THE EFFECTS OF PERCEIVED LOCUS OF CONTROL AND DISPOSITIONAL OPTIMISM

ON CHRONIC PAIN TREATMENT OUTCOMES

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The financial cost for health care and lost productivity due to chronic pain has been estimated at over $70 billion per year. Researchers have attempted to discover the psychosocial and personality factors that discriminate between people who learn to cope well with chronic pain and those who have difficulty adjusting. The purpose of the present study was to examine the effects of perceived locus of control and dispositional optimism on chronic pain treatment outcomes. Subjects reported significantly lower post-treatment pain levels as compared with pre-treatment levels ($M = 0.66$, $SD = 1.58$), $t(45) = 2.85$, $p = .007$ (two-tailed), but decreased pain was not associated with scores on the internality dimension of the Pain Locus of Control Scale (PLOC) or on the Life Orientation Test-Revised (LOT-R) (a measure of dispositional optimism). Overall, participants' increased coping ability was associated with scores on the LOT-R, but not with scores on the internality dimension of the PLOC. Subjects with the lowest pre-treatment scores on the LOT-R demonstrated significantly greater increases in post-treatment coping ability than those with the highest scores ($F(2,40) = 3.93$, $p < .03$). Participants with the highest pre-treatment scores on both the PLOC internality dimension <u>and</u> the LOT-R demonstrated greater post-treatment coping ability ($F(2,32) = 4.65$, $p < .02$), but not less post-treatment pain than other subjects. Participants' post-treatment LOT-R scores were significantly higher than their pre-treatment scores ($M = 2.09$, $SD = 3.96$), $t(46) = 3.61$, $p = .001$ (two-tailed), but post-treatment PLOC internality scores were not significantly higher than pre-treatment scores. Implications of these results are discussed.

ACKNOWLEDGEMENTS

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CHRONIC PAIN AS A HEALTH CARE PROBLEM

Approximately 70 million Americans suffer from some type of clinically significant acute or chronic pain annually, and 10% of the population reports pain at least 100 days per year (Gatchel & Weisberg, 2000). Perhaps as many as 80% of physician visits are prompted by pain, and the financial cost for health care and lost productivity due to chronic pain has been estimated at over $70 billion per year (Gatchel & Turk, 1996). Eisenberg (1993) estimates that $47 billion is expended annually for chronic back pain <u>alone</u>. According to Gevirtz, Hubbard, and Harpin (1996), 80% of Americans will suffer back pain at some point in their lives, and approximately 18% will develop chronic low back pain. Chronic back pain is one of the most expensive health problems in industrialized nations, and is the leading cause of disability in people under age 45 (Garofalo & Polatin, 1999). Following an initial episode of low back pain, relapses are reported in 30% - 70% of patients sampled (Garg & Moore, 1992; Garofalo & Polatin, 1999).

According to the International Association for the Study of Pain, pain is defined as chronic when it persists for more than three months. Miller (1993) outlines the typical course of chronic pain. An accident or injury causes acute pain. Conventional biomedical treatment (e.g., surgery, nerve blocks, narcotic medication, microcurrentelectrotherapy such as TENS and ENS) is inadequate, and the pain becomes chronic. The pain begins to affect work and leisure activities, appetite and sleep are disturbed, and narcotic medication, though inadequate, may become habit-forming. New biomedical treatments are anticipated with hope, but, when each proves unsuccessful, it leads to greater depression and despair in addition to the physical pain. Chronic pain sufferers eventually withdraw from family and friends, and the pain becomes the center of their lives. Avoidance of activity and socializing causes greater incapacitation and decline, which eventually may lead to invalidism.

PSYCHOSOCIAL/PERSONALITY FACTORS IN CHRONIC PAIN DEVELOPMENT

Most low back cases and other chronic pain conditions (e.g., fibromyalgia, migraine headache pain) are physically unverifiable, and may be classified as "soft-tissue injuries" that are not validated through conventional radiography, magnetic resonance imaging, or physical examination. In fact, chronic pain is a subjective experience affected by psychosocial and personality factors, and it demonstrates a highly variable and, at best, modest association with tissue damage, physiological abnormalities (e.g., spinal imperfections), and overt pain behavior such as limping (Bishop, 1994; Gatchel & Turk, 1996, 1999). The longer pain persists, the greater the role of psychosocial and personality factors (e.g., depression, poor coping skills, unemployment, financial problems) in its maintenance (Gatchel & Turk, 1996, 1999; Grant & Haverkamp, 1995; Weiser & Cedaraschi, 1992). Some researchers have posited that perhaps 50% of the disability in someone reporting chronic back pain is attributable to psychosocial and personality factors, with the other 50% attributable to physical pathology (Gatchel, 1996; Maruta et al., 1997; Waddell, Main, Morris, DiPaola, & Gray, 1984). This explains why biomedical interventions (e.g., surgery, nerve blocks, narcotic medication, micro-current electrotherapy such as TENS and ENS) alone often are unable to alleviate chronic pain. The more widely distributed pain is in the body and the longer it persists, the less likely a biomedical intervention alone will succeed.

For at least the past 50 years, investigators have been searching for psychosocial and personality factors that predict the characteristics of persons most likely to develop chronic pain (Gatchel & Epker, 1999). Early efforts often used psychological instruments (e.g., the Minnesota Multiphasic Personality Inventory™, http://www.pearsonassessments.com) in an attempt to identify attributes of a "pain personality." For example, in the field of psychosomatic medicine,

rooted in psychodynamic psychology, researchers have attempted to determine personality characteristics associated with a general "pain-prone personality," and with specific disorders (e.g., "migraine headache personality"). Overall, these attempts have generated little empirical support (Gatchel & Epker, 1999; Pincus, Callahan, Bradley, Vaughn, & Wolfe, 1986), given that people who do not report pain often exhibit the same personality attributes as people who do, and physiological abnormalities that potentially cause pain (e.g., a bulging disk) are discovered in persons who do not report pain. Moreover, although chronic pain often is associated with psychological problems such as depression, the nature of the relationship and factors that mediate the relationship remain uncertain (Turk & Rudy, 1988).

No two people have identical experiences, and an irreducible difference exists between one's experience of the world and the actual state of the world. People create a mental representation or model of the world, and this representation largely determines their perception and experience of the world (Bandler & Grinder, 1975). Therefore, although no research consistently indicates a relationship between specific personality types and chronic pain development, people clearly develop unique patterns of perceiving and coping with pain, depending on their experiences (Gatchel & Weisberg, 2000).

In general, current hypotheses propose that persons' unique premorbid personalities and psychological characteristics, and socioeconomic/ environmental conditions interact with the stress of attempting to cope with chronic pain, producing variable patient outcomes (Gatchel & Epker, 1999; Gatchel, Polatin, & Mayer, 1995; Gatchel & Weisberg, 2000). For example, people with pre-existing depression, who then develop chronic pain and have economic problems due to disability and job loss, are more likely to experience an exacerbation of depressive symptoms (Gatchel & Epker, 1999; Gatchel & Weisberg, 2000).

