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# Pain State as a Mediator in the Psychological and Behavioral Assessment of Migraine and Tension Headache Sufferers

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# PAIN STATE AS A MEDIATOR IN THE PSYCHOLOGICAL AND BEHAVIORAL ASSESSMENT OF MIGRAINE AND TENSION HEADACHE SUFFERERS

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Chairperson

This dissertation meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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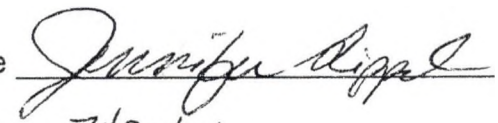
Signature 

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ABSTRACT

While research has suggested there is a possibility that headache assessment tools may be affected by the pain state of the individual, only one study to date has examined pain-state differences in assessment results for individuals diagnosed with a headache disorder. Holroyd, France, Nash & Hursey (1993) showed that most differences between headache sufferers and control groups on psychological symptom reports were an artifact of pain state. The present study examined the influence of headache pain state on self-reported psychological and behavioral variables. Undergraduate male and female subjects between the ages of 18 and 30 were selected based on their fulfillment of criteria for one of three groups: chronic tension-type headache sufferers (n=37), migraine headache sufferers (n=31), or headache-free individuals (n=30). Migraine and tension headache sufferers met the International Headache Society's criteria for chronic tension-type headache and migraine with or without aura (IHS, 1988). The results of a repeated measures MANOVA using subscales of the Coping Strategies Inventory revealed significant group and pain-state effects, such that scores on wishful thinking and social withdrawal subscales were higher during pain state. Results of a repeated measures MANOVA for the Daily Hassles Scale showed a significant group effect, such that migraine, tension and control groups differed on all seven

subscales. While significant group differences on inner concerns and time pressures on the Daily Hassles Scale replicated previous findings, group differences on all seven subscales had not been previously demonstrated. Significant correlations between headache subjects' pain rating during assessment and symptom reports, as well as discriminant analyses conducted to examine redundancies in symptom measures, were discussed. Results were discussed in terms of the importance of pain-state in the assessment of headache disorders.

between tension-type headache sufferers and controls disappeared when assessing tension subjects in a pain-free state. Subsequently, Holroyd et al. (1993) reported that elevated levels of depression and anxiety in headache sufferers were also mediated by pain state. The goal of the present study is to investigate the contextual nature of headache assessment by exploring the role pain state may play in headache assessment, and more specifically in differences often observed between headache sufferers and headache-free controls.

## Etiological Models: Headache Pathophysiology and Stress

### Migraine Headache

The classic etiological theory of migraine was formally synthesized and presented by Wolff and Tunis (1952). They proposed a physiological mechanism in which vasoconstriction occurs preceding headache pain. Specifically, intracranial vasoconstriction was thought to cause changes leading to prodromal aura symptoms (such as visual disturbance) which were theorized to be indicative of focal cerebral cortical and/or brain stem dysfunction. Then, extracranial vasodilation, in a rebound effect, was theorized to occur, causing excessive stretching of vessel walls, which was believed to contribute to the pulsating quality of the migraine pain itself. Early support for the classic theory of migraine etiology was garnered from studies showing that ergotamine (a known vasoconstrictor) was effective in relieving migraine pain (Graham & Wolff, 1938).

More recently, researchers have attempted to refine this two-stage model of migraine. Some studies have shown that the previously postulated, pre-headache phase of vasoconstriction actually involved more variable vasomotor activity in migraineurs as compared with headache-free controls (Sokolov, 1963; Feuerstein et al., 1982; & Morley, 1985). Other research has shown greater vasoconstriction in migraineurs than controls in the right temporal artery as opposed to the left (Ahles et al., 1988). Holroyd and Creer (1986) pointed out that "pain is not solely a consequence of vasodilation, however, because stimuli which induce simple vasodilation (e.g., hot bath, exercise) often fail to induce pain (Holroyd & Creer, 1986, p. 376)." Accordingly, researchers have investigated the importance of more central mechanisms involved in migraine pain, such as the neurotransmitter serotonin, along with brainstem activity (Raskin & Appenzeller, 1980; Diamond & Dalessio, 1982).

The trigeminal nerves extending from the brain stem (connected with the trigeminovascular system) have been shown to activate in response to noxious stimuli, causing vascular inflammation (Mayberg, Langer, & Zervas, 1981; & Moskowitz, 1992). These nerves have also been found to stimulate pain-transmitting neurons throughout the central nervous system (Moskowitz, 1992). Finally, elevated serotonin levels in urine have been correlated with migraine headaches (Anthony & Lance, 1975; MacKenzie et al., 1985; & Sicuteri et al., 1961). Amitriptyline (a drug used to control serotonin transmission) has been shown clinically to provide some relief from migraine headaches, providing

further support for the involvement of serotonin in migraine activity (Raskin, 1988). In sum, the initial two-phase, vasoconstriction-vasodilation theory of migraine pathophysiology has been expanded to include not only possible variation in vascular activity prior to migraine pain, but also more intricate, but less understood, neurological stimulation and neurotransmitter activity.

Chronic Tension-Type Headache

In a review of the literature, Martin (1993) described four major etiological models for chronic tension-type headache, each postulating the importance of muscle tension in the development and maintenance of tension headache: 1) chronically elevated muscle tension levels, 2) a sudden increase in muscle tension due to stress, 3) a slow decrease in elevated tension levels after stress, and 4) a low threshold for muscle tension pain. Though some initial research seemed to support one or more of those various muscle-tension hypotheses, later studies (Flor & Turk, 1989; Lipchik et al., 1996) and reviews (Andrasik et al., 1982; Pikoff, 1984) suggested that there was little evidence supporting any kind of abnormal muscle activity in chronic tension-type headache sufferers.

As in more recent studies investigating vascular factors in migraine headache pain, researchers noted that because muscle tension factors could not fully explain the occurrence of tension-type headache pain, other central processes may be involved. Studies have shown that tension-type headache sufferers experience elevations in pericranial muscle tenderness as compared to both control subjects and migraineurs (Drummond, 1987; Hatch et al., 1992;

Jensen et al., 1992; & Lipchik et al., 1996). Lipchik et al. (1996) explained the physiological mechanisms involved in pericranial muscle tenderness in terms of a shortened or absent exteroceptive suppression period (ES2) of the second temporalis/masseter muscle in chronic tension-type headache sufferers:

> Temporalis/masseter ES2 is a transient suppression of voluntary activity of temporalis and masseter muscles produced by stimulation of the trigeminal nerve, and is mediated in the brain stem by multisynaptic neuronal nets (Cruccu & Bowsher, 1986). The inhibitory brain stem interneurons that mediate ES2 in jaw-closing muscles receive strong input from limbic pathways (Kupyers, 1958; Nazaki et al., 1983; Yasui et al., 1985; Holstege & Van Krimpen, 1986), some of which are serotonergic and are implicated in pain modulation (Holstege, 1990). This suggests abnormal ES2 responses observed in chronic tension-type headache may reflect an excessive inhibition of these interneurons secondary to a distributed limbic control of brain stem relays such as the periaqueductal gray and the raphe magnus nucleus (Schoenen et al., 1987). The shortened second exteroceptive silent period observed in chronic tension-type headache may thus index a dysfunction of the endogenous central pain control system (Schoenen et al., 1987; Wallasch et al., 1991), and represent an interface between the psychogenic and myogenic factors putatively involved in the pathogenesis of chronic tension-type headache. (Schoenen et al., 1987, p 468)

Because not all studies have supported the shortened ES2 theory (e.g., Gobel, et al., 1992), it has been suggested that positive findings are associated with the chronicity and duration of the headache (Gobel et al., 1992). Indeed, Lipchik et al. (1996) found no shortened or absent ES2 suppression period in a college sample of chronic tension-type headache sufferers, reporting a diagnostic duration of no more than four years. Thus shortened ES2 suppression periods may not be an etiological factor, but a physiological adaptation in response to long-term headache pain (Lipchik et al., 1996).

## Stress and Headache: Etiology

Investigations focusing on the relationship between stress[1] and migraine and chronic tension-type headache, though showing conflicting results, have suggested stress is an important etiological and maintaining factor in headache. Three major types of studies include those examining stress via psychophysiological measures, stress and coping self-report measures, and a daily, time-series approach.

Mosley et al. (1991) carried out a time-series analysis of stress and headache incorporating migraine, muscle-contraction, and no-headache controls. He and his colleagues found that stressors measured on a daily basis predicted headache activity better than stressors measured weekly. However, temporal relationships between stress and headache were different for migraineurs and muscle-tension subjects. Muscle-tension headaches were best predicted by stress occurring during the headache activity, whereas migraineurs reported stressors one to three days prior to headache onset. Mosley et al. (1991) also reported widely varying individual differences in the degree to which stress and headache were associated. Thus, individual differences are important in discerning "for whom and under what circumstances" headache is related to stress (Mosley et al., 1991).

Spierings, Sorbi, Maassen, & Honkoop (1996) provided further support for Mosley et al.'s (1991) findings. They tracked reports of daily hassles for

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[1] Lazarus and Folkman (1984) defined stress as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being (p. 19)."

migraineurs. Data provided them with a "Migraine Time Line," showing that increases in subjective stress report during a given day would predict a migraine headache about one day later. Mood states such as alertness, tension, irritability, depression, fatigue, and quality of sleep were also predictors of migraine onset within about one day.

Holm, Lokken, and Myers (1996) investigated temporal relationships between daily stress and migraine headache in women. A group of twenty female migraineurs completed a test battery consisting of headache activity, perceived stress, cognitive appraisal, and coping strategies across a period of two months. Data supported the hypothesis that stress and headache "cyclically influence each other across time." In other words, migraine and stress were related in three ways: Migraine was related to stress following the headache, during the headache, and before the headache. This reciprocal triggering relationship between stress and headache may have clinical relevance in terms of using stress management as a means of reducing migraine headache. Additionally, these authors found significant correlations between both primary appraisal and migraine activity, as well as secondary appraisal and migraine activity.

Holm, Holroyd, Hursey, and Penzien (1986) focused not only on self-reported numbers and types of stresses, but also self-reported appraisal and coping. Recurrent tension headache sufferers and headache-free controls completed the Life Events Inventory, the Hassles Scale, the Cognitive Appraisal

Inventory, and the Coping Strategies Inventory. Tension headaches appeared to be strongly associated with everyday hassles rather than major life stressors. Tension headache sufferers appraised stress more negatively and coped in ways generally thought to be less effectively than headache-free controls. Tension headache sufferers reported more use of avoidance, self-blame, and shying away from social support than did headache-free controls. Additionally, when asked about the effectiveness of their own coping strategies, controls gave themselves more positive ratings than did tension headache subjects. Holm et al.'s (1986) findings suggest that future research should focus on headache sufferers' appraisal of and coping with minor life stress, or hassles, rather than major life stress.

Sorbi and Tellegen (1984) adopted Lazarus' (1984) "threat" (anticipation of damage or loss) and "challenge" (anticipation of gain or control) theory of appraisal related to migraine. Migraine occurred more in the presence of a threatening situation, and subjects reported using more depressive coping and less active-problem-solving. Challenge situations were not related to migraine occurrence, nor were they related to depressive coping. Additionally, "idiosyncratic coping patterns" (reports of using a variety of coping techniques, some adaptive and some maladaptive) led to higher incidence of migraine (Sorbi & Tellegen, 1984).

One of the most interesting studies relating stress to migraine and tension headache focused on self-reported appraisal and coping strategies (Ehde &

Holm, 1992). Researchers compared migraine, tension and headache free controls on three measures: the Life Events Inventory (LEI), the Coping Strategies Inventory (CSI), and the Cognitive Appraisal Inventory. When compared to headache-free controls, both migraine and tension headache subjects appraised events as more undesirable and more stressful, and they also coped with these events in what are generally considered to be more maladaptive ways (e.g., avoidance, wishful thinking and social withdrawal). Furthermore, migraineurs reported more stressful life events than control subjects. Ehde and Holm (1992) also examined the possibility of using appraisal and coping techniques to discriminate between the three groups used in the study. Tension and migraine subjects were prone to be very similar in their appraisal and coping strategies, and together they were both distinguished from control subjects. Though these results are interesting and suggest promising treatment regimens, Ehde and Holm (1992) maintain the need for replication concerning discriminant functions of appraisal and coping. Were future research to focus on the ability of subjective stress and coping to discriminate between headache sufferers and headache-free controls, it would be important to determine whether the discriminant functions worked better for assessment done during headache pain state or during a headache-free state.

Finally, connections have been made between physiological abnormalities during stress in headache sufferers. Passchier, Goudswaard and Orlebeke (1993) recorded temporal and digital pulse amplitudes, forehead temperature,

heart rate, respiration rate and electrodermal activity of migraineurs and headache-free controls during an adaptation or resting phase, an experimental stressor situation (an IQ test), and a real-life stress (an examination for an actual course the participant was taking at an undergraduate institution). The researchers found that migraineurs showed smaller pulse amplitudes of the temporal artery during the examination than did headache-free control subjects. Passchier et al (1993) suggested that the findings supported the symptom-specificity hypothesis, in that migraineurs exhibit abnormal vascular responses during stress.

Goudswaard, Passhier, and Orlebeke (1988) examined frontal, temporal, and corrugator EMG levels of migraineurs and headache-free controls. As in previous research, they found that absolute EMG levels in these three muscles did not differ between migraineurs and controls during rest or experimental stress. However, when EMG levels were transformed into proportions of the maximum EMG levels, migraineurs showed higher proportional EMG levels in the corrugator muscle than control subjects during experimental, and real-life stress. The same trend, although non-significant, was found for the frontal and temporal muscles.

Other researchers have examined whether both migraine and tension headache sufferers differ from headache-free controls in physiological response to laboratory stress (Arena, Blanchard, Andrasik, Appelbaum & Myers, 1985; Clarke, Morris, & Cooney, 1987; Holm, Lamberty, McSherry & Davis, 1997).

Results have been equivocal. Arena et al. (1985) found that migraineurs' vascular and skin temperature responses to stress took longer to recover than tension headache sufferers, and that tension headache sufferers' showed more neck muscle activity and less cephalic vascular activity than migraineurs in response to stress. However, Clarke et al. (1987) reported no physiological differences between migraineurs, tension headache sufferers and controls in response to a mental stressor. Only Holm et al. (1997) actually correlated self-reported stress with physiological differences in headache sufferers' responses to stress. They found that migraineurs' pulse rates took longer to recover to baseline after stress than did tension headache sufferers or controls. Additionally, migraineurs also decreased their appraisal of coping effectiveness upon receiving negative feedback, whereas tension headache sufferers and control subjects did not report that decrease.

Hursey et al. (1985) initially found no differences between tension headache sufferers and control subjects on EMG and heart rate reactivity to stress. But upon closer examination, the non-significant trend for tension headache sufferers showing elevated Frontal muscle EMG responses to stress became significant when accounting for pain state. Tension headache sufferers having a headache at the time of assessment showed elevated Frontal EMG levels in reaction to stress as compared to control subjects, while those without headache at assessment were not different from controls. Headache sufferers' physiological response to stress is not clearly understood, but is probably

mediated by pain state at the time of stress, as well as perceived or self-reported stress and coping variables.

## Other Mediating Variables and the Stress-Headache Model

The above research shows a strong relationship between headache and variables such as possible pathophysiology, stress, and general coping. However, in only a few of the above studies did authors prove able to specify any type of causal relationship between stress and headache, showing that stress tends to precede migraine headache in time, and that stress tends to occur concurrently with tension headache. Also, physiological responses to stress in headache sufferers may differ from controls, and those differences may be moderated by subjective reports of stress and pain state at the time of stress. Given this lack of clarity concerning the stress-headache relationship, it is important to examine other variables that may mediate that relationship. Pain-specific coping, pain locus of control, anxiety, and depression have all been found to be related to chronic pain in general, as well as specifically related to headache (Buckelew et al., 1992; Crisson & Keefe,1988; Haythornthwaite et al., 1998; Kashikar-Zuck et al., 1997; McCracken & Gross, 1993; & Parker et al., 1989).

