THE ROLE OF ACCEPTANCE IN APPRAISAL AND COPING WITH MIGRAINE HEADACHES

Christine E. Chiros

A Dissertation

Submitted to the Graduate College of Bowling Green State University in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2007

Committee:

William H. O'Brien, Ph.D. Advisor

Judy Adams, Ph.D.
Graduate Faculty Representative

Robert Carels, Ph.D.

Dara Mush-Eizenman, Ph.D.
ABSTRACT

William H. O'Brien, Advisor

Acceptance and chronic pain is an emerging topic both for research and intervention. Initial studies have demonstrated acceptance is correlated with higher quality of daily emotional, social, and physical functioning in various chronic pain populations. The purpose of the present study was to clarify the nature of the relationship between acceptance, appraisals that are common and relevant in chronic pain populations (i.e., control and catastrophizing), and coping among migraine headache sufferers, and to determine whether the relationships conform to the same pattern observed in other chronic pain populations. Seventy four participants with migraine headaches completed self report measures assessing appraisal, coping strategies, acceptance, and pain related disability. Sixty three participants also completed a 28-day daily dairy assessing headache activity, catastrophizing, control, acceptance, and coping strategies. Hierarchical regression and multilevel modeling were used to examine the relations between these variables.

Overall, results indicate acceptance is a relevant construct in the experience of migraine pain. Higher levels of pain-related acceptance were associated with lower levels of catastrophizing and pain-related interference, and increased perceived control. Participants who endorsed higher levels of pain related acceptance reported engaging in a higher level of activity overall, and indicated they use fewer coping strategies. Though many of the primary hypotheses had partial support, it is clear that a different pattern of relationships was observed between acceptance, coping, and appraisal among migraine headache sufferers. Unlike previous studies with other chronic pain populations, pain severity was significantly related to many of the constructs tested. This could have important implications in developing appropriate acceptance-
based treatment with headache sufferers. This highlights the importance of replicating and extending research with new populations. Acceptance continues to show promise as a way of viewing pain that lessens the detrimental impact of certain types of thoughts (i.e., catastrophizing), and leads to increased participation in daily life.
I dedicate this to my best friend, my life partner, and my soul mate, Paul.
ACKNOWLEDGMENTS

Though much of the day to day work in dissertation is solitary, the successful completion requires the involvement, support, and encouragement of many. I appreciate the guidance given and expertise shared by the members of my dissertation committee; Robert Carels, Dara Mushker-Eizenman, and Judy Adams. The committee’s enthusiastic contributions to this project strengthened the final product, and I was honored to have their involvement. I would also like to thank Richard Rowlands of the Bowling Green State University Human Subjects Review Board for his assistance and high level of responsiveness to my numerous questions about modifying the research protocol for online survey methodology.

This project would have been so much less without the help of my dissertation advisor and mentor, William H. O’Brien. His example of what it is to be a clinical psychologist, a research-practitioner, a mentor, and a teacher, has played an important role in shaping my professional identity. I greatly appreciate his patience, consistent encouragement, and steadfast belief in me as well as my work.

I am so thankful for the many supportive, loving, and forgiving friends old and new who helped me along the way. Special thanks to Monica Day, Le Reamer, Erin Foster, Lisa Hoffman-Konn, Zoe Peterson, Melissa Boyer, Vanessa Williams, Cynthia Cutshall, and Maureen Kennedy. I am also so grateful for the untiring support and care of my parents, John and Carol Chiros. Finally, I give special thanks to my new friends in the Phinished.org community, who helped me power through my work from data collection to defense.
# TABLE OF CONTENTS

**CHAPTER I. INTRODUCTION** ................................................................. 1

- Epidemiology of Migraine Headaches ............................................. 1

- Classification of Headaches ............................................................ 2
  - Migraine Headache ..................................................................... 2
  - Prodrome ...................................................................................... 3
  - Aura ............................................................................................ 4
  - Headache ..................................................................................... 4
  - Postdrome .................................................................................. 4

- Diagnostic Reliability and Validity .................................................... 4

- Etiology of Headache ................................................................. 7

- The Role of Stress in Headache ......................................................... 9

- New Directions in Stress-Reactivity Research ................................. 11
  - Appraisal ................................................................................. 12
  - Acceptance as a Form of Appraisal ........................................... 12
  - Castastrophizing and Pain .......................................................... 15
  - Castastrophizing and Headache .................................................. 17
  - Control and Pain ...................................................................... 18
  - Control and Headache ............................................................. 19

- Coping Efforts .............................................................................. 21
  - Coping and Headache ............................................................... 22
  - Types of Coping and Headache Diagnosis ................................. 23
  - Number of Coping Strategies ...................................................... 26

- Synthesis of the Literature and Future Directions ............................ 28
Self-Report Questionnaires ................................................................................................... 45
Daily Diary Data ................................................................................................................... 49
Hypothesis Tests ................................................................................................................... 50
Acceptance and Catastrophizing .......................................................................................... 50
Acceptance and Control ....................................................................................................... 56
Acceptance and Pain Interference ......................................................................................... 59
Acceptance and Avoidance of Daily Activities ..................................................................... 62
Stability of Acceptance ......................................................................................................... 64
Acceptance and Pain Intensity .............................................................................................. 65
Acceptance and Levels of Coping .......................................................................................... 66

CHAPTER IV: DISCUSSION ......................................................................................................69
Acceptance and Appraisal .......................................................................................................69
Acceptance and Coping ............................................................................................................73
Acceptance and Functioning Outcomes ....................................................................................74
Temporal Stability of Acceptance ............................................................................................76

REFERENCES ..........................................................................................................................83

APPENDIX A: INTERNATIONAL HEADACHE SOCIETY DIAGNOSTIC CRITERIA FOR MIGRAINE WITHOUT AURA ................................................................. 98

APPENDIX B: INTERNATIONAL HEADACHE SOCIETY DIAGNOSTIC CRITERIA FOR MIGRAINE WITH AURA ................................................................. 100

APPENDIX C: ABBREVIATED IHS DIAGNOSTIC INTERVIEW FOR HEADACHE ................................................................. 102

APPENDIX D: HEADACHE DIAGNOSTIC SYSTEM SAMPLE PRINTOUT ................................................................. 109

APPENDIX E: BACKGROUND INFORMATION QUESTIONNAIRE ................................................................. 111

APPENDIX F: WEST HAVEN-YALE MULTIDIMENSIONAL PAIN INVENTORY ................................................................. 113
APPENDIX G: CHRONIC PAIN ACCEPTANCE QUESTIONNAIRE .........................120
APPENDIX H: ACCEPTANCE AND ACTION QUESTIONNAIRE .......................122
APPENDIX I: COPING STRATEGIES QUESTIONNAIRE ..................................126
APPENDIX J: CHRONIC PAIN COPING INVENTORY ......................................129
APPENDIX K: PAIN CATASTROPHIZING SCALE ..........................................132
APPENDIX L: DAILY DIARY .........................................................................134
APPENDIX M: INFORMED CONSENT: .........................................................136
TABLES

Table 1. Demographic Characteristics of the Sample
Table 2. Headache Characteristics of the Sample
Table 3. Means and Standard Deviations of Background Questionnaires at Time1 and Time2
Table 4. Pearson Correlations of Pain-Related Acceptance and Study Measures
Table 5. Daily Diary Descriptives
Table 6. Summary of Hierarchical Regression Analysis for Pain Willingness Predicting Catastrophizing
Table 7. Summary of Hierarchical Regression Analysis for Activity Engagement Predicting Catastrophizing
Table 8. Daily Catastrophizing as a Function of Daily Pain Level and Daily Pain-Related Acceptance
Table 9. Summary of Hierarchical Regression Analysis for Pain Willingness Predicting Control
Table 10. Summary of Hierarchical Regression Analysis for Activity Engagement Predicting Control
Table 11. Daily Levels of Control as a Function of Daily Pain Level and Daily Pain-Related Acceptance
Table 12. Summary of Hierarchical Regression Analysis for Pain Willingness Predicting Pain Interference
Table 13. Summary of Hierarchical Regression Analysis for Activity Engagement Predicting Pain Interference
Table 14. Daily Levels of Interference as a Function of Daily Pain Level and
Daily Pain-Related Acceptance. ................................................................................................... 61

Table 15. Summary of Hierarchical Regression Analysis for Variables Predicting General Level of Activity ..................................................................................................................................... 63

Table 16. Summary of Hierarchical Regression Analysis for Variables Predicting General Level of Activity ..................................................................................................................................... 63

Table 17. Summary of Hierarchical Regression Analysis for Acceptance Predicting Level of Coping........................................................................................................................................... 67

Table 18. Pain-Related Acceptance and Number of Coping Strategies ............................................. 68
FIGURES

Figure 1. Activity engagement and pain willingness at time 1 and time 2............................... 64
Figure 2. Overall acceptance at time 1 and time 2........................................................................ 65
CHAPTER I. INTRODUCTION

Epidemiology of Migraine Headaches

Migraine headache is a commonly experienced phenomenon that is associated with high levels of subjective pain, as well as economic costs related to health care utilization, absence from work (Lipton, Bigal, Scher, & Stewart, 2003; Lipton, Diamond, Reed, Diamond, & Stewart, 2001) and overall work productivity (Ferrari, 1998a). Recent studies estimate the lifetime prevalence of migraine ranges from 11-29%, with 11% of the population categorized as active migraine headache sufferers at any given time (Arulmozhi, Veeranjaneyulu, & Bodhankar, 2005; Rasmussen, Jensen, Schroll, & Olesen, 1991; Russell, Rasmussen, Thorvaldsen, & Olesen, 1995; Stewart, Lipton, Celentano, & Reed, 1992). The World Health Organization found in a recent survey that severe migraine was rated as one of the most disabling chronic disorders (Leonardi, Steiner, Scher, & Lipton, 2005; Menkin, Munsat, & Toole, 2000), on par with quadriplegia, psychosis, and dementia. Recent findings suggest that 92% of women and 89% of men who get migraine headaches have some degree of disability associated with their headaches (Lipton, Diamond et al., 2001).

Gender differences in prevalence have been reliably observed in epidemiological research. Prevalence estimates range from 5-25% for women and 2-10% for men (Lipton, Stewart, Diamond, Diamond, & Reed, 2001; Perry Carson et al., 2004; Stewart, Linet, Celentano, Van Natta, & Ziegler, 1991).

Migraines tend to be familial; with migraine up to 50% more likely to occur in people who have a positive family history for migraine headaches (Stewart, Staffa, Lipton, & Ottmann, 1997). Race differences have been inconsistently observed, as have socioeconomic status differences. Early findings suggested that there were no racial differences and that higher
socioeconomic groups had increased prevalence (Stewart et al., 1992). These findings, however, were often based on clinical samples, which are often composed of more severe cases and people with insurance coverage. More recent population-based studies have reported higher prevalence among whites and lower socioeconomic groups (Lipton, Stewart, Diamond et al., 2001; Perry Carson et al., 2004; Stewart, Lipton, & Liberman, 1996). While North American and European rates of migraine headache have been similar (Lipton, Stewart, & Von Korff, 1995), other population studies have found much lower rate of migraine in some countries, including a monk population in Greece, and a population study in Ethiopia (c.f. Martin, 1998).

**Classification of Headaches**

In 1988, the Headache Classification Committee of the International Headache Society (IHS) updated the criteria for diagnosis of headache, with migraine headache criteria staying consistent in the 2004 update (Headache Classification Committee of the International Headache society, 1988; 2004). Until 1988, most researchers and practitioners used the Ad Hoc Committee on the Classification of Headache's (1962) standardized diagnostic criteria, which was based on the postulated phenomenology and etiology of headaches (Blanchard & Andrasik, 1985). The IHS classification criteria are more detailed than earlier nosologies and the system was developed, in part, to promote more standardized operational definitions of the many different types of headaches (Kunkel, 1993). Although there are many types of headaches included in the IHS classification system, only those for migraine headache (with and without aura) were examined in detail for the present review.

**Migraine Headache**

Historically, migraine headache was divided into two categories: common migraine and classic migraine (Saper, Silberstein, Gordon, & Hamel, 1993). In accordance with the current
IHS classification criteria, classic migraine is now called *migraine with aura* and common migraine is *migraine without aura*. In order to be diagnosed with migraine without aura (Appendix A), the following criteria must be met. The individual must experience at least five attacks lasting 4-72 hours, and possess at least two of the following characteristics: (1) unilateral location, (2) pulsating quality, (3) moderate or severe intensity, and (4) aggravation by routine physical activities. During the headache the individual must also experience at least one of the following: nausea and/or vomiting, photophobia, or phonophobia.

To meet the criteria for diagnosis of migraine with aura an individual must have at least two headaches that meet the criteria necessary for diagnosis of migraine without aura as well as several additional criteria (Appendix B). The individual's headache must possess at least three of the following characteristics: (1) reversible aura symptoms that suggest cerebral cortical and/or brainstem dysfunction (e.g., vertigo, tinnitus), (2) at least one aura symptom that slowly develops over more than four minutes or two or more symptoms that occur in succession, (3) no single aura symptom lasting more than 60 minutes, and (4) a headache following aura symptoms with a symptom free interval of less than 60 minutes (Saper et al., 1993).

Both types of migraine headache have four phases, which can occur independently of each other or in combination with any other phase. The four phases are prodrome, aura, headache, and postdrome (Saper et al., 1993).

**Prodrome**

The symptoms associated with the prodrome phase typically occur hours to days before the onset of the headache phase. Symptoms can be nonspecific neurological, autonomic, or mental (Saper et al., 1993). Neurological symptoms that may occur include increased sensitivity to light, sound, or smells. Autonomic symptoms that may occur include peripheral
vasoconstriction, increased frequency of urination, constipation, or diarrhea (Saper et al.). Mental symptoms that may occur include mood changes, depression, anger, or euphoria (Saper et al.).

Aura

The aura phase usually occurs approximately 15-20 minutes prior to the onset of the headache phase, although it may occur simultaneously (Saper et al., 1993). Additionally, the aura phase may occur without a subsequent headache (Saper et al.). Aura symptoms are usually visual, and can include scotomata (i.e., formed/unformed figures), light sensitivity, flashes of light, or fortification scotomata such as zigzag or scintillating figures (Saper et al.).

Headache

The headache phase usually lasts at least four hours and may last up to several days (Saper et al., 1993). There is no specific head location at which pain usually exists; in approximately 60% of headaches the pain is unilateral and in 40% it is bilateral (Saper et al.). Although most individuals with migraine experience pain during the headache phase, some do not. Symptoms that are often experienced in the headache phase fall into several categories such as gastrointestinal problems, visual disturbances, autonomic disturbances, motor abnormalities, and sensory abnormalities (Saper et al.).

Postdrome

The postdrome phase is characterized by several features such as fatigue, problems with concentration, and irritability (Saper et al., 1993). Individuals often experience muscle weakness, aches, or food cravings (Saper et al.).

Diagnostic Reliability and Validity

The criteria for the IHS headache categories were developed by clinical group consensus (Messinger, Spierings, & Vincent, 1991). Criteria were assumed to be valid if they corresponded
with clinical experience (Bruehl, Lofland, Semenchuk, Rokicki, & Penzien, 1999). Although researchers suggested that the IHS diagnostic criteria for headache were an improvement over previous diagnostic systems, few researchers have examined the reliability and validity of the diagnostic system.

Bruehl et al. (1999) evaluated the convergent and discriminant validity of IHS criteria by examining the degree to which headache symptoms clustered into specific diagnostic categories. The researchers administered the Structured Diagnostic Interview for Headache (Andrew, Penzien, Knowlton, & McAnulty, 1992) to 443 individuals recruited from the community who suffered either from migraine or tension-type headache. The researchers then conducted a cluster analysis to identify headache characteristics that tended to group together, resulting in two distinct clusters: migraine-like symptoms (i.e., pulsating/unilateral pain, aggravation from physical activity, photophobia, and phonophobia) and tension-like symptoms (i.e., pressing, bilateral pain, mild/moderate intensity, absence of nausea or vomiting). Replication of the analyses with a second sample yielded the same two clusters. The diagnosis/cluster sensitivity and specificity for sample 1 were .83 and .98, and for sample 2 were .77 and .84, thus supporting the validity of the IHS migraine and tension headache diagnoses (Andrew et al., 1992).

Iverson, Langemark, Andersson, Hansen, and Olesen (1990) conducted neurological exams and structured interviews on 81 headache patients in which they first diagnosed people according to the Ad Hoc criteria (1962) and then diagnosed them according to the IHS (1998) criteria. Using cross-tabulation of the criteria in both classification systems: migraine only, tension only, migraine mixed (i.e., migraine headaches in a person who primarily gets tension headaches), and tension-mixed (i.e., tension headaches in a person who primarily gets migraine headaches), they found that all of the headache sufferers were classified as having the same
diagnosis as they had under the previous nosology, and nine received an additional diagnosis using the IHS criteria.