Although persistent pain causes physical and emotional dysfunction for many people, some individuals appear to adapt relatively well. Researchers have attempted to discover the factors that could discriminate between people who learn to cope well with chronic pain and those who have difficulty adjusting (Cheng & Leung, 2000; Fisher & Johnston, 1998; Gibson & Helme, 2000). Persons with maladaptive coping patterns have greater problems adjusting to chronic pain. Strategies of cognitively appraising stressors are associated with preferred coping styles (Lazarus & Folkman, 1984), and identifying these appraisal strategies and coping styles has been helpful in understanding differences in adjustment to chronic pain (Seville & Robinson, 2000).

Behavioral medicine interventions for chronic pain seek to change the cognitive appraisal of pain and to improve coping skills. Although these treatments are effective for many people, not all patients benefit. Consequently, research continues to examine a variety of cognitive factors that influence pain perception in an effort to determine what will predict treatment success (Cheng & Leung, 2000; Conant, 1998; Fisher & Johnston, 1998; Gibson & Helme, 2000; Melding, 1995; Toomey, Mann, Abashian, & Thompson-Pope, 1991). These factors include the personal meaning of pain, coping skills, cultural norms, and the amount of control people believe they have over pain (Seville & Robinson, 2000).

Rotter (1966, as cited in Seville & Robinson, 2000) derived the theoretical construct of locus of control (LOC) to better explain individual differences in learning. Originally, LOC was measured using a one-dimensional, forced-choice, self-report test with twenty-nine items. A person's score represented the number of choices indicating "external" control (Bishop, 1994; Rotter, 1966, as cited in Seville & Robinson, 2000). Thus, low scores indicate the belief that one has control over events in his/her life (i.e., internal locus of control), whereas high scores indicate the belief that circumstances are the result of external influences such as the actions of other people or luck (i.e., external locus of control) (Rotter, 1975; Seville & Robinson, 2000). Rotter posited that persons with an internal LOC are more adaptable than persons with an external LOC. For example, people with a strong internal LOC probably are more aware of environmental information that provides feedback for future behavior, and take steps to improve their environmental circumstances (Rotter, 1975). These characteristics are important for success in chronic pain treatment, because patients must learn more effective ways of coping, including pain management skills (Crisson & Keefe, 1988; Hudzinski & Levenson, 1985; Toomey et al., 1991; Scharff, Turk, & Marcus, 1995).

Levenson (1974, as cited in Seville & Robinson, 2000) transformed the internal-external scale developed by Rotter into a multidimensional instrument with three independent scales that assess general beliefs about control over one's circumstances. The three independent scales are: (a) internality - the belief that one's actions control his/her circumstances; (b) powerful others - the belief that actions of other people, such as a boss, control one's circumstances; (c) chance - the belief that fate or luck controls one's circumstances. Wallston, Wallston, Kaplan, and Maides (1976) later revised Levenson's instrument and developed the Multidimensional Health Locus of

Control Scale (MHLC) that specifically assesses beliefs about health using the same three

independent scales devised by Levenson (1974, as cited in Seville & Robinson, 2000).

Wallston et al. (1976) proposed that the MHLC would have greater utility for researching

and understanding health beliefs than the previous general scales. Persons whose scores on the

MHLC reveal an external LOC believe that they don't have much control over their health, and

they endorse items on the chance and powerful others scales. People whose scores demonstrate

an internal LOC believe that their own actions significantly influence their health, and they tend

to endorse more items on the internality scale (Seville & Robinson, 2000; Wallston et al., 1976).

Despite some inconclusive research, people with a strong internal LOC are thought to enjoy

better long-term health than those with an external LOC (Seville & Robinson, 2000; Sobel,

1995).

A significant body of research has sought to determine the relationship between LOC and

adaptation to chronic pain (Cheng & Leung, 2000; Conant, 1998; Fisher & Johnston, 1998; Flor

& Turk, 1988; Gatchel & Epker, 1999; Gibson & Helme, 2000; Jensen & Karoly, 1992; Klapow

et al., 1995; Melding, 1995; Seville & Robinson, 2000; Sobel, 1995; Toomey et al., 1991).

Although many chronic pain investigations have utilized the MHLC to assess LOC, there are

studies that have used instruments specifically designed to assess pain beliefs, such as the Pain

Locus of Control scale (PLOC). Toomey et al. (1991) developed the PLOC by adapting the

MHLC to measure pain beliefs rather than general health beliefs.

Additional instruments have been created to assess LOC in pain populations as

investigators continue revising, adapting, and improving prior measures (Martin, Holroyd, &

Penzien, 1990; Ter Kuile, Linssen, & Spinhoven, 1993). However, despite many questionnaires,

no widely accepted standard instrument exists for measuring LOC in populations with either

generalized chronic pain or with various subtypes of chronic pain (e.g., arthritis, back, or headache pain).

Pain researchers posit that people with a strong internal LOC believe that they have control over their pain and, consequently, adapt and manage pain better than those with an external LOC (Cheng & Leung, 2000; Conant, 1998; Fisher & Johnston, 1998; Flor & Turk, 1988; Gatchel & Epker, 1999; Gibson & Helme, 2000; Jensen & Karoly, 1992; Klapow et al., 1995; Melding, 1995; Seville & Robinson, 2000; Sobel, 1995; Toomey et al., 1991). Individuals with an internal LOC are thought to possess more effective coping skills (Melding, 1995; Seville & Robinson, 2000), may be less stressed by pain (Melzack, 1999), and report less functional impairment (Flor & Turk, 1988), less pain intensity (Conant, 1998; Fisher & Johnston, 1998), and less depression (Gibson & Helme, 2000) than persons with an external LOC.

Nevertheless, research findings have not always confirmed these hypotheses. Investigators acknowledge that several factors can interact with and influence the perception of control, including gender, culture, and coping style. Additional study of gender and cultural effects on perceived LOC is crucial, because findings could enhance pain treatment effectiveness and help clinicians understand how to modify interventions to make them more personally relevant (Bates & Rankin-Hill, 1994; Seville & Robinson, 2000). This seems especially important as the U.S. population and, hence, pain treatment populations become increasingly diverse (Worsham & Ziegler, 2002). For example, because Latinos are disproportionately represented in occupations involving hard physical labor, they are at risk for job injuries requiring subsequent pain treatment.

Although much of the chronic pain literature indicates only a weak or moderate relationship between an internal LOC and decreased pain and psychological distress, there

appears to be a relatively robust relationship between pain and an external LOC that includes a high score on the chance scale (Seville & Robinson, 2000). Persons who believe that the prognosis for their pain is influenced mainly by luck or fate are inclined to engage in maladaptive coping strategies such as wishful thinking or catastrophizing (Crisson & Keefe, 1988). In addition, an external LOC is associated with greater levels of pain and psychological distress, and less ability to utilize self-management coping skills (Melding, 1995; Toomey et al., 1991; Toomey, Seville, & Mann, 1995).

An internal LOC may not be strongly associated with improved coping skills in the pain literature, because in many pain studies the internality scale scores generally are low. In at least one study, the internal LOC scores for pain patients were significantly lower than the scores for a group of patients with medical disorders not involving pain (Toomey, Mann, Abashian, Carnrike, & Hernandez, 1993). Thus, a critical level of belief in personal control over pain may be necessary to stimulate patients' adoption of improved coping strategies (Seville & Robinson, 2000).

