all by the things that used to irritate me.

12
0 I have not lost interest in other people.
1 I am less interested in other people than I used to be.
2 I have lost most of my interest in other people.
3 I have lost all of my interest in other people.

13
0 I make decisions about as well as I ever could.
1 I put off making decisions more than I used to.
2 I have greater difficulty in making decisions than before.
3 I can't make decisions at all anymore.

14
0 I don't feel I look any worse than I used to.
1 I am worried that I am looking old or unattractive.
2 I feel that there are permanent changes in my appearance that make me look unattractive.
3 I believe that I look ugly.

15
0 I can work about as well as before.
1 It takes an extra effort to get started at doing something.
2 I have to push myself very hard to do anything.
3 I can't do any work at all.

16
0 I can sleep as well as usual.
1 I don't sleep as well as I used to.
2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3 I wake up several hours earlier than I used to and cannot get back to sleep.

17
0 I don't get more tired than usual.
1 I get tired more easily than I used to.
2 I get tired from doing almost anything.
3 I am too tired to do anything.

18
0 My appetite is no worse than usual.
1 My appetite is not as good as it used to be.
2 My appetite is much worse now.
3 I have no appetite at all anymore.

19
0 I haven't lost much weight, if any, lately.
1 I have lost more than 5 pounds.
2 I have lost more than 10 pounds.
3 I have lost more than 15 pounds.

I am purposely trying to lose wei[ght] by eating less. Yes____ No____

20
0 I am no more worried about my health than usual.
1 I am worried about physical problems such as aches and pains; or upset stomach; or constipation.
2 I am very worried about physical problems and it's hard to think of much else.
3 I am so worried about my physical problems that I cannot think about anything else.

21
0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

DATE:________________ NAME:______________________________

MILLION VISUAL ANALOGUE SCALE

PLEASE MAKE AN "X" ALONG THE LINE TO SHOW HOW FAR FROM NORMAL TOWARD THE WORST POSSIBLE SITUATION YOUR PAIN PROBLEM HAS TAKEN YOU DURING THE PAST WEEK.

1. How bad is your pain?

no pain — worst possible

2. How bad is the pain at night?

no pain — worst possible

3. Does the pain interfere with your lifestyle?

no problem — total change in lifestyl

4. How good are pain killers for your pain?

complete relief — no relief

5. How stiff is your injured area?

no stiffness — worst possible stiffnes

6. Does your pain interfere with walking?

no problem — cannot walk

7. Do you hurt when walking?

no pain — worst possible pain

8. Does your pain keep you from standing still?

can stand as long as I want — cannot stand at all

9. Does your pain keep you from twisting?

no problem — cannot twist

10. Does your pain allow you to sit in an upright hard chair?

sit as long as I like — cannot use a hard chair at all

11. Does your pain allow you to sit in a soft arm chair?

sit as long as I like — cannot use a soft chair at all

12. Does your injured body part hurt when lying in bed?

no pain — no relief at all

13. How much does your pain limit your normal lifestyle?

no limit — cannot do anything

14. Does your pain interfere with your activities of daily living or work?

no problem — major problem

15. How much have you had to change your home or work place activities because of pain?

no change — a great deal of change

APPENDIX B

Table 1
Completers Only
Demographic Variables: Basic

Variable	Normal	Overweight	Obese I	Obese II	Obese III
n	634	973	715	283	225
Age (SD)	41.1 (10.4)	42.2 (9.3)	43.7 (9.4)	44.1 (10.0)	41.36 (9.4)
Gender (%m/f)	53.9/46.1	65.6/34.4	58.0/42.0	49.8/50.2	35.1/64.9
Race (%)					
Caucasian	68.8	59.3	59.3	65.4	61.8
AA	13.4	14.9	19.4	15.5	26.2
Hispanic	13.2	21.9	20.0	17.3	10.2
Other	4.6	3.9	1.3	1.8	1.8

Table 2
Statistical Analyses of Demographic Variables: Basic

Age

Group	Mean (SD)	F	df	p / linear p
Normal	41.1 (10.4)	8.6	4, 2825	.000/ .151
Overweight	42.2 (9.3)			
Obese I	43.7 (9.4)			
Obese II	44.1 (10.0)			
Obese III	41.36 (9.4)			

Gender

Group	%Male	X^2	df	p /linear p
Normal	53.9	81.8	4	.000/.000
Overweight	65.6			
Obese I	58.0			
Obese II	49.8			
Obese III	35.1			

Race

Group	Race	Percent	X^2	df	p /linear p
Normal	Caucasian	68.8	71.7	12	.000/.000
	AA	13.4			
	Hispanic	13.2			
	Other	4.6			

Table 2 (cont.)