### Variables Mediating the Stress-Chronic Pain Relationship

Parker et al. (1989) found that, in rheumatoid arthritis (RA) patients, lower pain intensity was predicted by lower age and high scores on the Pain Coping Rational Thinking (PCRT) subscale of the Coping Strategies Questionnaire

(CSQ). High scores on PCRT also predicted less helplessness, general psychological distress, and reports of hassles. While PCRT was not a significant predictor of better health status over education and age, increases in PCRT over one year were shown to correlate with lower pain intensity and improved physical functioning as measured by the AIMS.

Pain locus of control has been linked to pain experiences during mammographies (Kashikar-Zuck et al., 1997). Women reporting higher scores on coping efficacy predicted lower reports of pain intensity and pain/discomfort during the mammography. Coping strategies women reported using for day-to-day pain did not predict their report of pain or discomfort during the mammography. The fact that Kashikar-Zuck et al.'s (1997) study did not support Parker et al.'s (1989) finding that coping strategies affected pain intensity might be explained by postulating that pain coping strategies may have a more significant impact on the experience of pain when it is chronic in an individual's life, versus acute, as in a medical procedure such as a mammogram.

Regression analyses conducted by Crisson and Keefe (1988) showed that chronic pain patients rating their pain locus of control as mostly associated with chance (i.e., luck or fate) also reported higher psychological distress and higher scores on the helplessness and diverting attention/praying/hoping factors of the CSQ. Higher chance-oriented locus of control in chronic pain patients predicted increased use of helplessness and diverting attention and praying/hoping. Higher pain intensity ratings, along with increased chance-oriented locus of

control, predicted higher reports of psychological distress, including symptoms of depression and anxiety. Studies by Crisson and Keefe (1988) and Kashikar-Zuck et al. (1997) support the relationship between pain locus of control, pain-specific coping, and psychological distress in individuals coping with chronic pain.

Geisser and Roth (1998) have again shown a relationship between the above-mentioned variables, and whether or not patients agreed with their chronic pain diagnosis or lack thereof. Patients who were unsure of their diagnosis reported more pain than patients who agreed with their diagnosis. Patients disagreeing with their diagnosis were more likely to report they believed pain was a signal of harm, and reported more maladaptive coping strategies. Increased involvement in litigation for pain disability, higher scores on the SOPA Harm subscale (indicating the individual considers pain as a signal of harm), higher global psychological distress (measured by the BSI Global Severity Index), and increased reports of catastrophizing measured by the CSQ all predicted higher pain disability. Because Geisser and Roth (1998) found that these variables were independently predictive of pain disability and not redundant variables, they concluded that these variables should remain important parts of pain assessment batteries.

Another study showed that pain-coping strategies predicted patients' perceived control over pain. Haythornthwaite et al. (1998) showed that, after controlling for pain severity and education, higher use of coping self-statements

and reinterpreting of pain sensations (both subscales of the CSQ) predicted higher reports of pain control in chronic pain patients. Also, flexibility in using different coping pain strategies predicted pain control. Haythornthwaite et al. (1998) suggested that chronic pain patients' ability to shift coping strategies when one is unsuccessful could lead to more control over pain.

McCracken and Gross (1993) showed that the relationship between pain coping and anxiety in response to pain is more complex than initially thought. Cognitive anxiety symptoms (measured by the Pain Anxiety Symptom Scale--PASS) predicted use of coping self-statements, ignoring pain sensations, catastrophizing, increasing activity, and pain behaviors. Physiological anxiety reports predicted increased use of diverting attention, coping self-statements, ignoring pain sensations, praying and hoping, catastrophizing, and increasing activity. Escape/avoidance anxiety symptoms predicted increased use of pain behaviors.

The relationship between pain coping strategies and anxiety appears to be mediated by pain locus of control. Buckelew et al. (1992) showed that patients engaging in electrodiagnosis testing (a painful electromyographic procedure used to diagnose neuro-muscular disorders) analysis reporting increased catastrophizing, diverting attention, and coping self-statement strategies were more likely to give more intense reports of pain. Increases in reinterpreting pain as a coping strategy during the procedure predicted lower pain reports. A second multiple regression analysis showed that lower control

over pain predicted higher anxiety scores. Buckelew et al.'s (1992) results support only the relationship between anxiety and pain for acute pain management, and that further research of this type should be conducted on various chronic pain samples.

Variables Mediating the Stress-Headache Relationship

Headache-specific pain locus of control has been shown to be related to coping and psychological distress in headache sufferers (Martin, Holroyd, & Penzien, 1990; Scharff, Turk & Marcus, 1995; ter Kuile, Linssen & Spinhoven, 1993; & VandeCreek & O'Donnell, 1992). Martin et al. (1990) found that high scores on the Headache-Specific Locus of Control Scale (HSLC) subscale of Health Professional locus of control were related to higher medication use. High scores on Chance locus of control were related to depression, physical symptoms disability, and higher use of catastrophizing as a coping strategy. High scores on Internal locus of control were related to headache sufferers' preference for self-regulation treatment (such as progressive muscle relaxation training). VandeCreek and O'Donnell (1992) found that the HSLC was able to distinguish between headache sufferers who do and those that do not seek treatment from health care professionals. Ter Kuile et al.'s (1993) study of 170 chronic headache patients showed that subjects reporting higher internal locus of control were more likely to divert attention and ignore pain sensations. Also, subjects reporting physician-oriented locus of control reported catastrophizing and praying/hoping to deal with their pain. While Scharff et al. (1995) did not

assess self-reported stress or coping as it related to headache locus of control, they did assess psychosocial and behavioral adaptation of headache sufferers. They found that headache sufferers who were more active, and who had effectively adapted to their chronic headaches, were less likely to perceive chance or health care professionals as in control of their headaches than behaviorally dysfunctional headache patients. Locus of control was shown (Scharff et al., 1995) to be related to what can be considered a behavioral outcome of stress and coping.

Rates of depression and anxiety have been shown to be higher in headache sufferers than in the general population (Andrasik et al., 1982; Breslau et al., 1994; De Benedittis & Lorenzetti, 1992; Garvey et al., 1984; Martin et al., 1988; Spinhoven et al., 1991). Breslau et al. (1994) completed a large (N=1007), longitudinal epidemiological study examining prevalence rates of depression and migraine headache. They found migraineurs were 3.2 times more likely to report depression in the future (3.5 years later) than headache-free controls. Interestingly, the risk was nearly the same (3.1 times more likely than headache-free controls) for depressed individuals to report migraine diagnoses 3.5 years later. This surprising result suggested that a one-way cause and effect explanation for the headache-depression relationship is oversimplified, and that more complex relationships exist that are likely moderated by other variables discussed in this paper. Andrasik et al. (1982) found elevations of depression and anxiety in headache sufferers (with tension headache sufferers showing the

most psychopathology), but these elevations were not able to discriminate between headache groups. Martin et al. (1988) showed that self-monitored mood (including both depression and anxiety) and headache intensity were most strongly related during headache. Mood levels preceding or after a headache were not related to headache intensity. De Benedittis and Lorenzetti (1992) found that headache sufferers reporting more daily hassles also reported higher levels of depression and anxiety than did headache sufferers reporting fewer daily hassles. Finally, Holm et al. (1994) conducted a study examining the comorbidity of depression and headache, finding that somatic depressive symptoms were correlated with depression in headache sufferers, but cognitive depressive symptoms were not. Holm et al. (1994) suggested that somatic symptoms of depression may be transdiagnostic symptoms and therefore may not be good predictors of depression in headache sufferers.

So far, research has been presented that supports the role of stress, coping, locus of control, and psychopathology as etiological and maintaining factors of headache pain. These relationships have not yet been effectively put together in a model of headache. Gatchel (1996) discussed a logical, fairly well substantiated model of the cause and effect relationships between the above-mentioned variables and chronic pain in general. He argued that "chronic pain is a complex psychophysiological behavior pattern that cannot be broken down into distinct psychological and physical components." (p. 33) The main question he addressed was, "Which comes first--the psychopathology or the chronic pain?"

(p.33) His model consisted of three stages subsequent to acute pain. Individuals tend to respond to acute pain with initial psychological distress, including fear and anxiety. Major psychological problems do not develop at this stage. Pain persisting longer than the normal acute stage tends to be accompanied by more serious psychopathology such as depression, anxiety disorders, and substance abuse. Gatchel (1996) cited research supporting the notion that the type and severity of the more serious psychopathology found in stage 2 chronic pain patients depends on their premorbid psychopathology and current socioeconomic status. Finally, the third stage of chronic pain constitutes the individual's "acceptance of a sick role and [further exacerbation of] abnormal illness behavior." (p. 36)

Gatchel (1996) cited a study by Blanchard, Kirsch, Appelbaum, and Jaccard (1989) that provided some initial support for this causal model with headache. Blanchard et al. (1989) analyzed headache patients cross-sectionally at various stages of their experience of headache. They found that psychopathology existing before the onset of headache diagnosis was predictive of chronic headache. Another study by LeResche, Dworkin, Wilson and Ehrlich (1992) found no differences in reports of depression, anxiety, or daily hassles between a recent onset (less than two months) group and a chronic (six or more months) group of women suffering from temporomandibular disorder. However, the chronic group did report more catastrophizing as a pain coping strategy than the recent onset group. These findings suggest that psychopathology did not

change drastically during the first six months of a chronic pain disorder; however, data gathered from the two groups were not compared to a pain-free control group. Perhaps their reports of stress, coping and psychopathology might have differed from a normative sample. Gatchel (1996) also commented on specific chronic pain maintenance hypotheses. He cited research supporting a "feed back" loop linking physical deconditioning and negative affect, which perpetuate each other and contribute to maladaptive pain coping skills. In conclusion, given the current state of the literature supporting this theoretical model of headache and psychopathology, it still must be assumed that either psychopathology or chronic pain can occur first. But the specific type and severity of psychopathology associated with chronic pain in later stages depends on the presence and type of psychopathology before chronic pain onset.

## Assessment of Headache Pain

In part, because of the ambiguity surrounding the physiological etiology of both migraine and chronic tension-type headache, current practice of headache pain assessment is based mostly on a research-supported psychosocial framework of headache. "Headache...is largely subjective, absent of reliable objective markers, and multidetermined, calling for a comprehensive, multifactorial assessment approach" (Andrasik, 1992, p. 344). Assessment has often focused on headache sufferers' reports of daily stress and general coping strategies. However, other variables have been shown to be important in moderating the headache-stress relationship. These variables include pain-

specific coping, headache locus of control, and psychopathology (mainly depression and anxiety).

Several difficulties occur when attempting to get accurate information during a headache assessment. Global reports of headache frequency, duration and intensity rely on patients' ability to accurately recall these facts retrospectively. Daily monitoring reports are, in general, assumed to be more accurate information, with one exception (Martin, 1993); the actual task of monitoring may change the variable in question. Headache assessment tends to be rather time consuming, so many researchers and clinicians have employed self-report questionnaires focusing on headache symptoms and functional analyses. Some studies have called into question the test-retest reliability of self-reported headache intensity, duration and frequency(Thompson & Collins, 1979; Andrasik & Holroyd, 1980). Rasmussen, Jensen, and Olesen (1991) showed that self-report questionnaire data used in assessment was unsatisfactory as compared to a diagnostic interview. Lastly, a question receiving little attention in the literature is whether or not to assess a headache sufferer during a headache or while they are headache free. Few studies have examined context effects of headache assessment, and specifically, pain state effects.

## Context Effects

Context (both external and internal) has been shown to affect individuals' memory. Given the nature of self-report headache assessment requiring

patients to recall physical, psychological, and behavioral experiences, it is important to review how general context variables can influence memory. Well-controlled experiments have provided evidence that environmental variables affect individuals' memory (Baddeley, 1998). Internal environment (i.e., physiological or psychological state) has also been shown to affect memory (Baddeley, 1998). Baddeley (1998) described a study showing that more depressed individuals (measured by the Beck Depression Inventory) recall unpleasant experiences more quickly than less-depressed individuals. This illustrates the concept of mood state dependency, which suggests individuals recall, for example, negative experiences more readily when they return to the mood they were in during the past negative experience. Baddeley (1998) also reviewed evidence of mood-congruency: individuals' negative mood may enhance negative memories; in other words, they may describe past events as more distressing while experiencing negative mood than while not experiencing negative mood. In conclusion, the above experiments have demonstrated that internal and external context variables can affect individuals' ability to accurately recall facts and events. Because most psychological measures given during psychological assessments (including those for headache) require individuals to retrospectively provide information about past events, thoughts, and behaviors, studies investigating context variables affecting responses to such questionnaires are important.

Only a few such studies, however, address context effects on psychological/behavioral self-report inventories. Council (1993) described four studies in which he investigated the effect one self-report trait or symptom measure has on another such measure completed during the same administration. His first study showed that correlations between two questionnaires (Revised Paranormal Beliefs Scale and the Symptom Checklis-90-Revised) were weak when the two were administered together, and were very strong when administered one week apart, by different experimenters, and presented as different studies. Council (1993) concluded that context effects of simultaneously administered questionnaires confounded what would have been significant correlations. The second investigation showed that measures presented consecutively, as compared to spaced apart by other measures, were more highly correlated. Thirdly, correlations between childhood sexual trauma and psychopathology were only significant when the trauma measures were presented first (When the psychopathology measures were presented first, the individuals did not know that a childhood sexual trauma measure would follow.). Lastly, the researchers (Council, 1993) presented the Beck Depression Inventory (BDI) and the Attributional Style Questionnaire (ASQ) in one sitting. They were presented (counterbalanced for presentation order in all situations) as 1) a single study with one consent form, or 2) two studies with different consent forms, presented together for practical reasons. Internal attributions for negative outcomes (subscale of the ASQ) were only correlated with BDI scores when the

measures were presented as the same study. Council (1993) concluded that the best way to control for the above-described context effects is to administer measures in separate contexts (places, researchers, studies), and not together with counterbalancing.

Pain State Context as it Mediates Headache Patients' Symptom Reports

The above research supports a general investigation into context variables that may affect headache assessment measures. There have been specific studies showing how pain state affects individuals' reports of psychological symptom measures often used in headache assessment, as well as their ability to recall events.

Pain state has been found to affect individuals' memory of events, as well as correlate with individuals' psychological reports of depression and stress. Gil, Williams, Keefe and Beckham (1990) showed a relationship between negative thoughts (using the Inventory of Negative Thoughts in Response to Pain) and pain ratings, pain coping strategies (using the Coping Strategies Questionnaire), and psychological distress (Symptom Checklist-90) in three pain populations (sickle cell disease, rheumatoid arthritis, and chronic pain) during pain flare-up states. Overall, higher reports of negative self statements and negative social cognitions were directly related to higher pain ratings. Negative thoughts about self, social interaction, and blame were associated with higher levels of Catastrophizing as measured by the CSQ. Increased frequency and pervasiveness of negative thoughts in general were also related to increased

catastrophizing. Subjects reporting lower levels of control over negative thoughts reported more catastrophizing in response to pain. High INTRP subscale scores were also directly related to higher levels of depression, anxiety, as well as other indicators of psychological distress on the SCL-90. One of the most important findings of this study was that chronic pain sufferers (individuals experiencing near-constant pain) reported more negative thoughts in response to pain flare-ups than individuals experiencing pain due to rheumatoid arthritis and sickle cell disease. Gil et al. (1990) suggested that chronic pain (as opposed to the more intermittent pain of the other diagnostic groups) may cause more behavioral restriction and psychological distress, which in turn contributes to increased negative thoughts in response to pain.

