DISSERTATION

DEPRESSION AMONG INJURED WORKERS: MEASUREMENT AND PREDICTION

Submitted by

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY BRYAN STICE ENTITLED DEPRESSION AMONG INJURED WORKERS: MEASUREMENT AND PREDICTION BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

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ABSTRACT OF DISSERTATION

DEPRESSION AMONG INJURED WORKERS:

MEASUREMENT AND PREDICTION

Work-related injuries or disabilities result in significant negative consequences to physical, economic, social, and psychological well-being. Depression has been shown to increase post-injury and to contribute to poor return to work outcomes. Several authors have raised concerns about the use of instruments such as the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) with medically ill individuals, given the potential confounding of somatic items of depression and somatic items of medical illness/treatment. Furthermore, few studies have identified predictors of depression among injured workers. The goals of this study were to examine the reliability and factor structure of the BDI-II and to identify significant predictors of depression in an archived sample of 253 injured workers receiving vocational rehabilitation.

Item reliability analysis, factor analysis, and MLR analyses were conducted to answer the research questions and test the hypotheses of the study. The BDI-II demonstrated excellent psychometric properties, with none of the somatic items worthy of removal. Factor analysis resulted in two correlated factors (Cognitive and Somatic-Affective), consistent with the factor structure found in previous factor analyses of "unhealthy" (i.e., mentally/medically ill) individuals. Several significant predictors of depression emerged in MLR analyses: pain, psychosocial stress, Accepting work value, and the interaction between pain and stress. In a stepwise MLR analysis, the four

predictors explained 38% of the variance of depression scores, representing a "large" effect size ($f^2 = .62$; Cohen, 1988).

Several recommendations were offered based on the results. The BDI-II is recommended for use, without modification, when assessing depression among injured workers. Nonetheless, some clinicians and researchers may prefer to use the subscales to identify depressive symptomatology in greater detail. The significant predictors of depression should be routinely assessed. An equation was developed from the stepwise MLR that can be used to predict depression with relatively good accuracy. Future research with injured workers should further examine the validity and reliability of the BDI-II scores, identify other predictors of depression, identify the causal relationships among predictors and depression, use well-operationalized, standardized instruments, examine theoretical models, control for symptom exaggeration, and develop effective treatments that reduce depression among injured workers.

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Chapter I: Introduction

Work is an important part of most adults' life experience. Other than sleeping, more time is spent working than doing any other activity, among those aged 15 or older living in the United States (Bureau of Labor Statistics, 2006). Sigmund Freud, with uncharacteristic brevity, was once reported to have said that "to love and to work" ("*lieben und arbeiten*") were the two cardinal virtues that characterized "normal," mentally healthy individuals (Erikson, 1964, p. 265). Furthermore, Alfred Adler noted the "problem of work" as one of three basic tasks to resolve in life (Adler, 1931/1998). In a review of work literature, Šverko and Vizek-Vidović (1995) identified four distinct functions of work: an economic function, a social function (i.e., to meet and interact with people), a source of social status and prestige, and a psychological function (i.e., as "an essential source of identity, self-esteem, and self-fulfillment," p. 4). These varied functions of work can thus be considered to extend broadly to important areas in people's lives, far beyond the actual duties conducted at work.

Individuals do not work for many reasons, some within their control (e.g., motivation) and some outside of their control (e.g., lay-offs). Freud, Adler, and others' conceptualizations of work as a sign of individuals' mental health imply that they have control over whether or not they work. Unfortunately, these theories do not account for effects on mental health when individuals do not work for reasons outside of their control. However, given the importance of the role of work from the perspective of these

theorists, one may wonder whether such a departure from work would negatively affect their psychological well-being.

The purpose of this study is to examine a subset of the psychological characteristics of one such population, injured workers. Injured workers face losses in each of Šverko and Vizek-Vidović's (1995) four functions of work, and such deficits can be presumed to result in negative psychological consequences. This chapter begins with reviews of the prevalence and potential consequences of work-related injury and disability, addressing all four functions of work. In the interest of better understanding a subset of the psychological characteristics of injured workers, this chapter closes with the proposal of an original study.

Injured Workers with Disabilities in the United States: Prevalence and Current Status

Millions of individuals in the United States have a disability, and a large percentage of these individuals experience unemployment or work difficulties as a result of their disabilities. In 2000 the U.S. Census estimated that 49.7 million individuals (consisting of noninstitutionalized civilians aged 5 or older) endorsed a long-lasting condition or disability, representing 19.3% of the total population surveyed (Waldrop & Stern, 2003). Of these disabled individuals, 21.2 million indicated that they were physically disabled and 12.4 million indicated that they were mentally disabled (the categories of disability were not mutually exclusive; thus, an individual could have more than one type of disability). Of the Census population aged 16 to 64, 21.3 million (11.9% of those in this age bracket) endorsed "a physical, mental, or emotional condition that caused them difficulty working at a job or business" (Waldrop & Stern, 2003, p. 2).

While the majority of the individuals who endorsed a disability worked and lived above the poverty line, they were significantly less likely to work and more likely to be living in poverty than those who did not endorse a disability. For those aged 16 to 64 with a disability, 60.1 percent of men and 51.4 percent of women were employed, compared to 79.9 of men and 67.3 of women for those without a disability. Furthermore, those aged five and older with a disability were significantly more likely to be living in poverty, with 17.6 percent of those with a disability living in poverty, compared to 10.6 percent among those without a disability.

Of the millions of individuals with disabilities living in the United States, many become disabled as a result of an on-the-job injury. The U.S. National Safety Council (NSC) estimated that in 2004 alone, 10.5 million individuals experienced a disabling injury, with 3.7 million of these disabling injuries occurring on-the-job (NSC, 2006). Eighty million work days were lost by workers due to on the job injuries for the year 2004. Furthermore, injuries occurring during this year are estimated to result in a loss of 65 million days of productivity in future years. In 2003, 125.2 million workers were covered by workers' compensation, totaling an estimated $54.9 billion in paid expenses (NSC, 2006). The average cost per compensation claim from 2002 to 2003 was $17,787 (NSC, 2006). The 2004 economic costs of work injury, consisting of wage and productivity losses, medical costs, administrative expenses, and employer costs, totaled $142.2 billion, at approximately $34,000 per disabling injury and $1.15 million per death. As will be later reviewed, these economic effects often result in considerable personal consequences to the worker.

Consequences of Work-Related Injury, Impairment, and Disability

The approximately four million injured workers each year in the United States who experience a disabling injury face a multitude of changes and challenges. According to Livneh (1986), "The impact of a sudden physical trauma on an individual's life creates overwhelming physical, psychological, social, vocational, and economic effects" (p. 5). This section reviews the physical, economic, social, and psychological impacts due to work-related injury, impairment, and disability.

Physical Effects

Immediately following an injury causing bodily harm, medical care is needed to ameliorate the physical impairment resulting from the injury and return the individual as closely as possible to his or her preexisting medical state. Depending upon the level of impairment, this process of reaching "maximum medical improvement" (MMI) may require lengthy medical treatment, such as surgeries, pharmacology, rehabilitation, and numerous medical appointments. The energy, expense, time, physical strain, and psychological strain devoted to achieving MMI is often immense. Upon reaching MMI, many individuals still retain residual impairments in physical functioning. Injured workers often report experiencing continued physical symptoms, pain, and functional impairment (Keogh, Nuwayhid, Gordon, & Gucer, 2000; Pransky et al., 2000). Among one sample of injured workers, 81% reported that they could not "do as much as before the injury" (Keogh et al., 2000, p. 502).

According to 2003 statistics reported by the NSC (2006), the most common nonfatal on-the-job injuries in private industry were to the back (23.1%), multiple body parts (9.9%), lower extremities, excluding knee, foot, and toe (8.9%), finger (8.1%), and

knee (8.0%). The industry sectors resulting in the highest number of injuries were in manufacturing, education and health services, and retail trade.

Falvo (2005) recently provided a thorough narrative review of the psychosocial and functional effects of chronic illness and disability. She noted that "people vary in their tolerance to symptoms, their functional limitations, and their general ability to cope with chronic illness and disability" (p. 1). From this perspective, individual differences in responding to physical trauma may be as significant as the severity of the trauma itself. For example, two individuals may have identical occupations and experience identical physical trauma. However, one might have greater coping resources and adjust quickly to the trauma, while the other might have poor coping resources and adjust at a much slower pace, or not at all.

Work-related injuries can also result in physical change or disfigurement. Such changes can result in alterations to body image, an individual's perception of his or her physical appearance, and how the individual believes he or she is perceived by others (Falvo, 2005). As reviewed by Falvo (2005), Livneh, and Antonak (1997), chronic illness and disability may alter and/or distort one's body image, challenging the individual to accommodate the physical changes into a new self-image. Some factors that are believed to affect the level of accommodation are "the visibility of change, the functional significance of the change, the speed with which change occurred, and the importance of physical change or associated functional limitations to the individual reactions of others" (Falvo, 2005, p. 12).

Many injured workers also experience chronic pain as a result of their injuries. While historically viewed as a purely physical condition, chronic pain is more currently

conceptualized from the biopsychosocial model. This model describes chronic pain as a result of dynamically interacting biological, psychological, and social influences (Turk & Flor, 1999). Thus, the experience of pain is also highly individualized. Pain is also believed to result in psychological outcomes, which are reviewed later in this chapter. Waring (1982) described pain as having both affective and sensory-perceptional components, with chronic pain resulting in a worsened emotional state. According to Fernandez and Turk (1995), anger is the most common affective response to chronic pain.

Unfortunately, injured workers often feel that their medical care is unsatisfactory. They commonly report that they are treated with little respect by their medical providers and are given little information about their conditions or treatments (Roberts-Yates, 2003; Pransky et al., 2000). Dembe (1998) found that satisfaction with medical care was rated lower when provided through workers' compensation in comparison to treatment for nonoccupational conditions. In a survey of Canadian injured workers, only 31% of one sample and 18% of a second sample felt that the medical examinations of doctors provided by the workers' compensation system were fair and adequate (Kirsh & McKee, 2003).

Economic Effects

While individuals are unable to work, they receive income replacement that is usually set at a percentage of their previous income or at a standard wage. For 2002, the U.S. Department of Labor (USDL) reported maximum benefits to range from state to state from 60 to 75% of total earnings, or from 75 to 80% of spendable earnings (USDL, 2002). Thus, they must also adjust to their net loss in wages, which can result in

considerable hardship (Boden & Galizzi, 1999; Reville, 1999). This can be especially difficult for those of lower socioeconomic status, who also have the greatest risk of claim denial and delays in medical care (Dembe, 1999; Herbert, Janeway, & Schechter, 1999). Income replacement does not always come immediately following an injury. One study found that it took an average of 20 months after the injury for the workers to receive income replacement (Dawson, 1994). In one study, only 78% of injured workers who lost time from work indicated that they had received workers' compensation (Keogh et al., 2000). The financial losses among unemployed individuals (not limited to work-related injury) have been documented to contribute to psychological distress, reduced happiness, reduced life satisfaction, and familial difficulties (see Turner & Turner, 2004, for a review).

A survey of two samples ($N = 290$) of injured workers in Ontario, Canada, substantiated the extent of financial difficulties during the claims process (Kirsh & McKee, 2003). The percentage of those who agreed or strongly agreed to the statement "The amount of compensation I received was fair and adequate" was 50% in one sample and 16% in the other sample. Those who agreed or strongly agreed to the statement "My benefits were adequate for me and my family to meet our needs" totaled 32% of the first sample and 19% of the second. Furthermore, 12% of one sample and 41% of the other sample had their claims initially denied, and had to support themselves through savings, borrowed money, other family income, and other sources of income. Other studies also have found that many injured workers face difficulties paying bills and use savings or borrowed money to support themselves and their families (Keogh et al., 2000; Morse, Dillon, Warren, Levenstein, & Warren, 1998; Pransky et al., 2000; Texas Workers'

Compensation Research Center, 1995). Injured workers are also at greater risk of moving from their primary residence, losing their home, losing their car, and losing their health insurance in comparison to a non-injured control group (Morse et al., 1998).

A qualitative study consisting of interviews with 85 injured workers in South Australia further details the financial difficulties experienced in the workers' compensation system (Roberts-Yates, 2003). In nearly all of the interviews, workers indicated that financial compensation was not entirely consistent. As reported in one interview:

> My pay was mixed up for weeks...I was very worried about how I would feed the family whilst my pay was being sorted out...I had problems with the mortgage and I began to mistrust everyone connected to my case. (p. 899)

Another interviewee stated that "I did not have income supplement for four months and had problems with my mortgage" and that there was a "lot of trouble with the insurer paying me randomly" (p. 903). With this study taking place in another country, it is difficult to assess how well the results would generalize to populations of injured workers in other countries. Nonetheless, insofar as financial strain is placed on injured workers in the U.S., it can be presumed to result in negative consequences such as those reviewed by Turner and Turner (2004).

Social and Interpersonal Effects

An acquired disability, such as those caused by a work-related injury, can result in significant social effects. Financial strain, physical impairments, and continued medical rehabilitation can create significant hardships on injured workers' relationships and families (Sachs & Ellenberg, 1994). In one study, a sample of injured workers was found

to have higher levels of stress at home and a greater risk for divorce (Morse et al., 1998). One injured worker in an interview reported that, "My injury had a big impact on my family...the relationship with my partner deteriorated and our sex life suffered" (Roberts-Yates, 2003, p. 899). As reviewed by Falvo (2005), families may experience similar feelings and reactions as the injured worker (e.g., shock, denial), and they are also faced with adjusting to the multitude of changes. Given the differences in reactions and family dynamics, the type of family environment has been shown to help or hinder an injured family member's successful rehabilitation and return to work (Dembe, 2001; Falvo, 2005).

Dembe (2001) proposed one method to categorize the complex social effects of occupational illness and injury. His schema consisted of: "*who* is affected, *how* they are affected, *where* the effect takes place, and the *type* of effect," with the factors being highly interconnected (p. 405). One example of a social impact of a work-related illness or injury using the schema is "the inability of a worker's child to engage in recreational activities at school because of diminished family income resulting from the injured worker's reduced wages" (Dembe, 2001, p. 406). The strength of Dembe's model is that it recognizes the widespread and diverse social effects resulting from work-related illness and injury.

Keogh and colleagues (2000) examined several social outcomes of work injury in a study of 537 injured workers with upper extremity cumulative trauma disorders (i.e., tendonitis of the shoulder, arm and wrist, tenosynovitis, deQuervain's syndrome, epicondylitis, ulnar nerve entrapment, and carpal tunnel syndrome). As a result of their conditions, 47.9% of the injured workers reported family problems and 10.9% reported

separation from their spouse or partner. Participants indicated that their physical symptoms significantly impaired their abilities to perform simple activities of daily living (ADLs). For instance, only 46.3% of the sample indicated "no problem" with being able to lift a child over a crib rail. Such significant impairment in ADLs was believed to account for the finding that a greater proportion of respondents endorsed significant problems with home/recreation (63.9%) than work (53.3%) as a result of their symptoms. The authors also noted that female participants endorsed greater interference with home/recreation in comparison to work than male participants endorsed.

Injured workers also experience social isolation for many reasons, with Roberts-Yates (2003) going as far to suggest that "social support is perceived by many workers to be an imaginary landscape" (p. 904). Injured workers in Roberts-Yates' study reported feeling "[like] an outcast" (p. 898), "isolated and alone" (p. 899), and "isolated and [with] no support" (p. 904). Inpatient or outpatient medical care and rehabilitation may physically isolate them from their social supports (i.e., family, friends) for an indefinite period. Absence from work, position change, or unemployment may detach them from coworkers that previously provided a social network.

Functional impairments and disability can also interfere with social communication, interaction, and recreational activities, further isolating injured workers from others. For instance, in the study by Keogh and colleagues (2000), 37.2% of the participants indicated that they could hold a phone to their ears with difficulty or that they were unable to do it by themselves. Presumably, a diminished capacity to talk with social supports on the phone would increase social isolation. A lack of accommodations (e.g., wheelchair access, transportation) may limit access to environments that were previously

used for socializing. In a qualitative study by Strunin and Boden (1997), over a third of males and 13% of females could not engage in physically demanding recreational activities such as skiing, biking, bowling, or volleyball. In addition, 28% of the participants in the study reported difficulties having sex.

A pervasive source of isolation is the cultural stigma and diminished social status experienced by injured workers. An abundance of research supports the existence of both explicit and implicit prejudice against those with disabilities (Antonak & Livneh, 2000). Many injured workers report feeling stigmatized or prejudiced against by the medical community, the workers' compensation system, the work environment, and even friends and family. All too often, injured workers with legitimate claims feel that they are stereotyped as malingerers who are out to manipulate the system (Roberts-Yates, 2003). As stated in an interview by one injured worker, "There was a definite stigma. Relationships with workmates went through the window and I didn't tell anyone I had an injury unless I had to" (Roberts-Yates, 2003, p. 899). In a survey of injured workers in Canada, 18% of one sample and 35% of a second sample agreed or strongly agreed to the statement "I was discriminated against by my employer due to my injury" (Kirsh & McKee, 2003).

Falvo (2005) describes that social devaluation may result in "changes in social relationships or interactions," and that injured workers "may have to limit the number of social activities, all of which can result in social isolation" (p. 21). Social devaluation and prejudice is believed to also result in "negative self-appraisal and a negative worker self-concept" over time (Curnow, 1989, p. 273). With such negative self-appraisal and a skeptical environment, social stigma in many cases can limit the number of vocational

options considered, hinder a successful return to work, and interfere with healthy adaptation to one's impairments.

Psychological Effects

As reviewed in the previous sections, injured workers can experience a multitude of changes and losses as a result of work injuries. The effects of the injuries can range from minor physical impairment and a quick return to work to permanent physical/functional impairment, identity reformation, financial losses, changes in social relationships and treatment by society, and changes/losses in the world of work. Such effects have been shown to take a psychological toll. In one study, an increased risk of psychological problems was found among injured workers classified as permanently disabled (Texas Workers' Compensation Research Center, 1995). The psychological consequences can range from mild symptoms of distress to the development of psychopathology. Falvo (2005) notes that "psychological factors are ever present in all aspects of chronic illness and disability and influence individuals' response to their condition; sometimes these factors are part of the symptoms of the condition" (p.20). The various psychological effects of work injury and its secondary consequences will be reviewed in this section.

Career Development Effects

Workers who experience a severe on-the-job injury face "significant disruption in their working lives and subsequent labor market experiences" (Dembe, 2001, pp. 410–411). While receiving medical care and rehabilitation, their absence from work can range from a missed day of work to a permanent departure. In general, injured workers are at an increased risk of job loss or job change, and those with longer absences from work (i.e.,

typically because of more serious injuries) are likely to have more career changes upon returning to work (Pransky et al., 2000). Among one sample of injured workers, 82.8% had returned to work within a year after the injury (Pransky et al., 2000). In another study, 38% of injured workers reported they had been laid off, fired, or quit their job since the injury (Keogh et al., 2000). One study of Canadian injured workers found that 14% of one sample and 35% of a second sample did not return to work (Kirsh & McKee, 2003). For those who did return to work, it took an average of 128 days in one sample and 400 days in a second sample between the occurrence of the injury and the return to work.

Super (1990) provides a valuable theoretical perspective regarding the vocational effects of disability. According to a principle of Super's theory, "Work satisfactions and life satisfactions depend on the extent to which the individual finds adequate outlets for abilities, needs, values, interests, personality traits, and self-concepts" (p. 208). Another relevant principle of Super's theory is that "Work and occupation provide a focus for personality organization for most men and women, although for some this focus is peripheral, incidental, or even non-existent" (p. 208). Thus, injured workers who had a central focus on work and occupation and are not currently working may no longer have adequate outlets in which to satisfy their abilities, needs, values, interests, personality traits, and self-concepts. Super also theorized that illness or injury (among other precipitants) can result in destabilization. This destabilization can result in a "minicycle," which consists of movement through stages of new growth, reexploration, and reestablishment. A minicycle can provide opportunities for injured workers to satisfy their needs and values through new means (e.g., new forms of employment, home/leisure

domains) and to change their needs and values to better fit the environment. Those who do not achieve the stage of reestablishment may sustain unmet needs and dissatisfaction.