Overweight	Caucasian	59.3
	African-American	14.9
	Hispanic	21.9
	Other	3.9
Obese I	Caucasian	59.3
	African-American	19.4
	Hispanic	20.0
	Other	1.3
Obese II	Caucasian	65.4
	African-American	15.5
	Hispanic	17.3
	Other	1.8
Obese III	Caucasian	61.8
	African-American	26.2
	Hispanic	10.2
	Other	1.8

Table 3

Demographic Variables: Health

Variable	Normal	Overweight	Obese I	Obese II	Obese III
Comorbid Health Conditions (%)	33.3	37.7	28.9	38.5	40.4
Diabetes (%)	4.9	6.7	4.9	5.1	4.5
Cardiovascular Conditions (%)	5.3	3.6	5.2	3.4	2.2
Hypertension (%)	15.8	19.5	14.0	18.8	24.7
Gastrointestinal Conditions (%)	8.8	12.7	7.5	10.3	12.4
Cancer (%)	.7	2.4	2.9	2.6	1.1

Table 4

Statistical Analyses for Demographic Variables: Health

Comorbid Conditions	X^2	df	p / linear p
Any Comorbid Condition	8.5	4	.074/.604
Diabetes	1.8	4	.766/.673
Cardiovascular Conditions	2.9	4	.579/.365
Hypertension	7.7	4	.103/.294
Gastrointestinal Conditions	6.5	4	.163/.901
Cancer	4.5	4	.340/.364

Hypertension

Group	Percent	OR (95% CI)	X^2	df	p
Normal	15.8	1.8 (.983, 3.119)	3.7	1	.05
Obese III	24.7				

Cancer

Group	Percent	OR (95% CI)	X^2	df	p
Normal	.7	1.7 (.144, 17.95)	.152	1	.697
Obese III	1.1				

Any Comorbid Condition

Group	Percent	OR (95% CI)	X^2	df	p
Normal	33.3	1.4 (.832, 2.217)	1.509	1	.219
Obese III	40.4				

Table 5
Demographic Variables: Musculoskeletal Area/Injury Related

Variables	Normal	Overweight	Obese I	Obese II	Obese III
Lumbar + Combo (%)	57.9	58.3	52.6	53.4	52.0
Lower Extremities (%)	3.2	4.2	3.5	4.6	4.9
Other Non-Lumbar (%)	42.1	41.7	47.4	46.6	48.0
Time Since Injury in Months	12.7	12.1	12.9	13.6	11.6
Attorney Retained (%)	16.8	19.1	20.7	21.7	19.2

Table 6
Statistical Analyses of Demographic Variables: Musculoskeletal Area/Injury Related

Variables	X^2	df	p / linear p
Lumbar + Combo	8.5	4	.074/.015
Lower Extremities	2.5	4	.651/.295
Other Non-Lumbar	8.5	4	.074/.015
Attorney Retained	3.9	4	.451/.135
	F	df	p
Time Since Injury	.431	(4, 1192)	.786/.861

Table 7
Demographic Variables and Statistical Analyses: Program Completers

Variables	Normal	Overweight	Obese I	Obese II	Obese III
N (3341)	757	1134	840	342	268
Completers (%)	86.1	86.2	84.8	83.9	84.0
Non-Completers (%)	13.9	13.8	15.2	16.1	16.0

Variable	X^2	df	p / linear p
Completion Status	2.2	4	.705/.176

Table 8

Statistical Analysis of the Quantified Pain Drawing (Pain Intensity) at Pre- and Post-Treatment