Eich, Rachman and Lopatka (1990) completed a study supporting Gil et al.'s (1990) suggestion that pain causes psychological distress and negative thoughts. They asked 25 female subjects to complete measures of affect and autobiographical memory while in moderate to severe menstrual pain and while pain-free. At each session, subjects indicated their amount of happiness, sadness, and pain at the moment on 100-mm visual analogue scales. Then they were presented with a series of 20 common-word cues and given 30 seconds after each to give a cued memory from any time in their personal past, which was recorded by a researcher. After both sessions (pain and pain-free) were completed (with a total of 40 autobiographical memories), subjects were asked to rate the "original pleasantness" of each of their autobiographical memories they

described during the sessions. Eich et al. (1990) reported that about half of the subjects were in pain while completing this rating, while the other half were pain free. Initial bivariate analyses showed that while the subjects were in pain, they reported more negative affect and more negative autobiographical memories than when they were not in pain. However, in order to account for possible redundancy between affect and pain in their moderation of autobiographical memory, a multiple regression was conducted. Researchers found that while the multiple correlation including both pain and affect as predictors of memory was significant, only affect was a significant predictor of memory. A second multiple regression using the difference scores in memory pleasantness ratings as the dependent variable also found that pain blocked the memory of pleasant events only when negative affect was present. This study provided further insight about the pain-depression relationship as it affects individuals' self-reports. Eich et al. (1990) further speculated that pain may cause negative affect, which in turn increases the likelihood of recalling negative memories and thoughts, which further increases negative affect, and maintains continued or increased pain.

Wright and Morley (1995) responded to Eich et al.'s (1990) and other studies' findings that "memory for past pain intensity is a function of the level of pain at the time of recall." (see references cited in Wright & Morely, 1995) First, they noted that even though Eich et al.'s (1990) study found that only 9.3% of the recalled unpleasant memories were actual pain-related memories, this was perhaps a function of Eich et al.'s (1990) use of neutral word cues for memory,

and not pain-specific cues. This would be an important note concerning headache assessment. If a headache sufferer completes assessment during a headache, they not only experience the pain state context for memory, but also must respond to specific questions (cues) about pain events in the assessment. Wright and Morley (1995) also cited research indicating that pain memories were in general recalled more quickly than more neutral types of memories, such as social events. Thus Wright and Morely (1995) attempted to answer whether or not chronic pain patients recalled more pain memories than control subjects, and recalled them more quickly than control subjects, in response to pain-specific word cues. Indeed, chronic pain patients recalled more pain memories in response to pain word cues than control subjects; however, this difference was attributed to chronic pain patients' recall of memories of themselves in chronic pain. They did not differ from control subjects in their recall of pain events unrelated to chronic pain problems, or their recall of other people in pain. For all subjects, pain memories were recalled significantly faster (mean of 4.75 seconds) than non-pain memories (mean of 8.54 seconds). Wright and Morley (1995) said, "One might therefore predict that chronic pain patients show bias in retrieving episodes of chronic pain at times when there is a significant change in pain, either at the onset of a specific attack of pain, e.g. headache, or if chronic pain becomes more intense." They also noted that a within-subjects design similar to Eich et al. (1990) would better account for this (Wright & Morley, 1995). While this information is important and suggests that memories related to pain

are remembered differently than non-pain memories, the study did not take into account specific pain state of the individuals.

In one of the few studies investigating memory for pain using a clinically relevant model, Porzelius (1995) examined chronic pain patients' memory for pain after diagnostic nerve-block injections. Porzelius (1995) noted that in this situation, patients' accurate memory for pain is extremely important in treatment application and evaluation. Subjects were asked to report their pain before the nerve block and immediately after the nerve block. Then, they were asked to recall their pain intensity immediately after the nerve block, again at two days post block, and then at two weeks post block. Patients' two-week memories for their level of pain immediately following the nerve block were significantly higher than what they had initially reported. Further analyses showed patients' demographics, pain intensity, and emotional distress (measured by the MMPI-2, CSQ-Catastrophizing Scale, the Modified Symptom Perception Questionnaire, and the Functional Assessment Screening Questionnaire) variables did not predict memory distortion. This study suggests that pain recall data is inappropriate in a clinical setting, and that chronic pain patients should use monitoring. Porzelius' (1995) finding that emotional distress variables did not predict memory distortion may be called into question because subjects reported on these measures before the nerve-block injection, and not at two weeks after the nerve-block injection, when they were asked to recall pain. Porzelius (1995) said that his study did not support findings that mood or emotional distress

influences pain memory, but did not adequately consider the effect of only measuring these variables before the nerve-block injection. Given that nerve-block injections greatly change the chronic pain patient's experience of pain, and that mood state can fluctuate daily, it would be important to gather mood state and emotional distress information at the time patients are asked to recall pain intensity.

Dilsaver, Del Medico, and Qamar (1993) studied 43 participants individuals reporting depressive symptoms only during winter months. Twenty-two of the 43 reported pain concurrent with their depressive symptoms. Twelve of the 22 pain subjects reported headache pain. For all subjects, both pain and depression began in the fall and remitted in the spring. Fourteen of the pain subjects received treatment for pain only. Upon remission of their pain after treatment, their depressive symptoms also remitted. While this study did not examine individuals' reports of depression specifically while in pain, it did show that pain state and depression are related.

In addition to depression, negative cognitions, and autobiographical memory, physiological and subjective experience of stress may be affected by pain state. Passchier, van der Helm, and Orlebeke (1984) conducted an experiment measuring physiological and self-report measures in migraineurs, tension headache sufferers, and headache-free controls during rest, imaginary personal stress, mental task stress, and recovery. They did not find any differences overall in vascular or EMG response during rest, stress or recovery

between the three groups. However, when accounting for headache pain during the experiment, male migraine sufferers showed higher frontalis EMG responses during the experiment than male migraineurs without headache. There were no such differences in females, however. In addition, migraineurs with headache during the experiment reported more subjective tension during the imaginary personal stress task than migraineurs who were headache free. Tension headache sufferers with headache during the experiment showed higher heart rates which were correlated with more intense headache pain during the mental task stress and recovery. They also showed a correlation between temporal blood volume and headache intensity during imaginary personal stress and rest. The study failed in its goal to support the symptom-specificity hypothesis for migraine (vascular) and muscle tension headache. However, the study did show that both migraine and tension headache sufferers show physiological and subjectively reported stress changes during headache that they do not show while headache-free. Hursey et al.'s (1985) study showed very similar results. Initial analyses suggested there were no physiological differences in response to stress between tension headache sufferers and control subjects, while further examination of the data showed that tension headache sufferers experiencing headache at the time of the experiment did show elevated Frontal EMG levels in response to stress. Lastly, VandeCreek and O'Donnell (1992) found that headache sufferers completing the Headache Locus of Control Scale (HLCS) while in pain reported higher scores on the Health Professional locus of control

subscale than headache sufferers who were not in pain at the time of assessment.

Given that research has shown that headache sufferers experience stress differently, report more depression, report more anxiety, and recall events differently during pain, it is reasonable to hypothesize that pain state could affect headache assessment, which includes the above variables. Only one study to date has examined pain state differences in assessment results for individuals diagnosed with a headache disorder. Holroyd, France, Nash and Hursey (1993) compared tension headache sufferers, migraine sufferers, mixed (tension and migraine) sufferers, and a group of headache-free control subjects on psychological assessment results. Subjects completed measures of the following: pain state (11-point scale with six descriptive anchors), depression (Beck Depression Inventory), anxiety (trait scale of State-Trait Anxiety Scale), somatic complaints (Whaler Physical Symptom Inventory), headache locus of control (Headache Locus of Control Scale, a modification of the Multidimensional Health Locus of Control Scale), and global reports of headache activity.

Initial analyses involved comparing the four groups on all measures, without accounting for pain state. The researchers found that tension headache sufferers reported higher depression, anxiety, and somatic complaints than control subjects, and higher depression and anxiety than migraine subjects. Mixed headache sufferers reported more somatic complaints than control subjects. Migraine sufferers were not different than control subjects on any

measure. Finally, all headache sufferers reported a more external (higher scores on the Headache Locus of Control Scale) locus of control than headache-free subjects.

Researchers found, however, that results changed when accounting for headache subjects' pain state at the time of assessment. When examining headache sufferers that reported pain at the time of assessment, analyses replicated the above results except that tension headache subjects did not report more anxiety than migraineurs, but did report more somatic complaints than migraineurs. However, when examining headache sufferers not in pain at the time of assessment, analyses showed no differences between headache subjects and control subjects on measures of depression, anxiety, or somatic complaints. Migraineurs and mixed headache subjects did, however, score higher on the HLOC (indicating more external locus of control) than control subjects. In addition, a direct comparison also showed that headache subjects in pain during the assessment reported more frequent headaches than the pain-free assessment group.

Holroyd et al.'s (1993) findings showed that pain state contributed to the overall elevated psychological symptoms reported by headache subjects compared with control subjects. These results call into question other studies' findings of elevated psychological symptoms in headache sufferers (e.g. Garvey et al., 1984; Andrasik et al., 1982; Martin et al., 1988; De Benedittis & Lorenzetti,

1992; Breslau et al., 1994). Holroyd et al.'s (1993) study suggests that pain state moderates the relationship between headache and psychological distress.

## Present Study

The present study seeks to accomplish two general goals: 1) replicate the finding that pain state moderates the correlation between headaches and elevated psychological symptoms (Holroyd et al., 1993) using a within-subjects approach rather than the between-subjects design used by Holroyd et al. (1993), and 2) extend these findings into the assessment of stress and coping.

It is reasonable to hypothesize that, similar to Holroyd et al. (1993), results from this study will show that headache sufferers in pain at the time of assessment will report more depression and anxiety than headache free control subjects. It is also expected that headache sufferers in pain will report a more external locus of control than headache free controls, while this relationship will be weaker when comparing headache subjects to controls while pain-free. In addition, it is hypothesized that headache subjects in pain will report higher scores on the Health Professional locus of control subscale than when not in pain. Furthermore, headache subjects will show symptom reports similar to control subjects while assessed during a pain-free state.

Considering Eich et al.'s (1990) findings that individuals in pain recalled more negative events than when they were not in pain, it is likely that headache sufferers with headache pain during assessment in the present study will report more daily hassles and more maladaptive general coping strategies. This would

make sense given that the daily hassles scale requires an individual to recall past, potentially stressful events.

Finally, it is hypothesized that headache sufferers are likely to report more maladaptive coping strategies while in pain at the time of assessment, given Gil et al.'s (1990) results that scores of more maladaptive pain coping were directly related to chronic pain patients' pain intensity ratings during assessment.

# CHAPTER II

# METHOD

## Subjects

Approximately 700 undergraduate students at the University of North Dakota (UND) were screened using the UND Headache Questionnaire (see Appendix A). Male and female subjects between the ages of 18 and 30 were selected based on the likelihood of their meeting criteria for one of three groups: chronic tension-type headache sufferers, migraine headache sufferers, or headache-free individuals. After screening, potential participants were contacted by phone and, upon consent, were interviewed to determine whether they meet the study's criteria.

Subjects in the tension group (n = 37; 18 males, 19 females) met the International Headache Society's criteria for chronic tension-type headache (IHS, 1988). Subjects in the migraine group (n=31; 12 males, 19 females) met IHS criteria for migraine with or without aura. Subjects in the headache-free control group (n=30; 16 males, 14 females) did not meet migraine or chronic tension-type headache criteria, and they did not experience more than six headaches per year. See Appendix B for diagnostic criteria.

## Measures

### Beck Depression Inventory-II (BDI)

The Beck Depression Inventory (See Appendix C) is a 21-item measure assessing symptoms of depression (Beck, Rush, Shaw, & Emery, 1979). The BDI is widely used to assess depressive symptoms in clinical populations, and to screen for depressive symptoms in normal populations (Beck & Steer, 1987). The BDI addresses 21 symptoms of depression: Mood, Pessimism, Sense of Failure, Self-dissatisfaction, Guilt, Punishment, Self-Dislike, Self-accusations, Suicidal Ideas, Crying, Irritability, Social Withdrawal, Indecisiveness, Body Image Change, Work Difficulty, Insomnia, Fatigability, Loss of Appetite, Weight Loss, Somatic Preoccupation, and Loss of Libido.

Beck and Steer (1987) reported that initial research on the BDI showed no significant memory effects or response sets. The BDI has shown high internal consistency for both clinical and nonclinical populations, with Cronbach's coefficient alphas ranging from .79 to .90 (Beck & Steer, 1987). The BDI is not very stable (.48 to .86) when administered multiple times to a clinical psychiatric population (Beck, Steer & Garbin, 1988). However, administrations to nonclinical samples (.60 to .90) and college undergraduates (.90) have shown higher test-retest reliability (Beck, Steer & Garbin, 1988). Administrations of the BDI to a mixed sample was shown to be highly correlated with other measures of depression, such as the Hamilton Rating Scale for Depression (.60), the Beck Hopelessness Scale (.66), the Symptom-Checklist-90-Depression Subscale

(.76), and the Minnesota Multiphasic Personality Inventory-Deprssion Scale (.61) (Beck, Steer & Garbin, 1988).

Spielberger State-Trait Anxiety Questionnaire (STAI)-Trait Anxiety Scale

The State-Trait Anxiety Inventory (See Appendix D) consists of self-report scales measuring state and trait anxiety (Spielberger, et al., 1983). Only the Trait Anxiety (T-Anxiety) Scale will be used in the present study. The T-Anxiety Scale consists of twenty items to which the responder endorses "Almost or Never" (1), "Sometimes" (2), "Often" (3) or "Almost Always" (4). Item content examples include: "I feel nervous and restless;" "I worry too much over something that really doesn't matter;" and "I get in a state of tension or turmoil as I think over my recent concerns and interests." Raw scores are interpreted using percentile ranks based on normative data for normal adults in various demographic groups.

Normative data (Spielberger et al.,1983) for college students resulted in T-Anxiety total means of 40.40 (SD=10.15) for females and 38.30 (SD=9.18) for males. Internal consistency alphas for a large college student sample were .90 for males and .91 for females Speielberger, et al.,1983). Test-Retest reliability (Spielberger, et al., 1983) for the T-Anxiety scale given at a 30-day interval were .71 for males and .75 for females, while reliability coefficients for a 60-day interval were .68 for males and .65 for females. Concurrent validity (Spielberger, et al.,1983) was demonstrated with high correlations between the STAI and other

measures of anxiety, including the Institute for Personality and Ability Testing (IPAT) Anxiety Scale (.75) and the Taylor Manifest Anxiety Scale (TMAS) (.80).

Headache-Specific Locus of Control Scale (HSLC)

The Headache-Specific Locus of Control Scale (See Appendix E) was designed to assess headache sufferers' beliefs concerning whether their headaches were affected by things they did (internal locus of control), health care professionals did (health locus of control), or forces such as chance or fate (external or chance locus of control). Participants rate their agreement with items corresponding to the three above-mentioned factors, and they respond using a five-point Likert-like scale: 1 = "strongly disagree;" 2 = "moderately agree;" 3 = "neutral;" 4 = "moderately agree;" and 5 = "strongly agree."

Factor loadings for the Health Care Professionals locus of control subscale ranged from .54 to .79, with an internal reliability alpha of .88. Factor loadings for the Internal locus of control subscale ranged from .48 to .79, with an internal reliability alpha of .86 (Martin, Holroyd, & Penzien, 1990). Factor loadings for the Chance (or external) locus of control scale ranged from .40 to .70, with an internal reliability alpha of .84 (Martin, Holroyd, & Penzien, 1990). Correlations between the subscales were minimal (Martin, Holroyd, & Penzien, 1990). Test-retest reliability over three weeks was .75 for Internal, .78 for Health Care Professionals, and .72 for Chance. Construct and criterion validity were also strong (Martin, Holroyd, & Penzien, 1990).