Koehler, Dulz, and Buck-Emden (1991) used configural frequency analysis to evaluate whether specific symptom patterns conformed with IHS criteria in a sample of 726 headache patients. The researchers found that observed symptom combinations were consistent with the diagnoses for migraine with and without aura, and tension headache.

Leone, Filippini, D'Amico, Farinotti, and Bussone (1994) examined the inter-rater reliability of the IHS criteria for cluster, migraine, and tension-type headaches based on the clinical records of 100 consecutive headache patients. The kappa for the first digit of the classification (e.g., the broad diagnostic categories) was .88 for migraine headache. The kappa for the second digit of the classification (e.g., migraine with aura) was .90 for migraine with aura and .78 for migraine without aura. Granella et al. (1994) also observed comparable inter-rater reliability for primary headaches with an overall kappa for the one-digit level of .74 and for the two-digit level of .65. The results of these studies reflect satisfactory inter-rater reliability.

Taken together, the aforementioned studies provided some support for the reliability and validity of the IHS diagnostic criteria, particularly for episodic and chronic tension-type headache, migraine with aura, and migraine without aura. According to the Bruehl et al. study (1999) the criteria are adequately sensitive and specific. The main impediment to validation studies is that there are no “gold standards” against which one may compare IHS diagnoses (Martin, 1993). That is, there are no unambiguous markers of headache type that can be used as a criterion in validation studies.
Etiology of Headache

Researchers in medical and psychological fields tend to agree that the etiology, maintenance, and overall life impact of migraine headaches are influenced, at least in part, by psychological factors. Although a number of etiological models for migraine headache emphasize biological factors (Ferrari, 1998b; Wolff, 1972); they also acknowledge the potential relevance of other factors, particularly with regard to the maintenance of migraine headaches.

There are several theories regarding the etiology of migraine headache in particular. One theory that has been widely examined in the literature is the vascular theory. The vascular theory suggests that migraine headache sufferers experience a period of extracranial vasoconstriction prior to headaches that is followed by a period of vasodilation that occurs during the headache state (Wolff, 1972). Results of studies that have tested this theory have been mixed, likely in part due to substantial differences in methodologies employed. Alternative theories have emerged that may better account for changes that occur during migraine headaches. The neurological theory posits that abnormal neuronal firing and neurotransmitter release in brain neurons lead to migraine activity (Arulmozhi et al., 2005). Neurogenic theory combines aspects of the vascular and neurological theories, proposing that the vascular changes that occur during migraine headache are at the end of a chain of events involving the inflammation of sensory fibers in the brain that then release inflammatory neuropeptides. The neuropeptides, in turn, act on the meninges and dura, yielding inflammation and dilation, which then leads to vascular changes and further inflammation (Arulmozhi et al., 2005).

There are several factors that may predispose some people to get migraine headaches, such as gender, temperament/personality or family history (Martin, Milech, & Nathan, 1993). According to a number of epidemiological studies, females report experiencing migraine
headaches approximately 2.5 times more frequently than males (Rasmussen, Jensen, Schroll, & Olesen, 1992). A family history of migraines may also be associated with an increased likelihood for developing migraine headaches (Ziegler, 1978). For example, Laurence (1987) estimated that when both biological parents have migraine headaches, offspring have a 70% chance of developing migraine headaches. When one biological parent has migraine headaches, offspring have a 45% chance of developing migraine headaches. Both genetic and environmental differences appear to both contribute to this familial pattern (Gervil, Ulrich, Kaprio, Olesen, & Russell, 1999; Ulrich, Gervil, Kyvik, Olesen, & Russell, 1999), with genetic influences likely playing the more influential role (Svensson, Larsson, Waldenlind, & Pedersen, 2003).

Lifestyle factors may also moderate one's vulnerability to headaches, such as fatigue, too much or too little sleep, stress, and coping with stressors (Martin et al., 1993). Rasmussen (1993) studied the effects of sleep on the experience of headaches in migraine headache sufferers and found that for men, feeling fatigued after a full night of sleep was related to migraine headaches. With regard to stress, some researchers have reported that migraine headache sufferers appraise and cope with stress differently than non-headache individuals (Ehde & Holm, 1992). For example, Hassinger, Semenchuk, and O'Brien (1999) found that migraine headache sufferers engaged in more self-criticism and wishful thinking in response to a mental arithmetic stressor compared to non-headache individuals. This appraisal and coping literature will be addressed more thoroughly in a later section.

Researchers have reported relationships between certain types of events and the initial onset of chronic headaches. Potential triggering events may include physical or sexual abuse (Domino & Haber, 1987), personal loss (Kaiser & Primavera, 1993), onset of low back pain (Duckro, Schultz, & Chibnall, 1994), and menarche in women (Deubner, 1977). Because little
research has been conducted in this area, the mechanisms by which these events may trigger the onset of chronic headaches are unclear.

Other influences on migraine headache may include alcohol consumption (Peatfield, 1995), certain foods (e.g., cheese), loud noises, menstruation or other hormonal changes, changes in weather, and hunger (Lance & Goudsby, 1998; Newman, Lipton, & Solomon, 1993). For example, Rasmussen (1993) examined the relationship between the experience of migraine headaches among migraine headache sufferers and several risk factors including menstruation and pregnancy, physical activity, smoking, and coffee. He found that menstruation and pregnancy were related to migraine headaches in women. Conversely, physical activity, smoking, and coffee were not related to migraine headaches in men or women (Rasmussen, 1993).

Because stress (both dispositional and situational) is commonly believed to play a role in both the initial onset and maintenance of migraine headaches, researchers are beginning to look at psychological variables that may modify the stress experience such that migraine headache activity may be reduced (Penzien, Rains, & Holroyd, 1993). Until recently, relatively little attention has been paid to how appraisal and coping may relate to migraine headache experience. An enhanced understanding of appraisal and stress among migraine headache sufferers may lead to more relevant nonpharmacological treatments, thus improving quality of life.

The Role of Stress in Headache

Many researchers are looking closely at psychological variables that may modify the stress experience such that migraine headache activity may decrease (Penzien et al., 1993). Henryk-Gutt and Rees (1973) observed that approximately one-half of migraine headache sufferers experienced their first migraine attack during an emotionally stressful time. De
Benedittis and colleagues (1990) found that chronic primary headache sufferers (comprised of migraine, tension-type, and mixed headache sufferers) retrospectively recalled having experienced a higher number of stressors in the year prior to the onset of their chronic headache conditions.

Researchers have also explored the relationship between stress and the maintenance of headache disorders. In one retrospective study, migraine headache sufferers were asked to identify factors that consistently trigger migraine headache activity (Robbins, 1994). Of the participants assessed, 62% indicated that they get migraine headaches during stress, and 24% reported getting migraine headaches soon after a stressful period had passed. Prospective studies have also provided support for the relationship between stress and headache activity. In one prospective study exploring the relation between stress and headache, participants were asked to complete a brief headache diary for six months (Kohler & Haimerl, 1990). Results indicated that participants had significantly more headache activity on days that were reported to be high stress.

A stressful event may directly trigger a migraine headache. Gannon, Haynes, Cuevas, and Chavez (1987) examined this possibility and observed that eleven of sixteen migraine and muscle-contraction headache subjects (approximately 68%) developed a headache in response to a mental arithmetic stressor, while only two of the eight control subjects developed a headache (25%). Using comparable methodology, Haynes, Gannon, Bank, Shelton, and Goodwin (1990) induced headaches in 83% of headache sufferers (i.e. tension, mixed, migraine). Similarly, Martin and Seneviratne (1997) found that migraine and tension headache sufferers developed headaches in response to food deprivation (58% of headache sufferers) and difficult anagrams (93% of headache sufferers). Though not formally assessed, several recent laboratory studies assessing stress among migraine headache sufferers have yielded participant reports of getting a
headache from the exposure to common laboratory stressors (i.e., cold pressor, mental arithmetic) (Chiros, 2002; Hassinger, 2000).

Thus, it appears that stress and headache are related, but the direction of causality is unclear, as the majority of studies have been retrospective and/or correlative in nature. Additionally, the experience of a headache can in and of itself be a stressor, which further complicates the relationship (Fanciullacci, Alessandri, & Fanciullacci, 1998). One prospective study exploring the temporal relationship between migraine headache activity and stress found that over 55% of the participants had correlations between these two variables, but that individual differences emerged when the order of events was examined (Holm, Lokken, & Myers, 1997). In other words, individuals varied in experiencing headache activity before stress, during stress, and after stress. This finding highlights the potential reciprocal influence of stress and headache.

New Directions in Stress-Reactivity Research

Because of the frequency with which stressors, both major and minor (e.g., de Benedittis et al., 1990; Ehde & Holm, 1992; Fernandez & Sheffield, 1995; Holm, Holroyd, Hursey, & Penzien, 1986) minor daily hassles can occur, and because daily hassles are correlated with headache activity, it becomes highly relevant to consider how migraine headache sufferers respond to and cope with these hassles. The finding that perceptions of a situation vary among people, and that this variation may relate to variations in headache experience has led to an upsurge in research using Lazarus and Folkman's (1984) model of appraisal. The consideration of appraisal allows one to acknowledge and potentially explain the idiosyncratic nature of stress. That is, depending on how an event is perceived or appraised, the person may or may not experience the event as stressful (Materazzo, Cathcart, & Pritchard, 2000).
Appraisal

Lazarus and Folkman (1984) describe coping as a voluntary process that occurs in an individual in response to an event that subsequently prompts efforts to manage the impact of a perceived stressor. The manner in which an individual appraises an event determines in large part whether coping efforts will be made. This cognitive process involves two types of appraisal: primary and secondary. During the primary appraisal process, an individual (1) evaluates the significance of an event, and (2) rates the significance of the event based on the implications of that event for his or her well-being. During the secondary appraisal process, the individual evaluates his or her available resources to manage the event (Lazarus & Folkman). Together, primary and secondary appraisals allow an individual to determine the overall stressfulness of a situation (Lazarus & Folkman, 1984). Within the functional model, appraisals may fit within both setting and immediate factors, as well as psychophysiological mechanisms.

In recent years there have been a number of researchers who have explored the impact appraisals have on pain experience and overall functioning in a variety of chronic pain populations. Appraisals about pain are thought to play an important role in adjustment to chronic pain (Geisser, Robinson, & Riley, 1999; Jensen, Turner, Romano, & Karoly, 1991). There are several categories of appraisals that are frequently explored with regard to pain experience. Although many types of appraisals have been explored in pain populations, two types of appraisals emerge as particularly relevant in pain populations: catastrophizing and control.

Acceptance as a Form of Appraisal

Acceptance of stressful experiences or headache pain may preclude the need to engage in coping efforts to manage both environmental stressors and headache pain. The concept of acceptance has recently been receiving considerable attention by chronic pain researchers with
fairly consistent findings suggesting this is an area worthy of further investigation. One of the attractive aspects of acceptance as an approach to treating individuals with chronic pain is that the focus of treatment is on improving functioning rather than reducing pain (MacKichan, McCracken, & Eccleston, 2005).

Acceptance has been conceptualized as the willingness to experience thoughts, feelings, and physical sensations without engaging in efforts to avoid them or allowing them to determine one's behavior (Bond & Bunce, 2003). Within the current conceptual framework, acceptance may be similar to the primary appraisal process, such that if an individual encounters a stimulus and during primary appraisal determines that he or she can accept the situation, thoughts, or feelings that are present, coping efforts then need not be identified and utilized. In terms of chronic pain, McCracken (1998) conceptualized acceptance as a willingness to experience continuing pain without needing to reduce, avoid, or otherwise change it.

In his doctoral dissertation, Geisser (c.f. McCracken, 1998) compared two behavioral treatments for chronic pain: acceptance-based interventions and standard cognitive behavioral interventions. Both treatments were found to be effective and equivalent, with both groups endorsing significant increases in acceptance of pain, and a correlation between acceptance of pain and less interference of pain with daily activity and greater levels of activity.

Individuals who have identified that they are able to live a satisfying life despite pain (thereby implying some acceptance of the presence of pain), report greater confidence in coping ability, less depression, and less pain behavior than those who do not believe they can live a satisfying life despite pain (Jacob, Kerns, Rosenberg, & Haythornthwaite, 1993).

McCracken and Eccleston (2003) studied 200 chronic pain patients and found that acceptance of chronic pain predicted pain, depression, pain-related anxiety, disability, and
patient physical and vocational functioning more than commonly utilized measures of coping, such that higher acceptance was related to more adaptive outcomes. These findings are consistent with earlier findings in which acceptance of chronic pain was associated with lower reported levels of subjective pain, less physical and psychological disability, and lower levels of psychological distress (McCracken, 1998, 1999; Summers, Rapoff, Varghese, & Porter, 1991).

Chronic pain sufferers with higher levels of acceptance of pain have also been found to be more likely to adaptively respond to pain after controlling for the potential influence of depression, intensity of pain, and pain-related anxiety (McCracken, 1998; McCracken, Spertus, Janeck, Sinclair, & Wetzel, 1999). McCracken and colleagues (McCracken, Vowles, & Eccleston, 2004) identified that chronic pain sufferers who did not feel a need to control or avoid painful experiences were more likely to report experiencing less pain, less use of healthcare and medications, and less emotional distress. Researchers have found the relation between acceptance of chronic pain and adaptive outcomes was not explainable by pain intensity (i.e., acceptance scores did not correlate with intensity of the chronic pain condition) (McCracken et al., 1998). McCracken and colleagues (2005) found that less frequent attempts to control pain, fewer palliative and avoidant coping responses, and more explicit continuation of activity despite acknowledged pain were associated with lower levels of anxiety and depression as well as greater life functioning.

Although some researchers have considered acceptance as the willingness to give up attempts to control internal experiences (Hayes & Wilson, 1994), at least one study has shown a positive correlation between acceptance and perceptions of control (Viane et al., 2003). Additionally, adaptive copers have been observed to endorse greater acceptance of pain compared to dysfunctional patients (McCracken et al., 1999). These findings suggest that the
traditional notion of acceptance as giving up the need to control may somewhat inaccurate. Rather, it may be that acceptance is viewed by individuals with chronic pain as a means of controlling the negative sequelae that frequently accompany the pain experience.

_Catastrophizing and Pain._

Catastrophizing has been defined as “an individual’s tendency to focus on and exaggerate the threat value of painful stimuli” (Keefe et al., 2000, p. 326). This type of appraisal is thought to involve a lack of confidence as well as an expectation of negative outcomes (Materazzo et al., 2000). Catastrophizing has been considered both an appraisal and a coping strategy (Ellis & D'Eon, 2002). However, when Lazarus and Folkman’s (1984) definition of coping is considered; catastrophizing may be more accurately described as an appraisal (i.e., assessing one's ability to manage a stressor) rather than an actual coping strategy (i.e., using catastrophizing to modify the impact of a stressor). This conceptualization of catastrophizing has begun to receive empirical support. Sullivan and colleagues (1995) noted that the magnification and rumination that they observed among catastrophizers may be related to primary appraisal and involve a focus on and exaggeration of the threat value of stimuli (Geisser et al., 1999; Jensen et al., 1991; Jones, Rollman, White, Hill, & Brooke, 2003; Materazzo et al., 2000; Sullivan et al., 1995). Because catastrophizing among headache populations has been less thoroughly studied, this review will also initially summarize the broader chronic pain population literature to illustrate common themes.

The degree to which a person engages in catastrophizing in general has been found to relate to several dimensions of pain among chronic pain patients. For example, Lefebvre, Lester, and Keefe (1995) found a positive correlation between frequency of catastrophizing and one’s current level of pain and minimum level of pain among a sample of young adults, many of whom
were diagnosed with a chronic pain condition. A subset of the participants (i.e., those with low back pain and migraine headaches) engaged in more frequent catastrophizing compared to participants with only one pain condition or no pain condition. Keefe and colleagues (2000) found that osteoarthritis patients who endorsed high levels of catastrophizing on the Coping Strategies Questionnaire (CSQ) reported higher levels of pain and physical disability. Martin and Bradley (1997) have observed similar relationships between catastrophizing and pain-related disability among people with fibromyalgia and rheumatoid arthritis (Jones et al., 2003). The tendency for catastrophizing to relate to increased subjective pain experience may also extend to acute pain situations that chronic pain patients frequently endure. Catastrophizing was associated with higher acute pain experience during electrodiagnostic testing among patients who were referred for assistance in diagnosing various types of neuropathy (Buckelew et al., 1992). McCracken and colleagues (1998) conducted a laboratory study in which individuals with chronic low back pain displayed a positive correlation between catastrophizing and skin conductance level during an acute pain task, suggesting a higher level of stress reactivity among those who catastrophized more.