Pain Intensity at Pre-Treatment

Group	Mean(SD)	F	df	p / linear p
Normal	6.72 (5.2)	.641	(4, 2773)	.633/.142
Overweight	6.98 (5.2)			
Obese I	6.95 (6.1)			
Obese II	7.21 (7.2)			
Obese III	7.30 (7.3)			

Pain Intensity at Post-Treatment

Group	Mean (SD)	F	df	p / linear p
Normal	4.49 (2.7)	2.475	(4, 2648)	.042/.379
Overweight	5.05 (6.0)			
Obese I	5.32 (5.9)			
Obese II	5.36 (6.6)			
Obese III	4.74 (3.1)			

Table 9

Statistical Analysis of the Million Visual Analog Scale (MVAS) at Pre- and Post-Treatment

MVAS at Pre-Treatment				
Group	Mean(SD)	F	df	p / linear p
Normal	85.44 (27.1)	6.889	(4, 2761)	.000/.000
Overweight	89.36 (25.2)			
Obese I	90.65 (24.8)			
Obese II	92.49 (25.1)			
Obese III	93.90 (25.2)			
MVAS at Post-Treatment				
Group	Mean (SD)	F	df	p / linear p
Normal	57.98 (30.2)	4.026	(4, 2644)	.003/.123
Overweight	63.36 (30.1)			
Obese I	63.55 (31.5)			
Obese II	64.71 (28.7)			
Obese III	61.36 (30.4)			

Table 10

Statistical Analysis of the Beck Depression Inventory (BDI) at Pre- and Post-Treatment

BDI at Pre-Treatment				
Group	Mean(SD)	F	df	p / linear p
Normal	15.70 (10.1)	2.457	(4, 2761)	.044/.005
Overweight	15.94 (10.1)			
Obese I	16.80 (10.7)			
Obese II	16.75 (10.9)			
Obese III	17.76 (9.9)			
BDI at Post-Treatment				
Group	Mean (SD)	F	df	p / linear p
Normal	8.69 (8.5)	1.584	(4, 2638)	.176/.820
Overweight	8.98 (8.5)			
Obese I	9.69 (8.9)			
Obese II	9.55 (8.4)			
Obese III	8.57 (7.9)			

Table 11

Statistical Analysis of the Cumulative Physical Score at Pre- and Post-Treatment

Cumulative Physical Score at Pre-Treatment				
Group	Mean(SD)	F	df	p / linear p
Normal	43.33 (18.5)	6.759	(4, 2804)	.000/.000
Overweight	43.17 (18.6)			
Obese I	40.16 (17.2)			
Obese II	40.51 (17.5)			
Obese III	38.08 (16.8)			
Cumulative Physical Score at Post-Treatment				
Group	Mean (SD)	F	df	p / linear p
Normal	75.97 (18.3)	2.666	(4, 2655)	.031/.002
Overweight	75.71 (18.1)			
Obese I	74.69 (18.8)			
Obese II	74.68 (16.1)			
Obese III	71.67 (14.8)			

Table 12

One-Year Socioeconomic Outcome Variables

Variable	Normal	Overweight	Obese I	Obese II	Obese III
Surgery – Treated Area (%)	3.0	2.8	4.1	3.3	1.5
Health Care Utilization – New Provider (%)	22.8	23.8	23.9	27.8	26.0
Work Return (%)	90.4	89.5	88.7	3.4	87.6
Work Retention (%)	84.1	84.1	83.4	79.9	82.2
Return to Same Employer (%)	52.5	54.2	45.7	56.2	48.3
Return to Different Employer (%)	47.5	45.8	54.3	43.8	51.7
Hours Per Week Working (%)					
Full Time (40 hours or more)	83.4	84.4	79.3	86.5	82.3
Part Time (20 hours or less)	16.6	15.6	20.7	13.5	17.7

Table 13

Statistical Analyses of One-Year Socioeconomic Outcome Variables

Variable	X^2	df	p / linear p
Surgery-Treated Area	4.186	4	.381/.830
Health Care Utilization- New Provider	2.790	4	.594/.165
Work Return	10.700	4	.030/.013
Work Retention	3.286	4	.511/.175
Return to Same Employer	8.727	4	.068/.306
Return to Different Employer	8.727	4	.068/.306
Full-Time Employment	7.196	4	.126/.628
Part-Time Employment	7.196	4	.126/.628

