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Concurrent validity of the pain locus of control scale and its relationship to treatment outcome variables

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CONCURRENT VALIDITY OF THE PAIN LOCUS OF CONTROL SCALE AND ITS RELATIONSHIP TO TREATMENT OUTCOME VARIABLES

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by

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A MERRY HEART DOETH GOOD LIKE A MEDICINE;

BUT A BROKEN SPIRIT DRIETH THE BONES.

Proverbs 17:22

THESIS ACCEPTANCE

Acceptance for the faculty of the Graduate College, University of Nebraska, in partial fulfillment of the requirements for the Master of Arts in Counseling, University of Nebraska at Omaha.

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Abstract

Studies have shown that locus of control orientation is related to emotional and behavioral adjustment to chronic pain. Researchers have begun the process of establishing the validity and reliability of the Pain Locus of Control Scale. This study was conducted to establish the concurrent validity of the PLC Scale at the time of follow-up from pain management treatment, an effort not previously undertaken. In addition, studies suggest that those persons with an Internal locus of control orientation demonstrate more favorable treatment outcomes, as compared to a Powerful others or Chance locus of control. This research examined the relationship between treatment outcome measures and locus of control orientations, as measured by the PLC Scale.

Data analysis revealed that the PLC Scale correlated significantly with all of the instruments used to establish concurrent validity. These included the Pain and Impairment Relationship Scale, the Coping Strategy Questionnaire, and the Cognitive Errors Questionnaire-Low Back Scale. In addition, the Internal orientation correlated significantly with favorable treatment outcomes, while the Powerful others and Chance orientations correlated with unfavorable outcomes.

Several limitations of the study were noted and discussed. Suggestions were made for further research; these included replicating the concurrent validity of the PLC Scale at the time of follow-up.

CONCURRENT VALIDITY OF THE PAIN LOCUS OF CONTROL SCALE AND ITS RELATIONSHIP TO TREATMENT OUTCOME VARIABLES

CHAPTER I

INTRODUCTION

Historically, pain has been viewed either as a psychological or a purely sensory phenomenon (Turk & Rudy, 1986). Aristotle viewed pain as an emotion, and Stoic philosophers taught that it could be overcome through logic and reasoning. In contrast, Descartes's dualistic approach conceptualized pain as a purely sensory phenomenon determined exclusively by noxious sensory input; that is, the amount of pain experienced was directly proportional to the amount of physical damage. This sensory-physiological view gained popularity in the late 1800's with scientific advances. Psychological factors were given only secondary interest, if any at all.

In spite of major medical progress, which included an increased understanding of the nervous system, the development of potent analgesic drugs, and sophisticated surgical procedures, the permanent alleviation of pain was not always achieved. The model of intervention for acute pain did not seem to apply to cases of persistent pain. That is, when pain was reported to a physician, a specific cause and appropriate treatment were identified. For chronic pain patients, however, many therapeutic interventions may have been tried with limited success, and there was little encouraging information that an end would come to their suffering

soon. The inadequacy of surgical and drug treatment regimens produced frustration for patients and their families, and as the situation continued, demoralization for those suffering from persistent pain. Moreover, clinicians observed that patients responded quite differently to the same pain syndrome and reported widely varying benefits from identical treatments. Puzzled by this situation, researchers who adhered to this unidimensional sensory-physiological model began to suggest that the differences, if unrelated to pain neuropathways, must be the result of psychological factors.

The pronounced shift from conceptualizing pain as a purely sensory phenomenon to viewing it as a perceptual event was given the greatest impetus by developments in the middle 1960's, most notably by Melzack and later by Fordyce. Melzack & Casey, 1968; and Melzack & Wall, 1965, presented a multidimensional model of pain designed to address the inconsistencies in the sensory model of pain, termed the "gate control" model. This model views pain perception and response as complex phenomena, resulting from the interaction of sensory-discriminative, motivational-affective, and cognitive-evaluative components. The theory proposes that neural mechanisms in the spinal cord act like a gate which can increase or decrease the flow of nerve impulses from peripheral fibers to the spinal cord cells that project to the brain. Somatic input is, therefore, subjected to the modulating influence of the gate before it evokes pain perception and response. The gate is theorized to be profoundly influenced by descending influences from the brain; that is, somatic input is subjected to the modulating influences of cognitive, affective, and behavioral

factors before it evokes pain perception (Turk et. al., 1983). Psychological factors may mediate pain by altering the person's appraisals of the threat, their ability to control the quality of noxious sensations, and their emotional arousal. Thus, sensory aspects of pain are seen as only one dimension of the pain phenomenon.

Fordyce (1976) based his model on classical learning theory, specifically operant conditioning. He maintained that the consequences provided to pain behaviors may shape, direct or modify pain somewhat independently of the underlying neurophysiological events. He states that pain behaviors are, for the most part, operants. They are the verbal reports, the winces, grimaces, moans and limiting of behavior to avoid anticipated pain. There are also autonomically mediated behaviors, such as palmar sweating, variations in heart rate, etc., which serve as indicators to the observer that pain may be being experienced. There is evidence that even those autonomically mediated behaviors are not immune to conditioning effects, according to Fordyce. He states that the occurrence of pain behavior may indicate that there has been an antecedent stimulus that, in the context of chronic pain, that is, pain of several months duration, may be arising from the site of body damage. On the other hand, if the patient's environment has had the effect of providing sufficient positive reinforcement for pain behavior (or insufficient positive reinforcement to maintain alternative well behavior, or punishment of that well behavior, or all of these), it is reasonable to consider that there may have been little or no antecedent noxious stimulation from body damage to produce the pain behavior.

Although the operant and gate control models provide important points of departure from sensory models in terms of defining the chronic pain experience, each provides a somewhat limited view and is considered to be inadequate in and of itself (Turk & Rudy, 1989). The operant model fails to consider the contribution of cognitive appraisals as they affect patients' perceptions and responses to pain. The impetus for the development of a later model was the general dissatisfaction with interventions based exclusively on operant conditioning to generalize and be maintained following the termination of treatment. The gate control model is seen as more appropriate for understanding acute pain in that it does not consider environmental influences as they extend over time, as in chronic pain.

An alternative model that emphasizes both the importance of environmental factors underscored by the operant approach and the psychological contribution inherent in the gate control model has been formulated by Turk, Meichenbaum & Genest, 1983. Labeled the cognitive-behavioral model, it emphasizes the importance of sensory, cognitive, affective, and behavioral factors in the experience and treatment of pain. The goal of this approach is to affect the experience of pain by attempting to alter maladaptive thoughts, feelings, and behaviors, as well as sensory stimuli. It is self-control oriented, emphasizing coping skills as a means of gaining control of the pain experience and developing an increased sense of self-efficacy. According to this model, it is the person's perspective that interacts reciprocally with emotional factors, sensory phenomena, and behavioral responses. The person's behavior will elicit responses from significant

others who can reinforce both adaptive and maladaptive modes of thinking, feeling, and behaving. Thus, pain perception is not seen as the end result of a passive transmission and registration of impulses from physically defined stimuli, but as a dynamic, interpretative and interactive process.

Utilizing this model, Ross, Gil & Keefe, 1988, explained how responses are shaped or changed gradually over time as the person has more experience with pain, that is, as the situation becomes a chronic one. Changes are observed in the way the person acts, thinks and feels. Stated another way, learning affects behavioral, cognitive and affective responses. A poor behavioral adaptation to chronic pain is evident in extreme variability in behavior in the early stages of chronic pain, considered to be the first six months. On one day the person may be functional, but on the next, s/he is in bed and taking pain medication. Persons may engage in prolonged sitting, standing or walking and experience pain, then rest and/or take pain medication. Each time this 'pain cycle' is repeated, it is a learning trial. Because activity is repeatedly paired with pain, persons may come to fear simple activities and begin to avoid them. In addition, an association is made between pain and a chance to get relief from that pain. Rest and medication serve as positive reinforcers that reward pain and pain behavior. As pain persists over the months, behavior patterns are characterized by overly sedentary and restricted lifestyles because it seems to minimize pain and is rewarding in the short run. Long term consequences of the behavior are quite negative, however. In chronic pain, extreme inactivity often develops with persons spending

only a few hours out of bed. They may become very dependent on family and spouse, and communication may be minimal or absent. Family members often reinforce maladaptive forms of coping without being aware that they are doing so. Positive reinforcement may take the form of increased sympathy or attention whenever the person seems to be having more pain and showing more pain behavior. At the same time, the family members may be paying less attention to the person when s/he seems to be doing well. This differential reinforcement for pain behavior and lack of reinforcement for well behavior is believed to be a major factor in the maintenance of maladaptive pain behaviors.