Depression often accompanies chronic pain, and may be associated with learned helplessness feelings and behaviors (Abramson, Seligman, & Teasdale, 1978). The probability of developing learned helplessness may be high for chronic pain patients, because of the likelihood that they will experience situations in which they perceive little or no control over pain. For example, many pain patients are referred to a multidisciplinary pain program for treatment only after a series of biomedical interventions (e.g., nerve blocks, cortisone injections, and/or surgery) have failed to provide significant pain relief. This series of failed interventions and the knowledge that, despite medical advances, no cure exists for chronic pain can increase perceptions of helplessness and lack of control over pain. Also, other stressors such as inability

to work, financial problems, and family tension can increase the perception of lack of control over one's circumstances.

However, even if pain patients who perceive low control do not develop depression, they still may develop feelings of helplessness. A perception of low control and feelings of helplessness could lead to decreased motivation to learn cognitive and behavioral methods of managing pain (Seville & Robinson, 2000). Consequently, therapists must learn to recognize patients' feelings of low control and helplessness, and provide treatment that increases perceptions of control and self-efficacy (i.e., a personal conviction that one can successfully perform required behaviors to produce a desired outcome in a given situation).

Some researchers envision perception of control as a stable personality characteristic (Rotter, 1966, as cited in Seville & Robinson, 2000), but LOC also is affected by the quality of treatment that patients receive. For example, Lipchick, Milles, and Covington (1993) found that patients' internality scale scores on the PLOC significantly increased following a 3-4 week inpatient pain program, while their powerful others and chance scores decreased. In addition, LOC may change naturally over time. Bates and Rankin-Hill (1994) discovered a pattern in pain patients' retrospective accounts. Most of the patients in the study reported that the initial 6-24 months of chronic pain required large lifestyle changes, which often contributed to a sense of having lost control over one's life. However, after the first 6-24 months, the patients could be divided into two groups. One group slowly recovered a sense of control and attempted to return to work, quit taking pain medication, and tried to use positive coping strategies, while the second group continued to struggle with adapting to life with chronic pain.

Research has yet to elucidate the relationships between natural and longitudinal changes in LOC, evolution of an internal LOC during pain treatment, and LOC as a stable personality

characteristic (Seville & Robinson, 2000). Nevertheless, many investigators propose that early behavioral medicine interventions that increase self-efficacy and perceived control over pain are the key to effective pain management (Gatchel and Turk, 1996).

Currently, few controlled studies are available that investigate health LOC or pain LOC as a predictor of multidisciplinary treatment outcomes. In general, studies that have measured LOC have found that people with an internal LOC participate more in pain treatment and report better outcomes (Seville & Robinson, 2000). For instance, Haerkaepaeae, Jarvikoski, Mellin, Hurri, and Luoma (1991) found that patients with higher internal LOC exhibited better treatment outcomes than patients with lower internal LOC. In another study, Haerkaepaeae, Jarvikoski, and Estlander (1996) demonstrated that patients with low pre-treatment scores on the powerful others scale reported significant positive changes in their physical functioning at one year post-treatment.

OPTIMISM AND CHRONIC PAIN

In the past, most pain research has focused on the effects of stress, mood, psychological morbidity, and maladaptive personality characteristics on pain. For example, the significantly greater incidence of psychological morbidity among pain patients compared with the general population indicates that negative psychological variables affect the course and possibly the pathogenesis of chronic pain (Gatchel, 1996; Gatchel & Turk, 1999; Gatchel & Weisberg, 2000).

In contrast, because of the health-enhancing effects of optimism observed in populations with various medical problems (Garofalo, 2000; Harrison & Stuifbergen, 2001; Sobel, 1995) and growing interest in the effects of positive psychological factors on pain (e.g., optimism, locus of control, self-efficacy), some investigators propose that optimism can beneficially influence the course of chronic pain. Nevertheless, the effect of optimism on pain "has never been systematically examined" (Garofalo, 2000, p. 203).

Optimism "is the tendency to hold positive expectations about the future - a tendency that has been associated with psychological well-being and an overall positive outlook on life" (Garofalo, 2000, pp. 203-204). In response to chronic pain, optimism may take the form of a mental image of oneself in the future coping well with pain (Genie Davis, Ph.D., personal communication, June 22, 2004). A number of researchers have posited that optimism is a mediator of stress. It has been reported that positive expectations about the consequences of future events can support and energize one's actions in circumstances with uncertain outcomes, whereas negative expectations can decrease or halt progress toward a planned goal (Garofalo, 2000; Scheier, Weintraub, & Carver, 1986). So, the expectation of success or failure can affect thoughts, feelings, actions, and outcomes.

Depending on what is being assessed, optimism has been variously interpreted as a situational construct, a disposition, a coping style, a defense, a cognitive tendency, or a combination of these (Garofalo, 2000). Functional optimism refers to the adaptive effects of optimism, and the optimistic explanatory style (Seligman, 1991) and dispositional optimism are two examples of this concept. The optimistic explanatory style, sometimes termed learned optimism, is best viewed as the opposite of the depressed attributional style, described by Abramson et al. (1978). Seligman (1991) has suggested that optimists ascribe external, variable, and specific explanations to negative events, whereas depressed persons often ascribe internal, stable, and global explanations to negative events.

Dispositional optimism "is defined as generalized positive expectations for the future" (Garofalo, 2000, p. 204). Scheier and Carver (1985, 1992) have demonstrated that the propensity to expect positive outcomes is relatively stable longitudinally and across situations. Dispositional optimism often is explained as a self-regulation model, in which optimism, along with a realistic evaluation of future events, may lead one to act in ways that increase the probability of success (Scheier, Carver, & Bridges, 1994).

Perhaps the most widely accepted measure of dispositional optimism is the Life Orientation Test (LOT), developed by Scheier and Carver (1985). The LOT is a reliable, valid, and brief self-report instrument that conceptualizes optimism as a world view and assesses generalized expectations about the future, independent of other constructs associated with optimism such as locus of control and psychological well-being (Garofalo, 2000; Scheier & Carver, 1985, 1992; Scheier et al., 1994).

A growing literature demonstrates the beneficial effects of optimism on physical and psychological well-being (Andersson, 1996; Garofalo, 2000; Haerkaepaeae et al., 1996; Long &

Sangster, 1993; Novy, Nelson, Hetzel, Squitieri, & Kennington, 1998; Scheier & Carver, 1985, 1992; Scheier et al., 1994; Sobel, 1995). For example, Scheier and Carver (1985) found a negative correlation between level of optimism and reported physical symptoms in a sample of college undergraduates. Other investigations have found positive correlations between optimism and faster rates of post-surgical recovery and improved treatment effects in patients with heart disease, cancer, and other health problems (Carver et al., 1993; Chamberlain, Petrie, & Azariah, 1992; Harrison & Stuifbergen, 2001; Shepperd, Maroto, & Pbert, 1996).