Surgery-Treated Area

Group	% Yes	OR (95%CI)	X^2	df	p
Normal	3.0	.485 (.140, 1.672)	1.371	1	.242
Obese III	1.5				

Health Care Utilization – New Provider

Group	% Yes	OR (95%CI)	X^2	df	p
Normal	22.8	1.192 (.821, 1.731)	.857	1	.355
Obese III	26.0				

Work Return

Group	% Yes	OR (95%CI)	X^2	df	p
Normal	94.0	.749 (.465, 1.205)	1.425	1	.233
Obese III	87.6				

Table 13 (cont.)

Work Retention

Group	% Yes	OR (95%CI)	X^2	df	p
Normal	84.1	.876 (.586, 1.311)	.413	1	.520
Obese III	82.2				

References

Anagnostis, C., Mayer, T. G., Gatchel, R. J., & Proctor, T. .J. (2003). The Million Visual Analog Scale: Its utility for predicting tertiary rehabilitation outcomes. *Spine*, *28,* 1051-1060.

Anderrson, G.B.J., Pope, M.H., Frymoyer, J.W., & Snook, S.H.(1991). Epidemiology and cost. In Pope, M.H., Anderrson, G.B.J. Frymoyer, J.W., & Chaffin, D.B. (Eds.), *Occupational Low Back Pain: Assessment, Treatment, and Prevention.* St. Louis: Mosby Year Book

Atlas, S.J. & Deyo, R.A. (2001). Evaluating and managing acute low back pain in the primary care setting. Journal of General Internal Medicine, 16, 120-131.

Baskin, M.L., Ard, J., Franklin, F., and Allison, D.B. (2005). Prevalence of obesity in the United States. *Obesity Reviews, 6*, 5-7.

Baum, A., Gatchel, R.J., & Krantz, D.S (1997). *An introduction to health psychology (3rd edition)*. New York: Random House.

Beals, R. (1984). Compensation and recovery from injury. *Western Journal of Medicine,* 104, 233-237.

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

Beck, A. T., Ward, C.H., Mendelson, M.M., Mock, J. & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4*, 561-571.

Berke, E. M., & Morden, N. E. (2000). Medical management of obesity. *American Family Physician, 62*, 419-26.

Brown, W. J., Mishra, G., Kenardy, J., & Dobson, A. (2000). Relationship between body mass index and well-being in young Australian women. *International Journal of Obesity, 24*, 1360-1368.

Buthcer, J.N. (1990). The MMPI-2 in psychological treatment. New York:Oxford University Press.

Butcher, J.N., Dahlstorm, W.G., Graham, J.R., Tellegen, A., & Kaemmer, B. (1989). *MMPI-2 (Minnesota Multiphasic Personality-2): Manual for administration and scoring*, Minneapolis: University of Minnesota Press.

CDC chief tries to deflate obesity debate. (2005).

Colditz, G. A. (1999). Economic costs of obesity and inactivity. *Medicine and Science in Sports and Exercise, 31*, 663-667.

Crowther, J.H., Wolf, E.M., & Sherwood, N. (1992). Epidemiology of bulimia nervosa. In M. Crowther, D.L. Tennenbaum. S.E. Hobfoll, & M.A.P. Stephens (Eds.), *The etiology of bulimia nervosa: The individual and familial context (pp. 1-26)* Washington, D.C.: Taylor & Francis.

Dahlstorm, W.G., Welsh, G.S., & Dahlstorm, L.E. (1975). An MMPI handbook: Vol. I. Clinical interpretation. Minneapolis: University of Minnesota Press.

Deyo, R.A. (1983). Conservative therapy for low back pain: Distinguishing useful from useless therapy. *Journal of the American medical Association, 250*, 1057.

Faas, A., Van Eijk, J., Chavannes, A., Gubbels, J. (1995). A randomized trial of exercise therapy in patients with acute low back pain. *Spine, 20*, 941-947

Fairburn, C.G., Hay, P.J., & Welch, S.L. (1993). Binge eating and bulimia nervosa: Distribution and determinants. In C.G. Fairburn & G.T. Wilson, (Eds.), *Binge eating: Nature, assessment, and treatment (pp. 123-143)*. New York: Guilford

Fannuele. J.C., Abdu, W.A., Hanscom, B. et al. (2002). Association between obesity and functional status in patients with spine disease. *Spine*. 27, 306-312.