Daily Hassles Scale (DHS)

A shortened version of the Daily Hassles Scale (see Appendix F) originally developed by Kanner et al. (1981) and revised by Holm and Holroyd (1992) assesses "irritating, frustrating demands that occur during everyday transactions with the environment (Holm & Holroyd, 1992, p. 1)." The original DHS did not allow subjects to report an event occurred, but that it was not distressing or not a hassle. As a way of disentangling the occurrence of an event from the person's reaction to the event, Holm and Holroyd (1992) used the following six-point scale: 0 = "did not occur"; 1 = "occurred, not severe"; 2 = occurred, somewhat severe"; 3 = "occurred, moderately severe"; 4 = "occurred, very severe"; 5 = "occurred, extremely severe." Factor analyses have suggested the presence of a hierarchical factor structure for the DHS-R. These analyses suggested seven primary or first-order factors. Inner Concerns ($\alpha$ = .83) included items (with factor loadings ranging from .31 to .58) such as regrets over past decisions, being lonely, and inability to express oneself. Financial Concerns ($\alpha$ = .81) included items (with factor loadings ranging from .39 to .75) such as not enough money for basic necessities, concerns about owing money, and concerns about getting credit. Time Pressures ($\alpha$ = .81) included the following items (factor loadings ranging from .30 to .75): too many things to do, too many interruptions, and concerns about meeting high standards. Work Hassles ($\alpha$ = .65) included items (factor loadings ranging from .40 to .78) such as job dissatisfaction, worries about decisions to change jobs, and problems with employees. Environmental

Hassles ($\alpha$ = .57) included pollution, crime and traffic (factor loadings from .35 to .59). Family Hassles ($\alpha$ = .59) included problems with one's children, taxes, and home maintenance (factor loadings from .31 to .50). Finally, Health Hassles ($\alpha$ = .64) included physical illness and concerns about bodily functions (factor loadings ranging from .34 to .71).

The two higher-order factors suggested by the analyses each incorporated some of the seven primary domains. Covert Hassles (Chronbach's $\alpha$ = .88) include all 42 items loading on Inner Concerns, Time Pressures, and Health Hassles. Overt Hassles (coefficient $\alpha$ = .80) included all but one of the 21 items loading on Environmental Hassles, Financial Concerns, Work Hassles, and Family Hassles.

Imaginal Stressor

All participants were asked to imagine that they have received a significantly worse grade than they had expected in a college course (See Appendix G). This exercise prepared the participants to respond to the Coping Strategies Inventory (described below). The researcher selected this particular stressor because it is assumed to be a stressor to some degree for most college students, but does not constitute such a life event as, for example, the death of a parent. Because daily hassles have been shown to be more important than major life events in the stress-headache relationship, it makes sense to attempt to sample coping strategies one might use in response to a stressor more characteristic of a daily stress than a major life event.

Coping Strategies Inventory (CSI)

The Coping Strategies Inventory (CSI) (see Appendix H) asks subjects to rate the frequency with which they use different coping strategies. Based on the imaginal stressor described above, participants rate 72 items consisting of thoughts and behaviors related to coping on a frequency scale of 1 (not at all) to 5 (very much). Items pertain to eight coping strategy subscales: Problem-Solving (e.g., I made a plan of action and followed it.), Cognitive Restructuring (e.g., I convinced myself that things aren't quite as bad as they seem), Social Support (e.g., I found somebody who was a good listener), Expressing Emotions (e.g., I let my emotions out.), Problem Avoidance (e.g., I went along as if nothing were happening), Wishful Thinking (e.g., I hoped a miracle would happen), Social Withdrawal (e.g., I avoided being with people.), and Self-Criticism (e.g., I blamed myself.).

These eight primary subscales are part of a tri-level hierarchical structure (Tobin, Holroyd, Reynolds, & Wigal, 1989). Problem Solving and Cognitive Restructuring fall under the secondary coping factor called Problem-Focused (cognitive and behavioral strategies). Expressed Emotion and Social Support make up Emotion-Focused coping (communication of feelings). Together, these factors combine under the tertiary coping factor called Engagement. Engagement coping strategies, though different in terms of their primary description, all measure the extent to which individuals continually interact with the environment in an effort to cope with a stressor.

The other tertiary subscale, Disengagement, includes items measuring the extent to which individuals remove themselves from interacting with the environment in terms of both the stressor and potential resources. Disengagement, like Engagement, is broken down into two secondary subscales. Problem-Focused includes Problem-Avoidance and Wishful Thinking which both indicate denial and an inability to look at the situation differently. Emotion-Focused coping is comprised of Social-Withdrawal and Self-Criticism which involve isolating and blaming oneself.

Test-retest reliability data suggests that different stressors may affect individuals' scores. When subjects were asked to reflect on a stressor of their choice, Pearson correlations ranged from .39 to .61 with a mean of .51 (Tobin, Holroyd, & Reynolds, 1983). However, when a standard stressor (similar to the imaginal stressor which will be used in the present study) was used, test-retest data improved to a range of .49 to .65 with a mean of .61 (Tobin, Holroyd, & Reynolds, 1983). Thus a standardized imaginal stressor was used in the present study in order to maximize reliability. Internal consistency for the primary scales ranged from $\alpha$ = .72 to $\alpha$ = .94 (Tobin, Holroyd, & Reynolds, 1983). Secondary scales ranged from $\alpha$ = .87 to $\alpha$ = .92. The tertiary scales also showed good internal consistency; engagement $\alpha$ = .90 and disengagement $\alpha$ = .89 (Tobin, Holroyd, & Reynolds, 1983).

Coping Strategies Questionnaire (CSQ)

The CSQ (See Appendix I) is a 48-item measure designed to assess pain-specific coping strategies (Rosenstiel & Keefe, 1983). The original scale (Rosenstiel & Keefe, 1983) was rationally developed and suggested a six-factor subscale model for cognitive coping strategies (Distraction, Catastrophizing, Ignoring Pain, Distancing from the Pain, Coping Self-Statements, and Praying). Two behavioral strategies (Increased Behavioral Activities and Pain Behaviors) were also included in the model. Since its development, two studies have supported a five-factor structure (Tuttle, Shutty, & DeGood, 1991; Swartzman, et al, 1994). However, these studies used rather small sample sizes. Two more recent studies (Robinson et al, 1997; Riley & Robinson, 1997) using much larger sample sizes have supported the original six-factor model. Riley and Robinson (1997), using confirmatory factor analysis, suggested dropping 21 of the original 48 items because they did not load satisfactorily on the six factors. While it would have been desirable to use a shortened version, because more data supporting Riley and Robinson's (1997) CSQ-Revised was not available, the present study used the full 48-item questionnaire.

Global Assessment of Headache and Demographic Information

Headache and demographic (See Appendix J) data were also collected as part of the assessment battery. Participants recorded the following demographic variables: gender, age, racial or ethnic group, undergraduate year, religion, estimated income of household in which they grew up (or if currently

independent of parents, estimated income of current household), and state they spent the most time living in during childhood and adolescence. Global headache assessment variables included: average frequency of headaches, average pain intensity of headaches, when they started having headaches like they do now, and to what extent their headaches disrupt their lives.

## Procedure

Migraine, tension, and control subjects each completed two identical assessment batteries consisting of the measures described above. Half of all male participants and half of all female participants in each of the headache diagnostic groups were scheduled to complete one assessment battery during a pain-free state first. The other half of the participants in each group first completed their pain-state assessment battery, and then a second scheduled, pain-free assessment. This counterbalancing effort was intended to reduce re-test effects. Participants in the headache-free control group also completed two assessment batteries, but both assessments occurred while pain-free. In order to include the control group in the analyses, one testing point was yoked to the headache subjects' pain-state condition, and the other control subjects' testing point was yoked to the headache subjects' non-pain condition.

All subjects agreeing to participate in the study were asked to attend a preliminary instructional meeting. Subjects were instructed that they were to complete two assessment packets at home, in a quiet room with no television, radio, music or other distractions. They were also told that if they did need to

interrupt their assessment packet (i.e., someone interrupts them, or perhaps their headache becomes unbearable), they were to indicate their stopping point and time on the packet, and indicate the time they continued completing the packet. They were also instructed to indicate any change in pain state during the assessment or after an interruption (subjects reported pain state both at the beginning and end of the assessment packet, as well as any interruption point).

Subjects, regardless of their headache group status or whether or not they completed their first assessment battery in pain or while pain-free, received an assessment packet at the preliminary meeting. If they were instructed to complete the packet during a pain-free state, they were instructed to complete the assessment at some time within a three-day period specified by the researcher. The researcher provided calendar pages to remind subjects of the time they were to take the assessment. Also, the researcher called the participant at the beginning of the time-frame in order to remind them to complete the test packet. When the participant was ready to begin taking the assessment packet, he or she called the researcher (who carried a cell phone for the duration of the data collection phase). Subjects were instructed to do this so that the researcher was able to document the date and time a subject completed the assessment packet, and to take an official pain rating (to ensure as much as possible that the subjects were pain-free during the assessment). Additionally, the researcher scheduled a time within the next day for the participant to meet again to return the completed packet.

At the preliminary meeting, the participants also were instructed regarding the second test packet, which would be another pain-free assessment for control subjects, and a pain-state assessment for headache subjects. Subjects instructed to complete their second assessment packet while in headache pain were given a period of time (two to four weeks after the completed the pain-free assessment) during which to attempt to complete the pain state assessment. Again, the participants received calendars to help them remember the time frame, and the researcher called them at the beginning of the time frame to remind them to complete the assessment. (If the participant failed to contact the researcher by the end of the time frame, the researcher called the participant to determine whether or not to continue waiting for an opportunity to complete the pain-state assessment.) Again, the participant called the researcher when they were ready to complete the pain-state assessment. The researcher documented the date and time of the assessment, took an official pain rating, and also asked diagnostic questions to verify the individual's current experience of headache at the time of assessment. The researcher again asked the participant to meet and return the second assessment packet. The participant was fully debriefed about the study at this last meeting.

Individuals completing the pain state assessment first were sent home with instructions to take the assessment during the first headache they experienced after the meeting. They followed the same procedure of paging the

researcher in order to document date, time, pain state, and headache symptom verification.

Upon receiving the completed assessment packets, the researcher reviewed item 9 of the BDI, which assesses suicidality. Participants endorsing a 2 ("I would like to kill myself") or 3 ("I would kill myself if I had the chance.") for this item, or scoring above a 16 for a total BDI score were evaluated for suicide risk and provided the appropriate assistance.

## Statistical Analyses

Several 3 (Headache Group) X 2 (Pain State) mixed MANOVA's were conducted to examine the effects of Headache and Pain State on assessment responses. The first MANOVA examined each groups' responses to the BDI and STAI during two assessment periods. The second MANOVA will include responses to the three subscales of the HSLC, while the third examined the seven subscales of the DHS-R. The fourth MANOVA included the eight CSI subscales, while the fifth examined subjects' responses to the six CSQ subscales. Finally, the sixth MANOVA examined the data from the global assessment of headache symptoms.

In addition, some exploratory discriminant analyses were performed to examine redundancies in any measures found to significantly differ by pain-state or by headache group.

# CHAPTER III

# RESULTS

## Demographic Information

Chi-square analyses found no significant differences between the three groups (migraine, tension, and control) on the variables of gender, race/ethnicity, religious preference, or home state. A series of one-way ANOVAs also found no significant differences between the three groups (migraine, tension, or control) with regard to age, undergraduate year, childhood family income, current independent income, or estimated population of hometown. The mean age and ratio of men to women for each

Table 1. – Demographic Characteristics

| Feature | Migraine (n=31) | Tension (n=37) | Control (n=30) |
|---|---|---|---|
| Age (mean ± SD) | 20.35 ± 2.71 | 20.97 ± 3.42 | 20.80 ± 2.54 |
| Ratio of men to women | 0.63 (n=12:n=19) | 0.95 (n=18:n=19) | 1.14 (n=16:n=14) |

group can be found in Table 1, while Table 2 contains other demographic information for the entire sample. In addition, the average childhood household yearly income for the sample was $51,021.83, and the average adult

independent yearly income (if independent from parents) for the sample was $16,150.79.

Table 2. – Demographics of Sample

| Undergrad. Year | | Home State | |
|---|---|---|---|
| First-Year | 33% | Upper Midwest | 85% |
| Sophomore | 29% | Western States | 6% |
| Junior | 20% | Eastern States | 3% |
| Senior | 12% | "Not North America" | 3% |
| Year 5+ | 6% | Southern States | 1% |
| | | Canada | 1% |
| Race/Ethnic Group | | | |
| Caucasian | 94% | Religion | |
| African Background | 2% | Protestant | 58% |
| "Mixed" | 2% | Catholic | 32% |
| Native American | 1% | Jewish | 1% |
| Middle Eastern | 1% | Not Specified | 9% |

One-way ANOVAs conducted on headache symptom characteristics of migraineurs and tension headache sufferers showed that migraineurs ($M$ = 7.61, $SD$ = 1.38) reported significantly more headache pain [$F(1, 67) = 24.74$, $p<.001$] than tension headache sufferers ($M$ = 6.01, $SD$ = 1.27). Also, migraineurs ($M$ = 2.58, $SD$ = 0.85) reported that their headaches disrupted their lives [$F(1, 65) = 20.43$, $p<.001$] significantly more than tension headache sufferers ($M$ = 1.61, $SD$ = 0.88). The two headache groups did not differ on reported headache frequency or total number of years they had experienced headache.

Finally, an effort had been made to counter-balance the assessment packet order effects. A Chi-square analysis of assessment order effects revealed that the groups did not significantly differ with regard to number of subjects completing their first assessment packet during pain (versus during a pain-free state).

Table 3. – Between-Subjects Effects for DHS Subscales

| DHS Subscale | F-Value | p-value |
|---|---|---|
| Inner Concerns | F(2,95) = 10.34 | p<.001 |
| Time Pressures | F(2,95) = 12.19 | p<.001 |
| Health Concerns | F(2,95) = 11.10 | p<.001 |
| Work Concerns | F(2,95) = 6.59 | p<.005 |
| Environment Concerns | F(2,95) = 6.41 | p<.005 |
| Financial Concerns | F(2,95) = 3.66 | p<.05 |
| Family Concerns | F(2,95) = 3.38 | p<.05 |

Daily Hassles Scale (DHS)

A 3 (headache group) X 2 (pain state) repeated-measures MANOVA was conducted using the seven primary subscale summed scores of the Daily Hassles Scale. While the headache group by pain state interaction and the pain-state within-subjects effect were not significant, a significant between-subjects group main effect was observed [$F(14, 180) = 2.63$, $p<.01$]. Follow-up ANOVAs showed group differences on all seven of the DHS subscales (see Table 3), and subsequent Bonferroni post-hoc tests conducted on the seven DHS subscales collapsed (averaged) across pain-state revealed specific group differences on

each of the seven subscales (see Table 4 for group means). Migraineurs reported significantly more Inner Concerns than both tension headache sufferers

Table 4. – Group Means for DHS Subscales

| DHS Subscale | Tension Group Mean/SD | Migraine Group Mean/SD | Control Group Mean/SD |
|---|---|---|---|
| Inner Concerns | 25.28 ± 13.03 | 34.11 ± 15.12 | 19.00 ± 10.56 |
| Time Pressures | 20.61 ± 8.62 | 23.16 ± 8.83 | 13.37 ± 6.30 |
| Health Concerns | 5.03 ± 2.90 | 5.76 ± 3.92 | 2.30 ± 1.94 |
| Work Concerns | 7.54 ± 7.23 | 9.08 ± 8.12 | 3.10 ± 3.68 |
| Environment Concerns | 6.26 ± 3.79 | 6.48 ± 3.05 | 3.72 ± 3.16 |
| Financial Concerns | 13.82 ± 9.40 | 14.68 ± 10.81 | 8.70 ± 4.65 |
| Family Concerns | 3.53 ± 3.84 | 4.00 ± 3.37 | 1.92 ± 2.34 |

and control subjects. Tension and migraine headache sufferers reported significantly more Time Pressures, Health Concerns, Work Concerns, and Environmental Concerns than control subjects. Migraineurs reported significantly more Financial and Family Concerns than control subjects.