Much of the research examining the association between optimism and health has been studies comparing optimists and pessimists (Garofalo, 2000). Investigators hypothesize several mechanisms through which optimism positively influences health. First, optimism may serve as a defense against the effects of stress on health. For instance, in a longitudinal study of Harvard graduates, Peterson, Seligman, and Vaillant (1988) examined the relationship between a tendency to pessimistically explain negative life events at age 25 and health over the next 35 years. Even when investigators controlled for initial health status at age 25, persons who expressed pessimistic views exhibited poorer long-term health than those who were more optimistic. Second, in the face of stressors optimists may utilize more effective coping strategies than do pessimists. Carver, Scheier, and Weintraub (1989) proposed that pessimists use more emotion-focused coping strategies, whereas optimists use more problem-focused strategies. In other words, optimists tend to confront problems directly. Third, an optimistic outlook may engender a perception of control over the future, including one's future health. Consequently, optimists may have healthier lifestyles and, thus, enjoy better health than pessimists. Finally, some research indicates that aspects of personality, such as optimism, may have direct effects on overall health through physiological mechanisms, independent of their effects on health

behaviors (Sobel, 1995). For example, in a study of 7,000 adults (Kaplan & Camacho, 1983), men who rated their health as poor were 2.3 times and women 5 times more likely to die than those who perceived their health as excellent. The significance of self-reported health remained even after controlling for health behaviors (e.g., smoking, drinking alcohol), social relationships (e.g., marriage, friendship), and psychological status (e.g., depression).

However, despite growing evidence demonstrating the beneficial health effects of optimism, few investigators have examined the role of optimism in coping with chronic pain. Perhaps this is because negative psychological factors, such as pessimism, are observed and reported by pain patients much more often than optimism and, therefore, are more likely to become a focus of research. Nevertheless, in the few studies conducted, optimism has positively influenced the course of chronic pain. For instance, in a study by Haerkaepaeae et al. (1996), control and health-related optimism beliefs predicted treatment outcomes. Subjects with more optimistic beliefs about their health and back pain prognosis appeared to exhibit longer improvement following treatment, and were more likely to return to work than participants with a pessimistic outlook.

Long and Sangster (1993) examined the role of dispositional optimism during their investigation comparing the coping strategies of rheumatoid arthritis and osteoarthritis patients. Patients in both disease groups who were more optimistic mainly used problem-solving coping techniques, whereas pessimistic patients mainly used wishful thinking. An optimistic outlook was associated with improved psychological adjustment for both groups. Poorer psychological adjustment was associated with a pessimistic outlook, accompanied by wishful thinking and physical disability (Long & Sangster, 1993).

Novy et al. (1998) investigated the coping strategies of 90 chronic pain patients and found that greater optimism was associated with active-coping techniques which, in turn, were related to greater pain locus of control (LOC). In a study examining the psychosocial adjustment of rheumatoid arthritis patients, Brenner, Melamed, and Panush (1994) found that better psychosocial adjustment was associated with greater dispositional optimism, perceived social support, and less disability. Nevertheless, regardless of disability level, only dispositional optimism predicted improved psychosocial adjustment over time.

In summary, an internal LOC and optimism appear to act as stress buffers, lead to more active, problem-solving coping strategies and better psychosocial adjustment, and may have direct effects on health through physiological mechanisms and indirect effects through improved health behaviors (Garofalo, 2000; Seville & Robinson, 2000; Sobel, 1995). As only a limited number of studies have investigated the relationships between chronic pain, LOC, and dispositional optimism, the purpose of the present study is to examine these relationships in a multicultural, lower SES group of subjects with severe, chronic pain. The patients were a sample of individuals receiving treatment at a multidisciplinary pain clinic in Garland, Texas.

RESEARCH HYPOTHESES

The hypotheses for this study are as follows:

1.   a.   Subjects with higher pre-treatment scores on the internality dimension of the Pain Locus of Control Scale will demonstrate greater post-treatment decreases in pain, as measured by the Positive Pain Management Post-Treatment Questionnaire - Revised.

    b.   Participants with higher pre-treatment scores on the Life Orientation Test - Revised will demonstrate greater post-treatment decreases in pain, as measured by the Positive Pain Management Post-Treatment Questionnaire - Revised.

    c.   Subjects with higher pre-treatment scores on the internality dimension of the Pain Locus of Control Scale will demonstrate greater post-treatment increases in ability to cope with pain, as measured by the Positive Pain Management Post-Treatment Questionnaire – Revised.

    d.   Participants with higher pre-treatment scores on the Life Orientation Test - Revised will demonstrate greater post-treatment increases in ability to cope with pain, as measured by the Positive Pain Management Post-Treatment Questionnaire - Revised.

2.   There will be a negative correlation between post-treatment scores on the internality dimension of the Pain Locus of Control Scale and post-treatment levels of pain, as measured by the Positive Pain Management Post-Treatment Questionnaire - Revised.

3.   There will be a negative correlation between post-treatment scores on the Life Orientation Test - Revised and post-treatment levels of pain, as measured by the Positive Pain Management Post-Treatment Questionnaire - Revised.

4.   a.   Participants with the highest pre-treatment scores on both the internality dimension of the Pain Locus of Control Scale and the Life Orientation Test - Revised will report the greatest post-treatment decreases in pain, as measured by the Positive Pain Management Post-Treatment Questionnaire - Revised.

    b.   Participants with the highest pre-treatment scores on both the internality dimension of the Pain Locus of Control Scale and the Life Orientation Test - Revised will report the greatest post-treatment increases in ability to cope with pain, as measured by the Positive Pain Management Post-Treatment Questionnaire - Revised.

5.   Participants' post-treatment scores on both the internality dimension of the Pain Locus of Control Scale and the Life Orientation Test - Revised will be significantly higher than their pre-treatment scores.

METHOD

Subjects

Forty-seven consecutive patients for whom English is a primary or secondary (i.e.,

bilingual) language, who volunteered, and who were available for testing at the Positive Pain

Management (PPM) clinic in Garland, Texas participated in the study. Subjects were a subset of

a broader investigation of 107 patients treated at PPM clinics in Houston, El Paso, San Antonio,

and Garland. Patients attended a thirty-day, interdisciplinary, outpatient pain program, because

conventional biomedical treatment had failed to significantly relieve their pain. The program

focuses on teaching patients skills that enable them to self-manage chronic pain, and includes the

following interventions: medication management, physical therapy, aquatics, biofeedback,

ergonomic assessment and training, group and individual psychotherapy, psychological

assessment, stress management and relaxation training, vocational counseling, nutritional

counseling, hypnotherapy, massage therapy, t'ai chi, yoga, acupuncture and acupressure, Pilates,

nia, and feldenkrais.

The subjects were 34% male and 66% female. Of the sample, 38% categorized their

racial/ethnic background as white, 34% as black, 21% as Latino, 2% as Asian, and 2% as "other"

racial/ethnic group. Participants ranged in age from 26 to 68, with a mean age of 46. On average,

subjects had suffered job injuries and had experienced pain for 37 months; most reported chronic

back pain, but some reported neck, arm, shoulder, or lower extremity pain.

Subjects averaged 11 years of formal education. Prior to their injuries, 32% had worked in

semi-skilled blue collar or unskilled/laborer jobs, whereas 46% had worked in skilled blue collar

jobs. Patients had not worked for an average of 28 months, and mean annual household income

was $16,400. Eighty-one percent of subjects reported at least one and 38% reported at least two

of the following psychosocial stressors: financial problems, unemployment, marital/family problems, loss of previous abilities, limited social support/social isolation, lack of coping skills, other medical problems (besides pain), other stressors. The most frequently reported stressor was financial problems (38%) (Table 1).