Flegal, K.M., Carrol, M.D., Ogden, C.L., Johnson, C.L. (2002). Prevalence and trends in obesity among U.S. adults. *JAMA, 288*, 1723-27.

Fordyce, W.E. (1976). *Behavioral methods for chronic pain and illness*. St. Louis: Msby.

Fordyce, W.E. (1985). Back pain, compensation, and public policy. In J. Ronsen & L. Solomon (Eds.). *Prevention in Health Psychology*. Hanover, VT: University press of NE.

Fordyce, W.E. (1995). *Back pain in the workplace: Management of disability in nonspecific conditions*. Seattle: IASP Press.

Frank, J.W., Kerr, M.S., Brooker, A. (1996). Disability resulting from occupational low back pain: I: What do we know about primary prevention? A review of the scientific evidence on prevention before disability begins. *Spine, 21*, 2908-2917.

Fransen, M., Woodward, M., Norton, R., et. al. (2002). Risk factors associated with the transition from acute to chronic occupational back pain. *Spine*, 27, 92-98.

Frymoyer, J.W. (1988). Back pain and sciatica. *New England Journal of Medicine, 318*, 291-300.

Frymoyer, J.W. & Cats-Baril, W. (1991). An overview of the incidence and costs of low back pain. *Orthopedic Clinics of North America, 22*, 263-271.

Gatchel, R.J. (1991). Early development of physical and mental deconditioning in painful spinal disorders. In T.G. Mayer, V. Mooney, & R.J.

Gatchel (Eds.), *Contemporary Conservative Care for Painful Spinal Disorders*. (p. 278-289). Philadelphia: Lea & Febiger.

Gatchel, R.J. (1991). Psychosocial assessment and disability management in the rehabilitation of painful spinal disorders. In T.G. Mayer, V. Mooney, & R.J. Gatchel (Eds.), *Contemporary Conservative Care for Painful Spinal Disorders* (p.441-454). Philadelphia: Lea & Febiger.

Gatchel, R.J., Polatin, P.B., & Mayer, T.G. (1995). The dominant role of psychosocial risk factors in the development of chronic low back pain disability. Spine, 20, 2702-2709.

Geisser, M. E., Roth, R. S., & Robinson, M.E. (1997). Assessing depression among persons with chronic pain using the Center for Epidemiological Studies-Depression Scale and the Beck Depression Inventory: A comparative analysis. *The Clinical Journal of Pain*, 163-170.

Gordon, R.A. (1990). Anorexia and bulimia: Anatomy of a social epidemic. New York: Blackwell

Graham, J.R. (1993). *MMPI-2: Assessing personality and psychopathology* (2nd Edidtion). New York: Oxford University Press.

Hathaway, S.R., & McKinley, J.C. (1942). A multiphasic personality schedule (Minnesota): III. The measure of symptomatic depression . *Journal of Psychology, 4*, 73-84.

Hazard, R., Fenwick, J., Kalish, S., Redmond, J., Reeves, G., Reid, S., Frymoyer, J. (1989). Functional restoration with behavioral support: a one-year prospective study of chronic low back pain patients. Spine, 14, 157-165.

Hazard, R.G., Bendix, A., & Fenwick, J.W. (1991). Disability exaggeration as a predictor of functional restoration outcomes for patients with chronic low-back pain. *Spine, 16*, 1062-1067.

Hegel, M.T., & Ahles, T.A. (1994). Appropriateness of the MMPI-2 in the psychological assessment of chronic pain patients (Letter to the editor). *Journal of Pain and Symptom Management, 9*, 1-2.

Hellsing, A.L. & Bryngelsson, I.L. (2000). Predictors of musculoskeletal pain in men: A twenty-year follow-up from examination at enlistment. *Spine, 23*, 3080-3086.