Two, 3 (headache group) X 2 (pain state) repeated-measures MANOVAs were also conducted using the number of endorsed stressors scores and the average stress ratings of the DHS seven primary subscales, respectively. Both of these analyses revealed the same pattern of results: no significant group by pain-state interaction, no significant pain-state effect, but a significant group main effect on all seven primary DHS subscales. These results mirrored those attained in the analysis with the summed subscale scores.

## Coping Strategies Inventory (CSI)

A 3 (headache group) X 2 (pain state) MANOVA was conducted using the eight primary subscales of the Coping Strategies Inventory. While the headache

group by pain state interaction was not significant, there was a significant between-subjects group main effect [$F(16, 178) = 1.93$, $p<.05$] and a significant within-subjects (pain-state) effect [$F(8, 88) = 2.26$, $p<.05$].

Follow-up ANOVAs revealed significant group differences on four CSI subscales (Cognitive Restructuring, Wishful Thinking, Self-Criticism, and Social Withdrawal (see Table 5). Subsequent Bonferroni post-hoc tests conducted on the four CSI subscales (showing group differences) collapsed or averaged across pain-state revealed the following group differences: a) migraineurs and tension headache sufferers reported using less Cognitive Restructuring than headache-free control subjects and b) migraineurs reported using significantly more Wishful Thinking, Self-Criticism, and Social Withdrawal than headache-free control subjects (see Table 6 for group means).

Table 5. – Between-Subjects Effects for CSI Subscales

| CSI Subscale | F-Value | p-value |
|---|---|---|
| Cognitive Restructuring | $F(2,95) = 7.73$ | $p<.001$ |
| Wishful Thinking | $F(2,95) = 3.08$ | $p=.05$ |
| Self-Criticism | $F(2,95) = 5.05$ | $p<.01$ |
| Social Withdrawal | $F(2,95) = 3.76$ | $p<.05$ |

Table 6. – Group Means for CSI Subscales

| CSI Subscale | Tension Group Mean/SD | Migraine Group Mean/SD | Control Group Mean/SD |
|---|---|---|---|
| Cognitive Restructuring | 26.11±4.39 | 26.05±5.29 | 30.32±5.14 |
| Wishful Thinking | 23.86±6.97 | 26.21±6.33 | 22.15±5.76 |
| Self-Criticism | 29.39±8.31 | 32.13±8.76 | 25.57±7.07 |
| Social Withdrawal | 20.82±6.82 | 23.95±7.12 | 19.35±6.15 |

Univariate tests showed pain-state differences (irrespective of group) on three CSI subscales. Reports of Expressing Emotions, Wishful Thinking, and Social Withdrawal during pain state were significantly higher than those during pain-free state (see Table 7).

Table 7. – Within-Subjects Univariate Effects for CSI Subscales

| CSI Subscale | F-Value | Pain-State Mean/SD | No-Pain Mean/SD |
|---|---|---|---|
| Expressing Emotions | $F=8.79$, $p<.005$ | 23.48±0.71 | 21.58±0.65 |
| Wishful Thinking | $F=4.44$, $p<.05$ | 24.68±0.72 | 23.47±0.71 |
| Social Withdrawal | $F=5.80$, $p<.05$ | 21.92±0.68 | 20.83±0.75 |

Beck Depression Inventory (BDI) and Trait-Anxiety Inventory (STAI)

A 3 (headache group) X 2 (pain state) MANOVA was conducted using the total scores for the Beck Depression Inventory and the Trait-Anxiety Inventory. While the headache group by pain state interaction was not significant, there was a significant between-subjects group main effect [$F(4, 190) = 5.23$, $p<.005$] and a significant within-subjects (pain-state) effect [$F(2, 94) = 9.05$, $p<.001$].

Follow-up ANOVAs showed group differences on both the BDI and STAI total scores (see Table 8 for between-subjects effects and group means).

Table 8. – Between-Subjects Effects for BDI and STAI scores

| Scale | Tension Group Mean/SD | Migraine Group Mean/SD | Control Group Mean/SD |
|---|---|---|---|
| Beck Depression Inv. [$F(2,95) = 11.09$, $p<.001$] | 10.07±1.44 | 15.71±1.58 | 5.13±1.60 |
| Trait Anxiety Inventory [$F(2,95) = 6.88$, $p<.005$] | 39.78±1.84 | 46.37±2.01 | 35.87±2.05 |

Subsequent Bonferroni post-hoc tests conducted on the BDI and STAI total scores collapsed (averaged) across pain-state revealed that migraineurs reported more symptoms of depression and anxiety than tension headache sufferers or headache-free controls. Univariate follow-up tests for the within-subjects effect showed pain-state differences on both the BDI and STAI total scores (see Table 9). Reports of symptoms of depression and anxiety during pain state were significantly higher than those during pain-free state.

Table 9. – Within-Subjects Univariate Effects for BDI & STAI Scores

| Scale | F-Value | Pain-State Mean/SD | No-Pain Mean/SD |
|---|---|---|---|
| Beck Depression Inv. | $F$=16.04, $p$<.001 | 11.60±1.04 | 9.01±0.85 |
| Trait Anxiety Inventory | $F$=11.24, $p$<.005 | 41.69±1.21 | 39.66±1.15 |

## Headache Pain Locus of Control (HLOC)

A 3 (headache group) X 2 (pain state) repeated-measures MANOVA was conducted using the three subscales of the Headache Pain Locus of Control scale. While the headache group by pain state interaction and the pain-state within-subjects effect were not significant, there was a significant between-subjects group main effect [$F(6, 184) = 9.08$, $p$<.001]. Follow-up ANOVAs showed group differences on two of the three subscales (External Chance and Internal; see Table 10 for between-subjects effects and group means). On average, migraineurs scored significantly higher than tension headache sufferers and control subjects on the External Chance subscale of the HLOC. Tension

Table 10. -- Between-Subjects Effects for HLOC Subscale Scores

| HLOC Subscale | Tension Group Mean/SD | Migraine Group Mean/SD | Control Group Mean/SD |
|---|---|---|---|
| External Chance [F(2,93) = 21.72, p<.001] | 29.93±8.15 | 36.73±7.42 | 23.84±6.96 |
| Internal [F(2,93) = 9.79, p<.001] | 39.54±4.99 | 38.65±7.14 | 32.07±9.31 |

headache sufferers also scored significantly higher on the External Chance subscale than headache-free controls. Migraineurs and tension headache sufferers did not differ on the Internal HLOC subscale, but both headache groups scored significantly higher than headache-free controls.

Table 11. -- Between-Subjects Effects for CSQ Subscale Scores

| CSQ Subscale | Tension Group Mean/SD | Migraine Group Mean/SD | Control Group Mean/SD |
|---|---|---|---|
| Catastrophizing [F(2,97) = 19.45, p<.001] | 8.55±5.76 | 14.47±6.29 | 5.43±5.19 |
| Praying [F(2,97) = 3.19, p<.05] | 10.99±6.67 | 13.74±6.13 | 9.22±8.33 |

Coping Strategies Questionnaire (CSQ)

A 3 (headache group) X 2 (pain state) MANOVA was conducted using the seven primary subscales of the Coping Strategies Questionnaire. While the headache group by pain state interaction and the pain-state within-subjects effect were not significant, there was a significant between-subjects group main effect [F(14, 180) = 2.97, p<.001]. Follow-up ANOVAs showed group differences on two of the seven CSQ subscales (Catastrophizing and Praying; see Table 11 for

between-subjects effects and group means). Subsequent Bonferroni post-hoc tests conducted on the Catastrophizing and Praying subscale scores revealed that migraineurs reported engaging in more Catastrophizing than both tension headache sufferers and controls. Also, migraineurs reported praying more than headache-free control subjects.

## Comprehensive Discriminant Analyses

Two comprehensive discriminant analyses were conducted, using as predictors those variables producing significant between-subjects effects in the above analyses. The first analysis attempted to discriminate subject groups from each other when headache sufferers were in pain, while the second attempted to discriminate subject groups when headache sufferers were not in pain.

The analysis conducted with the predictors obtained while headache sufferers were in pain resulted in the best outcome. This analysis yielded two significant functions, accounting for 43.69% [$X^2(6,98)=60.90$, $p<.001$] and 8.41% [$X^2(2,98)=8.06$, $p<.05$] of the total variance. Table 12 contains the standardized

Table 12. – Standardized Canonical Discriminant Function Coefficients

| | Function | |
|---|---|---|
| | 1 | 2 |
| Pain-State HLOC Internal | .350 | .825 |
| Pain-State HLOC External Chance | .713 | -.685 |
| Pain-State Hassles Health Concerns Sum | .448 | .378 |

discriminant function coefficients associated with these two functions, while Table 13 contains the correlations between each predictor and each function. Table 14

Table 13. – Correlations Between Predictors and Functions

| | Function | |
|---|---|---|
| | 1 | 2 |
| Pain-State HLOC External Chance | .840* | -.491 |
| Pain-State Hassles Health Concerns Sum | .543* | .238 |
| Pain-State Hassles Time Pressures Sum[a] | .535* | .223 |
| Pain-State Hassles Inner Concerns Sum[a] | .511* | .064 |
| Pain-State CSQ Catastrophizing[a] | .495* | -.085 |
| Pain-State Hassles Work Concerns Sum[a] | .493* | .045 |
| Pain-State Hassles Environmental Concerns Sum[a] | .490* | .091 |
| Pain-State BDI Total[a] | .467* | -.010 |
| Pain-State Trait-Anxiety Total[a] | .409* | -.007 |
| Pain-State CSI Self-Criticism Sum[a] | .386* | .168 |
| Pain-State CSI Social Withdrawal Sum | .382* | .063 |
| Pain-State Hassles Financial Concerns Sum[a] | .371* | .033 |
| Pain-State CSI Wishful Thinking Sum[a] | .327* | -.024 |
| Pain-State CSI Cognitive Restructuring Sum[a] | -.244* | .016 |
| Pain-State Hassles Family Concerns Sum[a] | .231* | .127 |
| Pain-State CSQ Praying[a] | .219* | .183 |
| Pain-State HLOC Internal | .449 | .695* |

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions. Variables ordered by absolute size of correlation within function.

*Largest absolute correlation between each variable and any discriminant function.

[a]This variable not used in the analysis.

Table 14. – Classification Results for Pain-State Data[a]

| | | | Predicted Group Membership | | | |
|---|---|---|---|---|---|---|
| | | Headache Group or Control Group | Tension | Migraine | HA-Free Control | Total |
| Original | % | Tension | 63.9 | 19.4 | 16.7 | 100.0 |
| | | Migraine | 35.5 | 58.1 | 6.5 | 100.0 |
| | | HA-Free Control | 24.1 | 6.9 | 69.0 | 100.0 |

Table 15 – Functions at Group Centroids for Pain-State Data

| Headache Group or Control Group | Function 1 | 2 |
|---|---|---|
| Tension | .180 | .379 |
| Migraine | .939 | -.286 |
| HA-Free Control | -1.227 | -.165 |

presents a summary of the classification results using these two functions. Finally, Table 15 presents functions at group centroids for pain-state data.

The analysis conducted with the predictors obtained while headache sufferers were not in pain resulted in fewer correct classifications. This analysis yielded two significant functions, accounting for only 25.70% [$X^2(4,98)=32.88$, $p<.001$] and 4.93% [$X^2(1,98)=4.76$, $p<.05$] of the total variance. Table 16 contains the standardized discriminant function coefficients associated with these two functions, while Table 17 contains the correlations between each predictor and each function. Table 18 presents a summary of the classification results for data collected during pain-free state, using these two functions. Finally, Table 19 presents functions at group centroids for pain-free data.

Table 16 – Standardized Canonical Function

| | Function | |
|---|---|---|
| | 1 | 2 |
| No-Pain HLOC | .43 | .911 |
| No-Pain Catastrophizing | .84 | -.552 |

Table 17 – Correlations Between Predictors and Functions

| | Function | |
|---|---|---|
| | 1 | 2 |
| No-Pain CSQ Catastrophizing | .903* | -.431 |
| No-pain Hassles Inner Concerns Sum[a] | .540* | -.035 |
| No-Pain CSI Self-Criticism Sum[a] | .491* | .129 |
| No-Pain CSI Social Withdrawal Sum[a] | .482* | .003 |
| No-Pain CSQ Praying[a] | .462* | -.070 |
| No-Pain BDI Total[a] | .422* | .024 |
| No-Pain Trait Anxiety Total[a] | .409* | -.054 |
| No-Pain CSI Wishful Thinking Sum | .402* | .066 |
| No-Pain HLOC External Chance | .380* | .012 |
| No-Pain Hassles Time Pressures Sum[a] | .340* | .171 |
| No-Pain Hassles Health Concerns Sum[a] | .264* | -.122 |
| No-Pain Hassles Work Concerns Sum[a] | .229* | -.067 |
| No-Pain Hassles Environmental Concerns Sum | .209* | -.104 |
| No-Pain Hassles Financial Concerns Sum[a] | .149* | -.107 |
| No-Pain Family Concerns Sum[a] | -.022* | -.009 |
| No-Pain HLOC Internal | .547 | .837* |
| No-Pain CSI Cognitive Restructuring Sum[a] | -.083 | .109* |

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions. Variables ordered by absolute size of correlation within function.

*Largest absolute correlation between each variable and any discriminant function
[a]This variable not used in the analysis.

Table 18. – Classification Results for Data Collected During Pain-Free State[a]

| | | | Predicted Group Membership | | | |
|---|---|---|---|---|---|---|
| | | Headache Group or Control Group | Tension | Migraine | HA-Free Control | Total |
| Original | % | Tension | 62.2 | 21.6 | 16.2 | 100.0 |
| | | Migraine | 35.5 | 51.6 | 12.9 | 100.0 |
| | | HA-Free Control | 33.3 | 13.3 | 53.3 | 100.0 |

[a]56.1% of original grouped cases correctly classified.

Table 19 – Functions at Group Centroids for Pain-Free Data

| Headache Group or Control Group | Function 1 | 2 |
|---|---|---|
| Tension | 2 28E-02 | .287 |
| Migraine | .709 | -.183 |
| HA-Free Control | -.760 | -.165 |

## Correlational Analysis

Finally, correlations were examined between the migraine and tension headache subjects' (N=64) scores on the BDI, STAI, DHS, CSI, CSQ and HLOC during pain-state, and their pain-ratings at the time of those reports. Table 20 presents the Pearson Correlations and p-values associated with each variable.

Table 20. – Pearson Correlations Between Pain-State and DVs

| Variable | Pain-State Correlation |
|---|---|
| BDI Total | 0.36** |
| Trait Anxiety Total | 0.42*** |
| HLOC External Chance | 0.61*** |
| DHS Inner Concerns | 0.51*** |
| DHS Time Pressures | 0.53*** |
| DHS Health Concerns | 0.25* |
| DHS Work Concerns | 0.25* |
| DHS Environmental Concerns | 0.44*** |
| CSI Seek Social Support | -0.35** |
| CSI Wishful Thinking | 0.27* |
| CSI Self-Criticism | 0.28* |
| CSI Social Withdrawal | 0.51*** |
| CSQ Catastrophizing | 0.48*** |

*p<.05

**p<.01

***p<.001

# CHAPTER IV

# DISCUSSION

Some studies have suggested that individuals in pain recalled more negative events than when they were not in pain (e.g., Eich et al., 1990), and Holroyd et al. (1993) found that individuals who suffer from migraine and tension headache and who are in pain at the time of psychological assessment reported more symptoms of depression and anxiety, and a more external locus of control.