Cognitive processes include chronic pain patients' thoughts, self-statements, or evaluations when in pain, beliefs, interpretations and attributions about their pain and their medical condition, and cognitive reactions or appraisals regarding the impact of pain on their lives (Turk & Rudy, 1986). Irrational thoughts often occur when pain persists (Ross, Gil & Keefe, 1988). A person with chronic pain may believe that his problem will resolve when the right doctor or cure for his pain is found. The recognition that pain is chronic triggers substantial anxiety. There is often an increased focus on bodily symptoms, such as feelings of numbness and tingling. Selective attention to these symptoms can trigger thoughts such as: 'I need to avoid standing, it always makes my pain worse.' As time passes without a change in the pain condition, the cognitive response pattern may become deeply embedded. The person may endorse a wide variety of pain related thoughts that result in depression; for example, 'It doesn't matter what I do, the pain will continue,' or

'The pain is awful, and I'm overwhelmed by it.' These cognitions create the feelings of helplessness and hopelessness. The person may perceive his need for pain medication and rest as evidence that s/he is weak or worthless, leading to depression. Depression may be made worse by a reduction of participation in social and recreational activities.

It is clear that chronic pain is a complex, subjective phenomenon that is uniquely experienced by each person. Knowledge about an individual's appraisals of his pain and coping repertoires is important for treatment planning and for evaluating outcomes. In this regard, clinician-researchers have focused attention on the development of instruments to measure locus of control, a cognitive construct based on social learning theory. This theory maintains that an individual develops an expectancy about the reinforcements he receives. Through a learning process, the person comes to expect either that certain outcomes are a result of their own actions or that they are a result of forces external to them (Lewis, Morisky & Flynn, 1978). Individuals who have an internal locus of control believe that a positive cause/effect relationship exists between their own behavior and the outcomes they experience. People having an external locus of control, on the other hand, perceive a lack of a relationship between their activities and consequent outcomes. For these persons, outcomes may be perceived as controlled by sources external to themselves, such as through powerful others or by chance factors, such as fate or luck. The health locus of control construct proposed by Wallston and colleagues (Wallston et. al., 1975) is derived from a social learning theory which emphasizes the significance of cognitions and belief system expectations

in predicting behavior. According to this model, the likelihood of performance of health related behaviors is a product of expectancy of personal control of health.

Researchers have also applied the locus of control construct to the chronic pain population. Persons with an internal locus of control believe that their own efforts are likely to affect the course of their pain. On the other hand, persons with an external locus of control believe either that the course of their pain is determined by powerful others, such as doctors or family members, or determined by chance factors; for example, fate or luck.

STATEMENT OF THE PROBLEM

Foci of the Present Study

Continued development and refinement of instruments which apply the locus of control construct to the chronic pain population has lead to the creation of the Pain Locus of Control Scale (PLC) (Toomey, 1988). This scale is a revision of the Multifactorial Health Locus of Control Scale, (Wallston, Wallston & DeVellis, 1978), an instrument to assess expectancies that health is determined by internal control (I), control by powerful others (PO), or by chance (C). The validity of the Pain Locus of Control Scale has yet to be fully demonstrated. The present study is undertaken in an effort to further examine the concurrent validity of the Pain Locus of Control Scale. Research conducted by Toomey Penzien and their colleagues has focused on patients prior to or during treatment. The specific contribution of this study will be to examine concurrent validity at the time of follow-up, a procedure not as yet undertaken by other researchers.

Correlational analysis will be utilized to examine the relationship between the PLC Scale and other well established cognitive measures. In addition, the relationship between treatment outcome measures and locus of control orientations, as measured by the PLC Scale, will be examined.

Social and Economic Impact of Chronic Pain

Chronic pain is a serious social problem, with consequences for individuals, families, and the community. Approximately 30-40 million Americans live with chronic pain (Mims, 1989). Low back pain affects approximately 8 million Americans yearly, and is the single most common cause of disability in persons less than 45 years of age. Work-related injuries, striking persons during their most productive years, account for 93 million lost work days per year. The total estimated cost of chronic pain, including treatment, litigation, and compensation is between $40-60 billion dollars per year.

The social consequences of chronic pain reach far beyond economic concerns. Persons who live with it have tremendous anguish. Roles are altered, income declines, and independence is threatened. Divorce rates as high as 70% have been reported among couples wherein one member suffers from chronic pain (Mims, 1989).

REVIEW OF THE LITERATURE

Development of the Multidimensional Health Locus of Control Scales

Wallston et. al. (1975) noted the difficulty of predicting behavior

in a specific area such as health using Rotter's Internal-External Locus of Control Scale (Rotter, 1966). This later scale is a generalized, non-health specific measure upon which much locus of control research has been based, (Wallston et. al. 1978). For this reason, they developed the Health Locus of Control Scale (HLC). Alpha reliability of the 11 items was .72. Concurrent validity of the HLC Scale was evidenced by a .33 correlation ($p < .01$) with Rotter's I-E Scale. Wallston et. al. (1975) noted that the magnitude of the correlation between the HLC Scale and the Rotter I-E Scale suggested that the two instruments shared some common meaning, but were measuring different phenomena as well. That is, the HLC Scale measured generalized reinforcement expectancies for health, while the I-E Scale measured global reinforcement expectancies. Several experiments showed discriminant validity of the HLC Scale in contrast with Rotter's Internal-External Locus of Control Scale (Wallston et. al. 1976).

In a review of the literature published in 1978, Wallston and Wallston summarized research findings on locus of control and health studies. They noted that there was evidence that internals showed more positive behaviors in each of the following areas: seeking information, taking medication, making and keeping physician appointments, maintaining a diet, and giving up smoking.

Wallston, Wallston and DeVellis (1978) noted that further HLC Scale data suggested the need to investigate the scale dimensionality issue. The original alpha reliability of .72 dropped considerably when the scale was used with later samples, ranging from .40 to .54. The researchers

reconceptualized health locus of control along multidimensional lines, paralleling Levenson's constructs (Levenson, 1973, 1974, 1975). She had argued that both the understanding and prediction of behaviors could be improved by studying fate and chance expectations separately from external control of powerful others. Levenson developed three 8-item Likert-type scales (internal, powerful others, and chance) to measure generalized locus of control beliefs and demonstrated initial evidence of their discriminant validity.

Wallston et. al. (1978) designed the Multidimensional HLC (MHLC) Scales utilizing three dimensions of health locus of control beliefs: internality, powerful others, and chance externality. The health locus of control items were mixed with Levenson's I., P. and C. scale items. Separate item analyses were computed on the pools of IHLC, PHLC and CHLC items. Alpha reliabilities for the MHLC Scales (six-item forms) ranged from .673 to .767 and, when Forms A & B were combined into 12-item scales, the alpha reliabilities increased (.830 to .859). These figures compared favorably to Levenson's I., P. and C. scales (alpha reliabilities = .508 to .733). Intercorrelational analysis indicated that each MHLC Scale correlated most highly with its theoretical counterpart among Levenson's scales. Correlations were computed between health status and the MHLC scores. Health status correlated positively with IHLC ($r=.40$, $p < .001$), negatively with CHLC ($r= -.27$, $p < .01$) and did not correlate with PHLC ($r= -.05$). These results provided an initial indication of predictive validity of the MHLC. Wallston, Wallston and DeVellis suggested that by

assessing more than one dimension of health locus of control, the probability of increasing understanding and prediction of health behaviors was increased.