Ibrahim, T., Hobson, S., Esler, C.A.N., & Power, R.A. (2004). Does body mass index influence patient satisfaction following total hip arthroplasty? Presented at the British Orthopaedic Association Annual Congress. September 14-17, 2004. Manchester, England.

Jackson, R., Boston, D., Edge, A. (1983). Lateral mass fusion: A prospective study of a consecutive series with long-term follow-up. *Spine, 10*, 828-833.

Jordan, K. (1996). *Length of Disability in the Rehabilitation of Chronic Spinal Disorder Patients: Treatment Outcomes and Psychological Descriptors*.

Unpublished doctoral dissertation. The University of Texas southwestern Medical Center at Dalllas, Dallas, TX.

Kolotkin, R. L., Meter, K., & Williams, G. R. (2001). Quality of life and obesity. *Obesity Reviews, 2*, 219-229.

Krause, N. & Ragland, D.R. (1994). Occupational disability due to low back pain: A new interdisciplinary classification based on a phase model of disability. *Spine, 19*, 1011-1020.

Lake, J. K., Power, C., Cole, T. J. (2000). Back pain and obesity in the 1958 British birth cohort: cause or effect? *Journal of Clinical Epidemiology, 53*, 245-250.

Linton, S.J., Hellsing, A.L., Hallden, K.A. (1998). A population-based study of spinal pain among 35-45-year-old individuals. *Spine, 23*, 1457-63

Main, C.J. & Spanswick, C.C. (1995). Personality assessment and the Minnesota Multiphasic Personality Inventory-50 years on: Do we still need our security blanket? *Pain Forum, 4,* 90-96.

Marchiori, D., Henderson, C. (1996). A cross-sectional study correlating cervical radiographic degenerative findings to pain and disability. *Spine, 21*, 2747-52

Mayer, T.G. (1983). Rehabilitation of the patients with spinal pain. *Orthopedic clinics of North America, 14*, 623-637.

Mayer, T.G., Gatchel, R. J., Kishino, N., Keeley, J., Capra, P., Mayer, H., Barnett, J. & Mooney, V. (1985). Objective assessment of spine function following industrial injury: A prospective study with comparison group and one-year follow-up. *Spine, 10*, 482-493.

Mayer, T. G., Gatchel, R. J., Mayer, H., Kishino, N., Keeley, J. & Mooney, V. (1987). A prospective two-year study of functional restoration in industrial low back injury: An objective assessment procedure. *Journal of the American Medical Association, 258*, 1763-1767.

Mayer, T.G. & Gatchel, R.J. (1988). *Functional restoration for spinal disorders: The sports medicine approach*. Philadelpia: Lea & Febinger.

Mayer, T. G., Polatin, P.B., & Gatchel, R.J. (1999). Functional restoration and other rehabilitation approaches to chronic musculoskeletal pain disability syndromes. In M. Grabois and E. Henley (Eds.), *Critical Reviews in Physical and Rehabilitation Medicine*. Begell House, Inc.: New York.

McTigue, K.M., Garrett, J.M., Popkin, B.M. (2002). The natural history of development of obesity in a cohort of young U.S. adults between 1981 and 1998. *Annals of Internal Medicine, 136*, 857-864.

Mechanic, D. (1966). Response factors in illness: The study of illness behavior. *Social Psychiatry, 1*, 11-20.

Mechanic, D. (1972). Social psychological factors affecting the presentation of bodily complaints. *The New England Journal of Medicine, 286*, 1132-1139.

Melzack, R. (1973). *The puzzle of pain*. Harmondsworth, England: Penquin.

Melzack, R. (1993). Pain: Past, present, and future. *Canadian Journal of Experimental Psychology, 47*, 615-629.

Melzack, R. & Wall, P. (1965). Pain mechanisms: A new theory. *Science, 150*, 971-979.

Merskey, H. (1965). The characteristics of persistent pain in psychological illness. *Journal of Psychosomatic Research, 9*, 291-298.

Miles, K., Maimaris, C., Finlay, D., Barnes, M. (1988). The incidence and prognostic significance of radiological abnormalities in soft tissue injuries to the cervical spine. *Skeletal Radiology, 17,* 493-496.