<div align="center">Instruments</div>

Demographic Questionnaire. The demographic questionnaire asked subjects to provide general information that included date of injury or date the pain began, whether they currently are working or in school and, if not, the last date when they were working or in school, and a listing of names and dosages of current medication. For the latter question, subjects were encouraged to note all prescribed medications, and any over-the-counter products, herbal remedies, etc. that they were taking; this listing of current medication was repeated at the end of the thirty-day pain treatment program. In addition, subjects recorded their occupation or job title, and the investigators categorized responses into the following categories: professional, clerical, skilled, semi-skilled, unskilled or laborer. Finally, six questions from the Short Acculturation Scale for Hispanics were included in the demographic questionnaire to measure level of acculturation.

Pain Locus of Control Scale. Toomey et al. (1991) developed the Pain Locus of Control Scale (PLOC) by modifying the Multidimensional Health Locus of Control Scales to measure pain LOC rather than LOC beliefs concerning general medical health. The PLOC is a 36-item instrument using a 6-point Likert design, with 12 items representing each of the three subscales: internality, powerful others, and chance. Items composing the internality subscale include questions #1, 6, 8, 12, 13, 17, 19, 24, 26, 30, 31, and 35. Chance subscale items are questions #2,4,9,11,15,16,20,22,27,29,33, and 34. Items composing the powerful others subscale include

questions 3, 5, 7, 10, 14, 18, 21, 23, 25, 28, 32 and 36. The score on each subscale is the sum of all subscale items endorsed, and scores on each subscale can range from 12-72 (Table 2).

Penzien et al. (1989, as cited in Seville & Robinson, 2000) demonstrated that the split-half reliability of the PLOC is .89. Gibson and Helme (2000) found that internal consistency reliability of the three subscales is good to excellent, with Cronbach alpha coefficients of .87 for powerful others, .81 for chance, and .75 for internality. The alpha coefficients failed to improve with the deletion of any single item, indicating that all items on each scale contribute to the reliability of the total scale score (Gibson & Helme, 2000). Content, convergent, and discriminant validity appear moderate to good (Gibson & Helme, 2000; Toomey et al., 1991). Factor analysis of the PLOC confirmed the a priori assumption of three underlying factors. The three-factor solution revealed a well-defined factor structure with only four items exhibiting a significant loading (i.e., > .30) on any factor other than where they primarily loaded (Gibson & Helme, 2000).

Life Orientation Test - Revised. The Life Orientation Test - Revised (LOT-R) is a 10-item questionnaire designed by Scheier et al. (1994) to measure dispositional optimism. Four questions (2, 5, 6 and 8) are filler items and not used in scoring. Of the six scored items, three are scored in a positive direction and three are reverse-scored. Respondents indicate the extent of their agreement with each of the items, using the following responses: A = I agree a lot; B = I agree a little; C = I neither agree nor disagree; D = I DISagree a little; E = I DISagree a lot. In the present study, responses least consistent with an optimistic disposition were coded with a score of one, whereas responses most consistent with an optimistic disposition were coded with a score of five. For example, the first question is: "In uncertain times, I usually expect the best;" an

answer of "A" was scored as a five, while an answer of "E" was scored as a one. Thus, scores on the LOT-R ranged from 6-30 (Table 2), with higher scores indicating greater optimism.

Internal consistency reliability (Cronbach's alpha = .78) and test-retest reliability (.68 - 4 months; .60 - 12 months; .56 - 24 months; .79 - 28 months) are good. Content, convergent, and discriminant validity appear moderate to good (Hjelle, Belongia, & Nesser, 1996; Scheier et al., 1994). Results of a factor analysis revealed that the six scored LOT-R items yielded one factor; the mean factor loading for the items was .69 (Chang & McBride-Chang, 1996; Scheier et al., 1994).

Positive Pain Management Pre-Treatment Questionnaire - Revised. The Positive Pain Management Pre-Treatment Questionnaire - Revised (PPMPT-R) is a brief, easy-to-understand instrument (Worsham & Ziegler, 2002). The PPMPT-R is composed of five questions that ask subjects to rate their usual pain level during the past week, the effect of pain on their regular daily activities, their coping ability, their perceived self-efficacy, and their perceived locus of control. The questions were constructed using Likert-type numerical rating scales ranging from 0-10; the endpoints of 0 and 10 have verbal descriptors. Scores can range from 0-50 (Table 2), with higher scores indicating greater levels of the variable being assessed (e.g., usual pain level during the past week).

Positive Pain Management Post-Treatment Questionnaire - Revised. Like the PPMPT-R, the Positive Pain Management Post-Treatment Questionnaire - Revised (PPMPPT-R) is a brief, easy-to-understand inventory that utilizes Likert-type numerical rating scales ranging from 0 - 10 (Worsham & Ziegler, 2002). The PPMPPT-R is composed of nine questions, the first five of which are identical to the questions asked on the PPMPT-R. The last four questions ask patients to rate their satisfaction with the pain program at Positive Pain Management, to describe what

they liked most and least about the program, and to write any additional comments about the program. Scores can range from 0-60 (Table 2), with higher scores indicating greater levels of the variable being assessed (e.g., usual pain level during the past week).

For purposes of statistical analysis, post-treatment differences in pain were determined by subtracting patients' post-treatment pain levels (PPMPPT-R #1) from their pre-treatment pain levels (PPMPT-R #1). Post-treatment differences in coping ability were determined by subtracting subjects' post-treatment coping ability:

(PPMPPT-R #3 + PPMPPT-R #4 + PPMPPT-#5) /3

from their pre-treatment coping ability:

 (PPMPT-R #3 + PPMPT-R #4 + PPMPT-R #5)/3.

The PPMPT-R and PPMPPT-R were developed in September 1999 as in-house measurement tools at the Positive Pain Management clinic, and they have been in continuous use since then. For several reasons, clinic staff wanted the ability to assess patients with short, easily understood questionnaires. First, because the average clinic patient has less than twelve years of formal education and approximately 15% of patients are functionally illiterate, the staff was concerned about the reading level of most questionnaires. Second, approximately 10% of patients speak little or no English (most often their first language is Spanish, although the first language of some is Vietnamese), and brief, easily understood questionnaires also are simpler to translate. Third, most patients experience the severest types of chronic pain, so their attention level may wane if they are asked to complete lengthy instruments. Therefore, the PPMPT-R and PPMPPT-R were created to address these concerns. As mentioned above, they are composed of mostly numeric rating scales, and provide a global assessment of patients' status. Numerical rating scales such as the PPMPT-R and PPMPPT-R have demonstrated moderate to good

reliability and validity in past pain research (Turk & Melzack, 1992). To maximize content validity, a number of respected sources were consulted and used as inspiration in creating the PPM instruments including the Handbook of pain assessment (Turk & Melzack, 1992), Psychological approaches to pain management: A practitioner's handbook (Gatchel & Turk, 1996), the Behavioral Assessment of Pain (Tearnan & Lewandowski, 1992), McGill Pain Inventory, and others. Future alternate forms reliability and, possibly, internal consistency reliability research is planned.