Studies on Locus of Control in Chronic Pain Population

Researchers have explored the locus of control construct relative to the chronic pain population, using a variety of instruments. Nitti (1981) examined the effects of biofeedback treatment on locus of control in chronic pain patients. It was found that patients scoring in the mid-external range on Rotter's Locus of Control Scale demonstrated significant changes toward internality after biofeedback treatment.

Hudzinski and Levenson (1985) found that 82% of chronic headache patients achieved and maintained a significant decrease in overall headache intensity, severity and duration 20 months after biofeedback-behavioral treatment. Sex, number of sessions attended, age at time of treatment, program participation and locus of control, as measured by the Levenson Internal, Powerful Others, and Chance Locus of Control Scales (Levenson, 1981) were found significantly related to the effectiveness of treatment. Chronic patients benefiting most were under 40 years of age and had an internal locus of control.

Fitzpatrick et. al. (1987) found significant correlations between subjective outcomes and social class, previous hospital treatment and health locus of control, as measured by the Multidimensional HLC Scale, in patients treated at a rheumatological back pain clinic. Those with a high powerful others scale score had higher satisfaction scores with their clinic attendance.

Toomey, Finneran and Scarborough (1988) administered the MHLC, combined forms A and B, to patients with chronic pain in the head/neck region at pre-treatment. Persons attributing health control to powerful others were older, less likely to report use of analgesics, and were more convinced of a somatic basis for their symptoms. Patients who attributed control of health behaviors to themselves obtained lower disease conviction scores. Individuals attributing control to chance factors were less educated and obtained higher disease conviction scores.

Modifications of MHLC and Development of PLC Scale

Crisson and Keefe (1988) examined the relationship of locus of control orientation to pain coping strategies and psychological distress in chronic pain patients. These researchers used a modified version of the MHLC Scale, changing all references to health/illness to references to pain. Patients were also administered the Coping Strategies Questionnaire, (Rosenstiel & Keefe, 1983) to measure patients' use of pain coping strategies and the Symptom Checklist-90 Revised (Derogatis, 1983) to assess psychological distress. Correlational analyses revealed that patients who viewed outcomes as controlled by chance factors such as fate or luck tended to rely on maladaptive pain coping strategies and rated their abilities to control and decrease pain as poor. They also exhibited greater psychological distress. Regression analyses indicated that patients having a chance orientation toward locus of control were more likely to report depression, anxiety, and obsessive-compulsive symptoms and to have higher overall levels of psychological distress. Chance locus of control also predicted greater reliance on diverting attention and praying/hoping in dealing

with their pain. In addition, patients high on chance locus of control reported feeling helpless to deal effectively with their pain problem.

Toomey, Wingfield, Mann and Abashian (1988) revised the Multifactorial HLC to assess personal control of pain rather than health. Two groups of chronic pain patients (mixed headache disorder and myofascial low back pain) were compared with normal volunteers. Results indicated significantly lower internal control scores for patients with myofascial low back pain when compared with mixed headache patients or normal volunteers. The authors suggested that the quality of pain may affect the perceived ability to control pain and that pain clinic treatment of patients may require intensive cognitive re-training in addition to the more physically based pain relief modalities.

Toomey, Lundeen, Mann and Abashian (1988) revised the item content of the MHLC to assess personal control of pain, naming it the PLC Scale (PLC). A group of normal volunteers was compared with a group of chronic pain outpatients. Results revealed significantly higher scores on the internal control dimension in the normal group and higher chance dimension scores in the patient group. The authors maintained that results supported the construct validity of the PLC and suggested that chronic pain patients report greater deficits in personal control of pain and greater control of pain by fate when compared to normals.

Toomey, Lundeen, Mann and Abashian (1989) used the PLC to compare two groups of patients with chronic pain in different anatomic sites; that is, myofascial low back pain, and temporomandibular joint dysfunction. Results indicated significantly lower internal control scores for LBP

compared to TMJ, and higher powerful other scores for LBP patients compared with TMJ. The authors suggested that results indicated that differences exist between LBP and TMJ patients in attribution of control of pain and suggest that interventions which stress independent management of pain may be especially effective with TMJ individuals.

Toomey, et al. (1989) used the revised MHLC to assess the perceived control of pain in chronic pain patients at pre-treatment. High and low internality groups were created by splitting I scores at the median. More favorable results were noted for the high I group on the variables of average pain intensity ($t=3.53$, $p<.001$), percent time in pain ($t=2.47$, $p<.05$), and report of pain free periods ($t=2.94$, $p<.005$).

Penzien, et al. (1989) administered the PLC to chronic pain patients at pre-treatment. Alpha reliabilities for the PLC Internal, Powerful Others, and Chance subscales (.81, .80, and .79 respectively, Form A) approximated the reported reliabilities of the MHLC. Split-half reliabilities (Spearman-Brown) revealed that responses for Form A and Form B subscales were highly consistent (.89 for Internal, Powerful Others, and Chance). Intercorrelations of the three scales indicated the dimensions were not altogether statistically independent. The Powerful Others subscale was correlated significantly with the Chance and Internal subscales ($r's=.30$ and .20, respectively); the Internal and Chance subscales were not significantly correlated ($r= -.08$). Further findings of this study are as follows. The I subscale was negatively correlated with McGill Pain Questionnaire Affective Score ($r= -.20$, $p = .05$), and also with a self-rating of depression ($r= -.22$, $p=.021$). Powerful Others was correlated

with pain frequency (r=.27, p=.005). In addition, Powerful Others highly and positively correlated with the Sickness Impact Scale scores (Physical, Psychological, and Total)(r=.74, p=.001, r=.58, p=.014, and r=.74, p=.001, respectively). Chance was correlated with several pain indices; these were McGill Sensory (r=.29, p=.004) and pain frequency (r=.26, p=.007). Chance was also positively correlated with a self-rating of depression (r=.23, p=.02) and the Sickness Impact Scale Physical score (r=.54, p=.025). Finally, Chance was correlated with age and gender (younger patients and males produced higher PLC Chance scores than older patients and females).

Development of Cognitive Errors Questionnaires

Recent research has attempted to clarify the manner in which cognitive distortion or errors play a role in chronic pain (Lefebvre, 1981; Smith et al., 1986). The results of these studies suggest that cognitive errors may be related to affective and behavioral responses to chronic pain; for example, depression and functional status.

Lefebvre (1980) developed two cognitive error questionnaires to measure specific cognitive errors. One questionnaire was designed to measure cognitive errors related to general life experiences (General C.E.Q.), and the other measured errors related to the problems experienced by persons with chronic pain (Low Back Pain C.E.Q.). He demonstrated that both cognitive error questionnaires have high test-retest reliability (.80-.85), alternate-form reliability (.76-.82), and internal consistency (.89-.92).

The Low Back Pain C.E.Q. utilizes a total of 24 vignettes. Scoring values range from 0 to 4 and are assigned to the response choices such at 0 = Not at all like I would think, 1 - A little like I would think, and 4 = Almost exactly like I would think. Example items include: 1. You have a back problem and sometimes your back hurts after having sex. Last time this happened, you thought to yourself, 'Someday, I won't be able to have sex,' (catastrophizing); 2. Your supervisor just announced that, because of temporary business difficulties, all sales personnel will be working reduced hours. You think to yourself, 'This probably wouldn't be happening to me if I didn't have this back problem,' (personalization); 3. You and your family went to an afternoon baseball game. You enjoyed the first eight innings, but then your back began to ache. You find yourself thinking, 'What an awful way to spend an afternoon' (selective abstraction).

Lefebvre (1981) measured the tendency to make cognitive errors in four groups of participants: depressed psychiatric patients, depressed low back pain patients, nondepressed low back pain patients, and nondepressed persons without low back pain. Participants were administered the General and Low Back Pain Questionnaires. In addition to measuring general cognitive distortion, the questionnaires measured four specific errors: catastrophizing, overgeneralization, personalization, and selective abstraction. Results indicated that all cognitive errors were endorsed significantly more strongly by depressed participants with or without low back pain. Although depressed low back pain patients made cognitive errors in interpreting many general experiences, they endorsed three out

of our errors focused on low back pain experiences significantly more strongly than depressed nonpain participants. Lefebvre maintained that these findings suggest that depression in low back pain patients is a function of both low back pain and cognitive errors.