One method to examine the impact of job loss caused by a work-related injury is by examining the meaning or importance of work in people's lives. Falvo (2005) highlights the importance of work in providing a "sense of contribution, accomplishment, and meaning to life" (p. 21). Terms such as work involvement, work salience, and work centrality address this psychological component of work (see Šverko & Vizek-Vidović, 1995, for a review). While the concepts vary in meaning, they generally identify aspects of the importance or relative importance given to work with regard to an individual's identity, self-image, or self-esteem. Some are strongly tied to work and identify work as central to their identities, whereas others perceive work as less important and consider alternate domains (e.g., leisure or family) to be more central than work.

Falvo notes that the "loss of the ability to work extends beyond financial consequences to social and psychological well-being," including the loss of "a socially valued role" (p. 21). In fact, studies of injured workers have found a correlation between negative psychological effects and a longer duration away from work (Fierro & Leal, 1988; Stice & Moore, 2005). In the context of injured workers who are away from work for a lengthy or permanent duration, those for whom work is of central psychological importance would be expected to face greater psychological losses (e.g., in self-esteem and identity). Peteet (2000) suggests that such a "loss of occupational identity can be a source of significant anxiety and depression" (p. 200).

Those who place greater psychological importance to domains other than work and can sustain activity in those domains would be believed to have fewer negative

psychological consequences. For instance, leisure activities provide opportunities to gratify needs, increase life satisfaction, and increase self-esteem, which all contribute to increased well-being (Dik & Hansen, in press). However, in many cases a work-related injury can result in a reduced ability to engage in non-work activities. For those with a primary identification other than work (e.g., leisure, home), such outcomes (e.g., not being able to hunt or fish due to work-related injury) would be expected to contribute to negative psychological outcomes (e.g., decreased life satisfaction, self-esteem, and well-being).

Šverko and Vizek-Vidović (1995) also note that those with higher occupational prestige are likely to be oriented to self-fulfillment and the satisfaction of intrinsic goals, whereas those with lower occupational prestige are more likely focused on extrinsic goals, such as economic security. Thus, injured workers from "lower" occupational levels may bode well insofar as they are receiving just and sufficient compensation. Those from "higher" occupational levels are more likely to have attributed significant self-fulfillment to their work role and may be at greater risk of facing greater psychological distress.

Many individuals experience vocational effects due to chronic medical conditions or diseases not caused by a work-related injury. Several studies have examined the meaning of work in such populations. Among cancer patients, the percentages that return to work have been reported to vary from 27% to 95%, based on the type of cancer (Peteet, 2000). Cancer patients, in a qualitative study, reported significant work-related distress (Peteet, 2000). Specifically, they noted the impact of loss/change in work-identity, reprioritization of core values, a loss of normalcy, and concerns about fairness at work. In another qualitative study, individuals living with HIV disease and AIDS

reported that work was primarily for survival purposes. However, they also noted that the benefits from work were far greater—such as means to restore hope, to contribute to society, and to provide a distraction from the disease (McReynolds, 2001). Given the importance work has been given in such studies, it can be presumed that injured workers would report similar concerns, hopes, and struggles.

In contrast to looking at the meaningfulness of work, vocational, sociological, and political theorists have described a condition in which work becomes meaningless called *work alienation.* According to Karl Marx (1844/1969), in a capitalist society workers are distanced from the production process and the objects of their labor. The result is alienation, which Marx defined as a separation of people from aspects of their "human nature" (e.g., work). The term has been operationalized more recently by Seeman (1959) as consisting of powerlessness, meaninglessness, anomie, isolation, and self-estrangement. Injured workers may experience work alienation due to difficulties in these areas, which can result in discouragement, blocked attempts to adjust to destabilization (such as in Super's minicycle), and impediments to the vocational rehabilitation process.

Stress. Many investigators have conceptualized stress as a reaction to change or demands (Holmes & Rahe, 1967; Selye, 1976), and individuals with acquired impairment or disability face changes in multiple domains, as already reviewed. Falvo (2005) described that:

> Chronic illness and disability produce significant change and consequently stress because individuals must deal with a change of customary lifestyle, loss of control, disruption of physiological processes, pain or discomfort, and potential loss of role, status, independence, and financial stability. (p. 3)

Workers with musculoskeletal injuries endorsed elevated levels of stress at home in one study (Morse et al., 1998). In another sample of injured workers, 34.7% indicated symptoms consistent with Posttraumatic Stress Disorder (PTSD) and 18.2% indicated symptoms of partial PTSD (Asmundson, Norton, Allerdings, Norton, & Larsen, 1998). In follow-up regression analyses, the symptoms were found to be connected to general negative affect.

Falvo (2005) considers stress levels to be exacerbated among those who have poor coping abilities, high perceived threat, and inadequate resources. She notes that those who have adaptive coping mechanisms and facilitative social supports are better apt to reduce their stress and facilitate growth. Among persons with disabilities, many studies have supported a relationship between "active, problem-focused, information-seeking, and social support-seeking coping strategies" to positive psychosocial outcomes, whereas "passive, emotion-focused, self-blame, avoidance-escape" strategies have been shown to contribute to negative psychosocial outcomes (Livneh & Antonak, 1997, p. 10).
Stress has been shown to contribute to the onset or exacerbation of various medical and mental illnesses (Grant, Sweetwood, Yager, & Gerst, 1978; Rahe, 1979; Rahe, Meyer, Smith, Kjaer, & Holmes, 1964; Rahe & Arthur, 1978). In a review of the relationship between stress and depression, Kessler (1997) stated that "There is a consistently documented association between exposure to stressful life events and subsequent onset of episodes of major depression" (p. 193).

According to the diathesis-stress model (Beck, 1987; Bleuler, 1963; Brown & Harris, 1978), organic and mental disorders are the result of biological predispositions (conceived broadly, to include cognitive and social predispositions) that are triggered by

environmental stressors. The stress incurred from a work-related disability may result in the development of psychopathology. According to the biochemical model (Blackburn-Munro & Blackburn-Munro, 2001; Bair, Robinson, Katon, & Kroenke, 2003), the increases in certain chemicals in the body is associated with stress as well as other conditions such as depression and pain. Additionally, the learned helplessness model (Seligman, 1991; Abramson, Seligman, & Teasdale, 1978) posits that exposure to uncontrollable and aversive circumstances can lead to cognitive distortions, apathy, submissiveness, and helplessness, which ultimately manifests as depression. Insofar as stress is seen an aversive and inescapable, stress could result in psychopathology.

Although work injury demonstrates a *prima facie* relationship to stress, there is surprisingly little empirical evidence supporting this claim. In one study that examined stress levels among injured workers, no difference was found in stress scores between 54 injured workers and a control group consisting of non-injured workers, college students, and retired persons (Brodwin, Sauer, Hallberg, & Goldfarb, 1996). In Kirsh and McKee's (2003) study, 45% of one sample and 70% of the other agreed or strongly agreed to the statement "I felt stressed out about the claims process." Clearly, there is a need for more empirical research on the levels of stress among injured workers.

Adjustment. Work injury, particularly when disabling, can demand great change and psychological adjustment. Adjusting to a disability can require identity reconstruction and acceptance of present and future losses. Falvo (2005) considers the "ultimate goal of adjustment" to be "acceptance of the condition and its associated limitations, along with a realistic appraisal and implementation of strengths" (p. 19).

One review of stage models of adjustment/adaptation to disability identified five broad stages: initial impact, defense mobilization, initial realization or recognition, retaliation or rebellion, and reintegration or reorganization (Livneh, 1986). While the progression towards adjustment or adaptation is considered to be internally triggered, external interventions (i.e., psychosocial, behavioral, or environmental) are believed to positively affect this progression (Livneh, 1986). In many cases, internal or external resources are insufficient or harmful (such as when coping methods are maladaptive or the social context is negative), and the final stage of adjustment is never reached. In these cases, maladjustment is characterized by "immobility, marked dependency, continued anger and hostility, prolonged mourning, or participation in detrimental or self-destructive activities" (Falvo, 2005).

As purported by the diathesis-stress model described previously, psychopathology is the result of a biological predisposition which is triggered by a significant degree of stress. The stress and challenges to adjustment imposed by the work injury and its secondary consequences can result in psychological symptomatology, especially for those who are already predisposed. Those who are maladjusted and experiencing significant psychological symptomatology may develop an Adjustment Disorder.

According to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (*DSM-IV-TR*; American Psychiatric Association, 2000) an Adjustment Disorder is a "psychological response to an identifiable stressor or stressors that results in the development of clinically significant emotional or behavioral symptoms" (p. 679). With an Adjustment Disorder, the reaction to the stressor(s) is excessive distress or significant impairment in social, occupational, or academic

functioning. According to *DSM-IV-TR* guidelines, Adjustment Disorders are classified as occurring with depressed mood, with anxiety, with mixed anxiety and depressed mood, with disturbance of conduct, with mixed disturbance of emotions and conduct, or unspecified.

Although the base rate of Adjustment Disorders among injured workers is currently unknown, Adjustment Disorders have been found to be relatively common among general medical and surgical patients. In one such study of 725 adult general hospital patients, 18.5% of the sample met criteria for Adjustment Disorder, with the "depressed mood" type being most common (52% of Adjustment Disorder diagnoses) and the "mixed emotional features" type being the second-most common (Foster & Oxman, 1994). The significant number of stressors in addition to medical problems that are experienced by injured workers suggests that they may be at higher risk for the development of an Adjustment Disorder in comparison to general hospital patients.

Depression. According to Seff, Gecas, and Ray (1992), "a job-related injury is usually depressing, especially if it is serious, painful, and disrupts work and other activities" (p. 573). For those who are predisposed to experiencing depression, a work-injury or disability and its secondary consequences may result in a depressive disorder. In some cases, individuals may develop a Major Depressive Episode (MDE). An MDE consists of a period of at least two weeks with depressed mood or anhedonia along with at least four additional symptoms of depression (i.e., weight loss/gain, insomnia/hypersomnia, psychomotor agitation/retardation, fatigue, feelings of worthlessness/guilt, difficulty concentrating, and suicidal ideation/plan/attempt). A Major Depressive Disorder (MDD) consists of one or more MDEs.

The learned helplessness model (Seligman, 1991; Abramson et al., 1978) provides an explanation as to why injured workers would be at risk for the development of depression. This model posits that exposure to uncontrollable and aversive circumstances can lead to cognitive distortions, apathy, submissiveness, and helplessness, which ultimately manifests as depression. Learned helplessness is theorized as likely to occur in injured workers since they may have limited control over their recovery, pain, and functional impairments. In addition, they are "beset by a complex system of medical, legal, financial, and work dynamics that also frequently create a sense of uncontrollability" (Walker, 1992, p. 203). Furthermore, the injured worker may feel powerless and dependent in the relationships needed for improvement (e.g., employer, physician, insurance carrier, attorney). When injured workers feel that the parties that they rely upon are not best serving their interests and there is little recourse, discouragement, learned helplessness, and depression may result.

The diathesis-stress model provides another explanation of the development of depression among injured workers (Beck, 1987; Bleuler, 1963; Brown & Harris, 1978). Specifically, this model posits that organic and mental disorders are the result of biological predispositions (conceived broadly, to include cognitive and social predispositions) that are triggered by environmental stressors. Thus, those injured workers who are predisposed to become depressed and are sufficiently stressed would be at higher risk for the development of depression. Given the number of stressors that they face, serious work-related injuries may produce considerable risk for the development of depression.

A third model of depression among injured workers is the biochemical model. The monoamine neurotransmitters (serotonin, norepinephrine, and dopamine) have been implicated in depression and other conditions that injured workers experience, such as pain (Bair et al., 2003; Fishbain, Rosomoff, & Rosomoff, 1997). While the relationships between pain and depression are complex, the depletion of such neurotransmitters contributes to increases in depression, as well as somatic symptoms such as pain, changes in appetite, attention/concentration, length of sleep, energy level, and sexual behavior. Adequate levels of such neurotransmitters are believed to protect against such symptoms. As reviewed by Blackburn-Munro and Blackburn-Munro (2001), activation of the hypothalamo-pituitary-adrenal (HPA) axis results in the release of hormones that are associated with symptoms of chronic pain, stress, and depression.

A fourth model, the developmental model, conceptualizes depression not only as a negative consequence of disability but also as a necessary developmental stage. According to Livneh and Antonak (1997), depression is considered to be "the typical reaction upon initial realization of disease symptomatology or the...realization of ensuing physical, social, and behavioral limitations" (p. 21). Furthermore, grief and depression have been described as "necessary prerequisites to future acceptance of loss and readaptation" (Livneh, 1986). In a review of 12 stage models of adjustment to disability, Livneh (1980) reported that depression was identified as a developmental stage (on average, about halfway to the final stage of adjustment) in all 12 models. In the developmental models, depression would be seen as "normal," in contrast to approaches that would identify such symptoms as pathological if it results in significant distress or impairment. Livneh further noted the importance of mental health providers ensuring that

individuals do not "get stuck" in this stage and instead facilitate progress toward the later developmental stages through internal and external interventions.

Empirical studies have documented relationships between depression and conditions that injured workers experience, such as pain, disability, and physical injury. In a review of the relationship between pain and depression, Fishbain and colleagues (1997) documented that individuals with chronic pain have higher rates of depression than the general population. Unfortunately, researchers have not conclusively identified the causal relationships between chronic pain and psychopathology such as depression, with studies supporting pain as both an antecedent and a consequent to psychopathology (Dersh, Polatin, & Gatchel, 2002; Fishbain et al., 1997).

One large-scale epidemiological survey by Turner, Lloyd, and Taylor (2006) reported the lifetime rates of having a psychiatric or substance disorder to be much higher among individuals with a disability in comparison to a nondisabled comparison group (37% and 22.3%, respectively). Major Depressive Disorder and Posttraumatic Stress Disorder were the only specific disorders that had significantly higher lifetime rates for both men and women with disabilities, in comparison to their nondisabled counterparts.

Physical injury has also been associated with depression. Usually, depressive symptoms manifest soon after the injury and then gradually decrease throughout the following months (see O'Donnell, Creamer, Bryant, Schnyder, & Shalev, 2003, for a review). One study documented depression rates of 60% at discharge from the hospital, which reduced to 31% at 6 months post-injury (Holbrook, Anderson, Sieber, Browner, & Hoyt, 1998).

In similar populations, depression has also been associated with other conditions that injured workers face, such as those with health problems (Evans et al., 2005; Gilmer et al., 2005; Rodin, Craven, & Littlefield, 1991), severe injuries (Piccinelli, Patterson, Braithwaite, Boot, & Wilkinson, 1999), physical disabilities (Turner & Turner, 2004; Turner et al., 2006), pain (Cairns, Adkins, Scott, 1996; Dersh et al., 2002; Fishbain et al., 1997; Hitchcock, Ferrell, & McCaffery, 1994; Verma & Gallagher, 2000), unemployment or low income (Dooley, Catalano, & Wilson, 1994; Gilmer et al., 2005), and stressful life events (Rahe, 1979; Zimmerman, O'Hara, & Corenthal, 1984).

Several studies have directly examined characteristics related to depression among injured workers. In a study in California with injured workers of Mexican origin, depression scores were elevated among those referred late to vocational rehabilitation (Fierro & Leal, 1988). Another study with a sample of 2,700 workers with job-related injuries found depression scores to be positively related to pain and work limitation, and negatively related to self-efficacy and self-esteem (Seff et al., 1992). In a more recent study, Stice and Moore (2005) examined depression levels among injured workers receiving vocational rehabilitation. They concluded that depression was significantly related to pre-injury psychological treatment, length of time away from work, and age. Depression was unrelated to gender, severity of injury, income, level of education, ethnicity, or job skill level.

Keogh and colleagues (2000) conducted a study of injured workers with upper extremity cumulative trauma disorders (UECTDs) in Maryland. Their study found no relationship between depression and carpal tunnel syndrome diagnosis, age, ethnicity, or gender. However, depression was inversely related to education, normal activities of

daily living, and being employed. The percentage of individuals classified with a high likelihood of having clinical depression was found to be higher in their sample (31%) than the percentage found in the general population (20%).

Dersh and colleagues (2002) examined the prevalence of psychiatric disorders in a sample of medical rehabilitation patients with work-related chronic musculoskeletal pain disability. Greater than 99% of their sample met criteria for an Axis I Mental Disorder post-injury, compared to 38% pre-injury. For Axis I disorders post-injury, Pain Disorders were the most common (0.4% pre-injury, 96% post-injury), followed by Major Depression (10.2% pre-injury, 49% post-injury). Excluding Pain Disorder, 56% of the sample met criteria for other Axis I disorders post-injury, with 38% meeting criteria pre-injury. Any anxiety disorder only captured 3.6% of the sample post-injury, which was actually a reduction from 9.2% pre-injury. Thus, depression appeared to be a more common psychological response to work injury than anxiety.

Depression also has been examined as a predictor for return to work outcomes. In one study, Ash and Goldstein (1995) concluded that depression scores were "the best single predictor of returning to work" (p. 207). Furthermore, other presumably "major" factors, such as financial incentives/disincentives to work, length of time away from work, cognitive abilities, and demographic variables were surprisingly minimally or not predictive of return to work after depression was statistically controlled for. In their sample, 63% of those with back-injury endorsed moderate to severe levels of depression, demonstrating the high risk of these workers of not returning to work. Among a population of individuals with chronic pain, depression and age were the best predictors of return to work outcomes (Vowles, Gross, & Sorrell, 2004). After receiving treatment

for their chronic pain, depression was measured and later found to account for 28% of the variance in return to work outcomes. Another study of individuals with disabling musculoskeletal pain found that individuals with moderate to severe depression had the least probability of returning to work, followed by those with mild depression and no depression (Sullivan, Adams, Thibault, Corbière, & Stanish, 2006).

The accuracy of the measurement of depression with medically or physically ill populations has been of concern. Depressive disorders encompass somatic, affective, and cognitive symptoms. Among the physically ill, somatic items that are unrelated to depression (i.e., somatic aspects of the illness or side-effects of medication) may be endorsed, falsely elevating their depression scores (Ammon Cavanaugh, 1995; Cavanaugh, Clark, & Gibbons, 1983; Coulehan, Schulberg, Block, & Zettler-Segal, 1988; Fishbain et al., 1997; Plumb & Holland, 1977). As reported by Fishbain and colleagues (1997), "between 50% and 80% of medical inpatients report psychomotor retardation, weight loss, sleep difficulties, decreased appetite, [and] fatigue" (p. 132)—all symptoms of depresion. Some authors have proposed higher cutoff scores (Rodin et al., 1991; Turk & Okifuji, 1994) to account for this problem. Others have proposed dividing depression instruments into various scales (Clark & Steer, 1994; Steer, Ball, Ranieri, & Beck, 1999) or deleting somatic items (Taylor, Lovibond, Nicholas, Cayley, & Wilson, 2005; Plumb & Holland, 1977). However, in studies with chronic pain patients (Geisser, Roth, & Robinson, 1997) and individuals with multiple sclerosis (Aikens et al., 1999) no advantage was found in deleting somatic items. In support of this premise and factorial evidence for such a model (see Beck, Steer, and Garbin, 1988, for a review), Beck and Steer (1993) approved the calculation of two subscales (Cognitive and Somatic-

Affective) with the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961).