The overall purpose of this study was to investigate the role of pain state as it mediates the psychological and behavioral assessment of chronic headache sufferers. Based on the Holroyd et al. (1993) results, it was hypothesized that headache subjects (both migraineurs and tension headache sufferers) would, during headache pain, report more psychological symptoms than headache-free control subjects. It was also expected that headache subjects would report more symptoms while assessed during a pain-state than while pain-free. Furthermore, based on previous findings (Holroyd et al., 1993), headache subjects were expected to show symptom reports similar to control subjects while assessed during a pain-free state.

Overall, the repeated-measures analyses designed to identify these potential differences failed to show that symptom reports between headache subjects and controls are mediated by pain-state. However, between-subjects

effects (averaging across pain-state) did indicate significant group differences on many of the variables, and within-subjects effects indicated significant pain-state effects (averaging three groups together) on some of the variables.

## Anxiety and Depression Symptoms

Migraineurs reported significantly more depressive and anxious symptoms than tension headache sufferers or controls. Furthermore, when the three group means were averaged together, all subjects tended to report more depressive and anxious symptoms during pain-state than while pain-free. Examination of headache sufferers' group means during pain-state and while pain-free showed patterns that tended to support the hypothesis that headache subjects would report more symptoms while in pain. However, the control group means also showed a decline from the first testing point to the second testing point. (Of note is that half of control subjects' data were entered with their first testing point corresponding to headache subjects' pain-state assessment, while the other half of control subjects' data were entered with their second testing point corresponding to headache subjects' pain-free assessment.) No explanation regarding an unexpected change in control groups over the two testing points can be given within the constraints of the present study, and contributing factors remain unknown.

These results contrast with Holroyd et al.'s (1993) conclusions that tension headache sufferers show the greatest increase in reports of depression and anxiety when in pain. It is possible that the different results obtained in this and

the Holroyd study were a function of sample differences. Tension headache sufferers in this study did not have a headache as frequently (global retrospective report average of about 4-8 headaches per month) as those participating in the Holroyd et al. (1993) study (global retrospective report average of 19.2 headaches per month). It may be that more frequent headaches in tension headache sufferers are related to increased reports of psychological distress.

## Stress Reports

Analyses examining reports of stress in the form of daily hassles also showed significant between-subjects main effects. However, there were no significant interaction or pain-state effects. Migraineurs reported significantly more Inner Concerns than both tension headache sufferers and control subjects. Tension and migraine headache sufferers reported significantly more Time Pressures, Health Concerns, Work Concerns, and Environmental Concerns than control subjects. Finally, migraineurs reported significantly more Financial and Family Concerns than control subjects.

No previous studies have been conducted to investigate pain-state as a mediator of reports of stress in headache sufferers. The present results suggest pain-state does not mediate headache subjects' reports of daily hassles. However, the overall group differences lend greater support to the theory that headache sufferers, in general, report more stress than headache-free controls. Previous studies have shown that migraineurs reported more stressful life events than control subjects (Ehde & Holm, 1992). Another unpublished study

controlling for menstrual cycle in young females also showed that migraineurs reported more inner concerns, time pressures and financial concerns than tension headache sufferers and controls (Sippel & Holm, 1999). The present study adds to the literature in that while assessing both males and females, and averaging across pain-state, there were differences between headache and control subjects on all seven subscales of the DHS.

The result that daily hassle reports were not mediated by pain-state is at odds with Eich et al.'s (1990) study, which suggested that individuals recall more negative events when in pain than when pain-free. In sum, the present data suggest that pain-state does not mediate headache subjects' actual self-reported levels of daily hassles, nor does pain-state mediate group differences between headache subjects' and control subjects' reports of daily hassles.

## Coping Strategies

Analyses examining coping strategy data showed significant main effects (between-subjects and pain-state), though no significant interaction. Tension and migraine headache sufferers reported using less Cognitive Restructuring than controls, while only migraineurs reported using significantly more Wishful Thinking, Self-Criticism, and Social Withdrawal than controls.

The between-group differences are somewhat consistent with previous research (i.e., Ehde & Holm, 1992; Sorbi & Tellegen, 1984) in that headache sufferers tend to report a greater use of maladaptive coping strategies and less use of adaptive ones than control subjects. However, the finding that migraine

subjects reported a greater use of maladaptive strategies than tension subjects is a little unusual but may be due to the present study's inclusion of tension headache sufferers experiencing relatively few headaches (as discussed above). Examination of group means during pain-state and while pain-free showed that headache sufferers reported engaging in more Wishful Thinking, Social Withdrawal, and Expressing Emotions while in pain. The greater use of Social Withdrawal and Wishful thinking is often considered maladaptive and therefore consistent with this study's hypothesis and previous research (i.e., Ehde & Holm, 1992; Sorbi & Tellegen, 1984). However, Expressing Emotion is generally considered an adaptive coping strategy and therefore is inconsistent with this study's hypothesis.

## Headache Pain Locus of Control

Subjects' reports of headache pain locus of control (LOC) showed only overall group differences, with migraineurs and tension headache sufferers both scoring significantly higher than controls on the External Chance and the Internal subscales. Holroyd et al. (1993) reported that all headache subjects in pain reported significantly higher external LOC than headache-free controls, but only migraineurs showed this difference for headache subjects not in pain. The findings from the present study obviously vary from Holroyd et al's (1993) by not finding any differences attributable to pain-state but are consistent in finding that headache subjects reported greater scores on the External Chance subscale.

The finding that both migraine and tension headache sufferers reported higher levels of internal LOC than control subjects has not been reported in the literature and as such is unusual. It may be that the control group's experience with headache was so limited that they simply did not endorse any items of the HLOC. Anecdotal reports of subjects in the control group were consistent with this explanation, and the majority of control subjects reported on the headache symptom screening form that they never experience headaches (as opposed to experiencing a few headaches per year).

## Coping with Pain

Analyses pertaining to self-reported, pain-specific coping strategies showed significant between-subjects main effects. However, there was no significant interaction or pain-state effect. Migraineurs reported engaging in more Catastrophizing than both tension headache sufferers and controls. Migraineurs also reported Praying more than controls. No previous studies have been conducted to investigate pain-state as a mediator of reports of pain-specific coping in headache sufferers. However, the present results are consistent with the findings for the HLOC (the other pain- or headache-specific measure). They suggest that pain-state does not mediate headache subjects' pain-specific coping strategies, nor does it mediate group differences between headache subjects and control subjects.

Discriminant Analyses: The Effect of Pain State

Stepwise discriminant analyses were conducted in order to determine whether the symptom and headache-related measures used in the present study could be used as predictors to correctly classify tension, migraine and control subjects. Separate analyses were conducted with data collected while headache subjects were in pain and when they were free from head pain. The functions formed with pain-state data (63.5% overall correct classification) were better at predicting group membership than those formed with pain-free data (56.1% overall correct classification).

Three variables made significant contributions to the functions formed with the pain-state data - internal locus of control, external chance locus of control, and health concerns/hassles. This analysis revealed that higher scores on each of these variables were associated with headache groups (especially migraineurs), while lower scores were associated with the control group. In addition, data pertinent to the second discriminant function revealed that the two headache groups could be distinguished by their pattern of scores on the locus of control subscales. Specifically, membership in the tension headache group was associated with higher scores on the internal locus of control subscale and lower scores on the external chance subscale, while the opposite was true for membership in the migraine group.

Similar results were found with the pain-free data. Two significant predictors were found with higher scores on both internal locus of control and the

catastrophizing subscale of the CSQ associated with membership in the two headache groups as contrasted with the control group. Results from the second function showed that tension headaches sufferers and migraineurs were discriminated by the tension sufferers having higher scores on the internal locus of control subscale and lower scores on the catastrophizing subscale. However, as discussed above, these analyses resulted in the formation of functions that accounted for less group variance than those formed with pain-state data.

Although the superiority of prediction with the pain-state data was slight, these analyses provide some support for the hypothesis that headache sufferer's assessment results are biased by the presence of pain and are more similar to headache-free controls when the headache sufferers are not in pain (i.e., currently experiencing a headache).

## Correlations Between Pain and Symptom Reports

Bivariate correlations were performed to determine whether the actual level of pain reported by headache subjects during the pain-state assessment correlated with symptom levels. There were significant correlations in the expected directions between reported pain and symptom levels on thirteen dependent variables gathered during pain-state (see Table 18 in the results section). All of these correlations were in the expected direction (i.e., greater pain was directly correlated with greater reports of symptoms or more maladaptive coping strategies), and as such provides more evidence to suggest that pain-state does mediate some headache sufferer's symptom reports.

## Conclusions and Limitations

In sum, Holroyd et al. (1993, p.233) concluded that, "Pain state thus was a moderator of symptom reports. Our results suggest that previous studies may have incorrectly concluded that recurrent headaches are associated with psychological disturbance." The present study lends some support to the fact that headache sufferers report more psychological symptoms during pain than while not in pain, but the findings were not as consistent and the conclusions cannot be as firm as those of Holroyd et al. (1993). Closer examination of actual group means (during both pain and pain-free states) from Holroyd et al.'s (1993) study revealed a slightly smaller magnitude of actual group differences with regard to depression and anxiety total score means (Table 21) than were observed in the present study (refer to Table 8 in Results section). With regard to external locus of control group means (Table 21), the actual magnitude of average differences between groups was only slightly larger in Holroyd's study than in the present study (refer to Table 10 in Results section). Thus, given that the present study did not show results similar to the Holroyd study, while showing very similar actual group mean differences, it may be concluded that the present study (which included about half as many subjects as Holroyd's) lacked the number of subjects required to detect the differences.

The primary problem in the present study was a combination of failing to find the expected magnitude of difference between headache sufferer's pain state and pain-free symptom reports and, in some instances, observing a larger

Table 21. Group Means (Pain-State and Pain-Free) from Holroyd et al. (1993)

| | Pain-State | | | Pain-Free | | |
|---|---|---|---|---|---|---|
| Measure | Ten. | Mig. | Cont. | Ten. | Mig. | Cont. |
| Depression | 11.8 | 7.7 | 5.0 | 6.4 | 7.8 | 5.0 |
| Anxiety | 22.9 | 19.7 | 18.0 | 19.6 | 19.6 | 18.0 |
| HLOC | 29.4 | 30.8 | 13.8 | 20.4 | 29.0 | 13.8 |

than expected change in the control group across the two assessments. Assessing what was considered a "college" sample in the present study (as opposed to a "clinical " sample in Holroyd's study), and noting that the present sample included tension headache sufferers who reported a much lower frequency of headache than in Holroyd's study, could have contributed to the smaller magnitude of change in symptom reports between pain and pain-free states. However, the average head pain rating during pain-state assessment for both tension and migraine headache sufferers in the present group was much higher in the present study ($\underline{M}$=6.02 and $\underline{M}$=6.94, respectively) than in Holroyd's study ($\underline{M}$=3.94). Even though Holroyd's sample would be considered "clinical" as opposed to our "college" sample, subjective pain reports would suggest that the present study did not suffer from a lack of "clinically significant" head pain during assessment. Thus it is more likely that Holroyd's study revealed statistically significant results because subject numbers were high enough to detect them. Nevertheless, examination of actual group mean differences suggest similar results in terms of magnitude of symptom report differences. Finally, with regard to the unexpected changes over testing points for control subjects, no explanation can be given within the constraints of the present study, and contributing factors remain unknown.

The present study and Holroyd et al. (1993) did differ in design which may, at least in part, be responsible for the different findings in the two studies. Holroyd et al. (1993) was solely a between-subjects design in which headache sufferers completed the assessment battery while either naturally in pain or pain-free. Their analyses of subjects in pain and not in pain could have been affected by any of a multitude of unassessed differences in subjects. The present study's repeated-measures design represents an improvement on Holroyd et al.'s (1993) between-subjects approach to detecting pain-mediating effects in psychological symptom reports and as such may provide more accurate depiction of pain-state's effects.

In terms of limitations, one major limitation of this study is the lack of generalizability due to the mostly young, Caucasian college sample. While the Holroyd et al. (1993) study was also conducted in a university setting, that sample was taken from a headache clinic at the university, and consisted of significantly older individuals. Their firmer conclusions regarding mediating effects of pain-state could be due to the more "clinical" nature of their sample, and the present study may have been limited by the above-mentioned demographics. Finally, no gender differences were examined due to lack of enough subjects for this type of analysis. Also, a repeated-measures MANOVA including investigation of gender differences would involve a greater risk of Type I error, as there would be eight overall tests for each MANOVA, rather than three as outlined in the present study.

Based on the above-mentioned limitations, it is suggested that more research be conducted to determine the effects of pain-state on psychological symptom reports of headache subjects, and perhaps other chronic pain sufferers. Future studies should draw samples from clinic populations that ideally include more diverse subjects with regard to age, race, ethnicity, geography, and socioeconomic status. Clinicians already collecting this type of data from larger numbers of chronic pain patients in order to inform treatment plans could, at the very least, investigate simple correlations between reported pain levels and symptom reports at the time of assessment. A more flexible clinic environment might provide opportunity for multiple assessments in order to replicate the repeated-measures design implemented in the present study, obtaining psychological assessment data from patients both during pain and while pain-free.

# APPENDICES

# APPENDIX A

# UND HEADACHE QUESTIONNAIRE

# UND HEADACHE QUESTIONNAIRE

A graduate student in the department of Psychology at UND will screen your answers and contact you by phone for opportunities to participate in a study. Your answers will remain confidential.

Your completing and turning in this questionnaire will serve as your informed consent for this screening only. Any further participation in an actual study will require your additional informed consent.

**NAME:** **EMAIL ADDRESS:**
**How often do you check your email?**

**COURSE INSTRUCTOR'S NAME:**

**COURSE TEACHING ASSISTANT'S NAME** (if applicable):

**NAME OF COURSE:**

**PHONE:**

**ADDRESS:**

**GENDER:** F M (circle one)

**AGE:** **DATE OF BIRTH:**

**1. About how often do you get a headache?** (check one)

___ never
___ a few times a year
___ 1 or 2 times per month
___ 1 or 2 times per week
___ 3 or 4 times per week
___ 5 or 6 times per week
___ 1 or more per day

*If you selected "never" for question 1, please stop here. If you selected any other answer, please finish the rest of the questions.*

2. **On the average, how painful are your headaches?** (check one)

___ I can't do anything when I have a headache
___ Concentration is difficult, but I can do undemanding tasks
___ My headaches are painful, but I can continue whatever I am doing
___ I can ignore my headaches most of the time
___ I only notice my headaches when I focus my attention on them

*Some people get warnings that a headache is coming before there is any pain. Please check the answer that matches how often, if ever, you experience each of the following warning signs BEFORE your headaches.*

3. Nausea or vomiting BEFORE ___ never ___ seldom ___ usually ___ always
4. Lights in front of eyes or blind spots BEFORE ___ never ___ seldom ___ usually ___ always
5. Tingling/numbness in hands or feet BEFORE ___ never ___ seldom ___ usually ___ always

*Some people experience other symptoms during a headache. Please check the answer that matches how often, if ever, you experience each of the following symptoms DURING your headaches.*

6. Nausea or vomiting DURING ___ never ___ seldom ___ usually ___ always
7. Sensitivity to light DURING ___ never ___ seldom ___ usually ___ always
8. Sensitivity to sound DURING ___ never ___ seldom ___ usually ___ always

*Answer the following questions about the QUALITY of your headaches.*

9. **Where do your headaches usually start?** (check one)
___ the temples ___ the forehead ___ the back of head or neck/shoulders ___ not sure

10. Do (or did) either of your biological parents get severe headaches? ___ yes ___ no ___ not sure

11. Which of the following best describes your headache pain?
___ throbbing/pulsing ___ constant, sharp pain ___ dull ache

12. Are your headaches aggravated by routine physical activity (such as walking stairs)?
___ yes ___ no

# APPENDIX B

# INTERNATIONAL HEADACHE SOCIETY DIAGNOSTIC CRITERIA

International Headache Society Diagnostic Criteria

Chronic Tension-Type Headache

A. Average headache frequency ≥ 15 days/month (180 days/year) for ≥ six months fulfilling criteria B-D listed below.

B. At least 2 of the following pain characteristics:

   1. Pressing/tightening quality
   2. Mild or moderate severity (may inhibit, but does not prohibit activities)
   3. Bilateral location
   4. No aggravation by walking stairs or similar routine physical activity

C. Both of the following:

   1. No vomiting
   2. No more than one of the following: Nausea, photophobia or phonophobia

D. At least one of the following:

   1. History, physical and neurological examinations do not suggest one of the disorders listed in groups 5-11.
   2. History and/or physical and/or neurological examinations do suggest such disorder, but it is ruled out by appropriate investigations.
   3. Such disorder is present, but tension-type headache does not occur for the first time in close temporal relation to the disorder.