Smith et. al. (1986) examined the relationship of cognitive distortion, as measured by the Cognitive Errors Questionnaire, to disability, as measured by the Sickness Impact Profile (Bergner, et. al., 1981), in a sample of chronic low back pain patients. As predicted, cognitive distortion was consistently related to several aspects of disability. The cognitive variables accounted for variance in disability beyond that explained by severity of pain, number of pain treatments, and depression. Overgeneralization was the specific cognitive error most closely and consistently correlated with disability.

Development of Coping Strategy Questionnaire

Keefe (1988) states that most persons who have experienced pain for some time develop ways to tolerate, minimize or reduce it. These behaviors, termed pain coping strategies, may include involvement in distracting activities, focusing on pleasant events, or imagery, reductions in activity level, attempting to ignore the pain, and saying calming statements to oneself. The coping strategies a person uses over prolonged time periods may significantly affect functioning. For example, persons who develop effective coping strategies may manage their pain well and be able to lead active lives. Persons who rely on ineffective coping strategies may be more seriously impaired by pain and lead more restricted lives.

Rosenstiel and Keefe (1983) devised the Coping Strategy Questionnaire, a self-report method, to assess the extent to which chronic low back pain patients reported using six cognitive coping strategies and two behavioral coping strategies when they felt pain. The respondent is asked to rate how frequently s/he uses the coping strategies on a scale where 0 = never do that, 3= sometimes do that, and 6 = always do that. Examples of strategies include the following: 'I try to think of something pleasant,' 'I pretend it's not a part of me,' 'I pray to God that it won't last long,' 'I read,' and 'I lie down.' The C.S.Q. also asks the respondent to rate how much control the individual feels s/he has over the pain on an average day. A 7-point scale is used, where 0 = no control, 3 = some control, and 6 = complete control. Finally, the respondent is asked how much s/he is able to decrease the pain on an average day using a 7-point scale where 0 = can't decrease it at all, 3 = can decrease it somewhat, and 6 = can decrease it completely. Coefficient alpha correlations within subscales ranged from .71 to .85 with one exception (r=.28). This later subscale was dropped from further analyses. Thus, results indicated that the questionnaire was internally reliable. Patients reported using praying or hoping and coping self-statements most frequently, and rarely reported reinterpreting pain sensations. Individuals rated their overall ability to control and decrease their pain as a mean of 2.37 and 2.38 on a 7 point scale, respectively. Three factors accounted for a large proportion of variance in responses; these included Cognitive Coping and Suppression, Helplessness, and Diverting Attention or Praying. Three factors accounted for a large proportion of variance in responses; these

included Cognitive Coping and Suppression, Helplessness, and Diverting Attention or Praying. These three factors were predictive of behavioral and emotional adjustment to chronic pain above and beyond what may have been predicted from analysis of patient history variables and patients' tendency to somaticize.

Gross (1986) utilized the Coping Strategy Questionnaire to assess the use of coping strategies in back pain patients prior to undergoing a laminectomy procedure. Three factors, Self-reliance, Loss of Control, and Active Coping and Suppression accounted for a large proportion of the variance in questionnaire responses. Specifically, persons high on two of these factors, Self-reliance and Loss of Control, rated their pain as significantly less and the operation as having a more positive outcome than participants low on these two factors.

Turner and Clancy (1986) assessed the effectiveness of a group outpatient cognitive-behavioral and operant behavioral treatment program for chronic low back pain patients. Patients completed the Coping Strategy Questionnaire, as well as measures of pain, depression and functional disability pre- and post-treatment. The previously reported factor structure of the C.S.Q. was replicated. Significant associations were found between the use of ignoring and reinterpretation strategies and downtime, between the use of attention diversion strategies and pain intensity, and between tendency to catastrophize and physical and psychosocial impairment. Treatment resulted in significant changes in the types of coping strategies used to deal with pain. The increased use of praying and hoping strategies was significantly related to decreases in pain

intensity. Decreased catastrophizing was also significantly related to decreases in pain intensity, as well as to decreases in physical and psychosocial impairment.

Keefe et. al. (1986) investigated the relation of pain coping strategies to pain, health status, and psychological distress in a group of osteoarthritis patients with chronic knee pain. Factor analysis of the C.S.Q. revealed two factors, Coping Attempts, and Pain Control and Rational Thinking, that accounted for 60% of the variance in C.S.Q. responses. Regression analyses controlling for demographic and medical variables identified the Pain Control and Rational Thinking factor as a significant predictor of the outcome measures. Patients scoring high on this factor had lower pain levels, better health status, and lower levels of psychological distress.

Development of the Pain and Impairment Relationships Scale

Riley, et al. (1988) developed the Pain and Impairment Relationship Scale (PAIRS) to assess the extent to which chronic pain patients endorse the belief that they cannot function normally because of their pain, and the relationship of this belief to functional impairment, measured subjectively and objectively. They theorized that many chronic pain patients link pain and impairment, believing that they are unable to live normal lives as long as they have pain, and that the extent to which they are able to function is inversely proportional to their level of pain. These individuals regard pain relief as a prerequisite to resuming a normal, active lifestyle, and will often engage in a relentless search for a medical treatment with the hope that it will eliminate their pain.

Riley, et al., states that it appears essential for persons with chronic pain to develop adaptive beliefs about the relation between pain and impairment, and to deemphasize the role of experienced pain in their regulation of functioning.

The PAIRS was administered to patients in a chronic pain treatment program. The instrument consists of 15 items in the form of statements explicitly or implicitly attributing impairment to pain (e.g., 'I can't go about my normal life activities when I am in pain'; 'As long as I am in pain, I'll never be able to live as well as I did before.'), followed by a 7-point Likert scale anchored with degrees of agreement or disagreement. Cronbach's coefficient alpha was computed at .82, demonstrating adequate reliability in internal consistency. In addition, the PAIRS was validated by computing its correlation with the Cognitive Errors Questionnaire-Low Back Scale, which has been shown to correlate significantly with measures of impairment in the chronic pain population (Smith, et al., 1986); the two scales correlated at .50 ($p<.001$). The PAIRS accounted for a significant proportion of variance in several measures of impairment beyond that accounted for solely by subjective pain estimate in multiple regression analyses. These measures included the Sickness Impact Profile (Bergner, et al., 1981), a global measure of disability yielding impairment indices on physical and psychosocial dimensions, as well as overall impairment, restrictions in range of motion, and statements of limitation during a standardized exercise routine.

Riley, et al. (1988) concluded that the belief that pain necessarily implies disability is associated with actual impairment, independent of

the actual contribution of reported pain. In terms of implications for treatment, he stated that functional status is likely to covary with subjective pain only to the extent that these two constructs are perceived as linked by a person with chronic pain. That is, disability may be reduced most among those individuals who are able to view their functional status as related to factors other than their level of pain.

Summary of Review of Literature and Hypotheses

The PLC Scale has evolved from a sound theoretical base. Numerous studies have shown that locus of control orientation is related to emotional and behavioral adjustment to chronic pain. Toomey and Penzien and their colleagues have begun the process of establishing the validity and reliability of the PLC Scale. This study was an extension of their work; that is, it is undertaken in an effort to establish the concurrent validity of the PLC Scale with other cognitive measures at the time of follow-up after treatment. In addition, although there are inconsistent findings, studies suggest that those persons with an internal locus of control demonstrate more favorable treatment outcomes, as compared to persons with a powerful others or chance locus of control orientation. This possibility will be examined in the current research by investigating the relationship between treatment outcome measures and locus of control orientations, as measured by the PLC Scale. The following hypotheses will be investigated:

1. There will be significant correlations among the PLC Scale and the Coping Strategy Questionnaire, the Cognitive Errors Questionnaire-Low Back Pain Scale, and the Pain and Impairment Relationship Scale.