Million, S., Hall, W., Haavik-Nielson, K., Baker, R.D., & Jayson, M.V. (1982). 1981 Volvo Award in clinical Science: Assessment of the progress of back-pain patients. *Spine, 7*, 204-212.

Nachemson, A.L. (1992). Newest knowledge of low back pain: A critical look. *Clinical Orthopaedics and Related Research, 279*, 8-20.

Novy, D.M., Nelson, D.V., Berry, L.A., & Averill, P.M. (1995). What does the Beck Depression Inventory measure in chronic pain?. *Pain, 61*, 261-267.

Parker, K.C.H., Hanson, R.K., & Hunsley, J. (1988). MMPI, Rorschach, and WAIS: A meta-analytic comparison of reliability, stability, and validity. *Psychological Bulletiin, 103*, 367-373

Peltonen, M., Lindroos, A.K., & Torgerson, J.S. (2003). Musculoskeletal pain in the obese: A comparison with a general population and long-term changes after conventional and surgical obesity treatment. *Pain, 104*, 549-557.

Pennie, B., & Agambar, I. (1991). Patterns of injury and recovery in whiplash. *Injury, 22*, 57-59.

Prokop, C. K. (1986). Hysteria scale elevations in low back pain patients: A risk for misdiagnosis? *Journal of Consulting and Clinical Psychology, 54*, 558-562.

Reid, S., Haugh, L.D., Hazard, R.G., & Tripathi, M. (1997). Occupational low back pain: Recovery curves and factors associated with disability. *Journal of Occupational Rehabilitation, 7*, 1-14

Richter, P., Werner, J., Heerlein, A., Kraus, A., & Sauer, H. (1998). On the Validity of the Beck Depression Inventory: A review. *Psychopathology, 31*, 160-168.

Riley, J.L., Robinson, M.E. & Geisser, M.E. (1993). Multivariate cluster analysis of the MMPI-2 in chronic low-back patients. *Clinical Journal of Pain, 9*, 248-252.

Robinson, J.P. (1998). *Occupational And Health Outcomes of Polymorphous Pain Individuals: Briquet's Syndrome Revisited*. Unpupblished doctoral dissertation. The University of Texas Southwestern Medical Center at Dallas, Dallas, TX.

Romano, J.M., & Turner, J. A. (1985). Chronic pain and depression: Does the evidence support a relationship?. *Psychological Bulletin, 97*, 18-34.

Roughton, J. (1993). Cumulative trauma disorders: The newest business liability. *Professional Safety, 38*, 29-35.

Rush, A.J., Beck, A.T., Kovacs, M., & Hollon, S. (1977). Comparative efficacy of cognitive therapy and imipramine in the treatment of depressed patients.

Rush, A.J., Guillon, C.M., Basco, M.R., Jarrett, R.B. & Trivedi, M.H. (1996). The Inventory for Depressive Symptomatology (IDS): psychometric properties. *Psychological Medicine, 26*, 477-486.

Shisslak, C.M., Crago, M., & Estes, L.S. (1995). The spectrum of eating disturbances. *International Journal of Eating Disorders, 18 (3),* 209-219

Smolak, L. (1996). National Eating Disorders Association/Next Door Neighbors puppet guide book

Spengler, D., Bigos, S., Martin, N., Zeh, J., Fisher, L., Nachemson, A. (1986). Back injuries in industry; A retrospective study 1. Overview and cost analysis. *Spine, 11*, 241-245

Turner, J., Ersek, M., Herron, L., Haselkorn, J., Kent, D., Ciol, M., Deyo, R. (1992). Patient outcomes after lumbar spinal fusions. *Journal of the American Medical Association, 268*, 907-11

Toda, Y., Segal, N., Toda, T., Morimoto, T., & Ogawa, R. (2000). Lean body mass and body fat distribution in participants with chronic low back pain. *Archives of Internal Medicine, 160*, 3265-3269.

Toyran, M., Ozmert., E., Yurdakok, K. (2002) Television viewing and its effect on physical health of schoolage children. *Turk Journal of Pediatrics*, *44*, 194-203.

Tsuritani, I., Honda, Ryumon, H., Noborisaka, Y., Ishida, M., Ishizaki, M., & Yamada, Y. (2002). Impact of obesity on musculoskeletal pain and difficulty of daily movements in Japanese middle-aged women. *Maturitas, 42*, 23-30.