Overall, the studies of coping with chronic pain experiences suggest that people who engage in higher levels of catastrophizing often experience higher levels of physical discomfort. More support was evident for a relationship between catastrophizing and coping in chronic pain populations than acute pain/regular populations. It is possible that avoidance of catastrophizing is more important for positive outcomes than is engagement in specific coping strategies (Keefe et al., 1987).
Catastrophizing and Headache

Similar to studies in which catastrophizing was explored as it relates to other pain conditions, headache sufferers have also been found to differ on this variable in relevant ways. Using self-report methodologies, researchers have found that migraine headache sufferers endorsed higher levels of catastrophizing relative to headache-free controls (Sorbi & Tellegen, 1988). Using diary methodology, Materazzo and colleagues (2000) also found that migraine headache sufferers reported higher levels of catastrophizing in their daily lives relative to headache free individuals. Lefebvre and colleagues (1995) found that young adults with migraine headache and low back pain engaged in a higher level of catastrophizing than did those who only had migraine headaches or no pain condition. This group also endorsed higher levels of baseline pain relative to people with only migraine headache or low back pain (as well as those without a pain condition). Hassinger and colleagues (2000; 1999) found that migraine headache sufferers reported catastrophizing more in general than did headache free individuals.

Differences have been less consistently observed during acute pain tasks. Ukestad and Wittrock (1996) conducted a laboratory study in which tension headache sufferers catastrophized more during a cold pressor and blood pressure task than did headache free individuals. However, migraine headache sufferers and headache free individuals failed to endorse different levels of catastrophizing in response to a cold pressor task (Hassinger, 2000; Hassinger et al., 1999).

Taken together these studies suggest headache sufferers may engage in higher levels of catastrophizing than headache free individuals in the presence of naturalistic stressors. However, there is less consistent support for these differences in levels of catastrophizing in controlled laboratory conditions. Several possible explanations for this discrepancy exist. First, there is evidence to suggest that headache sufferers and headache free individuals appraise events
similarly when they are negative or positive, and that it is in situations of ambiguity that these differences in appraisal emerge (Holm et al., 1986). Another possibility is that the tasks were not adequately intense to bring about the initial appraisal process. In the aforementioned studies, the tasks designed to elicit stress were generally rated as less than 4 on a 10-point Subjective Units of Distress scale. Additionally, the tasks designed to elicit pain were not assessed for their stressfulness: it is possible that these tasks were also insufficient in their ability to elicit stress in most of the participants.

Control and Pain

Another type of appraisal that may play an important role in the adaptation of individuals to chronic pain is control, although it has been less widely studied. Control appraisals involve having the perception that one has the ability and resources to manage the experience of pain (Lazarus & Folkman, 1984). In chronic and acute pain studies, control has typically been measured with several items directly asking participants to rate how much control they have over their pain and their ability to decrease their pain.

People with low to moderate levels of chronic pain who believe they can control their pain have been found to engage in higher levels of overall activity (Jensen & Karoly, 1991). Similarly, Keefe and colleagues (1987) found that for people with osteoarthritis, perceived ability to control and reduce pain was correlated with lower levels of physical impairment.

High appraisals of control have also been associated with adaptive psychological functioning as well. Keefe and colleagues (1987) observed that increased perceived control during electrodiagnostic testing was associated with lower levels of pain-related psychological disability as well as higher levels of general psychological wellbeing. Buckelew and colleagues found that chronic pain patients undergoing electrodiagnostic testing who perceived themselves
as having higher control over their pain endorsed lower levels of anxiety (1992). A study of people with rheumatoid arthritis suggested that higher perceived control over their daily symptoms was associated with less mood disturbance (Affleck, Tennen, Pfeiffer, & Fifield, 1987). Haythornthwaite and colleagues found that women with a variety of chronic pain conditions who made coping self-statements tended to have higher perceived control over the level of pain regardless of pain severity (1998). In a study of patients in an ongoing multidisciplinary pain treatment program, higher perceived control was associated with improvement (i.e., less pain-disability) among chronic pain patients (Jensen, Turner, & Romano, 2001).

Although not as widely studied, the relation between control appraisals and acute pain has also been examined with similar results. Geisser and colleagues (1992) found that individuals who were pain tolerant rated themselves as higher on the ability to control pain than did pain sensitive individuals. Taken together, these studies suggest that people with chronic pain benefit from appraising their pain as controllable and from engaging in coping strategies associated with perceptions of control. Individuals who engage in higher levels of control appraisals tend to experience lower levels of pain related disability and lower levels of negative emotionality. Of course, more prospective research would be important to clarify the direction and degree of causality (e.g., whether pain related disability precedes level of perceived control or vice versa).

Control and Headache

Similar to the pattern observed among chronic pain patients, aspects of the headache pain experience have been noted to covary with perceived levels of control. In a diary study, researchers found that migraine headache sufferers perceived themselves as having lower ability to control and decrease their pain relative to headache free individuals (Materazzo et al., 2000).
More generally, one study observed that migraine headache sufferers rated themselves lower on self-efficacy, which can be conceptualized as a form of control, relative to headache-free controls (Sorbi & Tellegen, 1988).

Some research suggests that interventions aiming to modify physiological variables thought to be related to migraine headache experience (i.e., arterial vasodilatation) can in turn impact headache sufferers’ estimations of control of headache pain. Ilacqua (1994) taught guided imagery and biofeedback to migraine headache sufferers, who reported feeling that the guided imagery was helpful (by providing control over migraine attacks) despite objective evidence that migraine activity was not affected either way by the treatments. It is interesting to note that what may have, in fact, changed, is the appraisal of the participants’ ability to control their pain, rather than the act of engaging in the particular self-regulation strategy (in this case guided imagery or biofeedback). In another study, tension headache sufferers who rated themselves as having high ability to control pain reported lower levels of headache pain intensity (Spinhoven, Jochems, Linssen, & Bogaards, 1991).

Thus, the scientific literature on appraisal and pain conditions provide some initial support that certain types of appraisal are related to important psychological aspects of the headache pain experience. Among headache sufferers, the tendency to catastrophize appears to be related to lower tolerance for pain, experiencing acute stressors as more stressful, and, in some cases, experiencing higher levels of pain. In terms of control, headache sufferers who perceive themselves as more able to control the pain have at times reported less headache activity, however, results have been inconsistent.
Coping Efforts

Within Lazarus and Folkman's model, if people determine an event as threatening or potentially harmful (i.e., primary appraisal), and believe they have the resources to manage that threatening or potentially harmful event (i.e., secondary appraisal), efforts will be made to cope with the event. Coping has received considerable attention in the chronic pain literature. The way in which individuals manage stressors as well as headache pain has been identified as possibly affecting future headache occurrence (Materazzo et al., 2000) via a feedback loop. Specifically, how individuals cope with stress may modify perceived ability to manage future events, which in turn can lead to changes (positive or negative) in subsequent stress responses and headache activity.

The manner in which people cope with stress is thought to play an important role in the onset and maintenance of stress-related physical symptoms (Folkman, Lazarus, Gruen, & DeLongis, 1986). These stress-related symptoms, in turn, can negatively impact health and social functioning (Jensen et al., 1991; Lazarus & Folkman, 1984). Theories regarding the importance of these variables have led to widespread research focusing on the relationship between coping and health effects.

Coping can be broadly defined in two ways. Some researchers conceptualize coping as the successful adaptation of an individual to a stressful situation (c.f. Lazarus & Folkman, 1984). In this case, only positive outcomes as a result of one’s efforts are considered coping. Other researchers conceptualize coping as a process of attempting to manage a stressful event, regardless of its perceived or actual effectiveness (Lazarus & Folkman, 1984; McCracken & Eccleston, 2003). This second conceptualization appears to be more commonly used among researchers. It allows for a more complete picture of how coping attempts (both successful and
unsuccessful) relate to pain-related quality of life variables (e.g., pain, stress, involvement in meaningful activities). It also allows researchers to obtain information about whether coping strategies differ in effectiveness by pain condition or by the stressor with which the person is attempting to cope. Additionally, it is possible that certain types of coping are related to more negative outcomes and would thereby be appropriate therapeutic targets for reduction. Failure to measure unsuccessful coping attempts may thus impede the development of potentially effective interventions for individuals with chronic pain.

Coping and Headache

Researchers have begun to evaluate coping strategies among migraine headache sufferers. Stress has often been identified in retrospective studies as an important potential causal factor in the occurrence of migraine headaches. Some researchers observed in one study that 92% of migraine headache sufferers indicated that they experienced stress prior to their headaches at least some of the time (Penzien et al., 1993). There also have been several studies in which certain types of coping and headache diagnoses are significantly correlated (e.g., Blomkvist, Hannerz, Orth-Gomer, & Theorell, 1997; Ehde & Holm, 1992; Holm, Lamberty, McSherry, & Davis, 1997; Holm, Lokken et al., 1997; Lefebvre et al., 1995; Myers, 2000; Scharff, Turk, & Marcus, 1995). There are two predominant methodologies that have frequently been employed to explore the relationship between coping and migraine headache. First, researchers have examined the relationship between headache and coping, primarily using self-report methodologies. Second, laboratory studies have been conducted in which stressors are presented and coping is examined after cessation of the stressor. Laboratory studies have frequently included a physiological reactivity component. In both methodologies coping is
typically assessed as a trait, that is, something that people do in general to manage an event that is appraised as threatening.

Migraine headache sufferers may utilize different coping strategies compared to individuals who experience other types of headaches as well as compared to people who do not experience headaches. Researchers who have examined coping strategies among migraine headache sufferers have focused on two broad areas. First, some researchers have explored ways in which migraine headache sufferers cope with pain (headache pain and/or a laboratory-based pain task). Second, some researchers have taken a more broad approach and examined ways in which migraine headache sufferers cope with stress in both naturalistic and laboratory settings. In the following section, findings will be organized by general categories of coping styles (i.e., active/passive), number of strategies employed, coping with pain, and then coping with stress.

*Types of Coping and Headache Diagnosis*

Some researchers note that coping strategies employed by migraine headache sufferers may be more accurately measured in relation to actual headache pain. Lazarus and Folkman (1984) noted that individuals’ preferred coping strategies, when evaluated as a process rather than a trait, may change as the person-environment relationship changes. Within this framework, it is plausible that migraine headache sufferers utilize different types of coping strategies on the basis of headache state, thus meriting inclusion in this review.

As mentioned previously, active coping has been found to be associated with the pathophysiological processes of cardiovascular diseases (Van den Bree, Passchier, & Emmen, 1990). Conversely, passive coping has been found to be related to immunological diseases (Henry, 1982). This may be a factor influencing many laboratory studies to differentiate between active and passive coping tasks when exploring the relationship between coping and
Physiological reactivity among headache sufferers. Research in which active and passive coping strategies are assessed among migraine headache sufferers and headache-free controls have typically failed to yield group differences in terms of active coping strategies, therefore much of the following review describes passive coping strategies.

Coping strategies of passiveness, avoidance, and emotion focusing have been inconsistently associated with headache activity and distress. Researchers have examined if coping strategies differ according to headache diagnoses. In a study comparing chronic tension-type headache sufferers, migraine headache sufferers, and headache-free controls on the relationship of coping with headache activity and distress, researchers observed several differences in use of coping strategies (Sorbi & Tellegen, 1988). Specifically, migraine headache sufferers engaged in more praying and hoping (i.e., passive coping strategies) relative to headache-free controls and tension-headache sufferers. However, these differences in coping appeared uncorrelated with headache activity and adjustment to headaches.

Kolotylo and Broome (2000) found that migraine headache sufferers were more likely to use avoidance of physical and cognitive activity when experiencing headache pain. Alternatively, people with non-migraine headaches were much more likely to cope with the pain by continuing with previous activities (Kolotylo & Broome). The avoidance of activity was also found in a study comparing migraine, mixed headache, and tension headache sufferers. The authors found that migraine headache sufferers avoided activity more than the other two diagnostic groups. When headache frequency, intensity, and duration were factored in, migraine headache sufferers continued to display higher levels of avoidance relative to tension headache sufferers (Appelbaum, Radnitz, Blanchard, & Prins, 1988). Other researchers have also observed the migraine headache sufferers engaged in higher levels of problem avoidance, wishful
thinking, and social withdrawal (all passive coping strategies) relative to headache-free controls (Ehde & Holm, 1992). The evidence thus far provides initial support that coping strategies differ according to headache diagnosis.

Scharff, Turk, and Marcus (1995) found that people with tension-type headache were less likely to avoid or reduce light levels, reduce social contacts, or sleep, and were more likely to “go on despite pain” relative to people with migraine headache. However, further analyses suggested that pain intensity was more influential in determining differential coping responses than were the actual International Headache Society diagnostic categories (as diagnostic group differences on coping strategies became nonsignificant after controlling for headache pain intensity). These authors did not use a pre-existing coping strategy inventory, but rather a list of behaviors that appear to have been generated by the study’s authors. Therefore, reliability and validity of these items as a measure of coping with headache pain are unknown.

Other studies have been conducted suggesting that coping may be related to the aspects of headache experience. For example, migraine headache sufferers who used imaginal coping strategies in one study reported decreased headache activity relative to those who did not use such strategies (Brown, 1984). However, other researchers have not observed this diminishing of headache activity subsequent to similar interventions (i.e., biofeedback and guided imagery) (Ilacqua, 1994). One study observed that people with chronic tension type headache engaged in higher levels of denying/wishful thinking and consoling with religion than did people with episodic tension type headache. (Rollnik, Karst, Fink, & Dengler, 2001). This finding led the authors to hypothesize that ineffectual coping may play a role in worsening of headache intensity, and may have been a significant factor in the progression from episodic to chronic tension type headache. However, these conclusions are quite tentative as this research is
correlational rather than causal. More generally, researchers have also found that headache intensity was positively correlated with passive coping, as well as palliative and depressive coping (Van den Bree et al., 1990). Although few in number, these findings provide some initial and tentative support for the potential relation between coping and intensity of headache pain.

**Number of Coping Strategies**

Kolotylo and Broome (2000) explored the relationships between migraine pain, disability, depressive symptomatology and coping. Using self-report methodology, the authors found that migraine headache sufferers used a higher number of different coping strategies and more frequently used coping strategies as compared to people who get other types of headaches. Siniatchkin and colleagues (1999) also found that migraine headache sufferers reported using a greater number of coping strategies relative to tension headache sufferers. Although little research has been conducted in this area; preliminary evidence suggests that migraine headache sufferers may utilize a wider variety of coping strategies relative to those who get non-migraine headaches, as well as headache-free individuals. No research exploring if using more strategies was related to outcomes on experience of headache or impact of headache on psychosocial variables was located.

The research literature thus far provides some preliminary support for the relationship between coping with headache pain and physical/psychological functioning. Coping differences appear to exist among individuals with different headache diagnoses. Additionally, there is some suggestion in the literature that headache intensity may influence the number of coping strategies utilized during pain more than headache diagnosis per se. Because few studies have been conducted in this area, more research is needed to determine if there are specific pain coping strategies that are more effective for headache sufferers during headache pain states.
Many of the coping strategies used to manage chronic pain in general and headaches in particular involve the person effortfully trying to change private internal experiences. For example, in cognitive behaviorally based strategies one might try to reinterpret pain sensations, modify dysfunctional thoughts about the impact pain will have on one's ability to fulfill daily responsibilities, or learn relaxation techniques with the goal of reducing pain levels in order to improve daily functioning. Though this approach has a good evidence base, sometimes cognitive behaviorally based treatments fail to lead to improvement.

Acceptance, as discussed earlier, has at its core the idea that sometimes internal events (e.g., emotions, thoughts) are not readily modified by traditional strategies. One of the central tenets of this approach acknowledges that although external situations can often be avoided or controlled, internal events often cannot (Hayes, Strosahl, & Wilson, 1999). Not surprisingly, people with chronic pain conditions in general as well as headaches often become avoidant of potential triggers or factors that they believe may exacerbate their pain. Additionally, because they frequently experience aversive internal events related to their pain condition; they may try to control pain levels directly, or thoughts about their pain (McCracken, Vowles, & Eccleston, 2005). These traditional attempts are sometimes unsuccessful, and correlate with increased distress and disability (McCracken, Eccleston et al., 2005). This can lead to a vicious cycle with increasing levels of avoidance and subsequently increasing levels of suffering (Hayes, Strosahl et al., 1999).

Acceptance as a component of treatment of other chronic pain conditions has been met with some empirical success. Correlational studies have shown acceptance to be correlated with higher quality of daily emotional, social, and physical functioning (McCracken, 1998; McCracken & Eccleston, 2003; McCracken et al., 1999). Treatment strategies that have included
an acceptance component yielded improvements in multiple areas of functioning as well, including less depression, less physical disability, less psychosocial disability (e.g., communication, alertness, social interaction), less rest time, and improvement in physical movement. Additionally, reductions were observed in work attendance, use of pain medication, and doctor's visits. (McCracken, Vowles et al., 2005).

Synthesis of the Literature and Future Directions

In summary, several types of variables have been identified as playing an important role in the physical and psychosocial experience of migraine headache. Research suggests that appraisals of events may relate more closely to headache experience than the actual number or objective intensity of those events. Catastrophizing and control appraisals appear to be most consistently related to the experience of pain and stress. Specifically, research suggests that catastrophizing tends to be associated with an increase in subjective stress, a decreased tolerance for pain, and an increase in pain. Individuals who engage in high control appraisals (e.g., perceiving a stressor as controllable, or as having the resources to manage the stressor) tend to display an increase in participation in daily activity and reduced levels of depression and anxiety, as well as a decrease in physical impairment and psychological disability. Early evidence also suggests that appraisals can be modified via behavioral techniques, which in turn appeared in one study to reduce the psychological disability associated with migraine headaches (Ilacqua, 1994). More research needs to be conducted to determine if catastrophizing and control appraisals vary among headache sufferers (i.e., a within group difference).