2. There will be significant correlations among continuous pain treatment outcome measures, as well as medication use and locus of control orientations, as measured by the PLC Scale. The Internal orientation will predict favorable treatment outcomes and Powerful Others and Chance orientations will predict unfavorable outcomes.
3. Employment status and PLC orientations will be related. Those with an Internal orientation will more likely be employed, while those with Powerful Others and Chance orientations will be more likely to be unemployed because of pain.

CHAPTER II

METHODOLOGY

Population

The participants in this study were individuals who had completed the Pain Management Program at the University of Nebraska Medical Center since December, 1984.

The primary purpose of the program is to help persons cope more effectively with pain and pain-related problems. It involves participation during the day over a four-week time period, five days a week. Specifically, treatment involves gradual reduction and eventual elimination of non-narcotic, narcotic and psychotropic pain medication, a progressively increasing program of daily exercise and physical activity, and an attempt to identify and resolve psychosocial issues related to or caused by the pain situation.

All persons met specific criteria before entering the program. These included: (1) pain of a benign nature, that is, not the result of an active disease process, (2) other medical or psychiatric treatments were not more appropriate, (3) the pain had been present for at least six months, (4) the patient wanted to participate in the program, and (5) the patient agreed to involve a family member or significant other person in the treatment.

Packets were mailed to 132 participants. Five persons were later removed from consideration in the study, four because of inappropriate diagnoses and one because she had completed the pain management program within the week. Packets were returned by 51 participants, a 40 percent return rate.

The mean age of participants at follow-up was 48 years; age range was 31-74 years. Thirteen males and thirty-eight females returned packets. Nearly half (24 participants) listed location of pain as lower back and lower limbs. An additional 10 participants listed lower back as a pain site, in combination with other site(s). Three participants listed pain as head alone, and an additional three participants listed location site as cervical. Three participants listed more than 3 sites of location of pain.

Comparison of demographic variables between individuals who responded to this study (N=51), and those who did not (N=76), was undertaken. No differences were found regarding marital status, education, compensation, or litigation status. Differences were found on sex, age, social status, and pain location variables. Respondents tended to be older, female, and of a slightly higher social status than non-respondents. In addition, approximately two-thirds of respondents listed pain as including low back, while only one-third of non-respondents did so. The majority of non-respondents listed location of pain as neither low back or headache.

Instruments

Participants were requested to complete the PLC Scale, the Pain and Impairment Relationship Scale, the Coping Strategy Questionnaire, and the Low Back Pain Cognitive Errors Questionnaire. Information was also collected on the following continuous variables: age, number of pain hospitalizations and surgeries for pain since treatment, number of hours of daily uptime, the degree to which pain may be interfering with daily living activities, and the number of months since treatment. In addition, participants were asked to rate their pain on a good day, bad day, today, and by estimating the past month's average using the Visual Analogue Scale. The V.A.S. is a vertical 100 mm line whose end points are marked with the labels 'pain as bad as it can be' and 'no pain.' Scott and Huskisson (1976) reported that visual analogue scales are the best available method for measuring pain. Participants were also requested to supply information on the following discontinuous variables: sex, diagnosis, employment status (unemployed, leave of absence or sick leave, employed, housewife because of pain, or retired because of pain), and medication use, (no/yes) regarding non-narcotics, narcotics, and psychotropics.

Procedure

In addition to the information listed above, packets mailed to participants contained a cover letter, explaining the purpose of the study and a request for participation. An informed consent form was included, per requirements set forth by the University of Nebraska Institutional Review Board. Participants were requested to return materials to the Nebraska Pain Management Center within 7-10 days. Follow-up phone

calls were made after 10 days, to insure return of materials. A minimum of 30 replies were sought by the investigator for data analysis.

CHAPTER III

RESULTS

Method of Analysis and Assumptions

Intercorrelations (Pearson's r) were computed among scores on the PLC Scale, the Pain and Impairment Relationship Scale, Coping Strategy Questionnaire, and Cognitive Errors Questionnaire (LBP). Correlations were also computed between the PLC Scale and each of the continuous pain treatment outcome variables. Since the instruments used yielded interval data, the presence of linearity was assumed. Correlations <.3 were considered low. Values between .3 and .6 were in the moderate range, and correlations >.6 were considered substantial.

Point biserial correlations were computed in the analysis of two dichotomous variables, medication use (no/yes) regarding narcotics, non-narcotics, and psychotropics and sex (demographic variable). The dichotomous variables were assigned the numerical values, 0 or 1.

Chi square was used to examine differences between the observed and expected frequencies in relation to PLC orientations and employment status and location of pain. This test assumes that responses are independent from one another, and that participants fall into one and only one category. It also assumes that sample frequencies are normally distributed about the population or expected value.

Relationship of PAIRS, CEQ-LB and CSQ

Pearson's r coefficients of correlation were first computed among the three instruments used to establish the validity of the PLC. That is, positive and negative relationships were examined among PAIRS, CEQ-LB, and CSQ. Results are presented in Table 1, and are described as follows.

The PAIRS moderately correlated with all of the cognitive errors and the total score of the CEQ-LB at stringent probability levels. Comparison of the PAIRS and CSQ produced both positive and negative statistically significant relationships. The PAIRS positively correlated with Catastrophizing, ($r=.68$, $p=.000$). A substantial, negative relationship was noted between PAIRS and Control Pain, ($r=-.63$, $p=.000$). A moderate, negative relationship was likewise noted between PAIRS and Decrease Pain, ($r= -.59$, $p=.000$). In addition, comparison of PAIRS and Ignoring Sensations produced a low, negative relationship.

Comparison of the CEQ-LB and the CSQ produced numerous relationships at significant levels. Overgeneralizing, a cognitive error, positively correlated with Catastrophizing at a substantial level, ($r=.67$, $p=.000$). The variables labeled 'Catastrophizing' from the CEQ-LB and the CSQ positively correlated at ($r=.56$, $p=.000$). The cognitive errors of Personalizing and Selective Abstraction both moderately related to Catastrophizing at ($r=.55$, $p=.000$) and ($r=.59$, $p=.000$), respectively. The total score from the CEQ-LB and Catastrophizing were substantially related at ($r=.69$, $p=.000$). Positive relationships were noted

Table I. Pearson's (r) and probabilities (p) between PAIRS, CEQ-LBP, and CSQ.

	r	p
A. PAIRS AND CEQ-LB COMPARISONS		
Positive Relationships		
Catastrophizing	.50	.000
Overgeneralizing	.54	.000
Personalizing	.42	.001
Selective Abstraction	.55	.000
CEQ-LB - TOTAL	.59	.000
Negative Relationships		
None		
B. PAIRS AND CSQ COMPARISONS		
Positive Relationships		
Catastrophizing	.68	.000
Negative Relationships		
Control Pain	-.64	.000
Decrease Pain	-.59	.000
Ignoring Sensations	-.25	.036
C. CEQ-LB AND CSQ COMPARISONS		
Positive Relationships		
Overgeneralizing and Catastrophizing (CSQ)	.67	.000
Catastrophizing (CEQ) and Catastrophizing (CSQ)	.56	.000
Personalizing and Catastrophizing (CSQ)	.55	.000
Personalizing and Praying/Hoping	.38	.002
Personalizing and Diverting Attention	.25	.037
Selective Abstraction and Catastrophizing (CSQ)	.59	.000
Selective Abstraction and Praying/Hoping	.32	.009
CEQ-LB TOTAL - Catastrophizing (CSQ)	.69	.000
CEQ-LB TOTAL - Praying/Hoping	.29	.017
Negative Relationships		
Catastrophizing (CEQ-LB) - Control Pain	-.60	.000
Catastrophizing (CEQ-LB) - Decrease Pain	-.41	.001
Overgeneralizing - Control Pain	-.50	.000
Overgeneralizing - Decrease Pain	-.46	.000
Overgeneralizing - Ignoring Sensations	-.26	.029
Personalizing - Control Pain	-.32	.010
Selective Abstraction - Control Pain	-.46	.000
Selective Abstraction - Decrease Pain	-.38	.002
CEQ-Total - Control Pain	-.54	.000
CEQ-TOTAL - Decrease Pain	-.43	.001

between Praying/Hoping and Personalizing, Selective Abstraction, and the CEQ-LB total score. Finally, Diverting Attention and Personalizing produced a low, positive relationship. Comparison of Catastrophizing (CEQ-LB) and Control Pain produced a substantial negative relationship at (r=-.60, p=.000). Moderate, negative relationships occurred between Catastrophizing and Decrease Pain, Overgeneralizing with both Control and Decrease Pain, Selective Abstraction and Control Pain, and the total score from the CEQ-LB with both Control and Decrease Pain. Finally, negative relationships were noted between Overgeneralizing and Ignoring Sensations, Personalizing and Control Pain, and Selective Abstraction and Decrease Pain.