With the release of the Beck Depression Inventory—Second Edition (BDI-II; Beck, Steer, & Brown, 1996), several studies have examined its factor structure. Identifying the factor structure of the BDI-II is important because it provides an assessment of the internal and external validity of its scores. Furthermore, it exposes differences in the structure and expression of depression among different populations. Factor analyses of the BDI-II have generally identified cognitive, somatic, and affective symptoms. Generally, two-factor solutions are reported, although a few studies have reported three-factor solutions (see Johnson, Neal, Brems, & Fisher, 2006, for a review). Whether a two-factor or three-factor solution is reported is typically a function of the parameters chosen in the factor analysis.

In two-factor solutions, either a cognitive and somatic-affective structure or a somatic and cognitive-affective structure is typically reported. According to Beck and colleagues (1996), affective items from the BDI-II may "apparently shift from loading on one dimension to another according to the type of sample being studied" (p. 34). Other factor analytic studies have also supported this claim (Kojima et al., 2002; Steer et al., 1999; Steer, Rissmiller, & Beck, 2000). In two-factor solutions with samples of mentally unhealthy individuals (e.g., psychiatric outpatients or inpatients), the affective items have typically factored with the somatic items (Beck et al., 1996; Steer et al., 1999; Steer et al., 2000; Steer, Kumar, Ranieri, & Beck, 1998). In two-factor solutions with samples of medically/physically ill individuals, the affective items have also typically factored with the somatic items (Arnau, Meagher, Norris, & Bramson, 2001; Penley, Wiebe, & Nwosu,

2003; Viljoen, Iverson, Griffiths, & Woodward, 2003). However, in two-factor solutions with "healthier" or "normal" populations (e.g., college students), the affective items have typically factored with the cognitive items (Al-Musawi, 2001; Beck et al., 1996; Dozois, Dobson, & Ahnberg, 1998; Osman, Downs, Barrios, Francisco, & Kopper, 1997; Steer & Clark, 1997; Storch, Roberti, & Roth, 2004; Whisman, Perez, & Ramel, 2000). Explanations have not been given as to why the affective items shift based on sample characteristics.

Purpose of the Study

As reviewed in this chapter, work-related injuries or disabilities can result in negative consequences to physical, economic, social, and psychological well-being. Unfortunately, the psychological ramifications are inadequately understood and under-researched, despite documented increases in MDD post-injury (Dersh et al., 2002) and a reduced likelihood of returning to work among those who experience depression (Ash & Goldstein, 1995; Sullivan et al., 2006; Vowles et al., 2004). Despite concerns about the measurement of depression in the medically ill (Ammon Cavanaugh, 1995; Cavanaugh et al., 1983; Coulehan et al., 1988; Fishbain et al., 1997; Plumb & Holland, 1977), prior research has not evaluated the measurement of depression among injured workers. Furthermore, there is also a paucity of research identifying predictors of depression among injured workers. Freedman and Fesko (1996) called for an increase in research on people with disabilities in the area of vocational rehabilitation; describing injured workers' self-reported work values should contribute to this goal.

In addition to the personal costs of the onset of depression among injured workers, one study predicts substantial economic benefits in the successful treatment of

depression among disability claimants (Leon, Walkup, & Portera, 2002). Furthermore, the presence of a depressive disorder increases the risk of suicide (Angst, Angst, & Stassen, 1999), and many courts of law have held employers/insurance carriers financially liable for the suicides of injured workers (see Drukteinis, 1985, for a review).

The primary goals of the present study are: (1) to evaluate the psychometric properties of the BDI-II with a sample of injured workers, and (2) to identify consequences of work-related injury (i.e., pain, physical illness, adjustment-related stress, vocational losses) that may predict depression among injured workers. In sum, it is believed that achieving these goals will benefit future researchers and clinicians, and consequently, injured workers themselves.

Research Questions

As discussed by several researchers (Ammon Cavanaugh, 1995; Cavanaugh et al., 1983; Coulehan et al., 1988; Fishbain et al., 1997; Plumb & Holland, 1977), the measurement of depression among medical patients has been of concern, given the potential confounding between somatic aspects of depression and medical illness or effects of medical treatment. Although previous authors (i.e., Taylor et al., 2005; Plumb & Holland, 1977) have recommended removing the somatic items to account for this concern, no research to date has examined whether this would be appropriate with a population of injured workers. Since injured workers experience medical problems and are usually receiving medical treatment, it is feasible that the somatic items on the BDI-II may be confounded by their medical problems and treatment. However, there are meaningful differences that exist between injured workers and the general medical populations studied (i.e., injured workers experience an injury rather than an acquired

disease or other chronic illness). Thus, the studies that have supported the confounding argument may not generalize to injured workers. Nonetheless, given the importance of being able to accurately measure depression among injured workers and sufficient concern expressed by other researchers, there is enough justification to explore the possibility of confounding with a population of injured workers.

To the extent that the somatic items are confounded in a population of injured workers, they would introduce measurement error and reduce the reliability (coefficient alpha) and construct validity of the instrument. Thus, it is believed that the removal of such items would reduce measurement error and significantly improve the reliability and construct validity of the instrument. Furthermore, insofar as the somatic items do not represent depression per se, they would have poor correlations with the total. Formally stated, the first research question is as follows:

> *Research Question 1: In an injured worker population, how reliable are the somatic items of the BDI-II? Are item-scale correlations sufficiently low and is there such a gain in alpha to warrant their removal?*

Since the release of the BDI-II a decade ago, a few studies have examined the instrument's factor structure with medical patients (i.e., Arnau et al., 2001; Grothe et al., 2005; Penley et al., 2003; Rowland, Lam, & Leahy, 2005; Viljoen et al., 2003). Unfortunately, none has examined its structure specifically among those with work-related injury or disability. As previously mentioned, injured workers share both similarities and differences with general medical patients. Since it is currently unknown whether the factor analyses of general medical patients can be generalized to injured workers, this needs to be evaluated with injured workers. An additional interest in the

present study is whether the affective items factor with the somatic items as in "unhealthy" populations (i.e., mentally or medically ill) or with the cognitive items as in "healthy" populations (e.g., college students). Formally stated, the second research question is as follows:

> *Research Question 2: In an injured worker population, what is the factor structure of the BDI-II? Do the affective items factor with the somatic items as in clinical/medical populations or with the cognitive items as in "healthier" populations?*

One large-scale longitudinal community study found that individuals who were unemployed had twice the risk of developing subsequent depression in comparison to those who continued working (Dooley et al., 1994), and another study found higher rates of depression among injured workers who were unemployed in comparison to those who were employed (Keogh et al., 2000). Given that injured workers are typically unemployed, there is sufficient reason to identify whether work-related variables are related to depressive symptoms. One possible connection between unemployment and depression is work values. As previously reviewed, lack of employment is likely to preclude or reduce one's ability to satisfy salient work values (i.e., Falvo, 2005; Super, 1990). Furthermore, as noted by Peteet (2000), a loss of occupational identity is believed to contribute to depression and other psychological problems. Thus, it is possible that those who identify with work values that are less attainable outside of the workplace may experience higher levels of depression. In addition, work values have been identified as personality traits (Knapp & Knapp-Lee, 1996), and personality traits (e.g., neuroticism, openness, and introversion) have been connected to depression (Barnett & Gotlib, 1988;

Chioqueta & Stiles, 2005). Research Question 3a is exploratory, with the interest of identifying any work values that may be related to depression. Formally stated, Research Question 3a is as follows:

Research Question 3a: Are work values related to depression?

Theory has also suggested that an inability to satisfy certain work values may be related to identity and adjustment (i.e., Falvo, 2005; Super, 1990), and adjustment problems have been shown to be related to depression (Grant et al., 1978; Kessler, 1997; Rahe, 1979). Thus, it may be that the relationship between work values and depression is stronger among those who are sufficiently stressed. Given this possibility, the following moderation hypothesis is also offered:

Research Question 3b: Are relationships between work values and depression moderated by adjustment-related stress?

Hypotheses

Previous research has documented the relationship between stress and depression (e.g., Kessler, 1997; see also Grant et al., 1978; Rahe, 1979; Zimmerman et al., 1984). As previously discussed, there is very little research on the relationship between stress and depression among injured workers. Given the strong relationship already documented between stress and depression in other populations, it is believed that stress and depression will be related in the population of injured workers. The first hypothesis is as follows:

Hypothesis 1: Injured workers' depression scores are hypothesized to be significantly and positively related to adjustment-related psychosocial stress.

Previous research has documented the relationship between pain and depression in populations other than injured workers (e.g., Cairns et al., 1996; Dersh et al., 2002; Fishbain et al., 1997; Hitchcock et al., 1994; Verma & Gallagher, 2000). Given the strong relationship already documented between pain and depression in other populations, it is believed that pain and depression will be related in this study of injured workers. Furthermore, based on the biochemical model, it is believed that pain will have a stronger relationship with the factor including the affective symptoms of depression than to the other factor(s).

Theory and research have also supported that physical pain contributes to problems with adjustment and stress (Falvo, 2005; Morse et al., 1998). Furthermore, problems with adjustment and stress have been shown to contribute to depression (Grant et al., 1978; Kessler, 1997; Rahe, 1979). Thus, it may be that the relationship between pain and depression is stronger among those who are sufficiently stressed. Given this possibility, a moderation hypothesis is also offered. The second hypothesis is as follows:

Hypothesis 2a: Injured workers' depression scores are hypothesized to be significantly and positively related to physical pain.

Hypothesis 2b: Physical pain will have a stronger relationship with the factor including the somatic items.

Hypothesis 2c: The relationship between physical pain and depression will be moderated by adjustment-related psychosocial stress.

Previous research has documented the relationship between physical injury/disability and depression (O'Donnell et al., 2003; see also Holbrook et al., 1998; Turner et al., 2006). Given the strong relationship already documented between physical

injury and depression in other populations, it is believed that the severity of physical injury and depression will be related in this study of injured workers. Furthermore, based on the biochemical model, it is believed that the severity of the injury will have a stronger relationship with the factor including the affective symptoms of depression than to the other factor(s).

Theory and research have also supported that physical injury contributes to problems with adjustment and stress (Falvo, 2005; Morse et al., 1998). Furthermore, problems with adjustment and stress have been shown to contribute to depression (Grant et al., 1978; Kessler, 1997; Rahe, 1979). Thus, it may be that the relationship between the severity of the injury and depression is stronger among those who are sufficiently stressed. Given this possibility, a moderation hypothesis is also offered. The third hypothesis is as follows:

Hypothesis 3a: Injured workers' depression scores are hypothesized to be significantly and positively related to severity of work injury.

Hypothesis 3b: Severity of work injury will have a stronger relationship with the factor including the somatic items.

Hypothesis 3c: The relationship between severity of work injury and depression will be moderated by adjustment-related psychosocial stress.

Chapter II: Method

Participants

Data available for the present study were drawn from an archived sample. Participants for the sample include 253 unemployed injured workers who were referred to a private practice vocational rehabilitation company by the Oklahoma Workers' Compensation Court, an attorney, a self-insured employer, or an insurance carrier. The workers were at the onset of the vocational rehabilitation evaluation, for the purpose of evaluating employment and retraining options. The age of the participants ranged from 21 to 73 years, with a mean age of 44.6 years and a standard deviation of 9.6. Of the sample, 55.3% (n = 140) were males and 44.7% (n = 113) were females. Respondents primarily identified their ethnic background as White/European American (79.8%, n = 202), followed by Native American (11.1%, n = 28), Black/African American (5.1%, n = 13), Latino/Hispanic American (3.6%, n = 9), and Asian American (0.4%, n = 1). With regard to education, 70.4% (n = 178) of the participants had a high school diploma or greater and 29.6% (n = 75) of the participants had less than a high school education. The annual income at the time of the injury was less than $30,000 for 65.2 % ($n$ = 165) of the participants and $30,000 and above for 34.8% (n = 88) of the participants. With regard to history of psychological or psychiatric treatment prior to the injury, 74.3% (n = 188) of participants denied receiving previous treatment and 25.7% (n = 65) reported a history of past treatment. With regard to length of time away from work, 31.6% (n = 80) had been

off of work less than a year, 31.6% (n = 80) had been off of work from one to two years, and 36.8% (n = 93) had been off of work for two or more years.

All of the workers were considered disabled on the basis of their work injury, with 73.1% (n = 185) of the injuries being severe enough to require surgery and 26.9% (n = 68) not severe enough to require surgery. Attempts were made to locate the percent of disability ratings to provide a more sensitive measurement of the severity of their injuries. Unfortunately, the ratings were not in the vocational rehabilitation reports since the vocational evaluation preceded the final determination of disability and often factors into the final rating. Furthermore, the court documentation was not considered public record due to anti-discrimination and ADA regulations, and was thus inaccessible to the general public. Also, while the *Guides to the Evaluation of Permanent Impairment, Fifth Edition* (Andersson & Cocchiarella, 2000) provides guidelines to evaluate the percent of impairment, a physician would be needed to physically assess the patient.

The *Dictionary of Occupational Titles* (*DOT*; U.S. Department of Labor, Employment and Training Administration, 1991) was used to classify workers' occupations at the time the injury occurred. In the *DOT*, all occupations are categorized into one of nine occupational categories: professional, technical, and managerial occupations; clerical and sales occupations; service occupations; agricultural, fishery, forestry, and related occupations; processing occupations; machine trades occupations; benchwork occupations; structural work occupations; and miscellaneous occupations. The miscellaneous category consists of occupations that cannot be categorized elsewhere. Divisions of the miscellaneous occupational category include: motor freight occupations; transportation occupations, not elsewhere classified; packaging and materials handling

occupations; extraction of minerals; production and distribution of utilities; amusement, recreation, motion picture, radio, and television; and graphic art work. Based on the occupational categories of the *DOT*, the highest percentage of participants worked in "miscellaneous" occupational category (22.9%, $n = 58$), followed by structural work (19%, $n = 48$), service (17.4%, $n = 44$), clerical and sales (12.6%, $n = 32$), professional, technical, and managerial (10.3%, $n = 26$), machine trades (9.5%, $n = 24$), benchwork (3.2%, $n = 8$), processing (2.8%, $n = 7$), and agricultural, fishery, forestry, and related occupations (2.4%, $n = 6$).

The *DOT* (1991) taxonomy was also used to assess participants' Specific Vocational Preparation (SVP), which represents the amount of lapsed time needed to train a worker to achieve an average level of job performance. As specified by the *DOT*, the SVP categories include: short demonstration only (i.e., receiving brief training consisting of watching a skilled worker perform and explain the duties); anything beyond short demonstration up to and including 30 days; over 30 days up to and including 3 months; over 3 months up to and including 6 months; over 6 months up to and including 1 year; over 1 year up to and including 2 years; over 2 years up to and including 4 years; over 4 years up to and including 10 years; and over 10 years. The highest percentage of participants had an SVP of over 3 months up to and including 6 months (26.9%, $n = 68$), followed by anything beyond short demonstration up to and including 30 days (20.6%, $n = 52$), over 30 days up to and including 3 months (17.8%, $n = 45$), two to four years (15.4%, $n = 39$), over 6 months up to and including 1 year (7.9%, $n = 20$), over 1 year up to and including 2 years (7.5%, $n = 19$), and over 4 years up to and including 10 years

(4.0%, n = 10). None of the participants' occupations were at the lowest or highest SVP levels (short demonstration only and over 10 years, respectively).

Measures

Beck Depression Inventory-II (BDI-II)

The BDI-II (Beck et al., 1996) is a self-administered questionnaire that measures the severity of depressive symptoms during the past two weeks, and can be used with individuals aged 13 years and older. The items of the BDI-II were revised over the previous version to correspond with criteria for depressive disorders as specified in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*; American Psychiatric Association, 1994). The BDI-II measures such depressive symptoms as sadness, loss of energy, and changes in sleeping pattern. As noted by Beck and colleagues, the BDI-II can be used to detect depression in both clinical and non-clinical populations. The scale contains 21 self-report items that are rated on a scale of increasing severity from zero to three points. The item values are summed to return a total score that ranges from zero to 63 points.

To establish criterion-related validity, Beck and colleagues administered the BDI-II to individuals who were categorized using *DSM-IV* criteria as being nondepressed, mildly depressed, moderately depressed, or severely depressed. The following means and standard deviations were obtained in their development sample: nondepressed, M = 7.65, SD = 5.9; mildly depressed, M = 19.14, SD = 5.7; moderately depressed, M = 27.44, SD = 10.0; and severely depressed, M = 32.96, SD = 12.0. Based on these findings, the BDI-II offers total score ranges to classify individuals as having minimal (0–13), mild (14–19), moderate (20–28), or severe (29–63) levels of depression.

The BDI-II has well-supported psychometric characteristics. Internal reliability of the BDI-II scores, measured by Cronbach's alphas, was found to be .92 for a sample of psychiatric outpatients (Beck et al., 1996) and ranged from .91 to .93 among samples of college students (Beck et al., 1996; Dozois et al., 1998). With a subset of the psychiatric outpatients, the test-retest correlation was found to be .93 after a one-week interval. However, test-retest examinations over longer intervals are not ideal for gauging reliability given that depression is not conceptualized as a stable trait. The construct validity has been supported in correlations of the BDI-II with other measures that support both convergence (i.e., with other measures of depression) and discrimination (i.e., with measures of anxiety) (Beck et al., 1996). The scale has been found to successfully identify individuals with mood disorders, as opposed to those with anxiety, adjustment, or other disorders (Beck et al., 1996). Furthermore, those with more serious depressive disorders received higher scores on the BDI-II. Another study was able to classify individuals according to their diagnostic label with 81% sensitivity, 92% specificity, and a kappa coefficient of .70 (Dozois et al., 1998).

Social Readjustment Rating Scale (SRRS)

The SRRS, developed by Holmes and Rahe (1967), is the most widely cited stress measurement instrument to date (Scully, Tosi, & Banning, 2000). The scale consists of 43 life events (e.g., death of spouse, divorce) that require some degree of personal adjustment. The list contains events judged as negative (e.g., jail term) as well as positive (e.g., vacation, outstanding personal achievement), yet all are considered stressful in the sense that they require some degree of adjustment. Each event has a numeric value which represents the level of adjustment required. The numeric values were obtained from an

average of values assigned by 394 participants to the 43 life events. The participants assigned the values with regard to "the intensity and length of time necessary to accommodate to a life event, regardless of the desirability of [the] event" (p. 213) in comparison to marriage, which was given an arbitrary value of 500. In clinical/research use, respondents indicate the events that they have experienced in a given time period, and total the point values. This total is labeled the Life Change Unit (LCU), which reflects the total level of readjustment needed and the total severity of social stressors in one's life. The LCU has a minimum score of zero and a maximum score of 1466. In a study by Dekker and Webb (1974), a control group of 40 community-recruited participants had a mean of 142.67 and a standard deviation of 104.04 on the SRRS.

The SRRS has a long history of psychometric support. With a population of substance abuse clients, the SRRS approximated a normal curve, with .44 skewness and -.12 kurtosis (Lei & Skinner, 1980). The study also reported a mean LCU of 280.2 and a standard deviation of 158.3. The test-retest correlations of LCU scores using a two-week interval with undergraduate samples were .78 in one study (Thurlow, 1971) and .82 in another (Bieliauskas & Strugar, 1976). A study by Costantini, Braun, Davis, and Iervolino (1974) with two undergraduate samples and a one-week test-retest interval found correlations for LCU scores to be .68 and .88. Using a longer three to six month test-retest interval with a non-clinical population (male employees at the San Diego V.A. hospital and the University of California), a .83 correlation was found (Gerst, Grant, Yager, & Sweetwood, 1978).