In terms of coping, no strategies have consistently emerged as superior in both clinical and laboratory settings (Tan, 1982). Additionally, there exists considerable disagreement in how to best categorize specific coping strategies into the broad categories of coping discussed earlier
(Fernandez & Turk, 1989). Continued discussion among researchers to reach consensus on meaningful ways to conceptualize coping would facilitate future research efforts. Research to date suggests that migraine headache sufferers may engage in a higher level of avoidance and social withdrawal to cope with pain relative to people with other headache diagnoses. This avoidance may lead to a negative cycle of increasing debility and subsequent higher levels of avoidance (Hayes, Strosahl et al., 1999). Acceptance may be an additional strategy that may prove helpful in improving the functioning of migraine headache sufferers.

It is important to evaluate different types of pain conditions to further develop the understanding of stress and coping. Migraine headaches account for a high level of absenteeism in the workplace (Kryst & Scherl, 1994) and negatively impact quality of life due to the severity of pain and frequency of occurrence. To the degree that stress experience precedes migraine headache episodes in many people; an enhanced understanding and the addressing of appraisal and coping processes may ameliorate the deleterious effects of this disorder. In particular, initial studies of the potentially beneficial role of acceptance as a strategy for living with chronic pain conditions have been promising. Thus, studies exploring the nature of acceptance among migraine headache sufferers would facilitate the development of potentially helpful treatments for this often debilitating condition.

Statement of the Problem

Preliminary studies provide consistent support for the idea that acceptance relates to adaptive outcomes in chronic pain patients, and may covary with control appraisals. However, no research to date has been located examining the potential relation of acceptance, other types of appraisal (i.e., perceived control and catastrophizing), and subsequent coping process in migraine headache sufferers. Initial research in the chronic pain literature suggests these variables are
related. Future research in this area may eventually offer an alternative strategy for improving the quality of life of individuals with migraine headaches, and is thus worthy of consideration.

The purpose of the present study is twofold. First, this project aims to clarify the nature of the relationship between acceptance, other types of appraisal (i.e., control and catastrophizing), and coping among migraine headache sufferers, and to determine whether the relationships conform to the same pattern observed in other chronic pain populations. Thus, this portion of the proposed study will extend the current acceptance and chronic pain literature. Second, this project aims to determine the degree to which acceptance varies across time among individuals who experience migraine headache. This second aim is exploratory. At the time of this review, no have been conducted that examined intraindividual variation in the relationship between acceptance and pain experiences.

Hypotheses

Acceptance, Appraisal, and Coping

It is hypothesized that (1) migraine headache sufferers with high pain acceptance will engage in lower levels of catastrophizing than will those with low pain acceptance. Conceptually, catastrophizing can be considered the tendency to magnify or exaggerate the threat value of painful or stressful stimuli (Sullivan et al., 2001), and therefore is at odds with the conceptualization of acceptance as experiencing. (2) Migraine headache sufferers with high pain acceptance will engage in higher levels of control appraisals over pain compared to those with low pain acceptance. Although this hypothesis is somewhat exploratory in nature, there has been initial support for the positive relation between acceptance and control appraisals (Viane et al., 2003). (3) Individuals with high levels of acceptance will report lower levels of headache pain interference in their daily activities, regardless of headache pain intensity. This hypothesis is
consistent with Geisser's findings that increased levels of acceptance were associated with less reported interference of pain in daily activities (as cited in McCracken, 1998). This relationship has been observed in studies of people with other chronic pain conditions (Viane et al., 2003), but has not yet been examined exclusively among migraine headache sufferers. (4) Individuals with higher levels of acceptance will report less avoidance of daily activities. This relationship has been demonstrated in a sample of chronic pain patients (McCracken, Eccleston et al., 2005). (5) Acceptance of headache pain will be similar across time. Although the temporal consistency of acceptance measures has not yet been formally assessed, researchers assessing item-level temporal consistency of pain coping (in which five items addressed acceptance strategies) found no change in mean scores for any of the acceptance items (McCracken, Eccleston et al., 2005). (6) Acceptance of pain will be unrelated to intensity of pain. This absence of a relationship between pain intensity and acceptance has been observed in other chronic pain populations (Viane et al., 2003). This hypothesis is an extension of the literature in which control and catastrophizing have found to not be significantly related to pain intensity. (7) Individuals with higher levels of pain acceptance will report lower levels of engaging in coping strategies than those who endorse lower levels of pain acceptance. Again, to the degree that acceptance functions as a type of appraisal; we would anticipate less of a need to cope given the anticipated reduction in threat/harm appraisals.

Daily Diary

Because a daily diary approach has not yet been used exploring the concept of appraisal, the purpose of this portion of the proposed study is to begin to understand the stability and fluctuation of acceptance, catastrophizing, and control appraisals in a migraine headache sample. Thus, the analyses for the present study will be primarily descriptive. This initial descriptive
work in diary methodologies is often skipped, reducing the overall potential of a research area by not laying this important foundation (Collins, 2006). Thus, individual differences in variability of acceptance, headache pain, perceived stressfulness of headache, catastrophizing, and perceived control will be explored. Learning more about the degree to which these variables change across time will allow for more appropriately-designed studies examining the relations between these variables in future studies.
CHAPTER II. METHOD

Participants

Participants for the present study were recruited in the Minneapolis metropolitan area and nationally. Potential participants were recruited via local newspaper advertisements, local community bulletin boards, online community bulletin boards, and migraine support groups. Adults who responded to the advertisements who reported (a) five or more headaches per month at a minimum pain intensity of 5, (b) pain primarily on one side of the head, (c) pulsating or throbbing sensation during headache, and (d) presence of photophobia, phonophobia, and/or nausea; were contacted and invited to be screened for participation in the study. Upon verbal consent, a diagnostic interview was conducted over the phone. The diagnostic interview is a 15-20 minute interview and was conducted by a trained graduate student using a shortened version of the Structured Diagnostic Interview for Headaches (Andrew et al., 1992). Based on the responses to the structured diagnostic interview, 78 people who met IHS criteria for migraine headache with or without aura were enrolled in the study. Headache diagnoses were made according to the criteria of the International Headache Society (Headache Classification Committee of the International Headache Society, 1988; 2004).

Of those who enrolled in the study, 74 people completed all three phases of the study (initial questionnaires, 28 day daily diary, follow up questionnaires). In exchange for their voluntary participation, participants received $25.00 at the end of the study. College students who were in courses that allowed extra credit for participation in the study were allowed to choose either extra credit or the $25.00 payment.

Participants were primarily female (86.5%), white (83.8%), and had some education beyond the high school diploma or GED equivalent (83.7%). Age ranged from 18 to 66 (M =
Participants had been experiencing migraine headaches for an average of 15.48 years (SD = 13.99). A sizeable minority of the participants (39.2%) were receiving treatment at the time of entry into the study. In terms of headache activity, participants experienced an average of 15 headaches during the month of daily monitoring (SD = 6.58, range = 3-28).

Measures

Headache Diagnostic System

The Structured Diagnostic Interview for Headache (Penzien, 1991) was modified to include only the items necessary to obtain an IHS diagnosis and brief headache history (Appendix C). Diagnoses were made using a computer program developed by Andrew, Penzien, Bains, Knowlton, and McAnulty (1992). Preliminary validation studies of this method yielded approximately 94.9% agreement rates between IHS diagnostic interviews and the IHS computer software (Penzien et al., 1992). Data were entered into the computer program, which provides a summary of the participants' headache diagnoses and the criteria fulfilled in establishing the diagnoses. See Appendix D for a sample printout.

Self-Report Measures

Background Information

The screening questionnaire consists of 6 items with basic demographic questions (Appendix E). These questions were developed by the author to assist in categorizing the sample of participants. As mentioned previously, the incidence and prevalence of headaches can vary across many demographic variables.

West Haven Yale Multidimensional Pain Inventory (WHYMPI)

The WHYMPI (Kerns, Turk, & Rudy, 1985) is a 60-item self-report instrument that assesses chronic pain patients' pain severity, perception of pain interference, degree of support,
perceived life control, and affective distress (Appendix F). The measure has adequate internal consistency ($\alpha = 0.74-0.89$) (Kerns et al., 1985). The MPI has been demonstrated to have good reliability and validity with chronic pain patients (Kerns et al., 1985; Turk & Rudy, 1988). The internal consistency for subscales used in the present study ranged from .69 (Pain Severity) to .91 (Pain Interference).

**Chronic Pain Acceptance Questionnaire (CPAQ)**

Acceptance will be measured using the CPAQ (Geisser, 1992; McCracken, Vowles et al., 2004), which is a 20-item Likert-type scale measuring acceptance of chronic pain (Appendix G). This measure was developed on chronic pain patients waiting for enrollment in multidisciplinary pain treatment program. It has two subscales assessing Activity Engagement (e.g., "it's okay to experience pain.") and Pain Willingness (e.g., "I need to concentrate of getting rid of my pain."). The measure's overall score can also be used as a general level of acceptance of chronic pain. Respondents rate items on a 7-point scale from 0 (Never True) to 6 (Always True). The CPAQ has adequate internal consistency ($\alpha = .78-.82$) and has reliably predicted patient functioning in several studies (Geisser, 1992; McCracken, 1998; McCracken, Vowles et al., 2004). The two subscales are moderately correlated ($r=.36$) (McCracken, Carson, Eccleston, & Keefe, 2004). In the present study the internal consistency was .75 for the Pain Willingness subscale and .84 for the Activity Engagement subscale. The two subscales were moderately correlated, $r=.29$. The mean scores for the two CPAQ subscales were higher than the scores in other chronic pain samples (e.g., McCracken, Vowles et al., 2005; Morley, Davies, & Barton, 2005)

**Acceptance and Action Questionnaire (AAQ)**

The AAQ (Hayes et al., 2004) is a 49-item self-report measure that assesses acceptance and experiential avoidance (Appendix H). This measure was developed using both clinical (i.e.,
psychological service seeking) and nonclinical samples. Respondents endorse the degree to which statements are true or false for them on a 7-point scale from 1 (Never True) to 7 (Always True). It possesses adequate convergent and discriminant validity (Hayes et al., 2004). For the present study, the internal consistency was .88.

**Coping Strategies Questionnaire (CSQ)**

The CSQ (Rosenstiel & Keefe, 1983) is a 42-item self-report measure that assesses the use of cognitive and behavioral pain coping strategies (Appendix I). The CSQ was developed on a sample of chronic low back pain sufferers. Respondents endorse the frequency with which they use each strategy on a seven-point Likert-type scale ranging from 0 (Never do it) to 6 (Always do it). Additionally, respondents rate coping strategy effectiveness (i.e., ability to control pain) on a 7-point scale ranging from 0 (No Control) to 6 (Complete Control) and a rating of ability to decrease pain with the strategies from 0 (Cannot Decrease it) to 6 (Can Decrease it Completely). The CSQ yields eight subscales; Diverting Attention, Reinterpreting Pain Sensations, Coping Self-Statements, Ignoring Pain Sensations, Increasing Activity Level, Increasing Pain Behavior, Praying/Hoping, and Catastrophizing. Additionally, the CSQ has two separate items that yield a Coping Efficacy scale (Rosenstiel & Keefe, 1983). The CSQ has been widely used in the pain coping literature and possess satisfactory internal consistency and concurrent validity (Rosenstiel & Keefe, 1983). The internal consistency of the subscales in the present study ranged from .78 (Coping Self-Statements) to .91 (Ignoring Pain Sensations). This sample's means and standard deviations were comparable to other migraine headache samples (e.g., Haythornthwaite et al., 1998; Materazzo et al., 2000).
Chronic Pain Coping Inventory (CPCI)

The CPCI (Jensen, Turner, Romano, & Strom, 1995) is a 56-item self-report measure designed to assess strategies used by patients to cope with chronic pain (Appendix J). It was developed using data from chronic pain patients receiving multidisciplinary pain treatment. The subscales are in each of three broad areas, illness-focused coping (Guarding, Resting, Asking for Assistance, Opioid Medication Use, Non-steroidal Medication Use), wellness-focused coping (Relaxation, Task Persistence, Exercise/Stretch, Coping Self-Statement), and other coping (Seeking Social Support). Respondents are asked to endorse the number of days in the past week they have used each strategy. Internal consistency is adequate, with subscales ranging from .74 to .91. Because this measure does not have catastrophizing as a subscale, it may be a more pure measure of coping. The CPCI has been found to be more predictive of pain related disability than the CSQ (Tan, Jensen, Robinson-Whelen, Thornby, & Monga, 2001). For the present study, the CPCI-42 will be used, as it is more abbreviated yet highly correlated with the original CPCI (Romano, Jensen, & Turner, 2003). The internal consistency in the present study ranged from .75 (Asking for Assistance) to .89 (Seeking Social Support). The means for the CPCI subscales were slightly lower in this study's sample compared to pain patients in chronic pain treatment studies (e.g., Tan et al., 2001).

Pain Catastrophizing Scale (PCS)

The PCS (Sullivan et al., 1995) is a 13-item self-report measure designed to assess cognitive and affective catastrophizing responses to pain (Appendix K). This measure was developed using both acute and chronic pain experiences. Although original factor analytic solutions suggested three factors (i.e., Rumination, Magnification, and Helplessness), the considerable overlap between the components suggest that they are all dimensions of one
underlying construct (D'Eon, Harris, & Ellis, 2004). The measure has adequate criterion, concurrent, and discriminant validity (Osman et al., 2000; Sullivan et al., 1995). The total score was used in the present study, which had an internal consistency of .92.

Daily Diary

The daily diary is a 28 item measure that was developed for use in the proposed study. The goal of the diary is to capture headache activity, appraisals (i.e., catastrophizing, control, and acceptance) and efforts to cope with headaches (Appendix L). People may continue to be concerned about headaches even on headache free days, thus coping and appraisals are measured daily, regardless of headache state. The first four items pertaining to headache activity (i.e., presence, pain, and stress ratings) are standard items that are used in headache research. Because migraine headache sufferers often get other types of headaches that may not be migraineous in nature, participants will be asked if the headache they had on any given headache day was a migraine headache.

The remainder of the daily diary items assessed appraisal and coping. Fourteen items were selected to address strategies an individual may use to cope with headache pain. The first eight items were adopted from the Chronic Pain Coping Inventory-42 (Romano et al., 2003). The diary contains one item for each of the eight subscales. Items were selected based on high loadings onto their respective subscales in a validation study (Hadjistavropoulos, MacLeod, & Asmundson, 1999) as well as face validity. Six items were taken from the Coping Strategies Questionnaire-Revised (CSQ-R) (Rosenstiel & Keefe, 1983). These items were selected on the basis of several factor analytic studies that found six factors that correspond with the original, rationally-derived cognitive coping subscales (Robinson et al., 1997; Swartzman, Gwadry, Shapiro, & Teasell, 1994). Six items measuring acceptance were adapted for use with headache
pain from the Chronic Pain Acceptance Questionnaire (Geisser, 1992; McCracken, Vowles et al., 2004). Finally, the control appraisal item was adapted from the CSQ-R and three items were adapted from the Pain Catastrophizing Scale to measure appraisal.

Procedure

Potential participants who were interested in participating contacted the experimenter via telephone or email (their choice). The overall purpose and procedures of the study were provided to them. Willingness to undergo the brief phone screening for migraine headache was taken as informed consent for the phone portion of the study. Individuals who met criteria for migraine headache with or without aura were invited to participate in the study. Those who agreed to participate completed the study using one of two methods; paper and pencil or internet.

*Paper and Pencil*

Participants who completed the paper and pencil version of the study met with the researcher in a convenient location to complete informed consent, the initial packet of questionnaires, and to receive the 28 day daily diary. Participants were given a written informed consent, with one copy to sign and one to keep for their records (Appendix M). After informed consent was signed, participants completed the first packet of questionnaires (WHYMPI, CPAQ, AAQ, CPCI, CSQ, PCS). Participants were then provided with the 28-day daily diaries. The diary was split into two 14-day packets, allowing participants to mail the first 14-days back to the researcher halfway through the study. Participants completed the daily diary once per day, within a few hours of going to bed. Upon completion of the daily diaries, participants met with the researcher a second time to return the second half of the daily diaries and to complete the second packet of questionnaires. Upon completion of the second packet of questionnaires, participants were debriefed, and compensated for their participation. Participants were contacted
by phone several times during the daily diary phase to maximize compliance and answer any questions (Bolger, Davis, & Rafaeli, 2003).