Procedures

The present study is a one-group pretest-posttest, quasi-experimental design. Subjects were administered the demographic questionnaire, the Pain Locus of Control Scale, the Life Orientation Test - Revised, and the Positive Pain Management Pre-Treatment Questionnaire - Revised on their first day of the thirty-day pain program, prior to any treatment. At the end of their final day of treatment, participants completed the section of the demographic questionnaire concerning medication usage, the Pain Locus of Control Scale, the Life Orientation Test - Revised, and the Positive Pain Management Post-Treatment Questionnaire - Revised.

RESULTS

Subjects reported significantly lower post-treatment pain levels as compared with pre-treatment levels ($M = 0.66$, $SD = 1.58$), $t(45) = 2.85$, $p = .007$ (two-tailed), but decreased pain was not associated with scores on the internality dimension of the Pain Locus of Control Scale (PLOC) or on the Life Orientation Test - Revised (LOT-R). Overall, participants' greater coping ability was associated with scores on the LOT-R, but not with scores on the internality dimension of the PLOC. Statistical analyses utilizing a factorial design were not employed, due to limitations imposed by the sample size.

The first research hypothesis (i.e., 1a – 1d) was tested with a series of one-way analysis (ANOVAs). For testing of hypotheses 1a and 1c, subjects' scores on the internality dimension of the PLOC were divided into three groups of approximately equal size. Cut scores were as follows: group 1 < 37; group 2 = 37-47; group 3 > 47; analyses were completed using mean difference scores for post-treatment pain and coping ability. No significant relationships emerged between pre-treatment scores on the internality dimension of the PLOC (low, medium, high) and greater post-treatment changes in pain ($F(2,34) = 0.25$, $p < .78$) or post-treatment changes in coping ability ($F(2,32) = 2.85$, $p < .07$) (Tables 3 and 4 in the Appendix).

For testing of hypotheses 1b and 1d, participants' scores on the LOT-R were divided into three groups of approximately equal size. Cut scores were as follows: group 1 < 18; group 2 = 18-21; group 3 > 21; analyses were completed using mean difference scores for post-treatment pain and coping ability. No significant relationship was revealed between pre-treatment scores on the LOT-R (low, medium, high) and post-treatment decreases in pain ($F(2,43) = 0.49$, $p < .62$) (Table 4). However, a significant difference in post-treatment coping ability emerged between subjects in LOT-R group 1 and LOT-R group 3. Closer examination through mean

difference coping scores and through post hoc tests (i.e., Tukey HSD) revealed a relationship opposite to that predicted in hypothesis 1d. Subjects with the lowest pre-treatment LOT-R scores (i.e, those in group 1) demonstrated significantly greater increases in post-treatment coping ability than those with the highest pre-treatment LOT-R scores ($F(2,40) = 3.93$, $p < .03$) (Table 6).

Pearson correlation demonstrated no significant relationship between post-treatment scores on the PLOC internality dimension (hypothesis 2) and post-treatment pain levels ($N = 40$; $r = -0.24$; $p = .14$). In addition, no association emerged between post-treatment LOT-R scores (hypothesis 3) and post-treatment pain levels ($N = 47$; $r = -0.18$; $p = .22$)

Hypotheses 4a and 4b were tested with one-way ANOVAs. First, PLOC internality and LOT-R scores were divided into two groups of approximately equal size. Cut scores were as follows - PLOC internality: group 1 <= 41; group 2 > 41; LOT-R: group 1 <= 20; group 2 > 20. Then, participants were placed into a "high," mixed", or "low" group, based on the combination of PLOC internality and LOT-R scores ("High" group = PLOC internality group 2/LOT-R group 2; "Mixed" group = PLOC internality group 2/LOT-R group 1 *or* PLOC internality group 1/LOT-R group 2; "Low" group = PLOC internality group 1/LOT-R group 1). No significant differences emerged between groups when examining post-treatment decreases in pain ($F(2,34) = 0.10$, $p < .91$) (Table 7). However, participants in the "high" group differed significantly in their post-treatment coping ability when compared with those in the "mixed" and "low" groups ($F(2,32) = 4.65$, $p < .02$) (Tables 8, 9).

Testing of the fifth hypothesis with t-tests demonstrated that participants' post-treatment scores on the LOT-R were significantly higher than their pre-treatment scores ($M = 2.09$, $SD = 3.96$), $t(46) = 3.61$, $p = .001$ (two-tailed), but that post-treatment scores on the PLOC

internality dimension were not significantly higher than pre-treatment scores ($M = 0.78$,

$SD = 11.14$), $t(31) = 0.40$, $p = .69$ (two-tailed); (*note: for this analysis, changes in LOT-R and

PLOC scores were determined by subtracting post-treatment scores from pre-treatment scores).

On a scale of 0-10, with 10 being "complete satisfaction" and 0 being "no satisfaction,"

72.3% of subjects rated the 30-day pain program as a 7 or above; the modal rating was 10, and

the mean was 7.46.

DISCUSSION

Subjects attended a thirty-day, interdisciplinary, outpatient pain program at Positive Pain Management (PPM) clinic in Garland, Texas because conventional biomedical treatment had failed to significantly relieve their pain. Participants reflected the most severe types of chronic pain and psychosocial characteristics. On average, they had experienced chronic pain for over three years, had been out of work for 2 1/3 years, had 11 years of formal education, and had an annual household income of $16,400. In addition, 81% of subjects reported at least one and 38% reported at least two significant psychosocial stressors, including 38% who reported financial problems. Research indicates that chronic diseases, including chronic pain, are significantly more prevalent among people of lower socioeconomic status, especially persons who have not completed high school, adjusted for race, gender, age, and access to medical care (Pincus, Wolfe, & Callahan, 1994). A low level of formal education may make people more vulnerable to psychological and behavioral risk factors that predispose them to development of chronic disease and poor outcomes. Contributory psychological and behavioral risk factors include smoking, diet, compliance and efficiency in utilizing medical services, life stress, lack of education about lifestyle contributions to disease and stress development, and coping resources, including adaptability, problem-solving capacity, and ability to cope with stress (Pincus et al., 1994). Some therapists believe that a large percentage of these patients need to be treated over a period of months (instead of a period of weeks), and systematically taught adaptive coping skills that parents and educators failed to teach them when they were children and adolescents.