Both retrospective studies (i.e., measuring the influence of a predictor variable after a condition has already manifested) and prospective studies (i.e., measuring the

influence of a predictor variable before a condition manifests) have demonstrated the criterion-related validity of the SRRS in measuring the risk of onset for stress-related psychiatric and medical conditions, such as acute schizophrenia, myocardial infarction, and tuberculosis (Aponte & Miller, 1972; Grant et al., 1978; Rahe & Arthur, 1978; Theorell, 1974).

Short Form McGill Pain Questionnaire (SF-MPQ)

The short form of the McGill Pain Questionnaire (SF-MPQ), developed by Melzack (1987), is a measurement of pain that provides information on sensory, affective, and evaluative dimensions. In comparison to the longer, standard McGill Pain Questionnaire (MPQ; Melzack, 1975), the short form has five fewer items and can be administered in approximately two to five minutes (compared to five to ten minutes for the full-length MPQ). The SF-MPQ contains 15 pain descriptors, with 11 addressing the sensory component of pain and four addressing the affective component. Each descriptor is rated on its intensity from zero ("none") to three ("severe"), and three Pain Rating Indexes (PRIs; Sensory, Affective, and Total) are computed by summing the ratings on the respective items. The Sensory PRI ranges from zero to 33 points, Affective from zero to 12 points, and Total from zero to 45 points. Each respondent indicates his or her present overall level of pain by selecting a descriptive word corresponding from zero to five points (i.e., no pain = 0, mild = 1, discomforting = 2, distressing = 3, horrible = 4, or excruciating = 5), which is identified as the Present Pain Intensity (PPI). Respondents also complete the Visual Analogue Scale (VAS) by marking where they lie on a horizontal line (usually 10 centimeters in length) anchored with "no pain" on one end and "worst possible pain" on the other.

The PRIs of the SF-MPQ are very highly correlated with the full-length MPQ, with correlation coefficients ranging from .62 to .97 (Dudgeon, Raubertas, & Rosenthal, 1993; Melzack, 1987). Construct validity has been further supported through moderate correlations with other measures of pain, such as the Brief Pain Inventory-Short Form, a visual analogue for pain while resting, and a visual analogue scale for pain upon movement (Zalon, 1999). The criterion-related validity of the SF-MPQ has been supported in multiple clinical studies in which medical treatments resulted in decreased PRI scores (Melzack & Katz, 1999). Grafton, Foster, and Wright (2005) evaluated the test-retest reliability of the SF-MPQ using a five-day interval with osteoarthritis patients. The intraclass correlations found were $r = .96$ for the Total PRI, $r = .95$ for the Sensory PRI, and $r = .88$ for the Affective PRI. Zalon (1999) examined the internal consistency of the PRIs when administered for present pain and for pain during the past 24 hours with a sample of postoperative patients. Cronbach's alphas on the PRIs for present pain ranged from .41 to .72, with estimates for pain during the past 24 hours ranging from .63 to .85. Both the MPQ and the SF-MPQ have demonstrated their external validity with various populations experiencing acute or chronic pain, such as those with arthritis, fibromyalgia, acute headaches, and chronic cancer pain (Melzack & Katz, 1999).

Career Orientation Placement and Evaluation Survey (COPES)

The COPES (1995 Edition; Knapp & Knapp-Lee, 1996) is a self-administered measure of work values for adolescents and adults. Along with two other vocational instruments, the COPES comprises a comprehensive vocational assessment battery called the COPSystem. The COPES can be interpreted independently or in combination with the other instruments in the COPSystem. The COPES contains 128 items in which

respondents indicate their responses to the statement "I value activities or jobs in which (I)...." With 16 items per scale, the COPES contains eight scales, representing bipolar work value dimensions. The eight scales, as defined by Knapp and Knapp-Lee (1996, p. 1), are as follows: Investigative (seek new solutions to complex problems) vs. Accepting (use existing solutions), Practical ("prefer to work in a hands-on situation") vs. Carefree (take an imaginative approach to new ideas), Independence (work without direction) vs. Conformity (work under careful supervision), Leadership ("the one who is in charge") vs. Supportive ("a good follower"), Orderliness (adhere to a strict plan) vs. Flexibility ("less rigid adherence to a strict plan"), Recognition (want to be admired and well known) vs. Privacy ("prefer to be unnoticed"), Aesthetic ("appreciate beauty and artistic skill in the workplace") vs. Realistic ("do not rely on their artistic senses or intuition in the workplace"), and Social (prefer to work with others) vs. Reserved (prefer to work alone).

The eight COPES scales were developed based on previous taxonomies and factor analyses of work-related values (e.g., Guilford, Christensen, Bond, & Sutton, 1954; O'Connor & Kinnane, 1961). One of the authors of the COPES considered the work values to represent "such general personality or motivational terms as 'work values,' 'work needs,' or 'work satisfactions' and all fall within the noncognitive, personality domain" (Knapp & Knapp-Lee, 1996, p. 1).

The COPES demonstrates adequate psychometric properties. The reliability of the 1995 Edition of the COPES was determined by computing the alpha coefficients of the eight scales, using two separate samples. The alpha coefficients of the scales ranged from .73 to .89, with a median value of .87 (Knapp-Lee, 1996). As reported by Knapp and Knapp-Lee (1996), the construct validity of the COPES has been supported by significant

correlations in expected directions with scale scores provided by the Myers Briggs Type Indicator (MBTI; Briggs-Myers & Briggs, 1962), the Study Attitudes and Methods Survey (SAMS; Michael, Michael, & Zimmerman, 1986), and other similar values scales (e.g., Allport & Vernon, 1970; Guilford, Christensen, & Bond, 1956). Support for the criterion-related validity of the COPES scores has been demonstrated by significant correlations between scale scores and achievement in academic subjects (Knapp & Michael, 1980), and between scale scores and occupational choice (Knapp & Knapp-Lee, 1996). Furthermore, predictive validity has been supported by evidence of correspondence between COPES results one to four years earlier and current job or course of study (Knapp & Knapp-Lee, 1996).

Procedure

Data useful for the present study were identified in an archived sample of participants who were receiving a vocational rehabilitation evaluation. During the evaluation, participants receiving services between March 2002 and February 2004 were given the opportunity to voluntarily participate in a research study (Stice & Moore, 2005). Those who voluntarily consented completed the BDI-II as well as a demographic form. The demographic form collected information on length of time away from work, age, history of pre-injury psychological treatment, gender, severity of work injury, income, education, and job skill level. As part of the vocational rehabilitation evaluation, clients were also routinely administered the SRRS, the SF-MPQ, and the COPES, as well as other instruments. Subsequently, the data from the latter instruments were reported in the vocational rehabilitation evaluation.

For the present study, a subset of data from the original data collection (Stice & Moore, 2005) consisting of the BDI-II and the demographic form was accessed. Additional data on the SRRS, the SF-MPQ, and the COPES were coded anonymously from the vocational rehabilitation evaluation records. All data for the present study were coded anonymously, with only an identification number used to keep track of the data. An authorization letter from the company possessing the data and vocational rehabilitation evaluation reports was obtained and submitted to the Human Research Committee at Colorado State University. This study received approval from the Human Research Committee at Colorado State University on December 29, 2006 under protocol number 06-311H (see Appendix for ethics application and letter of approval).

Chapter III: Results

Data Preparation and Descriptive Statistics

Missing Data

In the process of data collection and entry, some data were missing. While BDI-II surveys were available for all 253 participants, responses were missing or invalid on 66 out of 5313 (1.2%) items. To account for these missing items, an expectation-maximization algorithm was utilized to estimate and impute the missing values. Out of the 253 participants, scores were missing for 31 (12%) COPES, seven (2.8%) SRRS LCUs, and six (2.4%) SF-MPQ Total PRIs. Reasons for such missing data were failing to locate the scores (despite scores being initially obtained during the evaluation) or failing to initially obtain scores during the evaluation (e.g., due to lack of time, the evaluator forgetting to administer/score it, the client forgetting to complete/return it, running out of surveys, etc.). Based on the recommendation by Tinsley and Brown (2000), the mean BDI-II Total score of those who had missing data was compared to the mean of those who had no missing data, to see if they differed in a meaningful way. According to an independent samples *t* test, mean BDI-II Total scores did not significantly differ between participants without missing scores and those with at least one missing score on the three instruments (i.e., COPES, SRRS LCUs, SF-MPQ Total PRIs), $t(251) = -.847$, *ns*. However, it is possible that relationships with other variables could still differ between

those with and without missing data. Values were not imputed for the missing scores on the COPES, SRRS LCUs, and the SF-MPQ Total PRIs.

BDI-II

With regard to BDI-II Total scale scores ($N = 253$), the minimum value was two points and the maximum was 54 points, representing a range of 52 points. Furthermore, the mean score was 22.79, and the standard deviation of the scores was 12.03. Based on the cutoffs suggested in the BDI-II manual (Beck et al., 1996), 68 participants (26.9%) had a "minimal" level of depression, 43 participants (17.0%) had a "mild" level of depression, 66 participants (26.1%) had a "moderate" level of depression, and 76 participants (30%) had a "severe" level of depression. The mean score fell in the "moderate" depression category and the modal score fell in the "severe" depression category. The mean total BDI-II score of the present sample was compared with the two normative samples used in the development of the instrument (Beck et al., 1996). In comparison to psychiatric outpatients, the mean total BDI-II scores of the present sample did not significantly differ, $t(751) = .35$, *ns*. However, the mean BDI-II total score of the injured workers was significantly greater than that of a sample of "normal" college students, $t(371) = 8.10$, $p < .0001$.

The distribution of the scores was positively skewed, with a .593 skew and a .153 standard error of skewness. In addition, the distribution was slightly platykurtic, with a -.360 kurtosis and a .305 standard error of kurtosis. Normality testing was conducted with the Kolmogorov-Smirnov (K-S) test with Lilliefors significance correction. Based on this test, the BDI-II Total scale score distribution significantly departed from normality, $D(253) = .081$, $p < .05$. A square-root transformation was performed to improve the

normality of the distribution. As a result, the skew reduced to .065 (SE = .153), although the kurtosis inflated to -.664 (SE = .305). When a K-S test with Lilliefors significance correction was performed on the transformed data, the distribution no longer significantly departed from normality, $D(253) = .056$, $p > .05$. For use in regression equations, the transformed and non-transformed data were subsequently standardized (i.e., z transformed). Item-level descriptive statistics of the BDI-II can be found in Table 1.

SRRS

On the SRRS LCU (N = 246), the minimum score was zero points and the maximum was 768 points, representing a range of 768 points. Furthermore, the distribution had a mean score of 293.00 and a standard deviation of 158.90. The injured workers' mean SRRS LCU score was significantly higher than the mean score of a control group used by Dekker and Webb (1974), $t(291) = 5.79$, $p < .0001$. The distribution was positively skewed (G_1 = .603, SE = .155) and slightly platykurtic (G_2 = -.118, SE = .309). Normality testing was conducted with the K-S test with Lilliefors significance correction. Based on this test, the SRRS LCU distribution significantly departed from normality, $D(246) = .085$, $p < .05$. A square-root transformation was performed to improve the normality of the distribution. As a result, the absolute value of skew was reduced (G_1 = -.136, SE = .155), although the kurtosis inflated (G_2 = -.211, SE = .309). When a K-S test with Lilliefors significance correction was performed on the transformed data, the distribution no longer significantly departed from normality, D (246) = .038, $p > .20$. For use in regression equations, the square-root transformed and non-transformed data were subsequently standardized (i.e., z transformed).

SF-MPQ

On the SF-MPQ Total PRI ($N = 247$), the minimum score was zero points and the maximum was 43 points. Furthermore, the distribution had a mean score of 16.23 and a standard deviation of 10.83. This mean score was not significantly different from the mean score of individuals with musculoskeletal pain from the SF-MPQ development sample (Melzack, 1987), $t(261) = .88$, *ns*. The distribution was positively skewed ($G_1 = .588$, $SE = .155$) and platykurtic ($G_2 = -.658$, $SE = .309$). Normality testing was conducted with the K-S test with Lilliefors significance correction. Based on this test, the distribution significantly departed from normality, $D(247) = .126$, $p < .05$. A square-root transformation was performed to improve the normality of the distribution. As a result, skew was reduced ($G_1 = .066$, $SE = .155$), although the kurtosis inflated ($G_2 = -.908$, $SE = .155$). Despite this transformation, the distribution still significantly departed from normality according to K-S tests with Lilliefors significance correction, $D(247) = .07$, $p < .05$. For use in regression equations, the square-root transformed and non-transformed data were subsequently standardized (i.e., *z* transformed).

COPES

The means, standard deviations, skewness, and kurtosis values on the eight COPES scales scores can be found on Table 2. Minimum values were 0 for all scales and maximum values were 16 for all scales, representing a range of 16 for all scales. Normality testing was conducted with the K-S test with Lilliefors significance correction. Based on these tests, the distributions on all eight of the COPES scales scores significantly departed from normality. For all eight scales, the minimum values were increased to one and square-root transformations were performed. The means, standard

deviations, skewness and kurtosis values on the transformed data can also be found on Table 2. As a result of the transformations, skew and kurtosis were reduced on the Carefree vs. Practical scale. Unfortunately, on the Conformity vs. Independence, Flexibility vs. Orderliness, Privacy vs. Recognition, and Realistic vs. Aesthetic scales, skew reduced but kurtosis inflated. On the Investigative vs. Accepting, Supportive vs. Leadership, and Reserved vs. Social scales, kurtosis marginally improved but skew inflated. Despite these transformations, the distributions still significantly departed from normality according to K-S tests with Lilliefors significance correction. Furthermore, the K-S statistic actually worsened (i.e., increased) on the Investigative vs. Accepting, Supportive vs. Leadership, and Reserved vs. Social after the square-root transformations, so the transformations were not retained. For use in regression equations, the square-root transformed and non-transformed data for all eight scales' scores were subsequently standardized (i.e., *z* transformed).

Other Data Transformations

Based on recommendations by Frazier, Tix, and Barron (2004), effects coding was performed on the categorical variables (i.e., severity of injury, race, gender, level of education, and income). The ordinal variables of SVP and length of time away from work were simply standardized (i.e., *z* transformed). Cross-products for moderator analysis were computed by multiplying the SRRS LCU with the SF-MPQ Total PRI, the severity of injury variable, and each of the COPES scales. In computing the cross-products, both the square-root transformed/standardized and the non-square-root transformed/standardized versions of the SRRS LCU, SF-MPQ Total PRI, and the COPES scales were used. A factor analysis was performed to create scales used in some

of the analyses, the descriptive statistics and data transformations for which are provided later in this chapter.

Significance testing was conducted on both the square-root transformed/standardized variables and the standardized variables without the square-root transformations applied. In the events that the results were the same, the results from the standardized variables without the square-root transformations are reported to facilitate interpretation. However, the use of such non-transformed variables could potentially violate the assumption of multivariate normality in the significance testing. Despite this concern, the tests used in this study are reasonably robust to such violations. When the results are different based on the transformations applied, results from both the square-root transformed/standardized and the standardized variables without the square-root transformations are both reported. Unfortunately, while using the square-root transformed variables helps to meet the assumption of multivariate normality, interpretation is more difficult.

Research Question 1

Research Question 1: In an injured worker population, how reliable are the somatic items of the BDI-II? Are item-scale correlations sufficiently low and is there such a gain in alpha to warrant their removal?

To examine the first research question, Cronbach's alphas and item-total correlations were calculated on the 21 BDI-II items (see Table 1). The Cronbach's alpha for the BDI-II as a whole was .927. This is consistent with the Cronbach's alphas of .92 for psychiatric outpatients and .93 for college students found in the instrument development samples (Beck et al., 1996). The Cronbach's alpha-if-item removed

statistics ranged from .920 to .927. Thus, the deletion of any item neither significantly increased nor significantly decreased the reliability of the scale. Furthermore, the overall alpha and alpha-if-item removed values exceeded the recommended .90 for a scale to be considered appropriate for use in applied settings (Nunnally & Bernstein, 1994). Additionally, the alpha of .927 for all 21 items was reduced to .909 when the 7 somatic items were removed, and the alpha of the 7 somatic items was .793. While there was an advantage in reliability with deleting the somatic items, it is expected that the alpha for a 14-item scale would be somewhat greater than the alpha for a 7-item scale.

The point-biserial item-total correlations ranged from .435 (Agitation) to .751 (Worthlessness). Even the weakest point-biserial item-total correlation (Agitation) was significant even when using a conservative Bonferroni-corrected alpha ($\alpha = .05 / 21 = .0024$), $r_{pb}(251) = .435, p < .0001$. Furthermore, all item-total correlations exceeded the recommended minimum of .30 (Nunnally & Bernstein, 1994). In this sample of injured workers, all items, including the somatic ones, contributed to the reliability of scale scores. Since all items exceeded the minimum alpha values and item-total correlations proposed by Nunnally and Bernstein (1994), no items performed so poorly as to remove them from the scale. Thus, the confounding argument was not supported in this study.

Research Question 2

Research Question 2: In an injured worker population, what is the factor structure of the BDI-II? Do the affective items factor with the somatic items as in clinical/medical populations or with the cognitive items as in "healthier" populations?

To examine the second research question and to consolidate the data for use in subsequent analyses a factor analysis was conducted on the 21 BDI-II items for all 253 participants. A parallel analysis (Horn, 1965) was initially used to determine the ideal number of components to extract in the factor analysis. Recommended by Kahn (2006), O'Connor (2000) and others, a parallel analysis is method of selecting the optimal number of factors based on "the number of components that account for more variance than the components derived from random data" (O'Connor, 2000, p. 396). Parallel analysis has the advantage of being statistically-based, in comparison to arbitrary, "rule of thumb" methods such as Kaiser's criterion or the scree test. O'Connor's (2000) SPSS syntax was used to perform the parallel analysis, with 253 cases, 1,000 data sets, and the 95th percentile entered in the syntax. By comparing the parallel analysis output with the actual eigenvalues (see Table 3), a two-factor solution was supported. This is consistent with the great majority of previous factor analyses of the BDI-II that have also supported two-factor solutions (Al-Musawi, 2001; Arnau et al., 2001; Beck et al., 1996; Cole, Grossman, Prilliman, & Hunsaker, 2003; Dozois et al., 1998; Kojima, 2002; Penley et al., 2003; Steer et al., 1999; Steer & Clark, 1997; Steer et al., 2000; Storch et al., 2004; Whisman et al., 2000; Viljoen et al., 2003).

Based on the recommendations of Kahn (2006), Tinsley, and Tinsley (1987) in conducting exploratory factor analyses, a principal-axis factor analysis with Promax rotation and Kaiser normalization was performed (see Table 4). Given the findings from the parallel analysis, two factors were extracted. The first factor yielded an eigenvalue of 8.86 and 42.17% of the explained item variance. This factor was primarily cognitive in nature and consisted of 11 items: Worthlessness, Past Failure, Sadness, Pessimism, Self-

Criticalness, Guilty Feelings, Self-Dislike, Suicidal Thoughts/Wishes, Punishment Feelings, Loss of Interest in Sex, and Crying. The second factor returned an additional 1.48 eigenvalue and 7.03% additional explained item variance. It is primarily somatic and affective in nature and consisted of 10 items: Loss of Energy, Indecisiveness, Tiredness or Fatigue, Concentration Difficulty, Irritability, Loss of Interest, Loss of Pleasure, Changes in Sleeping Pattern, Changes in Appetite, and Agitation. Together, the two factors returned a cumulative eigenvalue of 10.33 and accounted for 49.20% of the explained item variance. The correlation between the two factors was statistically significant, $r(251) = .74, p < .001$.