Concurrent Validity of PLC

Pearson's r correlation coefficients were computed, as well, between each of the three orientations of the PLC and PAIRS, CEQ-LB and CSQ to examine concurrent validity. Results are found in Table 2, and are described as follows.

The Internal orientation positively and substantially correlated with Control Pain (r=.65, p=.000). A moderate relationship was computed with Internal and Decrease Pain, (r=.44, p=.001). A weak, but significant relationship was noted with Ignoring Sensations, as well. In terms of negative correlations, moderate relationships occurred between Internal and Catastrophizing (CSQ), (r=-.55, p=.000), PAIRS, (r=-.47, p=.000), and Catastrophizing(CEQ-LB), (r=-.42, p=.001). In addition, negative correlations were noted with Praying/Hoping, CEQ-LB total score, and the cognitive errors of Overgeneralizing and Personalizing.

Table II. Pearson's (r) and probabilities (p) between PLC Dimensions and PAIRS, CEQ-LB and CSQ

		r	p
A.	INTERNAL - PLC		
	Positive Relationships		
	Control Pain	.65	.000
	Decrease Pain	.44	.001
	Ignoring Sensations	.25	.033
	Negative Relationships		
	Catastrophizing (CSQ)	-.55	.000
	PAIRS	-.47	.000
	Catastrophizing (CEQ-LB)	-.42	.001
	Praying/Hoping	-.37	.004
	CEQ - Total	-.33	.007
	Overgeneralizing	-.28	.020
	Personalizing	-.28	.021
B.	POWERFUL OTHERS - PLC		
	Positive Relationships		
	PAIRS	.56	.000
	Selective Abstraction	.43	.001
	Catastrophizing (CSQ)	.41	.001
	CEQ - TOTAL	.36	.004
	Personalizing	.36	.004
	Praying/Hoping	.36	.005
	Overgeneralizing	.26	.030
	Negative Relationship		
	Decrease Pain	-.28	.022
C.	CHANCE - PLC		
	Positive Relationships		
	Catastrophizing (CSQ)	.66	.000
	PAIRS	.65	.000
	CEQ-LB - TOTAL	.50	.000
	Overgeneralizing	.47	.000
	Catastrophizing (CEQ-LB)	.44	.001
	Selective Abstraction	.43	.001
	Praying/Hoping	.41	.001
	Personalizing	.39	.002
	Negative Relationships		
	Control Pain	-.63	.000
	Decrease Pain	-.49	.000

Several positive, moderate relationships were noted relative to the Powerful Others orientation. These included PAIRS, (r=.56, p=.000), Selective Abstraction, (r=.43, p=.001), and Catastrophizing, (CSQ), (r=.41, p=.001). Positive relationships were computed between Powerful Others and CEQ-LB total score, Personalizing, Overgeneralizing and Praying/Hoping. In addition, a low negative correlation was computed between P.O. and Decrease Pain.

Catastrophizing (CSQ) and PAIRS positively correlated with the Chance orientation at substantial levels, (r=.66, p=.000) and (r=.65, p=.000), respectively. Other moderate relationships were computed as well; these included CEQ-LB total score, the cognitive errors of Overgeneralizing, Catastrophizing, and Selective Abstraction, and with Praying/Hoping. In addition, a positive relationship was computed with Personalizing and Chance. A substantial negative relationship was computed between Chance and Control Pain, (r=-.63, p=.000). Finally, a moderate, negative relationship was noted with Chance and Decrease Pain, (r=-.49, p=.000).

PLC and Treatment Outcome

In order to examine the relationship between PLC orientations and continuous treatment outcome variables, Pearson's r coefficients of correlation were computed. The results are shown in Table III, and are described as follows.

Table III. Pearson's (r) and probabilities (p) between PLC Orientations and Continuous Treatment Outcome Variables.

	r	p
A. INTERNAL - PLC		
Positive Relationships		
None		
Negative Relationships		
Interference with ability to sleep	-.50	.000
Interference with exercise	-.42	.001
Interference with having sexual relations	-.33	.011
Interference with yardwork/shopping	-.27	.026
Interference with socializing with friends	-.26	.035
Interference with going to work	-.25	.046
Pain ratings - Today	-.47	.000
Pain ratings - Good Day	-.32	.013
Pain ratings - Bad Day	-.26	.036
B. POWERFUL OTHERS - PLC		
Positive Relationships		
Hospitalization for pain	.26	.032
Interference with yardwork/shopping	.42	.001
Interference with household chores	.37	.003
Interference with exercise	.37	.004
Interference with having sexual relations	.35	.007
Interference with going to work	.33	.013
Interference with recreation/hobbies	.30	.015
Interference with socializing with friends	.28	.023
Interference with sleep	.27	.027
Pain ratings - Good Day	.35	.007
Pain ratings - Today	.25	.039
Negative Relationships		
Hours of uptime activity	-.41	.002
C. CHANCE - PLC		
Positive Relationships		
Interference with exercise	.56	.000
Interference with yardwork/shopping	.54	.000
Interference with socializing with friends	.53	.000
Interference with household chores	.51	.000
Interference with recreation/hobbies	.50	.000
Interference with sleep	.49	.000
Interference with work	.45	.001
Interference with sexual relations	.42	.002
Pain ratings - Today	.41	.002
Pain ratings - Good Day	.31	.015
Negative Relationship		
Hours of uptime activity	-.32	.012

No positive relationships were found between the Internal orientation and continuous pain treatment outcome variables. Two negative, moderate relationships were computed; these were with Interference with ability to sleep and Interference with exercise, at (r=-.50, p=.000) and (r=-.42, p=.001), respectively. Other negative relationships included Interference with having sexual relations, yardwork/shopping, socializing with friends, and going to work. Pain ratings for Today yielded a moderate, negative relationship with Internal (r=-.47, p=.000). In addition, negative relationships were found for Pain ratings for good day and Pain ratings for bad day.

Analysis of the Powerful Others orientation yielded the following relationships. A low, positive relationship was computed with Hospitalizations for pain (r=.26, p=.032). A moderate relationship was found between P.O. and Interference with doing yardwork/shopping (r=.42, p=.001). In addition, positive relationships were computed with Interference with doing household chores, exercising, having sexual relations, going to work, engaging in recreation/hobbies, socializing with friends, and ability to sleep. Two positive relationships were found with Pain ratings; these were ratings on a Good day and also for today. A moderate, negative relationship was found between P.O. and hours of uptime activity (r=-.41, p=.002).

Numerous positive, moderate relationships at stringent probability levels were found between the Chance orientation and interference with daily activities; these included exercise, doing yardwork and shopping, socializing with friends, doing household chores, engaging in

recreation/hobbies, ability to sleep, going to work and having sexual relations. A positive, moderate relationship was likewise found between Chance and Pain ratings for today, ($r=.41$, $p=.002$), as well as a relationship with Pain ratings on a good day. Finally, a negative relationship was computed between Chance and Hours of uptime activity.

No statistically significant relationships were found between PLC orientations and the continuous variables of age and months since treatment.

Data analysis yielded statistically significant correlations between medication use and locus of control orientations; see Table IV. A relationship was computed between the Internal orientation and psychotropics for pain at follow-up. Results also yielded a relationship between P.O. and non-narcotics for pain at follow-up. Finally, a relationship was noted between Chance and psychotropics for pain at followup.

Table IV. Point biserial correlations and probabilities between PLC dimensions and medication use.

	r	p
Internal (psychotropics)	-.35	.005
Powerful others (non-narcotics)	.23	.048
Chance (psychotropics)	.40	.002

No statistically significant relationships were found between PLC orientations and sex.