Internet

Participants assigned to the internet version of the study completed all study materials online. Survey Monkey was the tool used to deliver the surveys ("Survey Monkey," 2007). Survey Monkey is a company that operates in a secure server environment with standard Secure Socket Layer encryption. At the time of being invited to participate in the study, participants reviewed the research protocol and details of informed consent with the researcher over the phone. Participants then provided the researcher an email address to use when sending links to the questionnaires and daily dairy. Participants received an email inviting them to participate in the study, when they clicked on the link that directed them to the study, the first page was the informed consent. Participants who agreed to participate clicked "I agree", which directed them to the first page of the initial questionnaire packet. A "I do not agree" link was also available at the bottom of the informed consent. If that link was clicked, potential participants would have been thanked for their interest, and removed from the study roster. All participants who were invited to participate did so. Email messages were sent to participants daily with a link to that day's diary.

Data Reduction and Analysis

Most analyses were conducted in SPSS. Correlation analyses were performed to examine the relationship between the two subscale scores from the CPAQ (pain willingness and activity engagement) and coping, appraisal, and pain adjustment measures. Mean item scores, standard deviations, internal consistency, normality, and correlation scores for all of the self-report questionnaires were calculated. Hierarchical regression analysis were used to examine the
relation of acceptance with pain related disability after controlling for education, years since migraine onset, and pain severity. Education and years since onset of migraine headaches were entered in one block using a forward entry inclusion method. Pain severity was entered into the equation in the second block, and acceptance was entered in the final step. Hierarchical regression analysis were also conducted to determine the relation between acceptance, other types of appraisal (i.e., catastrophizing and control), and coping strategies. Hierarchical Linear Modeling software (Scientific Software International, 2007) was used to explore these relationships in the daily diary data. Descriptive statistics were also used to summarize the diary data at the individual level. Finally, standard deviations of acceptance were calculated for each participant as an estimate of the degree to which acceptance of headache pain varies across time (Eid & Diener, 2006).
CHAPTER III: RESULTS

Descriptive Statistics

Demographics

Participants were recruited both locally (Minneapolis/Saint Paul metropolitan area) and nationally for the present study, and multiple methods of participation (online and paper and pencil) were utilized. Of the 47 local participants, 17 completed the internet version and 30 completed the paper and pencil version. Of the 27 nonlocal participants, all completed the internet version. A set of initial analyses was conducted to determine if differences existed between these subgroups on demographics and/or measures used in the present study.

First, the responses for local and nonlocal participants were compared using chi-square analyses and t-tests. Local participants were similar to nonlocal participants in most demographics; including gender, age, marital status, ethnicity, and education level. They differed significantly on current employment. Local participants were more likely to be employed than nonlocal participants. (63% versus 30%), $\chi^2 (1, N=74)= 7.75, p=.005$. Responses to the self-report questionnaires did not significantly differ between local and nonlocal participants. Local and nonlocal participants also possessed similar headache characteristics, including number of overall headaches and number of migraines during the month in which they participated, average pain intensity, and treatment status (receiving or not receiving treatment for migraines), all $p$’s $>.05$. Details of participant demographics and headache characteristics are presented in Tables 1 and 2.
Table 1
Demographic Characteristics of the Sample

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>13.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>64</td>
<td>86.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>39</td>
<td>52.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>28</td>
<td>37.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>5</td>
<td>6.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separated</td>
<td>1</td>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>1</td>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>62</td>
<td>83.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonwhite</td>
<td>12</td>
<td>16.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some High School</td>
<td>1</td>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School or Equivalent</td>
<td>11</td>
<td>14.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some College</td>
<td>36</td>
<td>48.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associates</td>
<td>4</td>
<td>5.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor's Degree</td>
<td>10</td>
<td>13.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some Graduate School</td>
<td>5</td>
<td>6.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>7</td>
<td>9.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Time</td>
<td>19</td>
<td>25.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part Time</td>
<td>24</td>
<td>32.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed&lt;sup&gt;a&lt;/sup&gt;</td>
<td>26</td>
<td>35.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability</td>
<td>4</td>
<td>5.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>1</td>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age&lt;sup&gt;b&lt;/sup&gt;</strong></td>
<td>31</td>
<td>13.2</td>
<td>18-66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 74, <sup>a</sup>15 of those who were unemployed were students; <sup>b</sup>n=71, 3 people refrained from providing their age.
Second, the demographics and self-report responses were compared according to the two methods of completing the study. Participants who completed paper and pencil versions of the questionnaires and daily diaries were similar to those who completed internet versions in all demographics collected for the present study as well as in their responses to the questionnaires, all p’s > .05. Thus the variation in recruiting methods does not appear to have resulted in group differences that would significantly influence the outcomes examined in this study. Participants who completed paper and pencil versions of the questionnaires and daily diaries had similar headache characteristics to those who completed the internet versions.

Finally, demographic and self-report responses were compared according to treatment status at the time of participation in the study. Participants who were receiving treatment for their migraines at the time of the study were older, F(1,70) = 46.35, p=.000, and had had migraine headaches for longer F(1,68) = 37.50, p=.000, than their not in treatment counterparts. Preliminary statistical checks indicated that participants also differed on several outcome variables according to treatment status, therefore, the role of treatment status was considered throughout the primary hypothesis tests.
Table 2

Headache Characteristics of the Sample

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache days per month</td>
<td>15.1</td>
<td>11</td>
<td>6.58</td>
<td>3-28</td>
<td></td>
</tr>
<tr>
<td>Migraine headache days per month</td>
<td>8.64</td>
<td>7.91</td>
<td>0-28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average pain intensity</td>
<td>5.36</td>
<td>1.53</td>
<td>2.82-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migraine with aura</td>
<td>22</td>
<td>29.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migraine without aura</td>
<td>52</td>
<td>70.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>29</td>
<td>39.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>45</td>
<td>60.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of onset</td>
<td>14.96</td>
<td>5.48</td>
<td>4-36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since onset</td>
<td>15.48</td>
<td>13.99</td>
<td>0-55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N=72 for the daily diary variables. Headache days per month and pain intensity were taken from daily diary data, rather than initial self report at beginning of the study.

Self-Report Questionnaires

Seventy-four participants completed the first and second packets of self-report questionnaires. The first packet was completed after informed consent at the beginning of the study. The second packet was completed at the end of the 28-day daily dairy. Means and standard deviations of the self-report questionnaires are detailed in Table 3. A Bonferroni adjusted alpha was used to correct for the number of statistical comparisons. Participant responses were significantly different from Time 1 to Time 2 on several measures. At the end of the study, participants endorsed higher levels of pain willingness, higher levels of ignoring pain when it occurs, and increased task persistence. They endorsed lower levels of pain interference in daily activities, lower pain severity, and decreased praying.
### Table 3

**Means and Standard Deviations of Background Questionnaires at Time1 and Time2**

<table>
<thead>
<tr>
<th></th>
<th>Time 1 M</th>
<th>SD</th>
<th>Time 2 M</th>
<th>SD</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHYMPI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affective Distress</td>
<td>3.29</td>
<td>1.07</td>
<td>3.09</td>
<td>1.26</td>
<td>1.32</td>
</tr>
<tr>
<td>Pain Interference</td>
<td>3.18</td>
<td>1.25</td>
<td>2.52</td>
<td>1.42</td>
<td>6.22*</td>
</tr>
<tr>
<td>Support</td>
<td>3.70</td>
<td>1.62</td>
<td>3.54</td>
<td>1.56</td>
<td>1.27</td>
</tr>
<tr>
<td>Pain Severity</td>
<td>3.11</td>
<td>1.09</td>
<td>2.63</td>
<td>1.35</td>
<td>4.06*</td>
</tr>
<tr>
<td>Life Control</td>
<td>3.37</td>
<td>1.33</td>
<td>3.61</td>
<td>1.40</td>
<td>-1.15</td>
</tr>
<tr>
<td>Negative Responses</td>
<td>1.29</td>
<td>1.37</td>
<td>2.12</td>
<td>1.39</td>
<td>-4.07*</td>
</tr>
<tr>
<td>Solicitous Responses</td>
<td>3.34</td>
<td>1.38</td>
<td>2.90</td>
<td>1.29</td>
<td>3.39*</td>
</tr>
<tr>
<td>Distracting Responses</td>
<td>1.85</td>
<td>1.31</td>
<td>1.63</td>
<td>1.02</td>
<td>1.38</td>
</tr>
<tr>
<td>General Activities</td>
<td>2.68</td>
<td>0.93</td>
<td>2.64</td>
<td>0.90</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>CPCAQ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>25.86</td>
<td>7.99</td>
<td>29.60</td>
<td>9.32</td>
<td>-4.26*</td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>39.42</td>
<td>10.79</td>
<td>42.14</td>
<td>11.20</td>
<td>-3.01</td>
</tr>
<tr>
<td><strong>AAQ</strong></td>
<td>47.38</td>
<td>10.47</td>
<td>48.57</td>
<td>11.06</td>
<td>-0.94</td>
</tr>
<tr>
<td><strong>CSQ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distracting</td>
<td>3.06</td>
<td>1.56</td>
<td>2.93</td>
<td>1.54</td>
<td>0.83</td>
</tr>
<tr>
<td>Catastrophizing</td>
<td>2.36</td>
<td>1.29</td>
<td>2.06</td>
<td>1.34</td>
<td>2.70</td>
</tr>
<tr>
<td>Ignoring</td>
<td>2.58</td>
<td>1.29</td>
<td>3.10</td>
<td>1.62</td>
<td>-4.15*</td>
</tr>
<tr>
<td>Distancing</td>
<td>1.84</td>
<td>1.67</td>
<td>1.39</td>
<td>1.37</td>
<td>2.79</td>
</tr>
<tr>
<td>Coping Self Statement</td>
<td>4.03</td>
<td>1.22</td>
<td>4.13</td>
<td>1.06</td>
<td>-1.00</td>
</tr>
<tr>
<td>Praying</td>
<td>3.35</td>
<td>1.89</td>
<td>2.75</td>
<td>2.11</td>
<td>4.68*</td>
</tr>
<tr>
<td>Control</td>
<td>2.48</td>
<td>1.25</td>
<td>2.65</td>
<td>1.25</td>
<td>-1.19</td>
</tr>
<tr>
<td><strong>CPCI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guarding</td>
<td>1.49</td>
<td>1.44</td>
<td>1.44</td>
<td>1.41</td>
<td>0.26</td>
</tr>
<tr>
<td>Resting</td>
<td>3.20</td>
<td>1.93</td>
<td>3.20</td>
<td>1.92</td>
<td>-0.16</td>
</tr>
<tr>
<td>Asking for Assistance</td>
<td>1.51</td>
<td>1.60</td>
<td>1.67</td>
<td>1.71</td>
<td>-1.20</td>
</tr>
<tr>
<td>Relaxation</td>
<td>1.79</td>
<td>1.47</td>
<td>1.88</td>
<td>1.51</td>
<td>-0.91</td>
</tr>
<tr>
<td>Task Persistence</td>
<td>2.99</td>
<td>1.87</td>
<td>3.81</td>
<td>1.93</td>
<td>-3.72*</td>
</tr>
<tr>
<td>Exercise</td>
<td>1.89</td>
<td>1.83</td>
<td>2.37</td>
<td>1.88</td>
<td>-2.99</td>
</tr>
<tr>
<td>Coping Self Statement</td>
<td>2.74</td>
<td>2.08</td>
<td>2.73</td>
<td>2.15</td>
<td>-0.04</td>
</tr>
<tr>
<td>Seeking Social Support</td>
<td>2.37</td>
<td>2.01</td>
<td>2.60</td>
<td>2.08</td>
<td>-1.46</td>
</tr>
<tr>
<td><strong>PCS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rumination</td>
<td>8.62</td>
<td>3.96</td>
<td>7.68</td>
<td>3.91</td>
<td>2.12</td>
</tr>
<tr>
<td>Magnification</td>
<td>3.70</td>
<td>2.92</td>
<td>3.32</td>
<td>2.45</td>
<td>1.32</td>
</tr>
<tr>
<td>Helplessness</td>
<td>9.58</td>
<td>5.76</td>
<td>8.57</td>
<td>5.71</td>
<td>2.22</td>
</tr>
<tr>
<td>Total Score</td>
<td>21.90</td>
<td>10.86</td>
<td>19.57</td>
<td>10.54</td>
<td>2.71</td>
</tr>
</tbody>
</table>

*Note.* N = 74.

*p ≤ .002
Intercorrelations among the self-report measures, daily diary items, and the two pain-related acceptance subscales are detailed in Table 4. Generally, the relationships between pain-related acceptance (as measured at Time 1) and the other self-report measures were as expected, with higher levels of acceptance related to lower levels of catastrophizing, decreased pain severity, pain interference, and affective distress. Higher pain-related acceptance was related to higher control appraisals, also as expected. The relationships between pain-related acceptance and the daily diary measures indicate that higher levels of acceptance is related to lower levels of pain intensity, stress level, interference, catastrophizing, and number of coping strategies. The relation between pain-related acceptance and headaches differed according to the type of headache experienced. Migraine activity was associated with lower levels of pain-related acceptance, whereas other headache (non migraine) activity was associated with higher levels of pain-related acceptance.
### Table 4

**Pearson Correlations of Pain-Related Acceptance and Study Measures**

<table>
<thead>
<tr>
<th></th>
<th>Pain Willingness</th>
<th>Activity Engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Questionnaires</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Appraisals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catastrophizing (PCS)</td>
<td>-.493**</td>
<td>-.200</td>
</tr>
<tr>
<td>Control (CSQ)</td>
<td>.166</td>
<td>.291*</td>
</tr>
<tr>
<td><strong>Pain Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Severity (WHYMPI)</td>
<td>-.388**</td>
<td>-.280*</td>
</tr>
<tr>
<td>Pain Interference (WHYMPI)</td>
<td>-.510**</td>
<td>-.555**</td>
</tr>
<tr>
<td>General Activity (WHYMPI)</td>
<td>.073</td>
<td>.238</td>
</tr>
<tr>
<td>Affective Distress (WHYMPI)</td>
<td>-.134</td>
<td>-.102</td>
</tr>
<tr>
<td>General Acceptance</td>
<td>.356*</td>
<td>.225</td>
</tr>
<tr>
<td>Years Since Onset</td>
<td>-.278*</td>
<td>-.323*</td>
</tr>
<tr>
<td><strong>Daily Diary</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>.353*</td>
<td>.353*</td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>.364*</td>
<td>.376*</td>
</tr>
<tr>
<td>Pain Level</td>
<td>-.314**</td>
<td>-.058</td>
</tr>
<tr>
<td>Stress Level</td>
<td>-.567**</td>
<td>-.145</td>
</tr>
<tr>
<td>Interference Level</td>
<td>-.533**</td>
<td>-.251*</td>
</tr>
<tr>
<td>Number of Coping Strategies</td>
<td>-.266*</td>
<td>-.036</td>
</tr>
<tr>
<td>Control</td>
<td>.135</td>
<td>.232*</td>
</tr>
<tr>
<td>Catastrophizing</td>
<td>-.283*</td>
<td>.031</td>
</tr>
<tr>
<td>Number of Migraines</td>
<td>-.228*</td>
<td>-.227</td>
</tr>
<tr>
<td>Number of Other Headaches</td>
<td>.246*</td>
<td>.138</td>
</tr>
</tbody>
</table>

*Note.* N=74 for the initial questionnaires correlations. N=63 for the daily diary correlations. *p ≤ .05. **p ≤ .01. ***p ≤ .001.
For the daily diary data, there were two sources of incomplete data. The first source occurred when participants forgot to complete a daily diary, or when a technological problem (for the online participants) precluded completion of a daily diary. The second was a more systematic error made by a subset of participants, in which they only filled out the headache days correctly (despite several corrections). Overall, 74 people completed the daily diaries and were considered for data analysis.

Among the participants who completed the study and were included for possible data analysis, a total of 2072 time points for diary entries were possible. Of those possible, 1940 were completed, yielding a missing rate of 6.4 percent. Two participants completed fewer than 50% of the possible days and were excluded from data analysis. Nine additional participants were excluded, because they only completed the daily diaries on headache days. Thus, the headache day information was accurate for these nine participants. However, on nonheadache days, these participants noted they did not have a headache and failed to complete the rest of the daily diary items. Thus, the final sample for statistical analysis of the diary data was 63 participants. Table 5 provides descriptive information for the diary data.
### Table 5
**Daily Diary Descriptives**

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache Days</td>
<td>15.22</td>
<td>6.71</td>
<td>5-28</td>
</tr>
<tr>
<td>Migraine Days</td>
<td>8.44</td>
<td>8.01</td>
<td>0-28</td>
</tr>
<tr>
<td>Pain Rating (overall)</td>
<td>5.36</td>
<td>1.61</td>
<td>2.82 - 10.00</td>
</tr>
<tr>
<td>Stress Rating (of headache pain)</td>
<td>4.72</td>
<td>1.61</td>
<td>0.93 - 9.85</td>
</tr>
<tr>
<td>Interference</td>
<td>4.12</td>
<td>1.85</td>
<td>0.53 - 9.85</td>
</tr>
<tr>
<td># Coping Strategies</td>
<td>4.60</td>
<td>2.36</td>
<td>0.23 - 9.92</td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>10.47</td>
<td>3.80</td>
<td>0.84 - 17.25</td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>10.88</td>
<td>3.81</td>
<td>0.29 - 17.61</td>
</tr>
<tr>
<td>Catastrophizing</td>
<td>6.38</td>
<td>3.25</td>
<td>0.54 - 15.04</td>
</tr>
<tr>
<td>Control</td>
<td>2.74</td>
<td>1.42</td>
<td>0.11 - 5.85</td>
</tr>
<tr>
<td>Variation in Activity Engagement</td>
<td>2.76</td>
<td>1.47</td>
<td>0.37 - 6.73</td>
</tr>
<tr>
<td>Variation in Pain Willingness</td>
<td>2.52</td>
<td>1.27</td>
<td>0.66 - 7.14</td>
</tr>
</tbody>
</table>

*Note.* N=63.