Turk, D.C. & Rudy, T.E. (1987). Towards a comprehensive assessment of chronic pain patients. *Behavioral Research and Therapy, 25*, 237-247.

Turk, D.C. (1996). Biopsychosocial perspective on chronic pain. In R.J. Gatchel & D.C. Turk (Eds.), *Psychological Approaches to Pain Management: A Practitioners Handbook* (pp.3-32). Guilford Publications, Inc., New York.

Turk, D.C., & Flor, H. (1999). Chronic pain: A biobehavioroal perspective. In R. Gatchel & D. Turk (Eds.), *Psychosocial factors in pain: Critical Perspectives* (pp. 18-34). New York: The Guilford Press.

Turner, J.A., & Romano, J.M. (1984). Self-report screening measures for depression in chronic pain patients. *Journal of Clinical Psychology, 40*, 909-913.

Vannier, G., & Rose, F. (1991). Etiologies and prevalence of occupational injuries to the upper extremity. In *Occupational hand and upper extremity injuries and diseases.* M Kasdan (Ed.), Philadelphia: Hanley and Belfus.

Van Tulder, M., Koes, B., Bouter, L., (1997). Conservative treatment of acute and chronic nonspecific low back pain: A systematic review of randomized controlled trails of the most common interventions. *Spine, 22*, 2128-56.

Waddell, G. (1996). Low back pain: A twentieth century health care enigma. Spine, 21, 2820-2825.

Weisberg, J.N., & Keefe, F.J. (1999). Presonality, individual differences, and psychopathology. In R. Gatchel & D. Turk (Eds.), *Psychosocial factors in pain: Critical Perspectives* (pp. 56-73). New York: Guilford Press.

Wendelboe, A. M., Hegmann, K. T., Biggs, J. J., Cox, C. M., Portmann, A. J., Gildea, J. H., Gren, L. H., & Lyon, J. L. (2003). Relationship between body mass indices and surgical replacements of knee and hip joints. *American Journal of Preventative Medicine, 25*, 290-295.

Wendelboe, A. M., Hegmann, K. T., Gren, L. H., Alder, S. C., White, G. L., & Lyon, J. L. (2204). Association between body-mass index and surgery for rotator cuff tendonitis. The Journal of Bone and Joint Surgery, 86, 743-747.

Wesley, A.L., Gatchel, R.J., Polatin, P.B., Kinney, R.K. & Mayer, T.G. (1991). Differentiation between somatic and cognitive/affective components in commonly used measurements of depression in patients with chronic low-back pain. *Spine, 16*, 213-215.

Wilson, P. (1991). Chronic neck pain and cervicogeic headache. *Clinical Journal of Pain, 7*, 5-11

Wolf, A.M., Colditz, G.A. (1998). Current estimates of the economic cost of obesity in the United States. *Obesity Research, 6*, 97-106.

Yancy, W.S., Olsen, M.K., Westman, E.C., et al. (2002) Relationship between obesity and health-related quality of life in men. *Obesity Research, 10*, 1057-1064.

Zalewski, C.E., & Gottesman, I.I. (1991). Man versus mean revisited: MMPI group data and psychiatric diagnosis. *Journal of Abnormal Psychology, 100*, 562-568.

VITAE

Aleksandra Aceska was born in Skopje, Macedonia, on September 23, 1980, the daughter of Olga Aceska and Bozidar Aceski. After 12 years she moved to Oklahoma City, Oklahoma where she completed her high school work at Putnam City High School. In 1998 she entered Baylor University in Waco, Texas. During the spring semester of 2000 she attended the University of Freiberg, Germany. She received the degree of Bachelor of Arts with a major in Psychology and minor in German from Baylor University in August, 2002. During the following year she was employed at the University of Oklahoma Health Sciences Center as a research assistant. In August, 2003 she entered the Graduate School of Biomedical Sciences at the University of Texas Southwestern Medical Center at Dallas. She was awarded the degree of Master of Sciences in August, 2005.

Permanent Address: 15208 Worthington Lane
Edmond, Oklahoma 73013