For use in subsequent analyses, the items in each factor were summed to create two additional scales, a Cognitive scale and a Somatic-Affective scale. The Cognitive scale scores ranged from 0 to 30 points and the Somatic-Affective scale scores ranged from 2 to 27 points. The Cronbach's alphas were .882 for the Cognitive scale and .877 for the Somatic-Affective scale. The means and standard deviations were $M = 9.61$ and $SD = 6.76$ for the Cognitive scale scores and $M = 13.17$ and $SD = 6.13$ for the Somatic-Affective scale scores. The distributions of the scales' scores were both positively skewed, with a .868 skew ($SE = .153$) on the Cognitive scale scores and a .256 skew ($SE = .153$) on the Somatic-Affective scale scores. While the distribution of the Cognitive scale was leptokurtic ($G_2 = .341$, $SE = .305$) the Somatic-Affective scale was platykurtic ($G_2 = -.960$, $SE = .305$). Normality testing was conducted with K-S tests with Lilliefors significance correction. Based on these tests, the distributions of the Cognitive scale scores and the Somatic-Affective scale scores significantly departed from normality, $D(253) = .095, p < .05$ and $D(253) = .089, p < .05$, respectively.

Square-root transformations were performed to improve the normality of the scales' scores. As a result of the transformations, skew and kurtosis were reduced on both the Cognitive scale scores (G_1 = -.157, SE = .153; G_2 = -.125, SE = .305) and the Somatic-Affective scale scores (G_1 = -.146, SE = .153; G_2 = -.865, SE = .305). Despite these transformations, the distributions of the Cognitive scale scores and the Somatic-Affective scale scores still significantly departed from normality, $D(253) = .070$, $p < .05$ and $D(253) = .066$, $p < .05$, respectively. For use in regression equations, the transformed and non-transformed data for the scales' scores were subsequently standardized (i.e., z transformed). The standardized factor scales without square-root transformation are used in subsequent analyses unless otherwise noted.

Research Question 3

Research Question 3a

Research Question 3a: Are work values related to depression?

Research Question 3a was examined via Pearson product-moment correlations and multiple linear regression analyses, with the three BDI-II scales (i.e., Total, Cognitive, and Somatic-Affective) examined in separate analyses. The Pearson correlation coefficients between each of the eight COPES scales' scores and the three BDI-II scales' scores are listed on Table 5. To account for the increased risk of Type I error with multiple significance tests, a Bonferroni-corrected alpha of $\alpha = .05 / 24 = .0021$ was used for significance testing. Using this more conservative alpha, the Investigative vs. Accepting COPES scale was significantly correlated with the BDI-II Total scale, $r(220) = -.259$, $p < .0021$ and the BDI-II Somatic-Affective scale $r(220) = -.301$, $p < .0021$. The direction of the correlations indicates that those who valued Accepting-type

work (i.e., valuing work that consists of simpler tasks and allows for use of existing solutions to problems, such as consumer economics) had higher scores on the BDI-II Total and Somatic-Affective scales.

When the more liberal $\alpha = .05$ was used, additional COPES and BDI-II scales' scores were significantly correlated. The BDI-II Total scale scores were significantly correlated with the following COPES scales' scores: Carefree vs. Practical, $r(220) = -.153$, $p < .05$; Supportive vs. Leadership, $r(220) = -.179$, $p < .05$; and Privacy vs. Recognition, $r(220) = -.145$, $p < .05$. Based on the directions of the correlations, higher scores on Carefree, Supportive, and Privacy work values were associated with higher BDI-II Total scale scores. In addition, the BDI-II Cognitive scale scores were significantly correlated with the following COPES scales' scores: Investigative vs. Accepting, $r(220) = -.189$, $p < .05$; and Supportive vs. Leadership, $r(220) = -.176$, $p < .05$. Based on the directions of the correlations, higher scores on Accepting and Supportive work values were associated with higher BDI-II Cognitive scale scores. Furthermore, the BDI-II Somatic-Affective scale scores was significantly correlated with the following COPES scales' scores: Carefree vs. Practical, $r(220) = -.174$, $p < .05$; Supportive vs. Leadership, $r(220) = -.149$, $p < .05$; and Privacy vs. Recognition, $r(220) = -.137$, $p < .05$. Based on the directions of the correlations, higher scores on Carefree, Supportive, and Privacy work values were associated with higher BDI-II Somatic-Affective scale scores. The correlation between the COPES Reserved vs. Social scale scores and the BDI-II Somatic-Affective scale scores is significant only at the $\alpha = .10$ level, $r(220) = -.113$, $p < .10$, with higher scores on the Reserved work value associated with higher scores on the BDI-II Somatic-Affective scale.

Research Question 3a was further examined with two-step multiple linear regression analyses based on guidelines from Frazier et al. (2004). Each analysis was repeated three times, once for each BDI-II scale (i.e. Total, Cognitive, and Somatic-Affective) as the criterion variable. The following covariates were entered in the first step: income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work. To examine the predictor variables, each of the eight COPES scales was added independently in the second step, totaling eight separate analyses for each of the three criterion variables (i.e., 24 total analyses).

When each COPES scale was tested in a separate MLR analysis, several significant predictors and interactions with the SRRS LCU emerged (see Table 5). With regard to predictors, the Accepting vs. Investigative COPES scale resulted in a statistically significant increase of R^2 over the covariates on the BDI-II Total scale, $\Delta R^2 = .068$, $F(1, 209) = 17.40$, $p < .001$, the Cognitive scale, $\Delta R^2 = .039$, $F(1, 209) = 9.29$, $p < .05$, and the Somatic-Affective scale, $\Delta R^2 = .087$, $F(1, 209) = 23.22$, $p < .001$. The Carefree vs. Practical COPES scale also demonstrated a statistically significant increase of R^2 over the covariates on the Somatic-Affective BDI-II scale, $\Delta R^2 = .024$, $F(1, 209) = 5.88$, $p < .05$ and approached significance on the BDI-II Total scale, $\Delta R^2 = .014$, $F(1, 209) = 3.30$, $p < .10$. In addition, the Supportive vs. Leadership COPES scale also resulted in a statistically significant increase of R^2 over the covariates for the BDI-II Total scale, $\Delta R^2 = .025$, $F(1, 209) = 6.12$, $p < .05$, the Cognitive scale, $\Delta R^2 = .028$, $F(1, 209) = 6.56$, $p < .05$, and the Somatic-Affective scale, $\Delta R^2 = .016$, $F(1, 209) = 5.52$, $p < .05$. The Privacy vs. Recognition COPES scale approached significance on the BDI-II Total scale,

$\Delta R^2 = .014$, $F(1, 209) = 3.48$, $p < .10$ and the Cognitive scale, $\Delta R^2 = .014$, $F(1, 209) = 3.34$, $p < .10$.

Based on the directions of the beta coefficients, higher scores on the BDI-II Total scale were associated with higher scores on Accepting, Carefree, and Supportive work values on the COPES. Higher scores on the BDI-II Cognitive scale were associated with higher scores on Accepting and Supportive work values on the COPES. Finally, higher scores on the BDI-II Somatic-Affective scale were associated with higher scores on Accepting, Carefree, and Supportive work values on the COPES. The correlation between the Accepting vs. Investigative scale and annual income at injury approached significance, $r(220) = .131$, $p = .051$. Given this correlation, those who favored Investigative work had higher incomes, and those who favored Accepting work had lower incomes.

In an additional comprehensive analysis, the same covariates listed above were entered in the first step and all eight COPES scales were entered together in the second step. Each analysis was repeated three times, once for each BDI-II scale (Total, Cognitive, and Somatic-Affective) as the criterion. Together, the COPES scales resulted in a statistically significant increase of R^2 over the covariates for the BDI-II Total scale, $\Delta R^2 = .076$, $F(8, 202) = 2.39$, $p < .05$ and the Somatic-Affective scale, $\Delta R^2 = .10$, $F(8, 202) = 3.29$, $p < .01$. The only significant predictor, while controlling for the effects of the other independent variables, was the Accepting vs. Investigative COPES scale on the BDI-II Total scale, $t(202) = -2.68$, $p < .01$ and the Somatic-Affective scale, $t(202) = -3.52$, $p < .001$. Using the square-root transformed variables, the Accepting vs. Investigative COPES scale approached significance on the BDI-II Cognitive scale, $t(202)$

= -1.84, $p < .10$. However, when the non-square-root transformed variables were used, significance was not even approached, $t(202) = -1.61$, $p > .10$. On all scales, higher depression scores were associated with higher scores on the Accepting work value of the COPES.

Research Question 3b

Research Question 3b: Are relationships between work values and depression moderated by adjustment-related stress?

Research Question 3b was examined with three-step multiple linear regression analyses based on guidelines from Frazier et al. (2004). Each analysis was repeated with each BDI-II scale (i.e. Total, Cognitive, and Somatic-Affective) as the criterion variable. The following covariates were entered in the first step: income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work. The SRRS LCU and each of the eight COPES scales were entered independently in the second step. Furthermore, to examine moderation, the cross-product between each corresponding COPES scale and the SRRS LCU was entered in the third step. In total, eight analyses were run for each COPES scale and its corresponding moderator on each of the three criterion variables, resulting in 24 total analyses.

The interaction between the Realistic vs. Aesthetic COPES scale and the SRRS LCU resulted in a statistically significant increase of R^2 over the first and second steps on the BDI-II Somatic-Affective scale, $\Delta R^2 = .016$, $F(1, 205) = 4.32$, $p < .05$. As can be seen in Figure 1, for individuals with low SRRS scores, higher somatic-affective depression scores were associated with higher scores in the Aesthetic dimension. Among individuals

who scored high on the SRRS, higher somatic-affective depression scores were associated with higher scores in the Realistic dimension.

As recommended by Frazier et al. (2004), tests of the simple slopes were conducted to determine if the Realistic vs. Aesthetic scale is predictive of somatic-affective depression at different levels of the SRRS moderator. On higher levels of the SRRS LCU (+1 *SD*), the Realistic vs. Aesthetic COPES scale scores significantly predicted BDI-II Somatic-Affective scale scores, $B = -.178$, $t(216) = -2.053$, $p < .05$, with higher BDI-II Somatic-Affective scale scores significantly associated with higher scores in the Realistic dimension. However, on lower levels of the SRRS LCU (-1 *SD*), the Realistic vs. Aesthetic COPES scale scores did not significantly predict BDI-II Somatic-Affective scale scores, $B = .106$, $t(216) = 1.190$, *ns*. Based on these results, the Realistic vs. Aesthetic scale was only a significant predictor of somatic-affective symptoms of depression among those who had higher stress scores, with higher somatic-affective symptoms of depression associated with a preference for Realistic work.

Also, the interaction between the Privacy vs. Recognition COPES scale scores and the SRRS LCU resulted in a statistically significant increase of R^2 over the first and second steps on the BDI-II Total scale scores, $\Delta R^2 = .015$, $F(1, 205) = 4.13$, $p < .05$. As can be seen in Figure 2, predicted values of depression did not differ for individuals with scores in the direction of Recognition. However, among those with a preference for Privacy, higher SRRS scores were associated with higher depression scores than for those with lower SRRS scores. Tests of the simple slopes were again conducted. On higher levels of the SRRS LCU (+1 *SD*), the Privacy vs. Recognition COPES scale scores significantly predicted BDI-II Total scale scores, $B = -.296$, $t(216) = -3.268$, $p < .05$, with

higher BDI-II Total scale scores significantly associated with higher scores in the Privacy dimension. However, on lower levels of the SRRS LCU (-1 *SD*), the Privacy vs. Recognition COPES scale scores did not significantly predict BDI-II Total scale scores, $B = -.065$, $t(216) = -.760$, *ns*. Based on these results, the Privacy vs. Recognition scale was only a significant predictor of depression symptoms among those who had higher stress scores, with higher depression symptoms associated with a preference for Privacy.

In an additional comprehensive analysis, the covariates listed above were entered in the first step, the SRRS LCU and all eight COPES scales were entered together in the second step, and all COPES by SRRS LCU cross-products were entered together in the third step. The moderators were entered together in the same step to help reduce the tendency for increased Type I error when separate significance tests are performed for each moderator (Frazier et al., 2004). The addition of the moderators in the third step did not significantly increase R^2 beyond what was accounted for by the covariates and predictors in the first two steps on the BDI-II Total scale, $\Delta R^2 = .038$, $F(8, 191) = .205$, *ns*, the BDI-II Cognitive scale, $\Delta R^2 = .046$, $F(8, 191) = .125$, *ns*, or the BDI-II Somatic-Affective scale $\Delta R^2 = .026$, $F(8, 191) = .503$, *ns*. Based on recommendations by Frazier and colleagues, since this step did not significantly increase R^2 it was deleted from the model.

Hypothesis 1

Hypothesis 1: Injured workers' depression scores are hypothesized to be significantly and positively related to adjustment-related psychosocial stress.

Preparatory testing was conducted to determine which of the three BDI-II scales (Total, Cognitive, and Somatic-Affective) to use as the criterion variable in the analysis

of Hypothesis 1. To answer this question, a test of the difference between two Pearson product-moment correlations was conducted. The difference between the SRRS LCU and the BDI-II Cognitive scale correlation ($r = .389$) and the SRRS LCU and the BDI-II Somatic-Affective scale correlation ($r = .318$) was not statistically significant, $z = .90$, *ns*. Since there was no significant difference in relationship between the SRRS LCU and the two factors on the BDI-II, the BDI-II Total score was chosen as the criterion variable in the analysis of Hypothesis 1.

Hypothesis 1 was examined with a Pearson product-moment correlation and a two-step multiple linear regression analysis. The SRRS LCU was significantly correlated with the BDI-II Total scale, $r(244) = .38$, $p < .001$. On the multiple linear regression analysis, the BDI-II Total scale was used as the criterion variable given the findings from the preparatory testing. The following covariates were entered in the first step: income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work. The SRRS LCU was entered in the second step as the predictor. The SRRS LCU resulted in a statistically significant increase of R^2 over the effects of the covariates, $\Delta R^2 = .125$, $F(1, 233) = 38.27$, $p < .001$. Given the significant findings from the Pearson correlation and the multiple linear regression, Hypothesis 1 was supported.

Hypothesis 2

Hypothesis 2a

Hypothesis 2a: Injured workers' depression scores are hypothesized to be significantly and positively related to physical pain.

Hypothesis 2a was examined with a Pearson product-moment correlation and a two-step multiple linear regression analysis. The SF-MPQ Total PRI was significantly

and positively correlated with the BDI-II Total scale scores, $r(245) = .51, p < .001$. Thus, increases in pain as measured by the SF-MPQ Total PRI were associated with increases in total depression as measured by the BDI-II Total scale. On the multiple linear regression analysis, the BDI-II Total scale was used as the criterion variable given the findings from Hypothesis 2b. The following covariates were entered in the first step: income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work. The SF-MPQ Total PRI was entered in the second step as the predictor. The SF-MPQ Total PRI resulted in a statistically significant increase of R^2 over the effects of the covariates, $\Delta R^2 = .182, F(1, 234) = 60.72, p < .001$. Thus, Hypothesis 2a was supported.

Hypothesis 2b

Hypothesis 2b: Physical pain will have a stronger relationship with the factor including the somatic items.

To test Hypothesis 2b, a test of the difference between two Pearson product-moment correlations was conducted. The difference between the SF-MPQ Total PRI and the BDI-II Cognitive scale correlation ($r = .451$) and the SF-MPQ Total PRI and the BDI-II Somatic-Affective scale correlation ($r = .501$) was not statistically significant, $z = -.71$, *ns*. Thus, Hypothesis 2b was rejected. Since there was no significant difference in relationship between the SF-MPQ Total PRI and the two factors on the BDI-II, the BDI-II Total score was chosen as the criterion variable in the analysis of Hypothesis 2a.

Hypothesis 2c

Hypothesis 2c: The relationship between physical pain and depression will be moderated by adjustment-related psychosocial stress.

Hypothesis 2c was assessed with a three-step multiple linear regression analysis, using the BDI-II Total scale as the criterion variable. The following covariates were entered in the first step: income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work. The SF-MPQ Total PRI and the SRRS LCU were entered as predictors in the second step. In the third step, the cross-product of the SRRS LCU and the SF-MPQ Total PRI was entered. The addition of the moderator in the third step significantly increased R^2 beyond what was accounted for by the covariates and predictors in the first two steps, $\Delta R^2 = .015$, $F(1, 228) = 5.60$, $p < .05$. Thus, Hypothesis 2c was supported.

As can be seen in Figure 3, predicted values of depression did not differ for individuals with lower pain scores. However, for those with higher pain scores, higher SRRS scores were associated with higher depression than for those with lower SRRS values. Tests of the simple slopes were conducted. On higher levels of the SRRS LCU (+1 *SD*), SF-MPQ Total PRI scores significantly predicted BDI-II Total scale scores, $B = .565$, $t(239) = 7.29$, $p < .001$. In addition, on lower levels of the SRRS LCU (-1 *SD*), SF-MPQ Total PRI scores significantly predicted BDI-II Total scale scores, $B = .308$, $t(239) = 3.92$, $p < .001$. In sum, higher BDI-II Total scale scores were significantly associated with higher SF-MPQ Total PRI scores at both lower and higher levels of the SRRS LCU.

Hypothesis 3

Hypothesis 3a

Hypothesis 3a: Injured workers' depression scores are hypothesized to be significantly and positively related to severity of work injury.

Hypothesis 3a was examined with a Pearson product-moment correlation and a two-step multiple linear regression analysis. The severity of the work injury was not significantly correlated with the BDI-II Total scale, $r(251) = .045$, *ns*. On the multiple linear regression analysis, the BDI-II Total scale was used as the criterion variable given the findings from Hypothesis 3b. The following covariates were entered in the first step: income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work. The severity of work injury was entered in the second step as the predictor. The severity of work injury did not result in a statistically significant increase of R^2 over the effects of the covariates, $\Delta R^2 = .12$, $F(1, 240) = .125$, *ns*. Thus, Hypothesis 3a was rejected.

Hypothesis 3b

Hypothesis 3b: Severity of work injury will have a stronger relationship with the factor including the somatic items.

To test Hypothesis 3b, a test of the difference between two Pearson product-moment correlations was conducted. The difference between the severity of work injury and the BDI-II Cognitive scale correlation ($r = .050$) and the severity of work injury and the BDI-II Somatic-Affective scale correlation ($r = .033$) was not statistically significant, $z = .18$, *ns*. Thus, Hypothesis 3b was rejected.

Hypothesis 3c

Hypothesis 3c: The relationship between severity of work injury and depression will be moderated by adjustment-related psychosocial stress.

Hypothesis 3c was assessed with a three-step multiple linear regression analysis, using the BDI-II Total scale as the criterion variable given the results from Hypothesis

3b. The following covariates were entered in the first step: income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work. Severity of work injury and the SRRS LCU were entered as predictors in the second step. In the third step, the cross-product of severity of work injury and the SF-MPQ Total PRI was entered. The addition of the moderator in the third step did not significantly increase R^2 beyond what was accounted for by the covariates and predictors in the first two steps, $\Delta R^2 = .001$, $F(1, 231) = .387$, *ns*. Thus, Hypothesis 3c was rejected.

Comprehensive Analyses

Two additional comprehensive analyses were conducted that incorporated all variables used in the study. The first analysis was conducted to measure the total variance explained by all of the predictors/covariates and to identify individual effects while controlling for all other predictors and covariates. To achieve these goals, a three-step hierarchical multiple linear regression analysis was performed, using the BDI-II Total scale as the criterion. In the first step, all of the covariates were entered (i.e., income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work). In the second step, all of the predictors were entered (i.e., SRRS, SF-MPQ Total PRI, severity of work injury, and all eight COPES scales). In the third step, all of the interactions were entered (i.e., cross-products of SF-MPQ Total PRI, severity of work injury, and all eight COPES scales with the SRRS). The moderators were entered together in the same step to help reduce the tendency for increased Type I error when separate significance tests are performed for each moderator (Frazier et al., 2004).