### Hypothesis Tests

**Acceptance and Catastrophizing**

The first hypothesis was that migraine headache sufferers with high pain-related acceptance would engage in lower levels of catastrophizing than would those with low pain-related acceptance. Hierarchical regression analyses were performed to determine the potential value of acceptance in predicting catastrophizing beyond demographics and pain severity. Both age and years since migraine onset were originally planned for inclusion in step one of the regression model, in order to more closely duplicate previous work with general chronic pain populations. However, the high correlation between those two variables necessitated the removal of one variable to maintain independence among the predictors. Thus, age was not included in any of the regression models. Predictors were entered in a forward inclusion method with demographic variables entered at step one, pain severity at step two, and the pain acceptance subscale (pain willingness or activity engagement) in the final step (Tables 5 and 6). In this analysis, demographics did not contribute to the prediction of catastrophizing. At step two, pain
severity was a significant predictor of catastrophizing, such that increased levels of pain severity were associated with increased levels of catastrophizing. In the full model, however, pain willingness was the only significant predictor of catastrophizing (Table 5). Participants who endorsed higher levels of pain willingness engaged in lower levels of catastrophizing. For the second regression, activity engagement was not a significant predictor of catastrophizing, and pain severity remained significant in step three of the model (Table 6). These findings provide partial support for Hypothesis 1. Activity engagement was not related to catastrophizing, but pain willingness was related, and in the direction predicted.
### Table 6

**Summary of Hierarchical Regression Analysis for Pain Willingness Predicting Catastrophizing**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>R²</th>
<th>Adj R²</th>
<th>R²-change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>20.29</td>
<td>3.62</td>
<td>.009</td>
<td>-.021</td>
<td>.009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.20</td>
<td>.94</td>
<td>.03</td>
<td></td>
<td>.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.07</td>
<td>.10</td>
<td>.08</td>
<td></td>
<td>.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>12.18</td>
<td>5.06</td>
<td>.081</td>
<td>.038</td>
<td>.072</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.24</td>
<td>.91</td>
<td>.04</td>
<td></td>
<td>.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>-.01</td>
<td>.10</td>
<td>-.01</td>
<td></td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>2.93</td>
<td>1.31</td>
<td>.28</td>
<td></td>
<td>2.23*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>33.11</td>
<td>7.19</td>
<td>.251</td>
<td>.204</td>
<td>.170</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.58</td>
<td>.83</td>
<td>.08</td>
<td></td>
<td>.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>-.08</td>
<td>.10</td>
<td>-.10</td>
<td></td>
<td>-.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Severity (WHYMPI)</td>
<td>1.37</td>
<td>1.26</td>
<td>.13</td>
<td></td>
<td>1.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>-.63</td>
<td>1.66</td>
<td>-.46</td>
<td></td>
<td>-3.79***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* N = 74.

* *p<.05, **p<.01, *** p<.001 |

### Table 7

**Summary of Hierarchical Regression Analysis for Activity Engagement Predicting Catastrophizing**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>R²</th>
<th>Adj R²</th>
<th>R²-change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>20.29</td>
<td>3.62</td>
<td>.009</td>
<td>-.021</td>
<td>.009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.20</td>
<td>.94</td>
<td>.03</td>
<td></td>
<td>.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.07</td>
<td>.10</td>
<td>.08</td>
<td></td>
<td>.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>12.18</td>
<td>5.06</td>
<td>.081</td>
<td>.038</td>
<td>.072</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.24</td>
<td>.91</td>
<td>.04</td>
<td></td>
<td>.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>-.01</td>
<td>.10</td>
<td>-.01</td>
<td></td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>2.93</td>
<td>1.31</td>
<td>.28</td>
<td></td>
<td>2.23*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>20.50</td>
<td>8.03</td>
<td>.106</td>
<td>.049</td>
<td>.025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.26</td>
<td>.90</td>
<td>.04</td>
<td></td>
<td>.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>-.04</td>
<td>.11</td>
<td>-.06</td>
<td></td>
<td>-.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Severity (WHYMPI)</td>
<td>2.72</td>
<td>1.32</td>
<td>.26</td>
<td></td>
<td>2.07*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>-.18</td>
<td>.13</td>
<td>-.17</td>
<td></td>
<td>-.13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* N = 74.

* *p<.05, **p<.01, *** p<.001
The relationship between pain-related acceptance and catastrophizing was further explored with hierarchical linear modeling using the daily diary data. Bryk and Raudenbush's approach was used for model building (1992; Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004). The approach to model building for this first hypothesis mirrors that used in subsequent hypotheses, thus, equations are included below for further understanding of how the daily diary data were modeled. Participants recorded daily pain levels on headache days, stressfulness of the headache, pain interference, use of various coping strategies from the CSQ and the CPCI, level of perceived control, level of pain related acceptance (responding to several items from the CPAQ), and level of catastrophizing. The daily diary data have a hierarchical structure of up to 28 responses nested within each of the 63 participants. In multilevel analysis for repeated measures designs, the Level 1 observations, and corresponding model equations, refer to within subjects repeated measures variables. The Level 2 observations and corresponding model equations refer to and model the between subjects variables (Hox, 2002).

The first model tested was a within subjects model, determining if daily levels of catastrophizing was a function of daily levels of pain (PAINLEVEL) and pain-related acceptance (PAINWILL and ACTENG). Day was entered for all models to account for daily fluctuations in these variables. The Level 1 and Level 2 models for the initial within-subjects analysis were:

Level 1: \[ \text{CATASTROPHIZING} = \pi_0 + \pi_1(\text{DAY}) + \pi_2(\text{PAINLEVEL}) + \pi_3(\text{PAINWILL}) + \pi_4(\text{ACTENG}) + e \]

Level 2:
\[
\begin{align*}
\pi_0 &= \beta_{00} + r_0 \\
\pi_1 &= \beta_{10} + r_1 \\
\pi_2 &= \beta_{20} + r_2 \\
\pi_3 &= \beta_{30} + r_3 \\
\pi_4 &= \beta_{40} + r_4 
\end{align*}
\]
In the first model, the level 1 equation is similar to a typical regression equation. The level 2 equation model can be constructed in multiple ways, depending on how one thinks about potential between person differences. This is a fairly basic level 2 construction that is allowing the slopes to vary randomly between participants on each of the level one variables. In other words, the level 2 equations define the level 1 predictors as the overall mean of that predictor (e.g., $\beta_{40}$) plus individual differences (e.g., $r_4$).

The second model tested was a between subjects model, frequently referred to as an intercept-as-outcome model in the multilevel modeling literature (Raudenbush et al., 2004). This type of model allows for testing of between subjects differences in mean levels of the dependent variable, in this case, catastrophizing. The impact of treatment status on daily levels of catastrophizing (and in following analyses examining daily levels of other variables) is of interest in the present study as an exploratory analysis due to the initial between group differences observed among people in and not in treatment.

Level 1: $\text{CATASTROPHIZING} = \pi_0 + \pi_1(\text{DAY}) + e$

Level 2: $\pi_0 = \beta_{00} + \beta_{01}(\text{TREATMENT}) + r_0$
$\pi_1 = \beta_{10} + r_1$

The third model tested interaction effects, specifically, exploring the impact of treatment status on the strength of the relationship between acceptance and catastrophizing. Again, treatment status is explored due to initial between group differences observed on baseline measures.

Level 1: $\text{CATASTROPHIZING} = \pi_0 + \pi_1(\text{DAY}) + \pi_2(\text{PAINLEVEL}) + \pi_3(\text{PAINWILL}) + \pi_4(\text{ACTENG}) + e$
Level 2:  
\[ \pi_0 = \beta_{00} + \beta_{01} \text{ (TREATMENT)} + r_0 \]  
\[ \pi_1 = \beta_{10} + \beta_{11} \text{ (TREATMENT)} + r_1 \]  
\[ \pi_2 = \beta_{20} + \beta_{21} \text{ (TREATMENT)} + r_2 \]  
\[ \pi_3 = \beta_{30} + \beta_{31} \text{ (TREATMENT)} + r_3 \]  
\[ \pi_4 = \beta_{40} + \beta_{41} \text{ (TREATMENT)} + r_4 \]  

The results of the multilevel models for acceptance and catastrophizing show that daily levels of catastrophizing are a function of both types of pain-related acceptance; pain willingness and activity engagement (Table 8). Increased levels of pain-related acceptance predicts lower levels of catastrophizing. As the model shows, daily level of pain is also a predictor of level of catastrophizing. Increased level of pain predicts higher levels of catastrophizing. Participants did not differ according to treatment status in initial levels of catastrophizing nor differences in the strength of the relationship between pain level, acceptance, and catastrophizing.

Table 8  
*Daily Catastrophizing as a Function of Daily Pain Level and Daily Pain-Related Acceptance.*

<table>
<thead>
<tr>
<th>Model 1: Within Subjects Factors</th>
<th>Coefficient</th>
<th>SE</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>-0.00</td>
<td>0.01</td>
<td>-0.20</td>
</tr>
<tr>
<td>Pain Level</td>
<td>1.10</td>
<td>0.09</td>
<td>12.98***</td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>-0.33</td>
<td>0.05</td>
<td>-6.68***</td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>-0.12</td>
<td>0.04</td>
<td>-3.14**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 2: Between Subjects Effects</th>
<th>Coefficient</th>
<th>SE</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment status</td>
<td>-0.05</td>
<td>0.04</td>
<td>-1.29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 3: Moderating Effects</th>
<th>Coefficient</th>
<th>SE</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On day</td>
<td>-0.02</td>
<td>0.03</td>
<td>-0.76</td>
</tr>
<tr>
<td>On pain level</td>
<td>0.09</td>
<td>0.18</td>
<td>0.48</td>
</tr>
<tr>
<td>On pain willingness</td>
<td>0.13</td>
<td>0.11</td>
<td>1.22</td>
</tr>
<tr>
<td>On activity engagement</td>
<td>-0.08</td>
<td>0.09</td>
<td>-0.92</td>
</tr>
</tbody>
</table>

*Note. N = 63.*  
*p ≤ .05. ** p ≤ .01. *** p ≤ .001.*
Acceptance and Control

The second hypothesis was that migraine headache sufferers with higher pain-related acceptance would endorse higher levels of perceived control with regard to their pain compared to those with lower pain-related acceptance. Hierarchical regression analyses were performed to determine the potential value of acceptance in predicting control beyond demographics and pain severity. Predictors were entered in a forward inclusion method within demographic variables entered at step one, pain severity at step two, and the pain-related acceptance subscale (pain willingness or activity engagement) in the final step (Tables 9 and 10). None of the predictors were significantly related to control. Hypothesis 2 is not supported by these findings.
### Table 9
*Summary of Hierarchical Regression Analysis for Pain Willingness Predicting Control*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$R^2$</th>
<th>Adj $R^2$</th>
<th>$R^2$ change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.44</td>
<td>.41</td>
<td></td>
<td>.003</td>
<td>-.028</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.01</td>
<td>.11</td>
<td>.01</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.00</td>
<td>.01</td>
<td>.05</td>
<td>.39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.87</td>
<td>.58</td>
<td></td>
<td>.019</td>
<td>-.027</td>
<td>.016</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.01</td>
<td>.11</td>
<td>.01</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.01</td>
<td>.01</td>
<td>.09</td>
<td>.68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>-.15</td>
<td>.15</td>
<td>-.13</td>
<td>-1.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.14</td>
<td>.91</td>
<td></td>
<td>.036</td>
<td>-.026</td>
<td>.017</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-.01</td>
<td>.11</td>
<td>-.01</td>
<td>-.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.01</td>
<td>.01</td>
<td>.12</td>
<td>.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>-.10</td>
<td>.16</td>
<td>-.09</td>
<td>-.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>.02</td>
<td>.02</td>
<td>.14</td>
<td>1.04</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. N = 74.*

*p<.05, **p<.01, *** p<.001

### Table 10
*Summary of Hierarchical Regression Analysis for Activity Engagement Predicting Control*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$R^2$</th>
<th>Adj $R^2$</th>
<th>$R^2$ change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.44</td>
<td>.41</td>
<td></td>
<td>.003</td>
<td>-.028</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.01</td>
<td>.11</td>
<td>.01</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.00</td>
<td>.01</td>
<td>.05</td>
<td>.39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.87</td>
<td>.58</td>
<td></td>
<td>.019</td>
<td>-.027</td>
<td>.016</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.01</td>
<td>.11</td>
<td>.01</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.01</td>
<td>.01</td>
<td>.09</td>
<td>.68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>-.15</td>
<td>.15</td>
<td>-.13</td>
<td>-1.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.54</td>
<td>.91</td>
<td></td>
<td>.071</td>
<td>.012</td>
<td>.052</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.00</td>
<td>.10</td>
<td>.00</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.01</td>
<td>.01</td>
<td>.16</td>
<td>1.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>-.12</td>
<td>.15</td>
<td>-.10</td>
<td>-.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>.03</td>
<td>.02</td>
<td>.24</td>
<td>1.87</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. N = 74.*

*p<.05, **p<.01, *** p<.001
The relationship between pain-related acceptance and control was further explored with using the daily diary data. Participants recorded daily pain levels on headache days, daily level of pain related acceptance (via items from the CPAQ) and daily level of perceived control. As before, a within subjects model, a between subjects model, and an interaction model were built to explore the nature of these relationships.

Table 11.
Daily Levels of Control as a Function of Daily Pain Level and Daily Pain-Related Acceptance.

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: Within Subjects Factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day</td>
<td>-0.01</td>
<td>0.01</td>
<td>-2.21*</td>
</tr>
<tr>
<td>Pain Level</td>
<td>-0.09</td>
<td>0.02</td>
<td>-5.24***</td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>0.01</td>
<td>0.02</td>
<td>0.26</td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>0.13</td>
<td>0.02</td>
<td>7.39***</td>
</tr>
<tr>
<td>Model 2: Between Subjects Effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment status</td>
<td>0.00</td>
<td>0.01</td>
<td>0.19</td>
</tr>
<tr>
<td>Model 3: Moderating Effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On day</td>
<td>0.01</td>
<td>0.01</td>
<td>0.51</td>
</tr>
<tr>
<td>On pain level</td>
<td>-0.03</td>
<td>0.04</td>
<td>-0.83</td>
</tr>
<tr>
<td>On pain willingness</td>
<td>-0.04</td>
<td>0.04</td>
<td>-0.86</td>
</tr>
<tr>
<td>On activity engagement</td>
<td>-0.02</td>
<td>0.03</td>
<td>-0.56</td>
</tr>
</tbody>
</table>

*Note. N = 63.*
*p ≤ .05. ** p ≤ .01. *** p ≤ .001.

The results of the multilevel models for acceptance and control show that daily levels of control are a function of day, pain intensity, and pain-related acceptance (Table 11). Activity engagement and control appraisals related in the way predicted in this hypothesis, such that increased levels of activity engagement were associated with increased levels of perceived control. Pain willingness did not relate to control appraisals. There was an effect for pain intensity, such that increased pain was related to lower levels of perceived control. The effect for Day suggests that control appraisals decreased across time. Treatment status did not yield
between subject differences in initial levels of control nor differences in the strength of the relationship between pain level, acceptance, and control.

Acceptance and Pain Interference

The third hypothesis specified that participants with high levels of acceptance would report lower levels of headache pain interference in their daily activities, regardless of headache pain intensity. Hierarchical regression analyses were performed to determine the potential value of acceptance in predicting pain interference beyond demographics and pain severity. Predictors were entered in a forward inclusion method with demographic variables entered at step one, pain severity at step two, and the pain-related acceptance subscale (pain willingness or activity engagement) in the final step (Tables 12 and 13).