Chi square was computed between PLC orientations and the noncontinuous variables of pain location and employment status. Each of the PLC orientations was split at the median to create high and low groups.

Location of pain was divided into the following four categories: lower back and leg (n=24), lower back plus other site(s) (n=10), head or neck (n=6), and other (n=11). Four employment categories were designated; these were as follows: Category 1 - unemployed because of pain, on leave of absence or sick leave, a housewife only because it hurts too much to work, and retired because of pain; Category 2 - employed, a housewife by profession, doing volunteer work by profession, and attending school or job training; Category 3 - unemployed for reasons other than pain, retired because of reasons other than pain, and doing volunteer work because of pain. Analysis revealed no statistically significant Chi square values, indicating no relationship among PLC orientations and employment status or location of pain.

CHAPTER IV

INTERPRETATION OF RESULTS

Discussion

Relationship of PAIRS, CEQ-LB and CSQ

All of the instruments used to establish concurrent validity of the PLC were developed from cognitive-behavioral theory. Data analysis yielded numerous statistically significant relationships among these; results are discussed in relation to previous research as follows.

Moderate, positive relationships were found at follow-up between all of the pain-related cognitive errors measured by the CEQ-LB, as well as the CEQ-LB total score, and the belief that one cannot function normally because of pain, as measured by PAIRS. The highest of these correlations was computed between the CEQ-LB total score and PAIRS ($r=.59$, $p=.000$). Riley, et al. (1988) found both scales correlated at .50 ($p<.001$) at pre-treatment. In addition, the PAIRS showed a substantial positive relationship with Catastrophizing, as measured by the CSQ ($r=.68$, $p=.000$). Turner and Clancey (1986) found a significant relationship between the tendency to catastrophize and physical and psychosocial impairment at follow-up. That is, decreased endorsement of catastrophizing strategies on the CSQ was significantly related to decreases in total scores on the Sickness Impact Profile ($r=0.28$, $p<0.01$), a measure of pain-related physical and psychosocial disability. A substantial, negative relationship was found between PAIRS and Control Pain (CSQ) ($r=-.64$, $p=.000$), as well as a

moderate, negative relationship with Decrease Pain (CSQ) (r=-.59, p=.000). Keefe, et al. (1987) found patients scoring high on a factor of CSQ, Pain Control and Rational Thinking, rated their ability to control and decrease pain as high and had significantly lower scores than other patients on the psychological disability dimensions of the Arthritis Impact Measurement Scales, an instrument designed to measure health status in rheumatic disease patients.

Further analysis of the data revealed a substantial, negative relationship between Catastrophizing (CEQ-LB) and Control Pain (r=-60, p=.000). Catastrophizing (CEQ-LB) also negatively related to Decrease Pain (r=-.41, p=.001). Moderate, negative relationships were noted between the CEQ-LB total score and Control Pain and Decrease Pain as well (r=-.55, p=.000 and r=-.43, p=.001, respectively). Turner and Clancey (1986) found decreased endorsement of catastrophizing strategies significantly related to decreases in pain intensity ratings at post-treatment (r=.32, p<0.01). Keefe, et al. (1987), investigating the relation of pain coping strategies and psychological distress in a group of persons with osteoarthritis and chronic knee pain in pre-treatment, found persons who rated their ability to control and decrease pain as high endorsed few items on the catastrophizing subscale of the CSQ. These patients also had significantly lower levels of psychological distress on the Symptom Checklist-90 Revised (Derogatis, 1983), an instrument used to measure psychological symptoms.

In summary, examination of the data shows relationships among the instruments used to establish the concurrent validity of the PLC, which

are supported by other research completed at pre-treatment and also at follow-up. Analysis reveals a relationship between impairment and cognitive errors, as well as with poor ability to control/decrease pain. Cognitive errors also relate to less effective 'coping strategies' and to poor ability to control/decrease pain.

Concurrent Validity of PLC

As described in the results section, numerous relationships were computed between PLC orientations and the instruments used to establish concurrent validity. Findings are discussed below in relation to previous research.

Internal Orientation. A substantial, positive correlation was found between the Internal orientation (PLC), and Controlling Pain (CSQ) ($r=.65$, $p=.000$), as well as a moderate correlation with Decreasing Pain (CSQ) ($r=.44$, $p=.001$). Toomey, et al. (1989) found significant differences in the predicted direction between high and low internal groups at pre-treatment on the variables of average pain intensity ($t=3.53$, $p<.001$), percent of time in pain ($t=2.47$, $p<.05$), and report of pain-free periods ($t=2.94$, $p<.005$) using the revised MHLC. Penzien, et al., however, did not find the Internal orientation (PLC) to correlate with pain measures at pre-treatment.

Negative, moderate correlations were found between the Internal dimension and Catastrophizing, as measured by both the CSQ and CEQ-LB. In addition, a low, negative relationship was found between the Internal orientation and the total score of the CEQ-LB. Penzien, et al. (1989) found the PLC Internal was negatively correlated with a self-rating of

depression at pre-treatment (r= -.2265, p=.021). Several studies have suggested that cognitive errors are related to depression in the chronic pain population (Lefebvre, 1981; Smith, et al., 1986). Finally, the Internal orientation negatively correlated with PAIRS (r=-.47, p=.000).

In review, the Internal orientation of the PLC shows predicted relationships to all of the instruments used to establish concurrent validity at follow-up. The positive relationship of Internal to Control/Decrease pain and negative relationship to cognitive errors which are characteristic of depression are supported by research completed at pre-treatment.

Powerful Other Orientation. The PAIRS and Powerful Others orientation were moderately correlated (r=.56, p=.000). Penzien, et al. (1989) found the Powerful Others orientation (PLC) highly and positively correlated at pre-treatment with the Sickness Impact Scale scores (physical, psychological, and total) (r=.74, p=.001, r=.58, p=.014, and r=.74, p=.001), respectively). In addition, the present analysis produced a low, negative relationship between P.O. and Decrease Pain (CSQ)(r-.28, p=.022). Penzien, et al. (1989) found P.O. (PLC) was positively correlated with pain frequency (r=.27, p=.005) at pre-treatment.

In review, the current research shows a positive relationship of P.O. to PAIRS, CEQ-LB, and several subscales of the CSQ, and a negative relationship to Decrease Pain; these relationships are supported by research conducted at pre-treatment.

Chance Orientation. Both Catastrophizing (CSQ) and PAIRS positively correlated with the Chance orientation, yielding substantial relationships.

Crisson and Keefe (1988) reported that persons who viewed outcomes as controlled by chance were more likely to catastrophize and avoid increasing their activity as a way to cope with pain at pre-treatment. Moderate, positive relationships were found between the Chance orientation and all of the cognitive errors from the CEQ-LB, as well as with the CEQ-LB Total Score. Crisson and Keefe (1988) found that persons with a Chance orientation were more likely to report depression, anxiety, and to have higher overall levels of distress at pre-treatment, as compared to persons with I or PO orientation. Finally, Penzien, et al. (1989) found Chance (PLC) positively correlated with a self-rating of depression ($r=.23$, $p=.02$) at pre-treatment.

A substantial, negative correlation was found between Chance and Controlling Pain, as well as a moderate, negative correlation with Decreasing Pain. Crisson and Keefe (1988) reported that persons high on Chance rated their abilities to control and decrease pain as poor at pre-treatment. Penzein, et al. (1989) found Chance (PLC) positively correlated with frequency of pain at pre-treatment ($r=.26$, $p=.007$).

In review, the Chance orientation of the PLC shows predicted statistically significant relationships with all of the instruments used to examine concurrent validity. In addition, other researchers have found the Chance orientation to relate to catastrophizing, depression, and poorer pain control.

In summary, the PLC was found to correlate significantly at follow-up with all of the instruments used to examine concurrent validity; therefore, the first hypothesis is supported. Since this is the only

research that has examined concurrent validity at follow-up, it is suggested that these results be replicated.