The amount of variance of the criterion explained by each of the three steps was analyzed using MLR, and the significance of each step was analyzed using ANOVA (included in the MLR output). The first step explained a significant variation of the criterion, $R^2 = .115$, $F(10, 207) = 2.68$, $p < .01$. The second step also explained a significant variation of the criterion, $R^2 = .418$, $F(21, 196) = 6.69$, $p < .001$. Furthermore, the second step explained a significant increase in variance of the criterion beyond that explained by the first step, $\Delta R^2 = .303$, $F(11, 196) = 9.27$, $p < .001$. The third step explained a significant variation of the criterion, $R^2 = .462$, $F(31, 186) = 5.15$, $p < .001$. However, the third step did not explain a significant increase in variance of the criterion beyond that explained by the first and second steps, $\Delta R^2 = .044$, $F(10, 186) = 1.53$, *ns*. Based on recommendations by Frazier and colleagues (2004), since this step did not significantly increase R^2 it was deleted from the model. The effect size of the final model (the second step) is considered "large," $R^2 = .418$, $f^2 = .72$ (Cohen, 1988). The unstandardized coefficients (i.e., *B*s) from the final model (the second step) were examined to identify the variables that explained a significant amount of variance in the criterion while controlling for the other predictors.

Variables with significant coefficients included the SRRS LCU, $B = .277$, $t(196) = 4.66$, $p < .001$, the SF-MPQ Total PRI, $B = .373$, $t(196) = 5.95$, $p < .001$, and the Accepting vs. Investigative COPES scale scores, $B = -.160$, $t(196) = -1.99$, $p = < .05$. Age was a significant predictor of BDI-II Total scale scores when square-root transformations were applied, $B = -.012$, $t(186) = -2.00$, $p < .05$, but approached significance when the square-root transformations were not applied, $B = -.011$, $t(186) = -1.84$, $p = .068$. The direction of the significant coefficients indicated that higher BDI-II Total scale scores

were related to higher scores on the SRRS LCU, higher scores on the SF-MPQ Total PRI, younger age, and higher scores in the Accepting dimension of the Accepting vs. Investigative scale on the COPES.

A second comprehensive analysis was performed with the interest of developing a simplified regression equation consisting of only the predictors with the strongest relationships with total depression scores. In this analysis, all covariates, predictors, and interactions were entered together in a stepwise multiple linear regression analysis, with the BDI-II Total scale as the criterion. The final model consisted of four significant predictors, the SF-MPQ Total PRI, $B = .421$, $t(213) = 7.54$, $p < .001$, the SRRS LCU, $B = .249$, $t(213) = 4.43$, $p < .001$, the Accepting vs. Investigative COPES scale, $B = -.194$, $t(213) = -3.57$, $p < .001$, and the interaction between the SF-MPQ Total PRI and the SRRS LCU, $B = .127$, $t(213) = 2.22$, $p < .05$. The direction of the significant coefficients indicated that higher BDI-II Total scale scores were related to higher scores on the SRRS LCU, higher scores on the SF-MPQ Total PRI, and higher scores in the Accepting dimension on the COPES. The interaction between the SF-MPQ Total PRI and the SRRS was previously described. The final model was tested with ANOVA and explained a significant amount of variance of the BDI-II Total scale, $R^2 = .381$, $F(4, 213) = 32.80$, $p < .001$. The R^2 of the stepwise model corresponded with an effect size considered "large," $f^2 = .62$ (Cohen, 1988).

The following equation was developed from the final stepwise model: $\hat{Y} = -.031 + .421X_1 + .249X_2 - .194X_3 + .127X_1X_2$, where $\hat{Y}$ is the predicted z score value on the BDI-II Total, X_1 is the z score obtained on the SF-MPQ Total PRI, X_2 is the z score obtained on the SRRS LCU, X_3 is the z score obtained on the COPES Accepting vs. Investigative

scale, and X_1X_2 is the cross product between X_1 and X_2. In the equation, z scores are used because other samples may have different means and standard deviations, thus making the equation more functional.

Chapter IV: Discussion

As reviewed in the Introduction, work-related injuries or disabilities can result in negative consequences to physical, economic, social, and psychological well-being. Unfortunately, the psychological ramifications have been inadequately understood and under-researched, despite documented increases in MDD post-injury (Dersh et al., 2002) and a reduced likelihood of returning to work among those who experience depression (Ash & Goldstein, 1995; Sullivan et al., 2006; Vowles et al., 2004). Furthermore, concerns have been raised about the measurement of depression given the possible confounding of somatic aspects of illness and depression (Ammon Cavanaugh, 1995; Cavanaugh et al., 1983; Coulehan et al., 1988; Fishbain et al., 1997; Plumb & Holland, 1977), and there is a paucity of research identifying predictors of depression among injured workers. The primary goals of the present study were: (1) to evaluate the psychometric properties of the BDI-II with a sample of injured workers, and (2) to identify consequences of work-related injury (i.e., pain, physical illness, adjustment-related stress, vocational losses) that may predict depression among injured workers.

Use of the BDI-II with Injured Workers

Previous authors have suggested that in medically ill populations, symptoms of depression may be confounded with somatic symptoms, consequently reducing the reliability of the scale (Cavanaugh et al., 1983; Coulehan et al., 1988; Plumb & Holland, 1977). The current study is the first to address this concern with an injured worker

population. Results revealed that all items of the BDI-II, including the somatic items, contributed to the reliability of the scale and were correlated with the total score. Furthermore, using cutoffs proposed by Nunnally and Bernstein (1994), the results did not support the deletion of any items. Additional support to reject the confounding argument comes from the significant correlation between the Cognitive and the Somatic-Affective factors, indicating that cognitive and somatic-affective symptoms of depression were closely related. Furthermore, none of the predictors tested in correlational comparisons (i.e., medical severity, stress, and pain) was differentially related to the two factors. Given these results, the BDI-II is recommended for use without modification for researchers and clinicians assessing depression among injured workers. This finding is consistent with studies of chronic pain patients (Geisser, Roth, & Robinson, 1997) and individuals with multiple sclerosis (Aikens et al., 1999), in which confounding was not discovered and there was no advantage in deleting somatic items.

There are several explanations for the outcome of the first research question. One explanation is that over time, somatic symptoms cause depression. Given that the injured workers are several months post-injury, it could be hypothesized that the sample of injured workers had sufficient time for their somatic symptoms to contribute to cognitive and affective symptoms of depression. Such an explanation is supported by Livneh's (1980) description of stages of adjustment to disability or illness, with depression occurring midway through the adjustment process. This explanation could be examined in subsequent research, by measuring somatic, cognitive, and affective symptoms longitudinally from the time of the injury. This account would be supported if the somatic symptoms precede the other depressive symptoms, which then "catch up" over time.

From this point of view, it is possible that the somatic items do not significantly contribute to the reliability of the scale only soon after the injury occurred. Such a hypothesis could be tested in subsequent research.

A second explanation is that the somatic, cognitive, and affective symptoms are comorbid and longitudinally correlated. In this case, the somatic symptoms would not be considered a cause of the depressive symptoms, but rather, somatic and depressive symptoms may emerge in tandem. Such an account is supported by the biochemical mechanisms theory previously reviewed. For example, if monoamines are reduced or the HPA axis is activated as a result of the medical illness or treatment, increases in depression and other somatic symptoms would occur concurrently. This explanation could be examined in subsequent research by measuring somatic, cognitive, and affective symptoms longitudinally from the time of the injury. This account would be supported if, from time of the injury, the symptoms are correlated and the somatic items contribute significantly to the reliability of the scale.

The purpose of the second research question was to identify the factor structure of the BDI-II in a sample of injured workers. Based on the results from the parallel analysis, a two-factor solution was supported. This finding was consistent with the numerous factor analyses of the BDI-II that have also supported two-factor solutions (Arnau et al., 2001; Beck et al., 1996; Cole et al. , 2003; Dozois et al., 1998; Kojima, 2002; Penley et al., 2003; Steer et al., 1999; Steer & Clark, 1997; Steer et al., 2000; Storch et al., 2004; Whisman et al., 2000; Viljoen et al., 2003).

As previously reviewed, in factor analyses with "unhealthy" populations (i.e., those with mental or physical illness), the items measuring affective symptoms have

typically factored with the items measuring somatic symptoms (Arnau et al., 2001; Beck et al., 1996; Penley et al., 2003; Steer et al., 1999; Steer et al., 2000; Steer et al., 1998; Viljoen et al., 2003). In factor analyses with "healthier" or "normal" populations (e.g., college students), the affective items have typically factored with the cognitive items (Al-Musawi, 2001; Beck et al., 1996; Dozois et al., 1998; Osman et al., 1997; Steer & Clark, 1997; Storch et al., 2004; Whisman et al., 2000). In the present study, the affective items factored primarily with the somatic items, indicating that injured workers better correspond with the factor structure of "unhealthy" populations. It makes sense that they had an "unhealthy" factor structure because they experienced a physical injury, were found to have high levels of pain, and were found to have high levels of depression. Previous authors have not explained why the affective items tend to factor with somatic items in medically/mentally ill individuals. It is possible that such populations have experienced biochemical changes (e.g., reduced monoamines, increased activation of the HPA axis) that have strengthened the relationship between mood and somatic symptoms. Future research could continue to replicate the factor structure with mentally/medically ill individuals, investigate the biochemical explanation offered for this pattern, and test alternate explanations for this pattern.

The Cognitive and Somatic-Affective factor model is consistent with previous factor analytic studies of the BDI-II. The item distribution across factors was very similar to that found among psychiatric outpatients in the test development sample (Beck et al., 1996), with only two items (Crying and Loss of Interest in Sex) shifting to the opposite factor. Furthermore, the factor structure was also very similar to that found in factor

analyses of the BDI-II in medically ill populations (Arnau et al., 2001; Viljoen et al., 2003).

Predictors of Depression among Injured Workers

Work Values

As previously reviewed, work plays a meaningful role in people's lives and those who become unemployed can experience negative outcomes as a result. While several work values were related to depression in correlational tests, only one was consistently related to depression after accounting for covariates as well as other predictors. Additionally, while interactions between two of the COPES scales (i.e., Privacy vs. Recognition and Realistic vs. Aesthetic) and the SRRS were significant in single-moderator tests, the step with all of the moderators did not persist. The likelihood of Type I error is inflated with a large number of significance tests (Frazier et al., 2004), which is what likely happened in the single-moderator tests.

The primary finding with regard to work values in this study was that higher depression scores were related to higher scores on the Accepting end of the Accepting vs. Investigative work value dimension (i.e., or lower scores on the Investigative work value dimension). On the Investigative vs. Accepting dimension of the COPES, Investigative items represented a desire for information, intellectual curiosity, and a problem-solving disposition in the workplace (e.g., "I value activities or jobs in which (I)...struggle with complex problems; am able to overcome any difficulty"). Accepting items represented those who avoid difficult, complex, or challenging problems in the workplace (e.g., "I value activities or jobs in which (I)...don't have to struggle with complex problems; accept things as they are"). Given that work values are routinely measured in vocational

rehabilitation evaluations, it is recommended that individuals who have an Accepting work value are screened for depression.

It could be the case that individuals who have an Accepting work stance are characterologically passive and problem-avoidant, whereas those who have an Investigative work stance are characterologically active and problem-focused. As Livneh and Antonak (1997) described, an active, problem-focused, information-seeking approach to coping results in positive psychosocial outcomes, whereas a passive, avoidance-escape approach to coping results in negative psychosocial outcomes. Thus, the relationship between the Accepting vs. Investigative work value and depression may not be based on a work value per se, but rather to a global orientation towards problems and coping, or may be more of a function of socioeconomic status. Future research could explore whether the Accepting vs. Investigative work value is better accounted for by other variables, and whether the other variables are also related to depression. If these are both supported, a multiple linear regression equation could be performed to identify the predictor with the strongest relationship to depression.

Two COPES interactions were found to be significant in single-moderator multiple linear regression analyses, but were not significant in omnibus analyses. The relationship between the COPES Realistic vs. Aesthetic Scale and the BDI-II Somatic-Affective Factor was significantly moderated by the SRRS. An analysis of the simple slopes found that the Realistic vs. Aesthetic scale was only a significant predictor of somatic-affective symptoms of depression among those who had higher stress, with higher somatic-affective symptoms of depression associated with a preference for Realistic work. In addition, the relationship between the COPES Privacy vs. Recognition

Scale and the BDI-II Total Scale was significantly moderated by the SRRS. An analysis of the simple slopes found that the Privacy vs. Recognition Scale was only a significant predictor of depression among those who had higher stress, with higher symptoms of depression associated with a preference for Privacy-type work. In both interactions, it appeared that certain work values were only related to depression when significant levels of stress existed. The likelihood of Type I error is inflated with a large number of significance tests (Frazier et al., 2004), which is what likely happened in the single-moderator tests. Since these interactions were not supported in omnibus analyses, replication is necessary to support or reject these interactions.

Pain

This was the first known empirical study to examine the relationship between pain and depression in a population of injured workers. A strong positive relationship between pain and depression was found in this sample of injured workers. This relationship was supported by a significant Pearson correlation and several significant multiple linear regression analyses (with all covariates accounted for and pain being the only predictor, with all covariates, all predictors, and all interactions accounted for in a three-step analysis, and with all covariates, all predictors, and all interactions entered in a stepwise analysis). Given that pain is routinely measured in injured workers, it is recommended that those who endorse high levels of pain are screened for depression.

This result is consistent with previous research documenting a positive relationship between pain and depression among medically ill individuals (Dersh et al., 2002; Fishbain et al., 1997). An additional finding was that the injured workers had levels of pain consistent with a population that experiences considerable pain (e.g., those with

musculoskeletal disorders). Given their considerable levels of pain and the positive relationship between pain and depression, it makes sense that injured workers had high levels of depression. As previously reviewed, the biochemical and learned helplessness theories provide explanations for the relationship between pain and depression. The biochemical model posits that since certain biochemicals are implicated in both pain and depression, deficiencies in such biochemicals result in symptoms of both pain and depression. The learned helplessness model posits that exposure to uncontrollable and aversive circumstances (e.g., pain) results in helplessness, passivity, and depression. Future research should further investigate these models with injured workers.

The relationship between pain and depression was moderated by psychosocial stress. This interaction was supported by several significant multiple linear regression analyses (with all covariates and the two predictors accounted for, with all covariates, all predictors, and all interactions accounted for in a three-step analysis, and with all covariates, all predictors, and all interactions entered in a stepwise analysis). Although pain was positively associated with depression at both high and low levels of stress, the relationship between pain and depression was stronger at higher levels of stress. Thus, among those with high stress, pain was more predictive of depression than was the case for those with low stress. It could be that those with high stress have fewer resources available to cope with their pain, contributing to higher levels of depression. This explanation is supported by Lazarus and Folkman's (1984) cognitive-appraisal theory, which purports that stressors result in negative psychological outcomes (e.g., stress, depression) when they are appraised as threatening and there is a perceived inability to cope with them. Since pain is likely to be perceived as threatening and difficult to cope

with, stress and depression may ensue, especially as the number of stressors increase and one's coping resources become depleted.

Future research could further investigate the questions of causality raised by Dersh et al. (2002) and Fishbain et al. (1997). Although most available evidence supports the diathesis-stress model and that pain is an antecedent of depression, such models need to be examined with an injured worker population. With this being a novel result, the contribution of stress to increasing or reducing risk of depression among those with high pain needs to be further explored. Applied research could also examine the effects of interventions for pain on depression as well as the effects of interventions for stress on the relationship between pain and depression. Such applied research could help to identify causal relationships as well as to reduce injured workers' risks of developing depression.

One such program is the Pain-Disability Prevention Program-Revised (PDP-R; Sullivan et al., 2006). The PDP-R is 10-week, community-based, cognitive-behavioral program developed to reduce depressive symptoms and improve return to work outcomes with individuals with disabling musculoskeletal pain disorders. The program demonstrated a reduction in depressive symptoms from pre-treatment to post-treatment and an improvement in return to work outcomes for those with the lowest rates of post-treatment depression. However, the study did not include a control group, so the reductions in depressive symptoms cannot be specifically attributed to the program.

Severity of Injury

The severity of the work-related injury was not associated with depressive symptoms in the study. As discussed earlier, the severity of the injury has been

inconsistently associated with depression. It may very well be that this finding is an accurate representation of reality and that among injured workers, the severity of the injury has no relationship with depression. This would be supported by claims that perceptions of one's injury are more related to depression than the actual severity of the injury itself (Falvo, 2005). In addition, O'Donnell and colleagues (2003) note that certain characteristics of the injury such as the injury mechanism, the location of the injury, and disfigurement are more related to negative psychological outcomes than the severity of the injury. In addition, research has more consistently identified a relationship between severity of injury and anxiety disorders (e.g., Acute Stress Disorder and Posttraumatic Stress Disorder) than with depressive disorders (O'Donnell et al., 2003). Thus, future research may benefit from examining a broader range of psychological sequelae related to severity of injury (e.g., anxiety disorders in addition to depressive disorders) and characteristics of the injury in addition to its severity.

Alternately, a Type II error may have taken place. Since the study used archival data, the severity of injury variable was unfortunately dichotomous. Using an artificially dichotomous variable (surgical or non-surgical) results in a reduction of the variance that the variable can account for, which reduces power and increases the risk for a Type II error (Cohen & Cohen, 1983). Furthermore, operationalizing the severity of injury based on surgery is somewhat problematic. Hypothetically, in some cases of severe injury, surgery could not be performed because of being too dangerous or invasive (e.g., neurosurgery). On the other hand, surgery could be performed in cases of relatively "minor" injuries (e.g., hernia repair). Given the problem with operationalization, it may

be better to state that in the present study, no relationship was found between receiving surgery and depressive symptoms.

Future research could reexamine the relationship between severity of work injury and depression to determine the veracity of the current results. A standardized, well-operationalized measure of injury severity such as the Abbreviated Injury Scale (American Association for Automotive Medicine, 1980) or the Injury Severity Score (Baker, O'Neil, Haddon, & Long, 1974) could be completed. Furthermore, the injured worker could complete a standardized, well-operationalized, self-report measure to assess perceptions of the injury severity. The relationship between the two measures and depressive symptoms could then be evaluated to determine whether objective and/or subjective measures of injury severity are related to depressive symptoms. Furthermore, to evaluate whether the severity of injury and/or the perception of the severity of injury is related to conditions other than depression, the relationships between the measures and other psychological conditions (i.e., Acute Stress Disorder and Posttraumatic Stress Disorder) should also be explored.

Psychosocial Stress

As previously reviewed, injured workers face a multitude of stressors due to the direct and indirect effects of their injuries. While stress has been connected to depression and other negative psychological outcomes, there has been no prior research on this with injured workers. A positive relationship between psychosocial stress and depression was strongly supported in this sample of injured workers, with the injured workers scoring higher than a control group from a previous study. This relationship was supported by a significant Pearson correlation and several significant multiple linear regression analyses

(with all covariates accounted for and stress being the only predictor, with all covariates, all predictors, and all interactions accounted for in a three-step analysis, and with all covariates, all predictors, and all interactions entered in a stepwise analysis). This finding is consistent with previous research documenting a relationship between high stress and negative psychological outcomes in other populations (Grant et al., 1978; Rahe, 1979). Given the relationship between stress and depression, it is recommended that injured workers' stress levels are routinely measured and that those who have high stress levels are screened for depression.

According to the diathesis-stress model, stress would be considered a catalyst in the development of depression. With the multitude of stressors that injured workers experience, a person with a predisposition towards developing depression who experiences a work-related injury would be at an increased risk for developing depression. Although this theory provides a compelling conceptual rationale, a causal connection between stress and depression was not examined in the present study. Thus, it may be that as depression impairs functioning, stress increases. Additional research is needed to investigate these causal pathways.