Results indicate that pain interference is a function of years since onset of migraine headaches, pain severity, and both aspects of pain-related acceptance. Participants who had experienced migraines for longer had increased levels of pain interference. Pain severity was a predictor and remained so after the inclusion of acceptance variables. Participants who experienced higher levels of pain endorsed more pain interference. In the full models with all variables entered, years since onset of migraine headaches was no longer significant. Higher levels of both types of pain-related acceptance (pain willingness and activity engagement) were associated with lower levels of pain interference. Hypothesis 3 is partially supported by these findings, as acceptance did predict pain interference, however, so did pain severity.
Table 12
Summary of Hierarchical Regression Analysis for Pain Willingness Predicting Pain Interference

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>R²</th>
<th>Adj R²</th>
<th>R² change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.85</td>
<td>.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-.08</td>
<td>.10</td>
<td>-.09</td>
<td></td>
<td>0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.04</td>
<td>.01</td>
<td>.43</td>
<td></td>
<td>3.58***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.28</td>
<td>.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-.07</td>
<td>.08</td>
<td>-.08</td>
<td></td>
<td>-.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.02</td>
<td>.01</td>
<td>.27</td>
<td></td>
<td>2.48*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>.57</td>
<td>.12</td>
<td>.49</td>
<td></td>
<td>4.75***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.97</td>
<td>.67</td>
<td></td>
<td></td>
<td>-.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-.04</td>
<td>.08</td>
<td>-.05</td>
<td></td>
<td>1.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.02</td>
<td>.01</td>
<td>.20</td>
<td></td>
<td>3.75***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>.44</td>
<td>.12</td>
<td>.38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>-.05</td>
<td>.02</td>
<td>-.33</td>
<td></td>
<td>-3.29**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 74.
* p<.05, ** p<.01, *** p<.001

Table 13
Summary of Hierarchical Regression Analysis for Activity Engagement Predicting Pain Interference

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>R²</th>
<th>Adj R²</th>
<th>R² change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.85</td>
<td>.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-.08</td>
<td>.10</td>
<td>-.09</td>
<td></td>
<td>0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.04</td>
<td>.01</td>
<td>.43</td>
<td></td>
<td>3.58***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.28</td>
<td>.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-.07</td>
<td>.08</td>
<td>-.08</td>
<td></td>
<td>-.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.02</td>
<td>.01</td>
<td>.27</td>
<td></td>
<td>2.48*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>.57</td>
<td>.12</td>
<td>.49</td>
<td></td>
<td>4.75***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.97</td>
<td>.67</td>
<td></td>
<td></td>
<td>-.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-.06</td>
<td>.07</td>
<td>-.08</td>
<td></td>
<td>-.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.01</td>
<td>.01</td>
<td>.16</td>
<td></td>
<td>1.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>.51</td>
<td>.11</td>
<td>.45</td>
<td></td>
<td>4.78***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>-.05</td>
<td>.01</td>
<td>-.39</td>
<td></td>
<td>-4.12***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N=74.
* p<.05, ** p<.01, *** p<.001
The daily diary analyses yielded similar findings. The within subjects model indicates that pain level and both aspects of pain-related acceptance predicted daily levels of pain interference, in the directions expected. Higher pain levels were related to more pain interference. Higher pain-related acceptance was related to less pain interference. Treatment status was explored in a second model as a between group difference. Treatment status had an effect on participants' overall values of pain interference, such that people who were in treatment had increased levels of pain interference. In the model testing interaction effects, treatment also interacted significantly with pain level to predict higher pain interference.

Table 14.

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: Within Subjects Factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day</td>
<td>0.01</td>
<td>0.01</td>
<td>1.65</td>
</tr>
<tr>
<td>Pain Level</td>
<td>0.78</td>
<td>0.04</td>
<td>19.27***</td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>-0.10</td>
<td>0.02</td>
<td>-4.60***</td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>-0.08</td>
<td>0.02</td>
<td>-3.66***</td>
</tr>
<tr>
<td>Model 2: Between Subjects Effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Status</td>
<td>1.36</td>
<td>0.61</td>
<td>2.24*</td>
</tr>
<tr>
<td>Model 3: Moderating Effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On day</td>
<td>-0.01</td>
<td>0.01</td>
<td>-1.03</td>
</tr>
<tr>
<td>On pain level</td>
<td>0.19</td>
<td>0.08</td>
<td>2.27*</td>
</tr>
<tr>
<td>On pain willingness</td>
<td>0.04</td>
<td>0.04</td>
<td>0.90</td>
</tr>
<tr>
<td>On activity engagement</td>
<td>0.01</td>
<td>0.06</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Note. N = 63.
*p ≤ .05. ** p ≤ .01. *** p ≤ .001.
Acceptance and Avoidance of Daily Activities

The fourth hypothesis was that individuals with higher levels of pain-related acceptance would report less avoidance of daily activities. Because acceptance is conceptually the opposite of avoidance, the dependent measure used to test this hypothesis is overall level of general activity from the WHYMPI. Hierarchical regression analyses were performed to determine the potential role of acceptance in predicting general activity beyond demographics and pain severity. Predictors were entered in a forward inclusion method within demographic variables at step one, pain severity at step two, and the pain acceptance subscale (pain willingness or activity engagement) in the final step (Tables 15 and 16). Pain severity was not related to general activity level. People who endorsed higher activity engagement engaged in higher levels of general activity. In other words, people who indicated they are more willing to do things that are important to them even when they have pain were more likely to actually be out engaging in activities. Pain willingness was not related to general activity levels, \( p > .05 \). These data provide partial support for hypothesis 4.
Table 15
Summary of Hierarchical Regression Analysis for Variables Predicting General Level of Activity

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>(R^2)</th>
<th>Adj (R^2)</th>
<th>(R^2)change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.35</td>
<td>.31</td>
<td>.020</td>
<td>.020</td>
<td>.020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.09</td>
<td>.08</td>
<td>.15</td>
<td>1.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>-.00</td>
<td>.00</td>
<td>-.03</td>
<td>-.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.74</td>
<td>.44</td>
<td>.042</td>
<td>-.003</td>
<td>.022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.09</td>
<td>.08</td>
<td>.15</td>
<td>1.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.00</td>
<td>.01</td>
<td>.02</td>
<td>.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>-.14</td>
<td>.12</td>
<td>-.16</td>
<td>-1.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.64</td>
<td>.70</td>
<td>.043</td>
<td>-.018</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.09</td>
<td>.08</td>
<td>.14</td>
<td>1.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.00</td>
<td>.01</td>
<td>.02</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>-.13</td>
<td>.12</td>
<td>-.15</td>
<td>-1.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>.00</td>
<td>.01</td>
<td>.03</td>
<td>.19</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. \(N = 74\).

\(*p<.05, \,**p<.01, \,***(p<.001

Table 16
Summary of Hierarchical Regression Analysis for Variables Predicting General Level of Activity

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>(R^2)</th>
<th>Adj (R^2)</th>
<th>(R^2)change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.35</td>
<td>.31</td>
<td>.020</td>
<td>.020</td>
<td>.020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.09</td>
<td>.08</td>
<td>.15</td>
<td>1.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>-.00</td>
<td>.00</td>
<td>-.03</td>
<td>-.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.74</td>
<td>.44</td>
<td>.042</td>
<td>-.003</td>
<td>.022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.09</td>
<td>.08</td>
<td>.15</td>
<td>1.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.00</td>
<td>.01</td>
<td>.02</td>
<td>.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>-.14</td>
<td>.12</td>
<td>-.16</td>
<td>-1.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.65</td>
<td>.69</td>
<td>.100</td>
<td>.043</td>
<td>.058</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.09</td>
<td>.08</td>
<td>.14</td>
<td>1.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since migraine onset</td>
<td>.01</td>
<td>.01</td>
<td>.09</td>
<td>.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain severity (WHYMPI)</td>
<td>-.11</td>
<td>.11</td>
<td>-.13</td>
<td>-.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>.02</td>
<td>.01</td>
<td>.26</td>
<td>2.01*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. \(N = 74\).

\(*p<.05, \,**p<.01, \,***(p<.001
Stability of Acceptance

The fifth hypothesis was that pain-related acceptance would be similar across time. Paired sample t-tests indicated that pain willingness and activity engagement were different at Time 1 and Time 2, $t(69) = -4.26$, $p<.001$ and $t(69) = -3.05$, $p<.01$, respectively. However, overall acceptance (of difficult internal states in general, rather than specifically pain) was similar at time one and time two (Figure 1), $t(71) = -.942$, $p>.05$. These data do not support hypothesis 5, which was a strict test of pain-related acceptance. However, it is interesting that overall acceptance was more stable across time (Figure 2), and may have implications for targets during treatment of migraine headache sufferers.

![Figure 1. Activity engagement and pain willingness at time 1 and time 2](image-url)
The sixth hypothesis was that acceptance of pain would be unrelated to intensity of pain. The severity of pain subscale of the WHYMPI and each subscale of the CPAQ were compared to estimate the strength of this relationship. Pain severity was correlated with both subscales of the CPAQ. Pain severity correlated with the activity engagement scale, \( r (72) = -0.28, p < 0.05 \), and with the pain willingness scale, \( r (72) = -0.39, p \leq 0.001 \). The WHYMPI represents a proximal measure of pain severity, as it includes questions that target pain level at time of completing the items. Participants' mean pain level reported for their headaches in general at their initial screening for the study also correlated with pain willingness, \( r (72) = -0.24, p < 0.05 \), but not with activity engagement, \( r (72) = 0.03, p > 0.05 \). These data do not support hypothesis 6.
As a follow up analysis to further explore the relation between acceptance and pain intensity, the correlations between general acceptance (i.e., acceptance not related to pain) and pain intensity variables were examined. General acceptance, as measured by the AAQ, was unrelated to pain severity, $r (72) = -.07$, $p > .05$, and was also unrelated to mean pain levels reported by participants at entry into the study, $r (72) = .04$, $p > .05$.

**Acceptance and Levels of Coping**

The seventh hypothesis was that individuals with higher levels of pain-related acceptance would engage in fewer coping strategies than those who endorse lower levels of pain-related acceptance. The subscales of the CPCI were used to test this hypothesis. Participants endorsed at the beginning and end of the study how many days in the past seven they used each of a variety of coping strategies. Summary scores for this measure are by type of coping, and yields eight subscales. Table 17 presents a summary of the pattern of findings. Hierarchical regression was used, with education and years since diagnosis entered on the first step, pain severity on the second, and the acceptance scores on the third. Pain willingness was associated with less frequent use of asking for assistance, relaxation, and seeking assistance. Activity engagement was associated with less frequent use of guarding.
This hypothesis was also explored using the daily diary data (Table 18). The within subjects model indicates that participants who had increased pain also engaged in a higher number of coping strategies. Participants who endorsed higher levels of pain willingness engaged in fewer coping strategies, as predicted in this hypothesis. Treatment status did not interact with any of the other predictors to influence number of coping strategies, but did predict mean number of coping strategies used, with people in treatment using more coping strategies that people not in treatment. Hypothesis 7 is partially supported, particularly by the daily diary data.

Table 17
Summary of Hierarchical Regression Analysis for Acceptance Predicting Level of Coping

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain Willingness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guarding</td>
<td>-.04</td>
<td>.02</td>
<td>-.19</td>
<td>-1.70</td>
<td>.094</td>
</tr>
<tr>
<td>Resting</td>
<td>-.06</td>
<td>.03</td>
<td>-.24</td>
<td>-1.90</td>
<td>.062</td>
</tr>
<tr>
<td>Asking for Assistance</td>
<td>-.07</td>
<td>.03</td>
<td>-.34</td>
<td>-2.86**</td>
<td>.006</td>
</tr>
<tr>
<td>Relaxation</td>
<td>-.06</td>
<td>.02</td>
<td>-.30</td>
<td>-2.32*</td>
<td>.024</td>
</tr>
<tr>
<td>Task Persistence</td>
<td>-.03</td>
<td>.03</td>
<td>.11</td>
<td>.83</td>
<td>.409</td>
</tr>
<tr>
<td>Exercise</td>
<td>-.04</td>
<td>.03</td>
<td>-.19</td>
<td>-1.40</td>
<td>.166</td>
</tr>
<tr>
<td>Coping Self-Statement</td>
<td>-.07</td>
<td>.03</td>
<td>-.27</td>
<td>-2.20</td>
<td>.031</td>
</tr>
<tr>
<td>Seeking Assistance</td>
<td>-.07</td>
<td>.03</td>
<td>-.28</td>
<td>-2.21*</td>
<td>.027</td>
</tr>
</tbody>
</table>

Activity Engagement

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guarding</td>
<td>-.05</td>
<td>.01</td>
<td>-.34</td>
<td>-3.26**</td>
<td>.002</td>
</tr>
<tr>
<td>Resting</td>
<td>-.01</td>
<td>.02</td>
<td>-.03</td>
<td>-.25</td>
<td>.801</td>
</tr>
<tr>
<td>Asking for Assistance</td>
<td>.00</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>1.0</td>
</tr>
<tr>
<td>Relaxation</td>
<td>-.01</td>
<td>.02</td>
<td>-.10</td>
<td>-0.76</td>
<td>.450</td>
</tr>
<tr>
<td>Task Persistence</td>
<td>.02</td>
<td>.02</td>
<td>.12</td>
<td>.95</td>
<td>.345</td>
</tr>
<tr>
<td>Exercise</td>
<td>.02</td>
<td>.02</td>
<td>.11</td>
<td>.84</td>
<td>.403</td>
</tr>
<tr>
<td>Coping Self-Statement</td>
<td>.01</td>
<td>.02</td>
<td>.01</td>
<td>.23</td>
<td>.821</td>
</tr>
<tr>
<td>Seeking Assistance</td>
<td>.00</td>
<td>.02</td>
<td>.01</td>
<td>.11</td>
<td>.913</td>
</tr>
</tbody>
</table>

Note. N=74.  
*p<.05, **p<.01, *** p<.001
Table 18.
 Pain-Related Acceptance and Number of Coping Strategies

<table>
<thead>
<tr>
<th>Model 1: Within Subjects Factors</th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>0.01</td>
<td>0.01</td>
<td>0.75</td>
</tr>
<tr>
<td>Pain Level</td>
<td>0.13</td>
<td>0.04</td>
<td>3.49***</td>
</tr>
<tr>
<td>Pain Willingness</td>
<td>-0.14</td>
<td>0.03</td>
<td>-4.77***</td>
</tr>
<tr>
<td>Activity Engagement</td>
<td>0.02</td>
<td>0.03</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Model 2: Between Subjects Effects
Treatment Status 1.98 0.61 3.23**

Model 3: Moderating Effects
Treatment Status
On day 0.00 0.02 0.13
On pain level 0.07 0.07 1.04
On pain willingness 0.03 0.06 0.61
On activity engagement -0.02 0.05 -0.36

Note. N = 63.
*p ≤ .05. ** p ≤ .01. *** p ≤ .001.
CHAPTER IV: DISCUSSION

The purpose of the present study was to enhance our understanding of the relation between acceptance, appraisal, and coping among migraine headache sufferers. This study extends this newly developing literature on the role of acceptance in chronic pain to this common and frequently debilitating pain condition. In the following section, major findings of the present study and implications are summarized and discussed, as well as limitations, future research considerations, and recommendations.

Acceptance and Appraisal

Several findings in the present study extend our understanding of how acceptance relates to the two most commonly studied appraisals in chronic pain populations: catastrophizing and control. As expected, higher general levels of pain willingness were associated with lower general levels of catastrophizing. This relationship remained even when controlling for the effect of pain severity. Higher daily levels of pain willingness and activity engagement were also related to lower daily levels of catastrophizing in the daily diary data. In all cases, pain severity remained a significant factor in this relationship.

The only other study located in which catastrophizing and acceptance in chronic pain populations were directly compared yielded a similar pattern of findings. Viane and colleagues (2003) found that higher pain-related acceptance scores were associated with lower levels of catastrophizing. These researchers used a different measure of acceptance that was focused on acceptance of their chronic illness as part of a larger measure assessing the overall impact of illness on daily life.

The relationship found between acceptance and catastrophizing merits further consideration of the manner in which these two concepts relate. McCracken and Eccleston
(McCracken & Eccleston, 2003) have discussed this relationship at length, emphasizing the differences between the two. Catastrophizing is an automatic, negative, and unrealistic interpretation of a situation, in this case pain, with a focus on feared outcomes (McCracken & Eccleston, 2003), whereas acceptance involves a more deliberate choice to come into contact with pain and discontinue the struggle to control it or eliminate it, rather focusing on moving forward with living one’s values (e.g., spending time with family, engaging in meaningful work) (Hayes et al., 2004). McCracken and Eccleston (2003) suggest that acceptance of pain may be a way to reduce frequency and impact of catastrophizing. Viane argued (2003) that acceptance of pain in their study was independent of catastrophizing, and that acceptance of pain is not simply the absence of catastrophizing. Though these authors found that acceptance and catastrophizing had some independence in terms of predicting other variables, they were moderately statistically correlated. Taken together, the data from this study and previous research suggests that these two constructs are related, though they are not equivalent.