PLC and Treatment Outcome

As stated in the results section, no statistically significant relationships were found among PLC orientation and age, sex, or months since treatment. Hudzinski and Levenson (1985), however, found that chronic pain patients benefiting the most from biofeedback behavioral treatment of headache at follow-up were under 40 years of age and had an internal locus of control. Older people were less successful in headache reduction and showed greater external locus of control.

It seems reasonable to expect that younger patients would do better in treatment than older persons, as Hudzinski and Levenson found, as these persons may be less conditioned by the pain cycle. It also seems plausible that persons high on the Powerful Others orientation would be older (Toomey, et al., 1988), as depending on physicians for pain management has traditionally occurred. Locus of Control, as well as treatment outcomes are complex issues; age and sex variables are only a small part of a host of factors bearing on cognitive functioning and outcome. Because of the somewhat inconsistent findings in the literature, as well as a paucity of research, further study is recommended regarding demographic variables and locus of control both before and after treatment.

As described in the results section, numerous relationships were found between PLC orientation and outcome variables at follow-up. The Internal orientation negatively correlated with interference with daily activities and pain ratings. The Powerful others orientation positively

correlated with poor outcomes; that is, hospitalizations for pain, interference with daily activities, and pain ratings. In addition, the P.O. orientation was negatively correlated with hours of uptime. Chance positively correlated with interference with daily activities and pain ratings. It was negatively correlated with hours of uptime. In terms of medication use, a negative relationship was computed between the Internal orientation and use of psychotropics at follow-up. Positive relationships were found between P.O. and use of non-narcotics and Chance and use of psychotropics at follow-up. No relation was found between PLC orientation and employment status, thus not confirming the third hypothesis.

In terms of prior research, Hudzinski and Levenson (1985) utilized a specialized version of the Levenson Internal, Powerful Others, and Chance Locus of Control Scales to measure expectations of control in regard to pain. They found that chronic headache patients benefiting the most from a biofeedback behavioral treatment at follow-up had an internal locus of control. Success in self-regulation and internal locus of control was significantly related (x^2=89.4, $p<0.001$). In addition, with age, sex, education and number of sessions controlled, locus of control proved to be a significant predictor of 20-month post-treatment outcome ($F=119.5$, $p<0.001$). Nitti (1981), utilizing a single subject design (N=3), found that chronic pain patients scoring in the mid-external range on Rotter's Locus of Control Scale demonstrated significant changes toward internality after EMG biofeedback treatment. He did not find a positive relationship between patients' locus of control scores and pain levels after biofeedback treatment nor did he find a positive relationship

between locus of control scores and pain medication intake after biofeedback. Applegate (1981), using Rotter's Locus of Control Scale, found Locus of Control scores of those participants designated external on admission moved in the internal direction after treatment. Thermal biofeedback gains correlated significantly with locus of control scores in the direction of internality. No pain level measures correlated significantly with locus of control. Internals took fewer non-narcotic analgesics with less frequency that externals. Internals also significantly reduced the use of non-narcotic analgesics and tranquilizers from pre-admission to follow-up.

In summary, the present research generally supports and extends earlier research examining locus of control and pain treatment outcome. The Internal orientation is related to more favorable outcomes, while Powerful Others and Chance are related to unfavorable outcomes. The exception is in regard to employment status, as no relationship between this variable and locus of control orientation was found in the present study. Therefore, the second hypothesis is supported by these findings, while the third hypothesis is not. As contradictory findings are present in the literature in regard to locus of control and pain ratings, as well as with medication use, these areas are suggested for further research.

A further point relates to the intercorrelations of the PLC scale after treatment, as compared to pre-treatment (see Table V). Penzien, et al. (1989) found a different set of interrelationships at pre-treatment, as compared to the present findings. They found that Internal and Chance were essentially not related, in contrast to the substantial negative

relationship found after treatment in this research. The relationship of I and PO was also different at pre-treatment compared to follow-up. While this study found a low, negative relationship, Penzien and his collegues reported a low, positive one. Finally, the pre-treatment PO-C positive relationship was smaller than the one reported at follow-up.

Table V. Comparisons of Internal, Powerful Others, and Chance Interrelationships Across Studies.

	Present Study; Post-Treatment	PLC Penzien, et al. (1989) Pretreatment	MHLC Wallston & Wallston (1978)	Levenson (1974)
Internal-Chance	-.67	-.08	-.34	-.17 n.s.
Internal-Powerful Others	-.25	.20	reported as statistically independent	-.14
Powerful Others-Chance	.58	.30	.28	.59

While the present research cannot make the claim that pain management treatment resulted in these changes, as no pre-treatment measures were obtained, it is interesting to speculate as to why these differences are seen. After treatment, a wider range of scores were obtained on the PLC, yielding higher correlations. A goal of pain management treatment is to teach persons that they can exercise control over their pain in order to improve their functioning. Indeed, many individuals may become less dependent on physicians and family members to change their situation, as

they learn to rely on themselves. Thus, the changes in relationships among the PLC orientations are likely to be related to the effects of treatment.

Conclusion

There are several limitations in this study which need to be acknowledged. Correlational data analysis does not imply cause/effect relationships. That is, it is not possible to indicate cause/effect between PLC orientations and scores on the measures utilized to examine concurrent validity or treatment outcomes. In addition, all measures utilized were self-report. A diversity of treatment outcome measures was used, however. Results should be replicated with the addition of objective measures.

Examination of Table III indicates that PO and Chance orientations are similar in regard to their relationships to treatment outcome variables. Review of the literature which led to the development of the PLC scale reveals that Wallston and Wallston, et al. (1978) found the scales of the MHLC to be intercorrelated (see Table V). These researchers developed the Multidimensional HLC Scale using three dimensions based on Levenson's work (1973, 1974, 1975). She had hypothesized that persons who believed the world to be unordered (chance) would behave differently from people who believe that the world is ordered, but that Powerful Others are in control. In the latter cases, a potential for control exists. In a study conducted to ascertain the validity of the separation of Locus of Control into three dimensions, Levenson (1974) found that although I, P, and C emerged in factor analysis, the Powerful Others and Chance scales

moderately correlated with each other ($r=.59$, $p<.01$). Thus, the original work upon which the PLC was based did not demonstrate a distinct difference between the Powerful Others and Chance scales. It is therefore recommended that investigations using the PLC scale exercise caution when making comparisons between these two orientations and other research variables.

In conclusion, support for the concurrent validity of the PLC at follow-up was found in this study. In addition, evidence was found that high internal locus of control scores are related to positive pain treatment outcomes, while Powerful Others and Chance orientations are related to unfavorable outcomes. Because the PO and Chance orientations were moderately correlated in this research, as well as in reviewed studies, caution is deemed necessary when making comparisons with other variables.

Further research examining Locus of Control and treatment outcomes is deemed important, as knowledge of this relationship may help clinicians develop the most effective means of evaluating and treating the chronic pain population. Educational efforts designed to teach persons about the role they can play in managing their own pain may reduce the tendency to ascribe outcomes to powerful others or chance factors, and, indeed, therapy techniques which provide persons with tangible evidence of their own effectiveness may be especially relevant. In addition, identifying patient orientations may help clinicians to evaluate the utility of matching patient characteristics with intervention strategies.

It is important to bear in mind that locus of control is only one of a group of factors relating to treatment outcome. As noted early in this research, pain is a complex and dynamic phenomenon. An individual's

perspective interacts reciprocally with sensory information, emotional factors, and behavioral responses when pain is experienced. Further research of the locus of control construct may lead to an increased understanding of the cognitive dimension of the pain experience.

GLOSSARY OF TERMS

1. Pain - an interacting cluster of individualized overt, covert, and physiological responses that are capable of being produced by relevant tissue damage or irritation and may also be produced and maintained by other consequent stimuli (Sanders, 1979).

2. Chronic pain - pain which has persisted for six months or longer.

3. Pain behavior - a cluster of responses including descriptions of pain, reductions in activity, avoidance of home or work responsibilities, reliance on pain medication, adaptation of body postures and facial expressions indicative of pain.

4. Well behavior - behaviors which support or lead to adaptive functioning; for example, participation in vocational, social, or recreational activities.

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