Migraine without Aura

A. At least 5 attacks fulfilling B-D

B. Headache attacks lasting 4-72 hours (untreated or unsuccessfully treated)

C. Headache has at least two of the following characteristics:

1. Unilateral location
2. Pulsating quality
3. Moderate or severe intensity (inhibits or prohibits daily activities)
4. Aggravation by walking stairs or similar routine physical activity

D. During headache at least one of the following:

1. Nausea and/or vomiting
2. Photophobia and phonophobia

E. At least one of the following:

1. History, physical and neurological examinations do not suggest one of the disorders listed in groups 5-11.
2. History and/or physical and/or neurological examinations do suggest such disorder, but it is ruled out by appropriate investigations.
3. Such disorder is present, but migraine attacks do not occur for the first time in close temporal relation to the disorder.

Migraine with Aura

A. At least 2 attacks fulfilling B

B. At least 3 of the following 4 characteristics:

1. One or more fully reversible aura symptoms indicating focal cerebral cortical and/or brain stem dysfunction
2. At least one aura symptom develops gradually over more than 4 minutes, or 2 or more symptoms occur in succession

3. No aura symptom lasts more than 60 minutes. If more than one aura symptom is present, accepted duration is proportionally increased.
4. Headache follows aura with a free interval of less than 60 minutes (It may also begin before or simultaneously with the aura.).

C. At least one of the following:

1. History, physical and neurological examinations do not suggest one of the disorders listed in groups 5-11.
2. History and/or physical and/or neurological examinations do suggest such disorder, but it is ruled out by appropriate investigations.
3. Such disorder is present, but migraine attacks do not occur for the first time in close temporal relation to the disorder.

# APPENDIX C

# BECK DEPRESSION INVENTORY

**Instructions:** This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the **one statement** in each group that best describes the way you have been feeling during the **past two weeks, including today.** Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

**1. Sadness**
- 0 I do not feel sad.
- 1 I feel sad much of the time.
- 2 I am sad all the time.
- 3 I am so sad or unhappy that I can't stand it.

**2. Pessimism**
- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.
- 3 I feel my future is hopeless and will only get worse.

**3. Past Failure**
- 0 I do not feel like a failure.
- 1 I have failed more than I should have.
- 2 As I look back, I see a lot of failures.
- 3 I feel I am a total failure as a person.

**4. Loss of Pleasure**
- 0 I get as much pleasure as I ever did from the things I enjoy.
- 1 I don't enjoy things as much as I used to.
- 2 I get very little pleasure from the things I used to enjoy.
- 3 I can't get any pleasure from the things I used to enjoy.

**5. Guilty Feelings**
- 0 I don't feel particularly guilty.
- 1 I feel guilty over many things I have done or should have done.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

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

**7. Self-Dislike**
- 0 I feel the same about myself as ever.
- 1 I have lost confidence in myself.
- 2 I am disappointed in myself.
- 3 I dislike myself.

**8. Self-Criticalness**
- 0 I don't criticize or blame myself more than usual.
- 1 I am more critical of myself than I used to be.
- 2 I criticize myself for all of my faults.
- 3 I blame myself for everything bad that happens.

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

**10. Crying**
- 0 I don't cry anymore than I used to.
- 1 I cry more than I used to.
- 2 I cry over every little thing.
- 3 I feel like crying, but I can't.

**11. Agitation**
- 0 I am no more restless or wound up than usual.
- 1 I feel more restless or wound up than usual.
- 2 I am so restless or agitated that it's hard to stay still.
- 3 I am so restless or agitated that I have to keep moving or doing something.

**12. Loss of Interest**
- 0 I have not lost interest in other people or activities.
- 1 I am less interested in other people or things than before.
- 2 I have lost most of my interest in other people or things.
- 3 It's hard to get interested in anything.

**13. Indecisiveness**
- 0 I make decisions about as well as ever.
- 1 I find it more difficult to make decisions than usual.
- 2 I have much greater difficulty in making decisions than I used to.
- 3 I have trouble making any decisions.

**14. Worthlessness**

0 I do not feel I am worthless.
1 I don't consider myself as worthwhile and useful as I used to.
2 I feel more worthless as compared to other people.
3 I feel utterly worthless.

**15. Loss of Energy**

0 I have as much energy as ever.
1 I have less energy than I used to have.,
2 I don't have enough energy to do very much.
3 I don' t have enough energy to do anything.

**16. Changes in Sleeping Pattern**

0 I have not experienced any change in my sleeping pattern.

---

1a I sleep somewhat more than usual.
1b I sleep somewhat less than usual.

---

2a I sleep a lot more than usual.
2b I sleep a lot less than usual.

---

3a I sleep most of the day.
3b I wake up 1-2 hours early and can't get back to sleep.

**17. Irritability**

0 I am no more irritable than usual.
1 I am more irritable than usual.
2 I am much more irritable than usual.
3 I am irritable all the time.

**18. Changes in Appetite**

0 I have not experienced any change in my appetite.

---

1a My appetite is somewhat less than usual.
1b My appetite is somewhat greater than usual.

---

2a My appetite is much less than before.
2b My appetite is much greater than usual.

---

3a I have no appetite at all.
3b I crave food all the time.

**19. Concentration Difficulty**

0 I can concentrate as well as ever.
1 I can't concentrate as well as usual.
2 It's hard to keep my mind on anything for very long.
3 i find I can't concentrate on anything.

**20. Tiredness or Fatigue**

0 I am no more tired or fatigued than usual.
1 I get more tired or fatigued more easily than usual.
2 I am too tired or fatigued to do a lot of the things I used to do.
3 I am too tired or fatigued to do most of the things I used to do.

**21. Loss of Interest in Sex**

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

# APPENDIX D

# STATE-TRAIT ANXIETY INVENTORY

**Instructions:** A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate **how you generally feel**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you **generally** feel.

| | Almost Never | Sometimes | Often | Almost Always |
|---|---|---|---|---|
| 1. I feel pleasant | 1 | 2 | 3 | 4 |
| 2. I feel nervous and restless | 1 | 2 | 3 | 4 |
| 3. I feel satisfied with myself | 1 | 2 | 3 | 4 |
| 4. I wish I could be as happy as others seem to be | 1 | 2 | 3 | 4 |
| 5. I feel like a failure | 1 | 2 | 3 | 4 |
| 6. I feel rested | 1 | 2 | 3 | 4 |
| 7. I am "calm, cool and collected" | 1 | 2 | 3 | 4 |
| 8. I feel that difficulties are piling up so that I cannot overcome them | 1 | 2 | 3 | 4 |
| 9. I worry too much over something that really doesn't matter | 1 | 2 | 3 | 4 |
| 10. I am happy | 1 | 2 | 3 | 4 |
| 11. I have disturbing thoughts | 1 | 2 | 3 | 4 |
| 12. I lack self-confidence | 1 | 2 | 3 | 4 |
| 13. I feel secure | 1 | 2 | 3 | 4 |
| 14. I make decisions easily | 1 | 2 | 3 | 4 |
| 15. I feel inadequate | 1 | 2 | 3 | 4 |
| 16. I am content | 1 | 2 | 3 | 4 |
| 17. Some unimportant thought runs through my mind and bothers me | 1 | 2 | 3 | 4 |
| 18. I take disappointments so keenly that I can't put them out of my mind | 1 | 2 | 3 | 4 |
| 19. I am a steady person | 1 | 2 | 3 | 4 |
| 20. I get in a state of tension or turmoil as I think over my recent concerns and interests | 1 | 2 | 3 | 4 |

# APPENDIX E

# HEADACHE-SPECIFIC LOTUS OF CONTROL SCALE

**Instructions:** Please circle the number that represents the extent to which you disagree or agree with each of the following statements. Make sure that you **answer every item** and that you **circle only one** number per item. There are no right or wrong answers. This is a measure of your personal beliefs. Read each statement carefully, but do not spend too much time on any one item.

| | Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree |
|---|---|---|---|---|---|
| 1. Following the doctor's medication regimen is the best way for me not to be laid-up with a headache. | 1 | 2 | 3 | 4 | 5 |
| 2. When I drive myself too hard I get headaches. | 1 | 2 | 3 | 4 | 5 |
| 3. When I have a headache, there is nothing I can do to affect its course. | 1 | 2 | 3 | 4 | 5 |
| 4. Health professionals keep me from getting headaches. | 1 | 2 | 3 | 4 | 5 |
| 5. By not becoming agitated or overactive, I can prevent many headaches | 1 | 2 | 3 | 4 | 5 |
| 6. My headaches are beyond all control. | 1 | 2 | 3 | 4 | 5 |
| 7. My headaches can be less severe if medical professionals (doctors, nurses, etc.) take proper care of me. | 1 | 2 | 3 | 4 | 5 |
| 8. When I worry or ruminate about things I am more likely to have headaches | 1 | 2 | 3 | 4 | 5 |
| 9. I'm likely to get headaches no matter what I do. | 1 | 2 | 3 | 4 | 5 |
| 10. I usually recover from a headache when I get proper medical help. | 1 | 2 | 3 | 4 | 5 |
| 11. My actions influence whether I have headaches. | 1 | 2 | 3 | 4 | 5 |
| 12. Often I feel that no matter what I do, I will still have headaches. | 1 | 2 | 3 | 4 | 5 |
| 13. Having regular contact with my physician is the best way for me to control my headaches. | 1 | 2 | 3 | 4 | 5 |
| 14. My headaches are worse when I'm coping with stress. | 1 | 2 | 3 | 4 | 5 |
| 15. I am completely at the mercy of my headaches. | 1 | 2 | 3 | 4 | 5 |
| 16. My doctor's treatment can help my headaches. | 1 | 2 | 3 | 4 | 5 |
| 17. If I remember to relax I can avoid some of my headaches. | 1 | 2 | 3 | 4 | 5 |
| 18. No matter what I do, if I am going to get a headache, I will get a headache. | 1 | 2 | 3 | 4 | 5 |
| 19. If I don't have the right medication, my headaches will be a problem | 1 | 2 | 3 | 4 | 5 |
| 20. I can prevent some of my headaches by avoiding certain stressful situations. | 1 | 2 | 3 | 4 | 5 |
| 21. I'm just plain lucky for a month when I don't get headaches. | 1 | 2 | 3 | 4 | 5 |
| 22. Only my doctor can give me ways to prevent my headaches. | 1 | 2 | 3 | 4 | 5 |
| 23. I can prevent some of my headaches by not getting emotionally upset. | 1 | 2 | 3 | 4 | 5 |
| 24. It's a matter of fate whether I have a headache. | 1 | 2 | 3 | 4 | 5 |
| 25. When I have headaches, I should consult a medically trained professional. | 1 | 2 | 3 | 4 | 5 |
| 26. I am directly responsible for some of my getting headaches. | 1 | 2 | 3 | 4 | 5 |
| 27. When I get headaches, I just have to let nature run its course. | 1 | 2 | 3 | 4 | 5 |
| 28. When my doctor makes a mistake, I am the one to suffer with headaches. | 1 | 2 | 3 | 4 | 5 |
| 29. When I have not been taking proper care of myself, I am likely to experience headaches. | 1 | 2 | 3 | 4 | 5 |
| 30. Luck plays a big part in determining how soon I will recover from a headache. | 1 | 2 | 3 | 4 | 5 |
| 31. Just seeing my doctor helps my headaches. | 1 | 2 | 3 | 4 | 5 |
| 32. My headaches are sometimes worse because I am overactive. | 1 | 2 | 3 | 4 | 5 |
| 33. My not getting headaches is largely a matter of good fortune. | 1 | 2 | 3 | 4 | 5 |

# APPENDIX F

# DAILY HASSLES SCALE

**Instructions:** Hassles are irritants that can range from minor annoyances to fairly major pressures, problems, or difficulties. They can occur few or many times. Listed on the following pages are a number of ways in which a person can feel hassled. For each hassle, if it has **not happened** to you in the past month, **indicate that it is not applicable by circling N/A.** If it has happened to you in the **past month**, indicate by **circling a 1, 2, 3, 4, or 5, how SEVERE** it has been for you in the past month, according to the following answers. **Remember, if it has not happened in the past month, simply circle N/A.**