Importantly, subjects reported significantly lower post-treatment pain levels as compared with pre-treatment levels, but this finding should not be overemphasized. As discussed before, pre- and post-treatment pain levels were measured using a numerical rating scale with the

question: "On the scale below, please circle the number that matches the <u>usual</u> amount of daily pain you've felt during the <u>past week</u>." Although numerical rating and visual analog scales are widely used and accepted as the gold standard for pain measurement in many settings, and have demonstrated moderate to good reliability and validity in pain research, they measure only one aspect of pain. For example, the question above from the PPMPT-R and the PPMPPT-R measures pain intensity, but not pain duration and frequency. A decrease in pain intensity may be an insufficient indicator of pain relief for chronic pain patients, because a single rating of intensity cannot provide a comprehensive assessment of patients' well-being and functional capabilities (Chapman & Dunbar, 1998), and may decrease measurement reliability and validity (DeVellis, 1991). Moreover, the simplicity of numerical rating and visual analog scales are of concern, because brain imaging investigations provide compelling evidence of the complexity of chronic pain. Besides the somatosensory cortices, anterior cingulate, and several other areas, the limbic system plays a major role in pain perception and processing. More recent evidence suggests that when signals of acute tissue trauma reach the brain, the immune system and brain jointly produce a protective 'sickness' response, which probably evolved to help injured individuals avoid further damage and enable a healing environment. This adaptive but subjectively unpleasant state, which may be mediated by the HPA axis, can involve generalized discomfort, fatigue, and withdrawal from social interaction and a normal routine (Chapman & Dunbar, 1998). Chronic pain patients also may experience some aspects of the sickness response even though it is maladaptive beyond a normal healing period. Thus, chronic pain is a complex phenomenon and, ideally, should be measured in multiple ways, including measurement of functional status (Chapman & Dunbar, 1998). Finally, clinical experience suggests that a significant percentage of chronic pain patients experience limited or no permanent pain decrease

from treatment, but rather learn how to cope with their pain better through improved coping skills and perception of self-efficacy. Over time, perception of self-efficacy and improved coping skills may actually be more important than pain decrease, because chronic pain usually is incurable and waxes and wanes through the years, despite multiple and varied interventions.

The findings that (1) participants' optimism increased during the treatment program, and (2) those with the highest pre-treatment optimism and locus of control had the greatest post-treatment increases in coping ability are significant, considering the paucity of research examining the relationship between optimism and chronic pain. The finding that subjects with the lowest levels of pre-treatment optimism exhibited the greatest post-treatment increases in coping ability is intriguing, and may have resulted from treatment effects or a regression-to-the-mean effect. Assuming it resulted from treatment effects, this is perhaps a more encouraging finding than the hypothesized relationship, because it may indicate that subjects who were the least optimistic due to past treatment failures had the largest increases in post-treatment coping ability. In other words, the rich did not get richer (i.e., those with the highest pre-treatment optimism did not exhibit greater post-treatment increases in coping ability). In fact, based on mean scores, post-treatment coping ability appears to have decreased slightly for those with the highest pre-treatment optimism. Perhaps the pre-treatment optimism of some of these subjects was based on denial that chronic pain usually is incurable, or on unrealistic expectations about the characteristics/benefits of the PPM pain program. In addition, limits may have existed on the extent to which participants' coping ability could increase, due to reasons discussed above concerning a low level of formal education (Pincus et al., 1994). A significant part of successful chronic pain coping involves changing the nature of one's negative automatic thoughts and cognitive distortions about the personal meaning of pain, and a low educational level may

sometimes limit comprehension of this and other important psychological aspects of the treatment program, thereby restricting eventual coping ability increases.

Completed studies investigating the relationship between chronic pain and optimism and this researcher's clinical experience suggest that patients who are optimistic often engage in more adaptive, goal-directed actions which increase their ability to cope with chronic pain and increase the odds of treatment success (Hafen, Karren, Frandsen, & Smith, 1996). Also, in the few investigations conducted, optimism has had a positive influence on the course of chronic pain. For example, as discussed earlier, Haerkaepaeae et al. (1996) studied 175 subjects with chronic back pain who had completed a twelve-month treatment program. The investigation suggested that patients who exhibited more optimism and greater perceived control concerning their health and the course of their back pain appeared to demonstrate longer improvement following treatment. Interestingly, optimism and perceived control seem to be associated in the current study, as well.

Optimism appears to influence the coping strategies used by pain patients (Garofalo, 2000; Scheier & Carver, 1992). According to Scheier and Carver (1992), greater optimism contributes to more problem-focused coping and enables the belief that goals are achievable. Thus, optimism may lead to more problem-focused coping, which may lead to better adaptation to chronic pain, which then may lead to increased activity and decreased pain (Garofalo, 2000; Hafen et al., 1996).

The locus of control (LOC) construct was not originally intended for the assessment of pain. However, theoretically, people with high internal LOC perceive that they have control over their pain and function better than those with an external LOC, who believe that their pain mostly is influenced by factors such as chance, medication, or the actions of physicians (Seville

& Robinson, 2000). However, the research findings across studies are mixed and not consistent with this oversimplified view.

A number of reasons could explain why none of the hypotheses involving locus of control were significant (except for part of the fourth research hypothesis). First, virtually all of the clinic's patients have had experiences that accumulate to create a perception of low control over their lives. For example, in addition to experiencing an injury which they perceived as random and outside of their control and enduring numerous unsuccessful biomedical interventions (e.g., nerve blocks) for their pain, many patients experience significant stressors such as a decreased ability to work, financial problems, and a reduced ability to fulfill family obligations. Also, many of the clinic's patients possess inadequate coping resources that are an outgrowth of poor childhood experiences, such as poor parenting and poverty, over which they had little or no control. For instance, a typical female patient described in therapy how she was raised in poverty and how her father "used to call me stupid all the time." All of these factors can combine to create a low perception of control over one's life (i.e., a low internal LOC). Moreover, when patients already are depressed, as many are by the time they are referred to the PPM clinic, they sometimes report low internal LOC when discussing most factors in their lives, including pain (Seville & Robinson, 2000). Research by Bates and Rankin-Hill (1994) demonstrated that, for whatever reason, some patients continue to struggle with a life of chronic pain even many months after their diagnosis/injury. In their investigation, the majority of subjects reported that the initial 6-24 months of chronic pain necessitated significant lifestyle alterations, and often led to the perception of having lost control over one's life. However, after this time period, subjects could be divided into two groups. One group of patients gradually cultivated a perception of control, tried to return to work, and tried to utilize positive coping strategies. The other group

continued to have problems coping with chronic pain and perceived a low sense of control over their lives. In the present study, patients had experienced chronic pain for an average of 37 months and they all were characteristic of persons in the latter group, continuing to struggle with adaptation to a life of chronic pain.

Second, numerous factors interact with and influence LOC including coping style, the pattern of the different control dimensions in relation to one another (e.g., a person can indicate both high internal and powerful other beliefs), gender, and cultural factors (Bishop, 1994). Concerning cultural factors, Bates and Rankin-Hill (1994) discussed a series of studies that assessed LOC and pain in six ethnic groups in New England and Puerto Rico. They reported significant differences between and within ethnic groups in LOC and pain perception, including the finding that 82% of a New England Latino group reported an external LOC (Seville & Robinson, 2000). In the past, other research has suggested that Latinos as a group tend to have an external LOC. In the experience of this researcher and a Hispanic therapist colleague, a significant number of Latinos may indeed have an external LOC, but it often is a healthy external LOC grounded in religious faith. Many Latinos believe that God (i.e., a "powerful other" from the perspective of LOC theory) ultimately determines one's destiny, but also is a powerful source of strength and renewal during times of adversity. Thus, a Latino patient might exhibit a low internal subscale score and a high powerful others subscale score, but this wouldn't have the negative connotation that LOC theory associates with a low internal subscale score, because the patient's faith provides internal fortitude and enables him/her to cope and persevere with chronic pain. In addition, the finding that most Latinos have an external LOC may even be spurious, because a large amount of diversity exists within this group. For example, in the clinic where the present study was conducted, Latino patients are from varied backgrounds: some were born in

the USA, some were born in Mexico, some were born in a Central American country, some speak Spanish as a first language, some speak English as a first language, etc. Thus, despite some investigators' portrayal of Latinos as a relatively homogeneous group, in reality they are heterogeneous and, in some instances, their within-group differences are greater than the differences between Latinos and other racial/ethnic groups. If this occurs in the case of LOC, then LOC differences between Latinos and other groups would not be statistically significant. Future investigation of cultural and gender influences on perceived control over pain could provide more information about how to better tailor interventions to meet individual needs.