If stress is shown to contribute to depression, treatments could be designed to reduce stress to mitigate its impact on depression. For example, since stress is a response to change, those who provide services for injured workers could work to minimize the number of changes the injured worker would have to endure. Also, as reviewed by Livneh and Antonak (1997), problem-focused coping strategies contribute to positive psychosocial outcomes, whereas emotion-focused strategies have been shown to contribute to negative psychosocial outcomes. In addition, Falvo (2005) considers stress

levels to be higher among those who have poor coping abilities, high perceived threat, and inadequate resources. Coping Effectiveness Training (CET; King & Kennedy, 1999), based on Lazarus and Folkman's (1984) model of cognitive therapy, is a brief group-based intervention that helps individuals to increase the use of functional coping strategies, reduce perceptions of threat, increase available resources, and reduce stress. CET has been shown to effectively reduce depressive symptoms with individuals with spinal cord injury (Kennedy, Duff, Evans, & Beedie, 2003; King & Kennedy, 1999), although it has not been used with an injured worker population. Another group-based stress-reduction intervention, based on mindfulness meditation, has been shown to reduce physical and psychological symptoms and to increase functional status and well-being among a heterogeneous patient population (Reibel, Greeson, Brainard, & Rosenzweig, 2001).

Implications for Clinical Practice

Several recommendations are offered for clinicians based on the results from this study. Given the results from the assessment of the BDI-II, the BDI-II is recommended for use without modification to assess depression among injured workers. While no advantage was gained in using the subscales in the present study, some clinicians may favor doing so if they are interested in identifying the client's symptomatology in greater detail. Based on the severity of the scales, interventions could focus on cognitive symptoms, somatic-affective symptoms, or both. A drawback of using the Cognitive and Somatic-Affective scales instead of the Total scale is a slight reduction in reliability (loss of .045 alpha for the Cognitive scale, loss of .05 alpha for the Somatic-Affective scale).

Given their identification in this study as significant predictors of depression, stress, pain, and a preference for Accepting work value should be routinely assessed by clinicians. If an injured worker scores high in any of these predictors, a screening for depression should be conducted. The values of these four predictors can also be entered in the equation derived from the stepwise multiple linear regression analysis, which can be used to predict depression with relatively good accuracy. Cross-validation is recommended prior to using the equation in clinical settings. A depression screening is especially recommended if a high predicted depression score is obtained. Given the high rates of depression found in this study, an ideal would be for all injured workers to be screened routinely for depression and provided treatment as early as possible.

Several treatments for depression among injured workers are promising, yet need to be evaluated for efficacy with injured workers. As previously discussed, CET (King & Kennedy, 1999) has been shown to reduce stress, improve coping, and reduce depression, a mindfulness-based stress-reduction program has demonstrated positive physical and psychological changes (Reibel et al., 2001), and PDP-R (Sullivan et al., 2006) has some evidence in treating pain and depression as well as improving return to work outcomes. With regard to general treatments of depression, interpersonal and cognitive-behavioral psychotherapy (Elkin et al., 1989) and psychopharmacotherapy (Thase & Kupfer, 1996) have empirically-supported efficacy. There is a need for continued methodologically-sound applied research to develop and implement empirically-supported treatments that reduce depressive symptoms among injured workers.

Limitations of the Study and Implications for Future Research

There are several limitations for the present study. One concerns the generalizability of the results. It is unknown whether this sample is similar to injured workers in Oklahoma, injured workers throughout the United States, and injured workers in other countries. Since the study took place in Oklahoma and the individuals are within the jurisdiction of the Oklahoma Workers' Compensation Court, the experiences of the injured workers in this study may differ from injured workers in other states (e.g., more/less income replacement, more/fewer rights, better/worse availability of medical resources). While the sample was ethnically diverse, many Native Americans and few Asian Americans were in the sample. It is likely that there were more Native Americans and fewer Asian Americans in this sample than would be found in nationally representative samples. In addition, the injured workers in this study were receiving a vocational rehabilitation evaluation, which is usually conducted when the injured worker has reached MMI. Since the vocational evaluation may have taken place several months to several years after the injury took place, they may be at a later stage of physical recovery and psychological adjustment in comparison to other injured workers. Furthermore, the equation based on the stepwise multiple linear regression analysis will need to be cross-validated to support its use with other samples of injured workers. To determine the generalizability of the results, replication is needed. Future research could replicate the study with injured workers in other states/jurisdictions, in a nationally representative sample, in other countries, with injured workers at different lengths of time or periods of recovery after their injuries, and with injured workers not receiving vocational rehabilitation.

Another concern about the present study is the accuracy of the participants' responses. Some injured workers have secondary gains that may have resulted in an exaggeration of symptoms. Additional research could include a measurement of symptom-exaggeration to determine the accuracy of their responses. One such measure is the Test of Memory Malingering (TOMM; Tombaugh, 1996). The TOMM is a brief test of recognition memory for 50 pictures of common objects. Individuals with genuine memory impairment perform well on the TOMM, whereas those who are malingering perform poorly on the TOMM.

Several limitations are based on the study using archived data. While most of the data was located, many of the COPES surveys could not be found. Also, other measures could have been better than the ones that were used, and additional variables could have been measured that were not included in the archived data. For example, the Minnesota Importance Questionnaire (Rounds, Henly, Dawis, Lofquist, & Weiss, 1981) may have been a better measure for work values, the Abbreviated Injury Scale (American Association for Automotive Medicine, 1980) or the Injury Severity Score (Baker et al., 1974) may have provided a better measure of the severity of injury, and revised weights on the SRRS life events may have provided a more current and accurate appraisal of stress (Hobson et al., 1998). Furthermore, additional variables such as malingering could have been measured with tests such as the TOMM (Tombaugh, 1996). Future, non-archival research would benefit from selecting standardized, well-operationalized instruments.

Given that the study is correlational, the results do not imply causation, only prediction. While correlational evidence is necessary for causation, it is not sufficient. In

the study, several of the predictors were related to depression. However, it is unknown whether depression is an antecedent or a consequent of the predictors. It could also be possible that a third variable causes the predictor and depression, or that a third variable mediates the relationship between the predictor and depression.

Several suggestions are offered for future research, in addition to those previously stated. While the psychometric properties of the BDI-II were acceptable, additional examination of the reliability and validity could be conducted. For example, tests of content validity (e.g., sensitivity and specificity) and criterion-related validity (e.g., discriminant and convergent validity) of the BDI-II with an injured worker population could be evaluated to further support or dispute its use with injured workers. While a "large" effect size was accounted for in the stepwise multiple linear regression analysis (R^2 =.38, f^2 = .62), the proportion of variance unexplained was greater than the proportion of variance explained (i.e., $1 - R^2 = .62$ compared to R^2 =.38). Other meaningful predictors (e.g., self-efficacy, social support, coping method, perceived health, actual health, malingering) could be identified to increase R^2 and thus improve the accuracy of predicting depression. As already mentioned, it could be determined in future research if the Accepting work value could be better conceptualized as ones' global approach towards problems or other variables such as socioeconomic status. Also, the severity of injury and/or current health condition could be measured using both objective and subjective methods. Since several of the interactions did not persist in omnibus analyses, further replication of such analyses is needed. Future research should also evaluate theoretical models of depression (e.g., biochemical, diathesis-stress, cognitive-appraisal,

and learned helplessness). In any case, future research should utilize well-operationalized, standardized instruments.

In subsequent studies, well-controlled experimental research would be ideal for documenting causation. However, given the ethical quandaries in randomly assigning such conditions as pain and stress, such research is unlikely. Alternate research methods, such as prospective, quasiexperimental, case-control, and treatment effectiveness studies can provide greater insight as to the causal relationships between such predictors and depression than correlational research can offer and also meet ethical standards. Treatment effectiveness studies should be well-controlled (i.e., using one or more control groups, controlling for extraneous variables) and identify the ideal opportunities for intervention. Interventions with documented effectiveness in treating pain, stress, and depression could be tested with injured workers and adapted if needed to fit the specific needs and characteristics of injured workers. Generally speaking, interpersonal and cognitive-behavioral psychotherapies (Elkin et al., 1989) and psychopharmacotherapy (Thase & Kupfer, 1996) have demonstrated efficacy in the treatment of depression. The effectiveness of such interventions in reducing stress and depression could be measured empirically. As previously reviewed, the PDP-R has demonstrated a reduction in depressive symptoms but needs to be compared to a control group to support its effectiveness (Sullivan et al., 2006). Furthermore, a stress-management intervention based on mindfulness meditation has demonstrated positive physical and psychological outcomes with a heterogeneous patient population (Reibel et al., 2001).

Conclusion

As reviewed in the Introduction, work-related injuries or disabilities can result in significant negative consequences to physical, economic, social, and psychological well-being. Given documented increases in MDD post-injury (Dersh et al., 2002), a reduced likelihood of returning to work among those who experience depression (Ash & Goldstein, 1995; Sullivan et al., 2006; Vowles et al., 2004), and a paucity of research in the area, depression was selected as the focus of the present study. In this study, the reliability of the BDI-II was evaluated and several significant predictors of depression were identified. Given that injured workers are an at-risk population totaling millions of individuals, there is a need for continued research on depression among injured workers.

Despite concerns about the use of the BDI-II with medically ill individuals, the instrument demonstrated excellent psychometric properties. Since none of the somatic items (or any items for that matter) were worthy of removal, the concern of confounding was unsupported. The predictors did not relate differentially to the two depression factors and the factors were significantly correlated with each other. In addition, higher reliability was obtained using the total score as opposed to the Cognitive or Somatic-Affective scales. Given the advantage of using the Total score and the lack of a cogent rationale for dividing the instrument into subscales, the Total score is recommended for use when assessing depression among injured workers. Nonetheless, some clinicians and researchers may prefer to use the subscales to identify symptomatology in greater detail. A factor analysis of the BDI-II items resulted in a two-factor solution (i.e., Cognitive and Somatic-Affective), consistent with previous research. Furthermore, the somatic items

factored with the affective items, consistent with previous factor analytic studies of "unhealthy" populations.

Several significant predictors of depression were consistently identified in the present study: pain, psychosocial stress, Accepting work value, and the interaction between pain and stress. In a stepwise multiple linear regression analysis, a "large" effect size (R^2 =.38, f^2 = .62) was accounted for by the four predictors (Cohen, 1988). In addition, an equation was developed based on these predictors, which can be used by clinicians and researchers to predict depression with relatively good accuracy.

Several recommendations are offered for clinicians, treatment providers, and researchers based on the results of this study. The BDI-II is recommended for use, without modification, when assessing depression among injured workers. Given their strengths as predictors of depression, stress, pain, and Accepting work value should be routinely assessed. If an injured worker scores high in any of these predictors, a screening for depression should be conducted. Furthermore, a depression screening is especially recommended if a high predicted depression score is obtained from the equation developed from the multiple linear regression analysis. Given the high rates of depression found in this study, an ideal would be for all injured workers to be screened routinely for depression and provided treatment as early as possible. While there are several treatments that may be effective for reducing depression among injured workers, applied research is needed to support or reject their efficacy with injured workers. Future research should also examine the validity and reliability of the BDI-II scores among injured workers in greater detail, identify new predictors of depression, identify the causal relationships among predictors and depression, use well-operationalized, standardized instruments,

examine theoretical models, control for symptom exaggeration, and develop effective treatments that reduce depression among injured workers.

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Appendix

APPLICATION FOR HUMAN SUBJECTS RESEARCH REVIEW
COLORADO STATE UNIVERSITY
(Please type or electronically fill)

Complete the cover page, review summary, and sections A, B, C & D. For full review protocols, submit the ORIGINAL (with original signatures and copy of proposal/dissertation/thesis) and 13 copies (each with attachments except proposal/dissertation/thesis) to Regulatory Compliance Office (RCO), 321 General Services Building, Campus Delivery 2011. Assistance is available on the RCO web site at http://www.research.colostate.edu/rcoweb

H-100 COVER SHEET Part A

Project Title (identical to proposal or thesis/dissertation): **DEPRESSION AMONG INJURED WORKERS: SYMPTOMATOLOGY, PREDICTORS, AND MEASUREMENT RELIABILITY**
OR
Grant Title if different from Project Title:

Contact Information

Principal Investigator (PI):

Name: **Bryan Dik**	Department: **Psychology**
Campus Mailing Address & Mail Code: **Department of Psychology**	Phone #: **970-491-3235**
E-Mail Address: **bryandik@lamar.colostate.edu**	

Co-Investigator (attach information if more than one Co-PI):

Name: **Bryan Stice**	Department: **Psychology**
Campus Mailing Address & Mail Code: **Department of Psychology**	Phone #: **970-231-6600**
E-Mail Address: **bstice@lamar.colostate.edu**	

Funding Source:	**PASS #:**
Proposed Start Date (may not precede approval date): OR ☒ "Upon HRC approval"	**If Co-PI is a student, is this project for a:** ☐ **thesis** ☒ **dissertation** ☐ **other**
I think this qualifies for the following type of review: ☒ Exempt Category number 4b **(submit original)** ☐ Expedite Category number **(submit original & one copy)** ☐ Full Review **(submit original & 13 copies)**	**New Protocol** YES ☒ NO ☐ **Resubmission** YES ☐ NO ☒ **Follow-up to 118 request** YES ☐ NO ☒

As the PI submitting this proposed research and signing below, I agree to conduct the research involving human subjects as presented in the protocol or modifications to it and as approved by the Department and the Human Research Committee; to obtain and document informed consent and provide a copy of the consent form to each subject unless this is waived by the HRC; to present any proposed modifications in the research to the HRC for review and approval prior to implementation; to retain records for the mandated lengths of time; and to report to the HRC any problems or injuries to subjects.

PI Signature: _____ Date: _____

My signature below confirms that I have read this protocol and approve of this research.

Department Chair/Head ☐ or ☐ Acting Signature

Signature: _____ Date: _____
(If PI is Department Head, please have alternate/designee sign)

PART B. RESEARCH PROJECT REVIEW SUMMARY Your completion of the following checklist will facilitate the review process.

1. **SUBJECT POPULATION:** (Check all appropriate boxes.)
   - ☐ Healthy adults
   - ☐ Institutional residents
   - ☐ Elderly
   - ☐ Prisoners or parolees
   - ☐ Children or minors (<18)
   - ☐ Cognitively or psychologically impaired
   - ☐ Pregnant women or fetuses
   - ☐ Non-English speaking

2. **IF THE RESEARCH INVOLVES ANY OF THE FOLLOWING, CHECK THE APPROPRIATE BOXES:**
   - ☐ Interview
   - ☐ Clinical studies
   - ☐ Investigational drugs
   - ☐ Deception
   - ☒ Study of existing data
   - ☐ Study of human biological specimens
   - ☐ Venipuncture
   - ☐ PI or Co-PI is the treating physician
   - ☐ Survey/questionnaire
   - ☐ Behavioral observation
   - ☐ Investigational devices
   - ☐ Waiver of consent
   - ☐ Controlled substances
   - ☐ Microorganisms or recombinant DNA
   - ☐ Genetic research

3. **LOCATION(S) OF RESEARCH TO BE CONDUCTED AT:**
   - ☐ CSU campus
   - ☒ Other locations, specify: **on company site/off-campus**

4. **INFORMED CONSENT OF SUBJECTS: Your study protocol must clearly address <u>one</u> of the following areas: (justification for #2 & #3 must be included in your application) Discuss details in purpose section, (question If).**

   ☐ **DOCUMENTED INFORMED CONSENT**: Signed informed consent is the default. A model consent is available on the HRC website and should be used as a basis for developing your informed consent document. **If applicable, the proposed consent must be submitted with the study protocol. <u>http://www.research.colostate.edu/rcoweb/hr/hr_forms.htm</u>**

   ☐ **COVER LETTER**: You may request a waiver of documented informed consent under the following conditions: (1) *That the only recording linking the subject and the research would be the consent document and the principle risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern*; **(45CFR46.117c1)**, ***<u>OR</u>*** (2)*That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.* **(45CFR46117c2)**.

   It is the responsibility of the investigator to: a) provide clear justification for how a project meets the criteria for waiver of documented informed consent under one of the two previous categories, and b) provide what will be used to inform the subjects about research activities. It may be a telephone or verbal script, a cover letter, or some other means.

The cover letter needs to be sent to the subjects and to the HRC on CSU departmental letterhead.

☒ **NO INFORMED CONSENT**: You may request a waiver of informed consent under the following conditions: *(1) The research involves no more than minimal risk to the subjects; (2) the waiver or alteration will not adversely affect the rights and welfare of the subjects; (3) the research could not practicably be carried out without the waiver or alteration; and (4) when appropriate, the subjects will be provided with additional pertinent information after participation* (**45CFR46.116d**).

It is the responsibility of the investigator to: a) explain how a project meets all four of the criteria for waiver of informed consent and b) where applicable, provide an alternate form of sharing study information with prospective subjects (i.e., a public service announcement, or a modified version of a consent to be used in research that by design requires deception – this type of research requires an accompanying debriefing form that completes the informed consent process).

PART C. RESEARCH PROTOCOL:

I. PURPOSE, METHODS, AND PROCEDURES: Describe the following:

a. Purpose (will be used in assessing the risk/benefit ratio for subjects. The hypothesis to be tested may be listed.) **The purposes of the study are: (1) to better understand the factors that underlie depressive symptomatology of injured workers, (2) to improve the measurement of depression among injured workers, and (3) to better understand the relationships between secondary consequences of work-related injury (i.e., pain, physical illness, adjustment-related stress, vocational losses) and depression.**

b. Research methods and procedures of the study. (It is OK to diagram complex designs. Please include information on the time commitment required for each activity.) **Archived data will be collected from a vocational rehabilitation company.**

c. Variables to be studied (what is being measured or examined). **age, gender, depression, pain, severity of work-related injury, stress, work values, length of time away from work, history of pre-injury psychological treatment (yes or no), income, education, and job skill level**

d. Describe equipment used with subjects, if any. **none used**

e. How will subject confidentiality or anonymity be maintained? If a linked list is used, list when it will be destroyed. Provide a sample of the code that will be used. **While records are reviewed, subject names will be kept confidential by collecting and entering data on-site. Each subject will be designated with a number from 1–250 to establish anonymity and assit with data entry. The linking list will be kept at the site to retain confidentiality and will be destroyed when data entry is complete. Data will be anonymous**

when the linking list is destroyed. (Sample code: 1=John Smith, 2=Bob Johnson, etc)

f. Describe the consent process and method of consent to be used. (*signed consent, cover letter, other)* **No consent will be obtained since the study will be using archived data.**

g. How will research records be maintained during and upon completion of the project? (This may include audio or videotapes). Indicate when the records and/or tapes will be destroyed. ***Federal Regulations require that study data and consent documents be kept for a minimum of 3 years after the completion of the study by the PI; for longitudinal projects, a longer period may be needed.***

Paper records to be reviewed are the property of the company and will remain their property upon completion of the project. The anonymous data file will be given to the company upon completion of the study.

h. Address how you will monitor this study to ensure that the study is being conducted according to the protocol. **The Co-PI will personally monitor the data collection on-site and ensure the anonymity of the data file when taken off-site.**

i. Is a Data Safety Monitoring Board required to conduct such monitoring?
YES ☐ NO ☒
If yes, the HRC may request copies of the reports.