| | Not App. | Not Severe At All | Somewhat Severe | Moderately Severe | Very Severe | Extremely Severe |
|---|---|---|---|---|---|---|
| 1. Social obligations | N/A | 1 | 2 | 3 | 4 | 5 |
| 2. Troubling thoughts about your future | N/A | 1 | 2 | 3 | 4 | 5 |
| 3. Not enough money for clothing | N/A | 1 | 2 | 3 | 4 | 5 |
| 4. Not enough money for housing | N/A | 1 | 2 | 3 | 4 | 5 |
| 5. Concerns about owing money | N/A | 1 | 2 | 3 | 4 | 5 |
| 6. Concerns about money for emergencies | N/A | 1 | 2 | 3 | 4 | 5 |
| 7. Too many responsibilities | N/A | 1 | 2 | 3 | 4 | 5 |
| 8. concerned about the meaning of life | N/A | 1 | 2 | 3 | 4 | 5 |
| 9. Trouble making decisions | N/A | 1 | 2 | 3 | 4 | 5 |
| 10. Problems getting along with fellow workers | N/A | 1 | 2 | 3 | 4 | 5 |
| 11. Customers or clients give you a hard time | N/A | 1 | 2 | 3 | 4 | 5 |
| 12. Home maintenance (inside) | N/A | 1 | 2 | 3 | 4 | 5 |
| 13. Don't like current work duties | N/A | 1 | 2 | 3 | 4 | 5 |
| 14. Don't like fellow workers | N/A | 1 | 2 | 3 | 4 | 5 |
| 15. Not enough money for basic necessities | N/A | 1 | 2 | 3 | 4 | 5 |
| 16. Not enough money for food | N/A | 1 | 2 | 3 | 4 | 5 |
| 17. Too many interruptions | N/A | 1 | 2 | 3 | 4 | 5 |
| 18. Concerns about accidents | N/A | 1 | 2 | 3 | 4 | 5 |
| 19. Being lonely | N/A | 1 | 2 | 3 | 4 | 5 |
| 20. Not enough money for health care | N/A | 1 | 2 | 3 | 4 | 5 |
| 21. Fear of confrontation | N/A | 1 | 2 | 3 | 4 | 5 |
| 22. Financial security | N/A | 1 | 2 | 3 | 4 | 5 |
| 23. Inability to express yourself | N/A | 1 | 2 | 3 | 4 | 5 |
| 24. Physical illness | N/A | 1 | 2 | 3 | 4 | 5 |
| 25. Side effects of medication | N/A | 1 | 2 | 3 | 4 | 5 |
| 26. concerns about medical treatment | N/A | 1 | 2 | 3 | 4 | 5 |
| 27. Physical appearance | N/A | 1 | 2 | 3 | 4 | 5 |
| 28. Fear of rejection | N/A | 1 | 2 | 3 | 4 | 5 |
| 29. Concerns about health in general | N/A | 1 | 2 | 3 | 4 | 5 |
| 30. Not seeing enough people | N/A | 1 | 2 | 3 | 4 | 5 |
| 31. Wasting time | N/A | 1 | 2 | 3 | 4 | 5 |
| 32. Financing children's education | N/A | 1 | 2 | 3 | 4 | 5 |
| 33. Problems with employees | N/A | 1 | 2 | 3 | 4 | 5 |
| 34. Problems on job due to being a man or a woman | N/A | 1 | 2 | 3 | 4 | 5 |
| 35. Concerns about bodily functions | N/A | 1 | 2 | 3 | 4 | 5 |
| 36. Rising prices of common goods | N/A | 1 | 2 | 3 | 4 | 5 |
| 37. Not getting enough rest | N/A | 1 | 2 | 3 | 4 | 5 |
| 38. Not getting enough sleep | N/A | 1 | 2 | 3 | 4 | 5 |
| 39. Problems with your children | N/A | 1 | 2 | 3 | 4 | 5 |
| 40. Overloaded with family responsibilities | N/A | 1 | 2 | 3 | 4 | 5 |
| 41. Too many things to do | N/A | 1 | 2 | 3 | 4 | 5 |
| 42. Job dissatisfactions | N/A | 1 | 2 | 3 | 4 | 5 |
| 43. Worries about decisions to change jobs | N/A | 1 | 2 | 3 | 4 | 5 |
| 44. Too many meetings | N/A | 1 | 2 | 3 | 4 | 5 |
| 45. Not enough time to do the things you need to do | N/A | 1 | 2 | 3 | 4 | 5 |
| 46. Not enough personal energy | N/A | 1 | 2 | 3 | 4 | 5 |
| 47. Concerns about inner conflicts | N/A | 1 | 2 | 3 | 4 | 5 |
| 48. Feel conflicted over what to do | N/A | 1 | 2 | 3 | 4 | 5 |
| 49. Regrets over past decisions | N/A | 1 | 2 | 3 | 4 | 5 |
| 50. Concerns about getting ahead | N/A | 1 | 2 | 3 | 4 | 5 |

| | Not App. | Not Severe At All | Somewhat Severe | Moderately Severe | Very Severe | Extremely Severe |
|---|---|---|---|---|---|---|
| 51. Hassles from boss or supervisor | N/A | 1 | 2 | 3 | 4 | 5 |
| 52. Not enough money for transportation | N/A | 1 | 2 | 3 | 4 | 5 |
| 53. Note enough money for entertainment and recreation | N/A | 1 | 2 | 3 | 4 | 5 |
| 54. Property, investments, or taxes | N/A | 1 | 2 | 3 | 4 | 5 |
| 55. Not enough time for entertainment and recreation | N/A | 1 | 2 | 3 | 4 | 5 |
| 56. Yard work or outside home maintenance | N/A | 1 | 2 | 3 | 4 | 5 |
| 57. Concerns about new events | N/A | 1 | 2 | 3 | 4 | 5 |
| 58. Noise | N/A | 1 | 2 | 3 | 4 | 5 |
| 59. Crime | N/A | 1 | 2 | 3 | 4 | 5 |
| 60. Traffic | N/A | 1 | 2 | 3 | 4 | 5 |
| 61. Pollution | N/A | 1 | 2 | 3 | 4 | 5 |

Have we missed any hassles? If so, write them in below:

_____

_____

_____

Has there been a change in your life that affected how you answered this scale? If so, please describe what it was:

_____

_____

_____

# APPENDIX G

# IMAGINAL STRESSOR

**Instructions: Imagine that, despite your expectations, you have received a significantly worse grade than you expected in a college course important to your major field of study.**

Take a few minutes and imagine what this would be like. Now **compose a brief story** based on this scenario in the space below. Make sure that you **include some of the following**: What lead up to the situation? What does this mean to you now? In what ways will your life change because of this situation? Will your course of study or undergraduate experience change in any way? If so, how? What kinds of thoughts and feelings are you experiencing?

Now pretending that the above things have just happened to you (referring to your story as often as you'd like), please answer the **next questionnaire**, keeping in mind the above situation. Some items may not seem as appropriate for the situation as others, but please try to do your best in answering each item.

# APPENDIX H

# COPING STRATEGIES INVENTORY

**Instructions:** Each day people experience events that may be viewed as unpleasant or stressful. We are interested in **how you think you would cope with the imaginary stressful situation** presented on the page before. Below are listed a number of ways that people cope with stressful events. Please read each item and circle the number to the right that best describes how much you think you would use that way to handle receiving a significantly worse grade than expected in a college course.

| | Not at all | A little | Somewhat | Much | Very Much |
|---|---|---|---|---|---|
| **1.** I just concentrate on what I need to do next; the next step | 1 | 2 | 3 | 4 | 5 |
| **2.** I try to get a new angle on the situation | 1 | 2 | 3 | 4 | 5 |
| **3.** I find ways to blow off steam | 1 | 2 | 3 | 4 | 5 |
| **4.** I accept sympathy and understanding from others | 1 | 2 | 3 | 4 | 5 |
| **5.** I sleep more than usual | 1 | 2 | 3 | 4 | 5 |
| **6.** I hope the problem will take care of itself | 1 | 2 | 3 | 4 | 5 |
| **7.** I tell myself that if I wasn't so careless, things like this wouldn't happen | 1 | 2 | 3 | 4 | 5 |
| **8.** I try to keep my feelings to myself | 1 | 2 | 3 | 4 | 5 |
| **9.** I change something so that things will turn out alright | 1 | 2 | 3 | 4 | 5 |
| **10.** I look for the silver lining, so to speak; try to look on the bright side of things | 1 | 2 | 3 | 4 | 5 |
| **11.** I do some things to get it out of my system | 1 | 2 | 3 | 4 | 5 |
| **12.** I find somebody who is a good listener | 1 | 2 | 3 | 4 | 5 |
| **13.** I go along as if nothing were happening | 1 | 2 | 3 | 4 | 5 |
| **14.** I hope a miracle will happen | 1 | 2 | 3 | 4 | 5 |
| **15.** I realize that I bring the problem on myself | 1 | 2 | 3 | 4 | 5 |
| **16.** I spend more time alone | 1 | 2 | 3 | 4 | 5 |
| **17.** I stand my ground and fight for what I want | 1 | 2 | 3 | 4 | 5 |
| **18.** I tell myself things that help me feel better | 1 | 2 | 3 | 4 | 5 |
| **19.** I let my emotions go | 1 | 2 | 3 | 4 | 5 |
| **20.** I talk to someone about how I am feeling | 1 | 2 | 3 | 4 | 5 |
| **21.** I try to forget the whole thing | 1 | 2 | 3 | 4 | 5 |
| **22.** I wish that I never let myself get involved with that situation | 1 | 2 | 3 | 4 | 5 |
| **23.** I blame myself | 1 | 2 | 3 | 4 | 5 |
| **24.** I avoid my family and friends | 1 | 2 | 3 | 4 | 5 |
| **25.** I make a plan of action and follow it | 1 | 2 | 3 | 4 | 5 |
| **26.** I look at things in a different light and try to make the best of what is available | 1 | 2 | 3 | 4 | 5 |
| **27.** I let out my feelings to reduce the stress | 1 | 2 | 3 | 4 | 5 |
| **28.** I spend more time with people I like | 1 | 2 | 3 | 4 | 5 |
| **29.** I don't let it get to me; I refuse to think about it too much | 1 | 2 | 3 | 4 | 5 |
| **30.** I hope that the situation will go away or somehow will be over with | 1 | 2 | 3 | 4 | 5 |
| **31.** I criticize myself for what happens | 1 | 2 | 3 | 4 | 5 |
| **32.** I avoid being with people | 1 | 2 | 3 | 4 | 5 |
| **33.** I tackle the problem head-on | 1 | 2 | 3 | 4 | 5 |
| **34.** I ask myself what is really important, and discover that things aren't so bad after all | 1 | 2 | 3 | 4 | 5 |
| **35.** I let my feelings out somehow | 1 | 2 | 3 | 4 | 5 |
| **36.** I talk to someone that is very close to me | 1 | 2 | 3 | 4 | 5 |
| **37.** I decide that it is really someone else's problem and not mine | 1 | 2 | 3 | 4 | 5 |
| **38.** I wish that the situation had never started | 1 | 2 | 3 | 4 | 5 |
| **39.** Since what happens is my fault, I really chew myself out | 1 | 2 | 3 | 4 | 5 |
| **40.** I don't talk to other people about the problem | 1 | 2 | 3 | 4 | 5 |
| **41.** I know what has to be done, so I double my efforts and try harder to make things work | 1 | 2 | 3 | 4 | 5 |
| **42.** I convince myself that things aren't quite as bad as they seem | 1 | 2 | 3 | 4 | 5 |
| **43.** I let my emotions out | 1 | 2 | 3 | 4 | 5 |

| | Not at all | A little | Somewhat | Much | Very Much |
|---|---|---|---|---|---|
| **44.** I let my friends help out | 1 | 2 | 3 | 4 | 5 |
| **45.** I avoid the person who is causing the trouble | 1 | 2 | 3 | 4 | 5 |
| **46.** I have fantasies or wishes about how things might turn out | 1 | 2 | 3 | 4 | 5 |
| **47.** I realize that I am personally responsible for my difficulties and really lecture myself | 1 | 2 | 3 | 4 | 5 |
| **48.** I spend some time by myself | 1 | 2 | 3 | 4 | 5 |
| **49.** It is a tricky problem, so I have to work around the edges to make things come out OK | 1 | 2 | 3 | 4 | 5 |
| **50.** I step back from the situation and put things into perspective | 1 | 2 | 3 | 4 | 5 |
| **51.** My feelings are overwhelming and they just explode | 1 | 2 | 3 | 4 | 5 |
| **52.** I ask a friend or relative I respect for advice | 1 | 2 | 3 | 4 | 5 |
| **53.** I make light of the situation and refuse to get too serious about it | 1 | 2 | 3 | 4 | 5 |
| **54.** I hope that if I wait long enough, things will turn out OK | 1 | 2 | 3 | 4 | 5 |
| **55.** I kick myself for letting this happen | 1 | 2 | 3 | 4 | 5 |
| **56.** I keep my thoughts and feelings to myself | 1 | 2 | 3 | 4 | 5 |
| **57.** I work on solving the problem in the situation | 1 | 2 | 3 | 4 | 5 |
| **58.** I reorganize the way I look at the situation, so things didn't look so bad | 1 | 2 | 3 | 4 | 5 |
| **59.** I get in touch with my feelings and just let them go | 1 | 2 | 3 | 4 | 5 |
| **60.** I spend some time with my friends | 1 | 2 | 3 | 4 | 5 |
| **61.** Every time I think about it I get upset; so I just stop thinking about it | 1 | 2 | 3 | 4 | 5 |
| **62.** I wish I can change what happens | 1 | 2 | 3 | 4 | 5 |
| **63.** It is my mistake and I need to suffer the consequences | 1 | 2 | 3 | 4 | 5 |
| **64.** I don't let my family and friends know what is going on | 1 | 2 | 3 | 4 | 5 |
| **65.** I struggle to resolve the problem | 1 | 2 | 3 | 4 | 5 |
| **66.** I go over the problem again and again in my mind and finally see things in a different light | 1 | 2 | 3 | 4 | 5 |
| **67.** I get angry and really blow up | 1 | 2 | 3 | 4 | 5 |
| **68.** I talk to someone who is in a similar situation | 1 | 2 | 3 | 4 | 5 |
| **69.** I avoid thinking or doing anything about the situation | 1 | 2 | 3 | 4 | 5 |
| **70.** I think about fantastic or unreal things that make me feel better | 1 | 2 | 3 | 4 | 5 |
| **71.** I tell myself how stupid I am | 1 | 2 | 3 | 4 | 5 |
| **72.** I do not let others know how I am feeling | 1 | 2 | 3 | 4 | 5 |

# APPENDIX I

# COPING STRATEGIES QUESTIONNAIRE

**Instructions:** Individuals who experience pain have developed a number of ways to cope, or deal with, their pain. These strategies include saying things to themselves when they experience pain, or engaging in different activities. Below are a list of things that patients have reported doing when they feel pain. For each activity, indicate how much you engage in the activity when you feel pain. A 0 indicates you never do or say this when you are experiencing pain, a 3 indicates you sometimes do or say this when you are experiencing pain, and a 6 indicates you always do or say this when you are experiencing pain. Remember; you can use any point along the scale.

| | Never do that | | | Sometimes do that | | | Always do that |
|---|---|---|---|---|---|---|---|
| **1.** I try to feel distant from the pain, almost as if the pain was in somebody else's body | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **2.** I leave the house and do something, such as going to the movies or shopping. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **3.** I try to think of something pleasant. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **4.** I don't think of it as pain but rather as a dull or warm feeling. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **5.** It is terrible and I feel it is never going to get any better. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **6.** I tell myself to be brave and carry on despite the pain. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **7.** I read. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **8.** I tell myself that I can overcome the pain. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **9.** I count numbers in my head or run a song through my mind. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **10.** I just think of it as some other sensation, such as numbness. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **11.** It is awful and I feel that it overwhelms me. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **12.** I play mental games with myself to keep my mind off the pain. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **13.** I feel my life isn't worth living. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **14.** I know someday someone will be here to help me and it will go away for awhile. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **15.** I pray to God it won't last long. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **16.** I try not to think of it as my body, but rather as something separate from me. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **17.** I don't think about the pain. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **18.** I try to think years ahead, what everything will be like after I've gotten rid of the pain. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **19.** I tell myself it doesn't hurt. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **20.** I tell myself I can't let the pain stand in the way of what I have to do. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **21.** I don't pay any attention to it. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **22.** I have faith in doctors that someday there will be a cure for my pain. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **23.** No matter how bad it gets, I know I can handle it. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **24.** I pretend it is not there. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **25.** I worry all the time about whether it will end. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **26.** I replay in my mind pleasant experiences in the past. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **27.** I think of people I enjoy doing things with. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **28.** I pray for the pain to stop. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **29.** I imagine that the pain is outside of my body. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **30.** I just go on as if nothing happened. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **31.** I see it as a challenge and don't let it bother me. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **32.** Although it hurts, I just keep on going. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **33.** I feel I can't stand it any more. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **34.** I try to be around other people. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **35.** I ignore it. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **36.** I rely on my faith in God. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **37.** I feel like I can't go on. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **38.** I think of things I enjoy doing. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **39.** I do anything to get my mind off the pain. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **40.** I do something I enjoy, such as watching TV or listening to music. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **41.** I pretend it is not a part of me. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

| 42. I do something active, like household chores or projects | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|

43. Based on all the things you do to cope or deal with your pain, on an average day, how much control do you feel you have over it? Circle the number that estimates best.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| No Control | | | Some Control | | | Complete Control |

44. Based on all the things you do to cope or deal with your pain, on an average day, how much are you able to decrease it? Circle the number that estimates best.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Can't decrease it at all | | | Can decrease it somewhat | | | Can decrease it completely |

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