Third, LOC effects may depend on context. In one study of coping ability, subjects with an internal LOC were much more likely than subjects with an external LOC to engage in adaptive coping if they perceived that something could be done to change a situation. However, differences in coping strategy were significantly less if subjects felt that the situation was one they simply must accept (Bishop, 1994). Learning that no cure exists for chronic pain, most patients understand that they will have to accept a lifetime with at least some pain. Thus, true differences in coping strategy and ability between subjects with an internal and an external LOC may have been statistically insignificant.

Fourth, questionnaire deficiencies may have contributed to nonsignificant findings. Some patients reported that they think the Pain Locus of Control Scale (PLOC) is too long and that the wording of questions is hard to understand. This may have contributed to errant answers and decreased questionnaire reliability and validity. Also, many investigators consider LOC to be a relatively stable personality characteristic, but the overall correlation between the pre- and post-PLOC scores was only .67, suggesting possible reliability problems.

Finally, although past hypotheses suggest that a strong internal LOC contributes to better coping ability, much of the literature does not demonstrate a strong relationship between an internal LOC alone and reduced psychological problems and pain. One reason internality alone is not consistently associated with improved coping is that internal scores generally are low in many investigations of pain patients (Seville & Robinson, 2000). Treatment success is so elusive for true chronic pain patients that LOC is exceedingly difficult to stimulate. For example, Toomey et al. (1993) found that internal LOC scores of pain patients are significantly lower than those of medical patients without pain, which may mean that a critical level of belief in personal control must exist before a patient can begin to cope with chronic pain more positively. In other words, the development of a significant internal LOC likely depends upon patients' having a minimal level of optimism, hope, prior treatment successes, and/or self-efficacy. For instance, in the present study, this effect appears to have been strongly demonstrated as patients with the highest pre-treatment optimism and LOC had significantly greater post-treatment increases in coping ability, when compared with subjects who had low levels of optimism, low LOC, or both.

The ratio of female to male patients (~ 2:1) in the sample is an interesting finding. Intuitively, this female to male ratio appears atypical because, presumably, men are more likely to have jobs that increase the odds of injury (i.e., jobs that require strenuous physical labor and the use of potentially dangerous machinery). In an investigation completed at Positive Pain Management in 2001, the participants were 61% male and 39% female. Thus, the research findings may be atypical and lack external validity.

Of course, studies with a one-group pretest-posttest, quasi-experimental design normally are vulnerable to several threats to internal validity, including history, maturation, testing, instrumentation, and regression (Campbell & Stanley, 1963). For these reasons and because the

study did not involve random assignment of subjects, one cannot assume that treatment effects caused observed changes in subjects' pain level and coping ability.

In summary, the present study suggests that optimism is associated with greater coping ability, perhaps because optimism may lead to more problem-focused coping. Problem-focused coping may result in improved adaptation to chronic pain, which then may result in greater activity/functionality and less pain. Future research should examine the physiological processes associated with optimism that contribute to improved coping ability and health (e.g., what type of neurotransmitter/neuropeptide release occurs following optimistic thoughts and behaviors). Though past research suggests that an internal LOC alone contributes to improved coping ability, the present study and much of the literature do not demonstrate a significant relationship between an internal LOC and reduced psychological problems and pain. The LOC construct was not originally created or intended for the assessment of pain, and its assumed application to the experience of chronic pain needs to be reconsidered. Numerous factors may interact to determine LOC including coping style, the pattern of different LOC dimensions (i.e., internal, powerful others, chance) in relation to one another, and culture. Finally, because the internal LOC of pain patients tends to be low and difficult to stimulate due to a lack of prior treatment success, future research should investigate the possibility that a minimal level of one or more of the following factors is necessary for a significant internal LOC: optimism, hope, prior treatment success and/or self-efficacy.

Table 1.

Subjects' Demographic Characteristics

Total Number of Subjects	47
Gender	
Male	34%
Female	66%
Race/Ethnicity	
White	38%
Black	34%
Latino	21%
Asian	2%
Other Racial/Ethnic Background	2%
Mean Age	46
Mean Years of Formal Education	11
Mean Annual Household Income	$16,400
Occupation	
Unskilled or Laborer	2%
Semi-Skilled Blue Collar	29%
Skilled Blue Collar	46%
Clerical	2%
Professional	10%
Mean Number of Months With Chronic Pain	37
Mean Number of Months Since Subjects Last Worked	28
Subjects Reporting At Least One Psychosocial Stressor	81%

Table 2.

Instruments' Possible Range of Scores

Instrument Name/(Abbreviation)	Possible Score Range
Pain Locus of Control Scale (PLOC)	6-30
Life Orientation Test - Revised (LOT-R)	36-216
Positive Pain Management Pre-Treatment Questionnaire - Revised (PPMPT-R)	0-50
Positive Pain Management Post-Treatment Questionnaire – Revised (PPMPPT-R)	0-60

APPENDIX

ANOVA Tables

Table 3

ANOVA Table for Hypothesis 1a

Source	SS	df	MS	F	p
PRINTGP1	1.36	2	0.68	0.25	.78
Error	91.95	34	2.70		
Total	114.50	37			

Table 4

ANOVA Table for Hypothesis 1b

Source	SS	df	MS	F	p
LOTGP1	2.48	2	1.24	.49	.62
Error	109.56	43	2.55		
Total	132.25	46			

Table 7

ANOVA Table for Hypothesis 1c

Source	SS	df	MS	F	p
PRINTGP1	17.25	2	8.63	2.85	.07
Error	96.72	32	3.02		
Total	125.58	35			

Table 8

ANOVA Table for Hypothesis 1d

Source	SS	df	MS	F	p
LOTGP1	24.02	2	12.01	3.93	.03*
Error	122.16	40	3.05		
Total	154.14	43			

*p < .05

Table 9

ANOVA Table for Hypothesis 4a

Source	SS	df	MS	F	p
PREGP	0.52	2	0.26	0.10	.91
Error	92.79	34	2.73		
Total	93.31	36			

Table 10

ANOVA Table for Hypothesis 4b

Source	SS	df	MS	F	p
PREGP	25.66	2	12.83	4.65	.02*
Error	88.31	32	2.76		
Total	113.96	34			

*p < .05

Table 11

Post-Hoc Test for Hypothesis 4b: Tukey HSD

COPEDIF	Mean Diff.	Std. Error	*p*
High – Mixed	-2.05*	0.74	.04
High – Low	-1.76*	0.68	.03

* For this analysis, coping difference (i.e., COPEDIF) was pre-treatment coping ability – post-treatment coping ability.

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