II. SUBJECT SELECTION: Indicate the following (this section must also be completed for secondary data analysis):

a. How will subjects be recruited and where will the recruitment take place? (submit recruitment material) **subjects are not recruited since the study is archival**

b. If secondary data analysis is being conducted, please describe the original consent procedures.

c. What are the characteristics of the subject population? (age, gender, student, disease conditions, behavioral abnormalities; affiliations or memberships) **adult men and women who have experienced an on-the-job injury and are in the process of a vocational rehabilitation evaluation**

d. How many subjects do you plan to study? **250**

e. Address the inclusion and exclusion criteria. Federal regulations consider minors, pregnant women and prisoners vulnerable populations that require added protection. When vulnerable populations are involved, describe why they are necessary. Excluding any group, i.e., minors, elderly, gender, ethnic minorities, must be clearly justified and inconvenience can't be the reason. **For example, if minors are in a classroom where recruitment will take place, parental permission must be obtained or justification must be made to exclude the minors.** 250 subjects who have data on the variables to be studied will be included. Those who do not have data on the variables to be studied will be excluded

f. Will subjects be compensated for participation? If so, please describe the proposed compensation. **no**

g. Criteria for excluding participants involuntarily (such as "failed to keep food diary as required") **none**

h. Letters of agreement/approval from the organizations that will be recruiting subjects for the project will be needed. Such letters need to be initiated by the organization, on organization letterhead, and signed by a person authorized to do so. The letters need to include statements a) that the organization is familiar with the scope of the project, b) that it is satisfied the individuals it is involving are adequately protected as human research subjects, c) that the subjects' participation is completely voluntary, and d) identify what the organization's involvement will entail.

III. RISKS AND DISCOMFORTS:

a. Describe any potential risks to subjects and assess the likelihood and seriousness of those risks. **(If there are no known risks, state as such, but do NOT respond "NA".)** These could include: physical, psychological trauma or stress, legal, social, economic, loss of confidentiality. **There are no known potential risks to subjects other than the review of their records during data collection.**

b. Please describe the proposed methods to minimize the risks and discomforts associated with the research. For example, document how potential psychological distress will be addressed, by whom, and with what credentials (provide letter of agreement from counselor explaining their role – this must be someone other than the researchers on the project) Specify what factors will lead to stopping procedures causing physical or emotional stress. **Risks to subjects will be minimized by maintaining subject confidentiality (see IIId).**

c. If the methods of research create potential risks, describe other methods, if any, that were considered and why they will not be used. **no other methods considered**

d. Address procedures for maintaining confidentiality if a breach of confidentiality represents a risk. **Records will be reviewed on-site, the linking list will remain on-site and destroyed after data is coded, and the only data to be taken off-site will be anonymously coded and have no identifying information.**

IV. ADVERSE EVENTS: Explain your reporting mechanism for reporting adverse and serious adverse events to the HRC. (Even if no adverse event is anticipated, a plan should be in place. Generally, an accepted procedure is for the PI to notify the HRC through the RCO as soon as communication is available and reporting the event.) **The PI will notify HRC through the RCO as soon as communication is available and report the event.**

V. BENEFITS: Describe the anticipated benefits of the research to the individual subjects, to the particular group or class from which the subject population is drawn. The benefits must be realistic and not overly stated of what each person is likely to gain from the research. If there is no direct benefit to the subject, state so. For example: "There is no known benefit in participating in this study, but we hope you will gain more knowledge on..." Compensation, payment for participation, gifts, etc., are NOT benefits. **There is no known benefit to the individual subjects. However, the class of injured workers**

may benefit from having their levels of depression measured more reliably, and with improved measurement they can receive earlier and more effective intervention.

VI. Other matters pertinent to the human participant. **none**

Part D. SPECIAL REQUIREMENTS/ATTACHMENTS CHECKLIST: For the items below, check where applicable and include with your protocol submission. Items marked "required" must accompany an HRC protocol application or the project can not be approved.

Research Proposal Materials

☐ **Grant proposal** (if this is a funded project, this is required)
☒ **Thesis/dissertation methods** (if the project is a thesis or dissertation, this is required)
☐ **CV** (If this is a first time submission as PI, this is required. A current copy of the curriculum vitae of the PI must be on file in the Administrator's office. If the PI has submitted a vitae since July 1 of the current year, the PI does not need to include it with this application).

Research Instruments/Tools

☐ **Informed Consent**, or
☐ **Cover letter** (with justification for waiver), or
☐ **Justification for waiving informed consent**
☐ **Interviews** (phone or in person) - attach script if applicable and questions to be asked.
☐ **Surveys/questionnaires** - attach surveys and questionnaires if applicable. Provide permission use for instruments (whether copyrighted or public domain)
☐ **Focus Groups: attach introductory script to the group and sample questions. (describe in consent form what a focus group is)**
☐ **Recruitment materials**: Advertisements, press releases, in-class announcements, posted flyers, e-mail announcements, phone script, or other forms of recruitment.
☐ **Debriefing Materials**

Research Collaboration/Support Materials

☐ **IRB approval** from other institutions involved in research (collaborating university, hospital, etc.)
☐ **Letters of cooperation** from participating sites that do not have an IRB.
☒ **Letters of agreement** (i.e., from a site that is allowing you access, but is not directly involved in research, or a colleague allowing you to recruit from a class, a clinic or business allowing recruitment, etc.)
☐ **Letter of collaboration** from a counselor if needed.

Secondary Data Analysis (for research involving secondary data analysis, include original IRB approval and informed consent)

☐ IRB approval from collaborating organization
☐ Consent form from original data analysis

Colorado State University

Office of Regulatory Compliance
Office of Vice President for Research
Fort Collins, CO 80523-2011
(970) 491-1553
FAX: (970) 491-2293

COPY

Notice of Approval for Human Research

Principal Investigator: Bryan Dik, Psy, 1876
Co-Principal Investigator: Bryan Stice, Psy, 1876
Title: Depression Among Injured Workers: Symptomatology, Predictors, and Measurement Reliability
Protocol #: 06-311H **Funding Source:** N/A
Number of Participants/Records: 250
Committee Action: **Approval Date:** December 29, 2006 **Expires:** December 29, 2007
HRC Administrator: Janell Meldrem Janell Meldrem

Consent Process:
Because of the nature of this research, it will not be necessary to obtain a signed consent form. Consent is waived under § _ _.116 (d).

Investigator Responsibilities:

- It is the responsibility of the PI to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research.
- It is also the PI's responsibility to notify the Committee of any changes in experimental design, participant population, consent procedures or documents. This can be done with a memo describing the changes and submitting any altered documents.
- Students serving as Co-Principal Investigators must obtain PI approval for any changes prior to submitting the proposed changes to the HRC for review and approval.
- The PI is ultimately responsible for the conduct of the project.
- A status report of this project will be required within a 12-month period from the date of review. Renewal is the PI's responsibility, but as a courtesy, a reminder will be sent approximately two months before the protocol expires. The PI will be asked to report on the numbers of subjects who have participated this year and project-to-date, problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary continuation form (H-101) is available from the RCO web page www.research.colostate.edu/rcoweb/.
- Upon completion of the project, an H-101 should be submitted as a close-out report.
- If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice. This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647.
- **Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.**

Please direct any questions about the Committee's action on this project to me for routing to the Committee. Additional information is available from the Regulatory Compliance web site at http://www.research.colostate.edu/rcoweb/.

Date of Correspondence: January 8, 2007

Table 1

Descriptive and Reliability Statistics of BDI-II Items

			Reliability	
Item	*M*	*SD*	r_{pb}	α
Sadness	0.86	.822	.679	.922
Pessimism	1.09	.791	.670	.922
Past Failure	0.83	.983	.642	.922
Loss of Pleasure	1.37	.870	.607	.923
Guilty Feelings	0.68	.835	.597	.923
Punishment Feelings	0.74	1.147	.474	.927
Self-Dislike	1.05	.845	.580	.923
Self-Criticalness	1.00	.947	.640	.922
Suicidal Thoughts or Wishes	0.24	.472	.543	.925
Crying	1.05	1.035	.524	.925
Agitation	1.16	.881	.435	.926
Loss of Interest	1.24	1.141	.635	.923
Indecisiveness	0.98	.971	.732	.920
Worthlessness	0.89	.919	.751	.920
Loss of Energy	1.46	.747	.645	.922
Changes in Sleeping Pattern	1.76	.721	.502	.925
Irritability	1.30	.890	.682	.921
Changes in Appetite	1.23	.866	.476	.925
Concentration Difficulty	1.18	.820	.641	.922
Tiredness or Fatigue	1.50	.928	.575	.923
Loss of Interest in Sex	1.18	1.024	.522	.925

Note. r_{pb} = item-total point-biserial correlation. α = alpha-if-item removed statistic.

Table 2

Descriptive Statistics of COPES Scales

	Non-transformed				Square-root Transformed			
COPES Scale	*M*	*SD*	Skew	Kurtosis	*M*	*SD*	Skew	Kurtosis
Accepting vs. Investigative	8.02	4.39	.038	-.836	2.89	.804	-.500	-.487
Carefree vs. Practical	12.16	2.84	-1.17	1.59	-1.80	.771	.125	.258
Conformity vs. Independence	6.56	3.88	.535	-.434	2.65	.720	.017	-.678
Supportive vs. Leadership	6.70	4.75	.046	-1.38	2.60	.957	-.322	-1.249
Flexibility vs. Orderliness	10.50	3.52	-.718	.118	-2.45	.700	-.060	-.385
Privacy vs. Recognition	4.03	3.65	.846	-.018	2.10	.815	.284	-.936
Realistic vs. Aesthetic	4.44	3.58	.760	.193	2.20	.786	.108	-.801
Reserved vs. Social	6.80	4.03	.147	-.931	2.68	.782	-.351	-.740

Note. Under the COPES Scale column, the first work value (before the vs.) represents lower scores (i.e., closer to 0), whereas the latter work value represents higher scores (closer to 16). For example, on the Accepting vs. Investigative scale, Accepting represents lower scores on the scale and Investigative represents higher scores.

Table 3

Predicted and Obtained Eigenvalues from BDI-II Principal-Axis Factor Analysis

		Obtained Initial Eigenvalues		
Factor	Predicted Eigenvalues	Total	% of Variance	Cumulative %
1	1.55072100	8.855	42.167	42.167
2	1.45175303	1.476	7.029	49.196
3	1.37758534	1.060	5.049	54.245
4	1.31584049	.938	4.468	58.713
5	1.25538075	.797	3.797	62.510
6	1.20310001	.768	3.657	66.167
7	1.15321730	.746	3.552	69.719
8	1.10666540	.700	3.334	73.053
9	1.06192752	.677	3.222	76.275
10	1.01776702	.637	3.031	79.307
11	.97635985	.587	2.794	82.100
12	.93573564	.498	2.374	84.474
13	.89574808	.477	2.270	86.744
14	.85518666	.442	2.107	88.851
15	.81539498	.436	2.078	90.929
16	.77616388	.408	1.941	92.871
17	.73726568	.356	1.695	94.566
18	.69650191	.337	1.606	96.172
19	.65472032	.285	1.357	97.529
20	.60921074	.278	1.325	98.854
21	.55375440	.241	1.146	100.000

Note. Predicted values from parallel analysis. Eigenvalues obtained from principal-axis factor analysis with promax rotation using Kaiser normalization.

Table 4

Structure Matrix from Principal-Axis Factor Analysis of the BDI-II Items

	Factor	
Item	1	2
Sadness	**.789**	.655
Pessimism	**.737**	.494
Past Failure	**.725**	.591
Loss of Pleasure	**.712**	.578
Guilty Feelings	**.695**	.521
Punishment Feelings	**.671**	.467
Self-Dislike	**.628**	.479
Self-Criticalness	**.595**	.445
Suicidal Thoughts or Wishes	**.557**	.350
Crying	**.526**	.482
Agitation	**.519**	.477
Loss of Interest	.531	**.759**
Indecisiveness	.692	**.738**
Worthlessness	.453	**.728**
Loss of Energy	.552	**.723**
Changes in Sleeping Pattern	.637	**.692**
Irritability	.579	**.667**
Changes in Appetite	.568	**.616**
Concentration Difficulty	.412	**.575**
Tiredness or Fatigue	.389	**.547**
Loss of Interest in Sex	.411	**.418**

Note. Extraction method: principal-axis factoring. Rotation method: promax with Kaiser normalization. Factorial correlation: $r = .738$.

Table 5

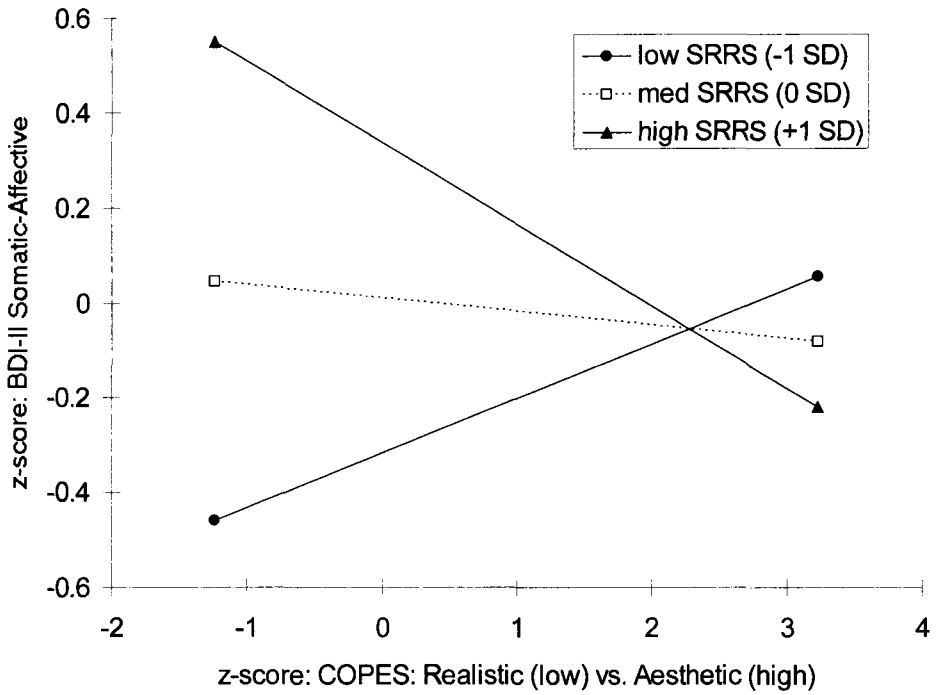
Correlation and Beta Coefficients Between the COPES and BDI-II Scale Scores

	BDI-II Total		BDI-II Cognitive		BDI-II Somatic-Affective	
COPES Scale	*r*	*B*/β	*r*	*B*/β	*r*	*B*/β
Accepting vs. Investigative	-.259**	-.272**	-.189**	-.205**	-.301**	-.307**
Carefree vs. Practical	-.153*	-.120	.098	-.070	-.193**	-.158*
Conformity vs. Independence	-.001	-.042	-.009	-.048	.008	-.028
Supportive vs. Leadership	-.179**	-.167*	-.176**	-.176*	-.158*	-.135*
Flexibility vs. Orderliness	-.081	-.060	-.081	-.069	-.070	-.043
Privacy vs. Recognition	-.145*	-.123	-.136	-.122	-.135	-.106
Realistic vs. Aesthetic	-.045	-.057	-.070	-.079	-.011	-.026
Reserved vs. Social	-.113	-.108	-.083	-.084	-.131	-.119

Note. All values were obtained from computations using *z* transformed COPES and BDI-II scales' scores. Under the COPES Scale column, the first work value (before the vs.) represents lower scores (i.e., closer to 0), whereas the latter work value represents higher scores (closer to 16). *B*s and βs were obtained from regression analyses with each COPES scale entered separately as the predictor, with income, gender, age, race, level of education, prior psychological treatment, SVP, and length of time away from work entered as covariates. Also, *B*s and βs are the same since standardized scales were used. ** $p < .01$. * $p < .05$.

Figure 1

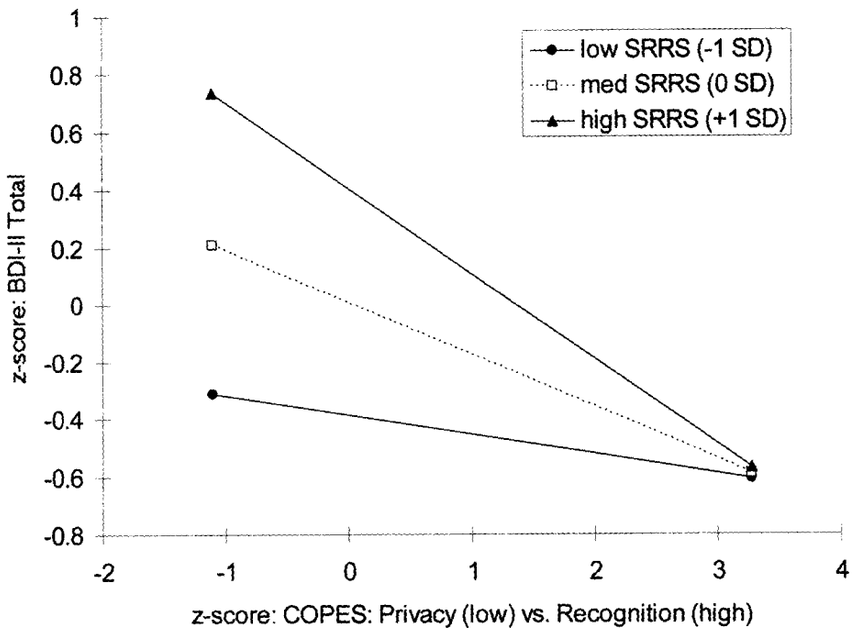
The Relationship Between the COPES Realistic vs. Aesthetic Scale and the BDI-II Somatic-Affective Factor, Moderated by the SRRS



Note. All variables used in this figure received *z* transformations.

Figure 2

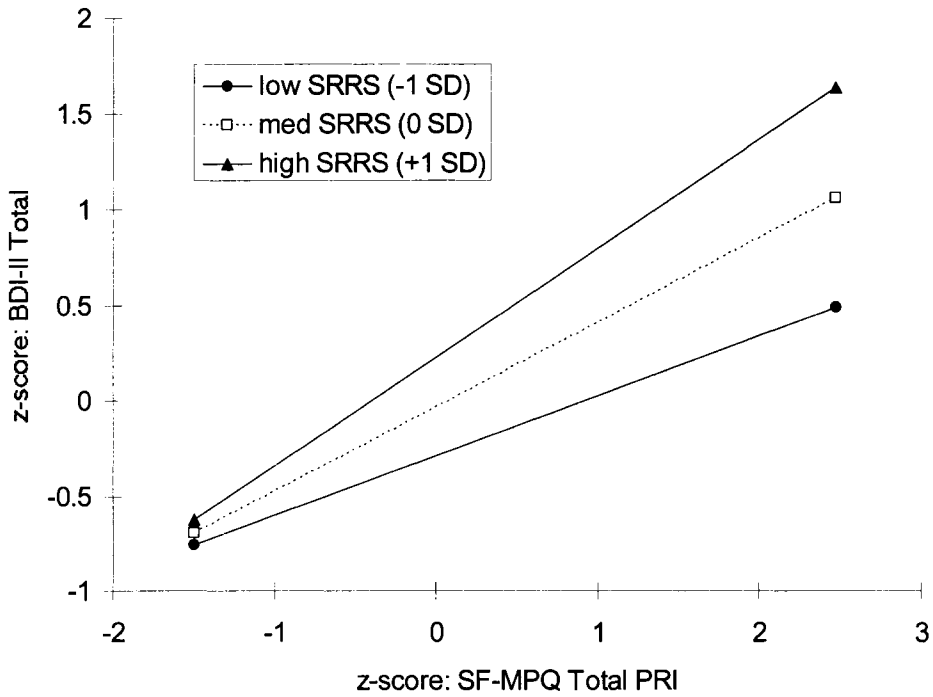
The Relationship Between the COPES Privacy vs. Recognition Scale and the BDI-II Total Scale, Moderated by the SRRS



Note. All variables used in this figure received *z* transformations.

Figure 3

The Relationship Between the SF-MPQ Scale and the BDI-II Total Scale, Moderated by the SRRS



Note. All variables used in this figure received *z* transformations.