Conceptually, the idea that acceptance and catastrophizing are different makes sense. Within the acceptance and commitment therapy framework, from which these research questions for the present study came, cultivating acceptance is distinct from any overt efforts to control internal experience (Hayes & Wilson, 1994). Thus, it is quite likely that catastrophizing thoughts would still remain in people who have high levels of acceptance. In the present study, the strength of the relationship between acceptance and catastrophizing varied across the study, suggesting that other factors influence this relationship. Within an acceptance framework, it is not surprising that people would continue to have catastrophizing thoughts but not feel a need to respond to them either by struggling with them mentally or changing their behavior to get those thoughts to stop. At the same time, the negative relationship observed between catastrophizing
and acceptance indicates that there is less of one when there is more of the other (though the examination of causal relationships was beyond the scope of the present study). Closer examination and, in particular, prospective studies of how acceptance and catastrophizing relate is clearly warranted and is being considered by other research labs (e.g., (McCracken & Eccleston, 2003).

Although this hypothesis was supported, the importance of pain severity was not wholly anticipated. Other researchers in the acceptance and chronic pain area have not observed a relationship between pain severity and acceptance. McCracken (McCracken, 1998, 1999) found that higher levels of acceptance were not associated with lower levels of pain.

Contrary to expectation, general levels of pain-related acceptance were not related to general levels of control. Daily ratings of activity engagement were related to daily levels of control however, such that higher levels of activity engagement were associated with higher levels of perceived control. There was a trend for time such that daily perceived control decreased across the 28-day daily diary period. No change in general perceived control was detected on the general measures at the beginning and end of the study.

Other researchers have found a positive association between control and pain-related acceptance (Geisser, 1992; Viane et al., 2003). On the surface, this appears to run counter to one of the central tenets behind acceptance, which involves giving up attempts to control negative internal sensations (thoughts, feelings, pain) when such efforts have been unsuccessful in the past. However, learning that one does not need to directly control an internal event in order to live life more fully may lead to a sense of increased control. Within this framework, control may be less about being able to control pain, but rather controlling the role pain plays in one's life, or how one responds to pain. These fine-grained distinctions about control and acceptance are
interesting and merit further investigation. Although qualitative research is relatively rare in psychological research, the fact that this is a new area, and that what is meant by control when individuals rate themselves highly in it is poorly understood, it would be helpful to conduct qualitative research to better understand what people consider control in order to create measures that better assess this construct. In the present study, only four items in the background questionnaires directly asked about control, and one in the daily diary data. Thus, these results are interesting, but preliminary.

In terms of intervention, at the present time acceptance-focused interventions discuss explicitly giving up control, which, in western society, is not an easily embraced concept (Hayes & Wilson, 1994). It would be a valuable contribution to the literature to compare different strategies of promoting acceptance, one that involves giving up of the need to control pain, while focusing on moving one's life in a valued direction (i.e., the traditional acceptance route), and the other more directly focused on modifying where one applies control strategies. In this second intervention strategy, the focus would be on teaching people to use control strategies to control how one responds to pain, rather than trying to directly control the pain experience itself. More broadly, the increased control people with high acceptance report may be about control over how one's life is lived. Exposure techniques may reduce emotional reactions and help people notice that pain is more varied or less severe than previously believed (e.g., gets people in touch with their experience instead of focusing on their beliefs).

This possibility is acknowledged by other pain researchers. Viane and colleagues (2003) and Risdon and colleagues (2003) discuss the possibility that acceptance may be more about acknowledging that disability and hopelessness are not inevitable consequences of pain, and that better outcomes can be had by taking control of such pain related thoughts. Hayes and Wilson
(1994) also discuss this possibility; that cognitive control is required in order to refrain from struggling and pushing against a negative experience. Tan and colleagues (2002) found that control appraisals are multidimensional, possessing at least six different dimensions. In summary, as McCracken (1998) articulated, there may be more than one route to the acceptance of pain.

Acceptance and Coping

As hypothesized, migraine headache sufferers who endorsed higher daily levels of acceptance engaged in fewer coping strategies. In Lazarus and Folkman's (1984) model of primary and secondary appraisal, the perception that an event is not threatening or potentially harmful, or that one has the resources to respond to such an event, would be expected to result in a reduced frequency of coping strategies. Thus, this finding provides support that acceptance may function as a type of appraisal.

Within an acceptance framework, and the focus of dropping the struggle to make pain go away in order to engage in important activities, it is expected that a person would potentially endorse fewer coping strategies. Because this is the first test to date of the relationship between acceptance and number of coping strategies however, it requires replication and further exploration. To further our understanding of acceptance and coping, it would be valuable to explore how acceptance and different types of coping strategies relate to one another.

Exploratory analyses indicated that people who were in treatment used more coping strategies than people who were not in treatment. In the present study, this difference was not merely a function of pain level, as the two groups (in treatment and not in treatment) endorsed similar levels of headache pain. The in treatment group did endorse higher levels of pain interference, which may be responsible for the difference. It is also possible that people who
participate in treatment receive information about ways to cope with headache pain, and thus adhere to a more coping-centric view of how to respond to their pain condition. Acceptance-based treatments do not include coping strategies as part of how to get better, because the focus is on participating in and living a valued life regardless of pain. Future research examining this relationship pre-and post different types of migraine treatment would further clarify the processes that may be at work.

Acceptance and Functioning Outcomes

The hypothesis that people with higher levels of pain-related acceptance would endorse lower levels of pain-related interference was supported. General levels of both types of pain-related acceptance were related to pain interference, such that increased acceptance was associated with less pain interference. The daily diary data yielded the same pattern, with higher daily levels of activity engagement and pain willingness associated with lower levels of pain related interference.

Contrary to expectation, headache pain intensity was significantly related to pain-related interference, with higher levels of pain associated with higher levels of interference. Other researchers have had mixed findings regarding acceptance, pain severity, and interference. McCracken (1998) found that pain significantly predicted other types of patient functioning, including pain related anxiety, avoidance, depression, physical disability, psychosocial disability, and work status. However, in another study, McCracken and colleagues found pain severity to be unrelated to a variety of adaptive outcomes (1998). Thus, it appears that the relative importance of acceptance and pain severity in accounting for adaptive outcomes may vary. It is possible that different types of pain conditions yield different relationships between these two constructs. Alternatively, perhaps where a person is within the treatment continuum makes a difference in
the nature of this relationship (e.g., people who have tried all medical approaches may have a weaker relationship between pain severity and outcomes than someone who is just starting to explore ways to manage their condition) (Hayes, Bissett et al., 1999; McCracken, Vowles et al., 2005).

The hypothesis that higher general levels of acceptance would be associated with lower levels of activity avoidance was only partially supported. One aspect of pain-related acceptance, activity engagement, was positively related to general activity, such that people who endorsed choosing to pursue valued activities even with pain did engage in higher levels of general activity. Unlike the acceptance and pain-related interference relationship, pain did not influence general activity level. This is a good reminder that pain level needs to be attended to separately when considering how people are functioning. Because this study was an assessment only, it does not really speak to the possibility that pain could play less of a role in pain interference. Outcome research that has been done with more general pain populations have found that the pain/pain interference relationship is weaker after multidisciplinary pain treatment (Geisser, 1992). An extension of the present study that takes people with migraine headaches, completes an acceptance intervention with them and measures this relationship pre- and post-treatment would be a really helpful contribution to this body of knowledge.

People who were in treatment endorsed higher levels of pain interference. Although it was not formally assessed at intake into the study, people were asked about medication usage. The most common types of treatment people mentioned were over the counter and/or prescription medications to take during migraine attacks. Several participants were receiving more multidisciplinary types of treatment. More thorough questioning of current and previous types of treatment was beyond the scope of this study. However, it is certainly possible that
different treatment approaches would yield different outcomes in terms of pain interference. Taking over the counter or prescription medications at the onset of pain may lead to different perceptions of how to respond to pain as compared to traditional multidisciplinary pain treatment programs in which effective functioning and learning to live with pain is the predominant focus. An acceptance-based focus in multidisciplinary treatment programs may also be more effective at reducing pain interference than medication focused treatment. This is an empirical area worthy of further investigation, given the economic and psychological impact migraine headache conditions often have on people.

Temporal Stability of Acceptance

The hypothesis that acceptance of headache pain would be similar across the length of the study was not supported. Both pain willingness and activity engagement increased significantly from when participants enrolled in the study to after having completed the daily dairy. This may be an example of the reactivity that can occur with self-monitoring. As other researchers have found in daily diary research, self-monitoring can lead people to learn more about their pain, such as daily fluctuations, actual levels of pain, effective coping strategies (e.g., Affleck, Zautra, Tennen, & Armeli, 1999). The change of pain willingness level across the study was actually the same magnitude the change in level of pain willingness in as one of the acceptance based treatment outcomes studies conducted on chronic pain patients (McCracken, Vowles et al., 2005).

At the end of the present study, participants were asked about what it was like to monitor their headaches, coping, and thoughts and feelings about headache pain for a month. Many participants reported using the list of coping strategies as a list of “possibilities”, and implemented them to determine what kind of effect they had on their headache activity. Others
noted misperceptions they'd had about their headache frequency or intensity. For example, one participant noted that the daily diary monitoring changed his way of looking at his headaches, because he has more headache free days than he had originally thought. He reported that prior to the study he believed he had headaches every day and did not "use [his] time well" (personal communication, 2007) on headache free days. Though anecdotal, these communications suggest the change people demonstrated across time in the present study involved reactivity to the daily diary. It may be that people were able to observe, by getting in contact with their daily experience, how much pain was interfering with their daily lives and tried to identify ways to have it interfere to a lesser degree. At least two people brought their daily diaries to their primary care doctors to show them what they were experiencing and were going to be starting preventive medications. Another participant contacted me a month after the study to ask about local resources for getting headache treatment.

The comments people gave regarding the daily diary at the end of the study also highlights the awareness (or lack thereof) that people often have with trying to control internal experience. A few participants spontaneously expressed awareness that control efforts were ineffective. Future research should have a more explicit method of collecting information about awareness, as this may be an important moderator variable in the relationship between acceptance and outcomes.

The two aspects of pain-related acceptance, pain willingness and activity engagement, were differentially related to variables of interest in the present study. This is similar to research by McCracken, Vowles, and Eccleston (2004), who found that the different subscales had different patterns of findings. This, and the moderate relationship found between the subscale scores in the present study, provides continued support for considering acceptance as a
multidimensional construct. Activity engagement is about pursuing life activities even when pain may be present. This is more than an attitude or perspective one might have about their pain, it reflects engaging in behavior and participating in a variety of important life activities regardless of pain. Pain willingness is more of a mental attitude or perspective involves the recognition that it is not effective to avoid or control pain (Viane et al., 2003).

The measures assessing acceptance in general did not vary across time, whereas pain-related acceptance did. This provides some discriminate validity support for the CPAQ. A formal treatment intervention and an examination of the changes in general acceptance and pain related acceptance would further clarify the degree to which each of these may change. To the degree that this finding that overall acceptance remains steady and pain-related acceptance varies is reliable, it highlights the potential importance of gearing acceptance-based treatments on increasing that specific area of acceptance (i.e., learning to accept pain experience) rather than acceptance in general (i.e., learning to accept internal experiences, thoughts, feelings, sensations that are related and unrelated to pain). Focusing acceptance-based treatment appropriately may ultimately lead to better treatment outcomes in chronic pain populations.

Pain severity was related to both types of pain-related acceptance, both at the beginning of the study and in the daily diary data. McCracken (1998) found that acceptance and pain intensity correlated at -.28, and suggested this indicates that acceptance is not simply a function of having a low level of pain. Viane and colleagues (2003) found that people with higher levels of pain acceptance had lower levels of pain severity. McCracken and colleagues (2004) found that pain willingness but not activity engagement was significantly related to pain intensity, such that increased activity engagement corresponded to lower levels of pain intensity. Although pain intensity was also related to a variety of treatment outcomes in another recent study,
catastrophizing and acceptance accounted for more of the variance in those outcomes (Vowles, McCracken, & Eccleston, in press).

Some of the differences observed between the present study and other studies in acceptance and chronic pain may involve the manner in which people were recruited. The majority of research to date published in this area involves recruiting people who are treatment seeking, or are enrolled in a treatment program. Among studies of people who aren't in treatment, one of the common areas of focus is providing and then comparing one treatment to another (i.e. treatment outcome studies), or providing a single treatment in a pre-post quasi-experimental design. The present study, as mentioned earlier, was geared to assessing the relationships between acceptance, appraisal, pain, and coping among people who are not treatment seeking. Thus, the possibility exists that these people are different in ways from populations studied before. For example, they may have had less severe pain problems than people in other published research. The acceptance scores in the present study were equivalent to what other researchers found in chronic pain populations after acceptance-based chronic pain treatment (e.g., McCracken, Vowles et al., 2005). Also, that many of them did not know about their diagnosis of migraine headaches may make them different than other participants in other studies. Interestingly, however, that a sizeable portion of the sample was receiving some type of treatment, and treatment did not predict outcomes in most analyses, speaks to the likelihood that the degree to which differences exist is likely small.

One of the areas that is worthy of further development is that of strengthening the understanding of the construct of acceptance. Much of the research to date in this area, and certainly within the chronic pain area, has involved researchers defining acceptance. However, it would be valuable to ask participants about how they interpret acceptance-based questions. It is
clear from the present study as well as the others reviewed here that acceptance reflects a process that is important in chronic pain experience. Accepting having migraine headaches *in general* (i.e., being a person who gets them) may be different than accepting migraine pain on any specific occasion. Knowing how people interpret these questions by formally evaluating it would provide additional clarity about what people who are “high in acceptance” are actually experiencing internally, aiding with interpretation of future research findings and development of acceptance-based treatment approaches.

One of the strengths of this study was the multimethod approach used. Both self-report questionnaires, and daily dairy data were used to measure the relationships between the constructs of interest. In the majority of analyses these relationships were comparable, lending strength to the findings. Future researchers in this area should consider similar types of multimethod design, as it can strengthen conclusions and enhance understanding and, as necessary, refinement of the construct of acceptance. Another strength of this study was the clarification of whether headache pain on any given day was migraine and non-migraine pain. Much of the research literature on the epidemiology of headaches, and diagnostic issues (Lipton, Stewart, & Scher, 2001) acknowledge that most people get more than one type of headache, and if they get migraine headaches they likely also get other types of headaches (most commonly tension or sinus headaches). On the other hand, this benefit was limited by the variation in degree to which people were aware that they get migraine headaches. The accuracy of one's self-assessment of whether current headache pain is migraine or non-migraine headache pain likely varies widely, and could be its own area of investigation. Particularly, it is questionable that people who were unaware of their migraine headaches as migraine until entry into the study would be able to accurately perceive the difference between migraine and non-migraine
headaches. However, the perception that they are different is still quite interesting, and thus warranted observation in this study. Finally, dropout rates in the current study were quite low. Almost everyone who began the study completed the study.

Several limitations of the present study also warrant mention. As mentioned earlier, awareness of having a migraine headache disorder varied. Thus, this study has two groups that were not statistically compared. The label of migraine headaches may impact one's relationship with a condition. In the present study, several participants did not believe their headaches were migraine because they did not seem “that bad.” Another person, who acknowledged that she gets migraines, stated she would never endorse a pain of 10, because that would mean it was “the worst possible”, and that she "could not emotionally handle that reality” (personal communication, 2007). Not only does this highlight the importance of language in these participants’ experience (i.e., the way of describing pain as more important than the actual sensation); it also highlights some interesting future areas of research. Though more real-world in nature, the heterogeneous sample in the present study (e.g., difference in awareness, treatment status, gender) may obfuscate findings and patterns that may exist. However, to the degree that we can be confident in the findings of the present study, this provides valuable information about what people in the community who are not in multidisciplinary pain treatment programs experience with regard to their thoughts and feelings and ways of responding to migraine headache pain.

Although in the present study the differences in how people completed the study did not vary in the outcome measures of the study, it would have been stronger methodologically to have some nonlocal participants complete a paper and pencil version as well. This was not feasible, however. Additionally, given the type of data collected, it is likely that there would not have
been differences in patterns of responses (Meade, Michels, & Lautenschlager, 2007; Stanton, 1998). Another limitation was the sizeable minority of people who completed the diary pages incorrectly. Additional training at the beginning of the study (i.e., having a participant complete a daily diary page during the initial meeting as if they had a headache and a daily diary page as if they did not have a headache) might have reduced the number of people who made this error. Additionally, technological glitches blocked participants from the server on which the surveys were housed during a system upgrade, and, many popular emails services upgraded their spam filters the same day and caused many online participants to not get surveys for several days.

All of these data were obtained using self-report measures. Thus, common method variance is a limitation, and may have yielded artificially high relationships between the measures. Future research may be strengthened by the inclusion of behavioral observations by others, or including more objective variables such as workplace absenteeism in order to assess pain interference in daily activities, and some observable coping strategies. These types of studies, of course, may best be conducted in a workplace-type intervention and would require buy-in from key stakeholders. Given that chronic pain conditions frequently impact those around the person with chronic pain (i.e., friends, family, coworkers), it would be helpful to consider future research that includes such other people reporting about observations and rate the chronic pain sufferer on various behavioral dimensions. Also, this was a self-selected sample, limited to people who respond to advertisements for research (cite these differences)

In close, this study further strengthens the evidence base that acceptance is a construct worth exploring that may have relevance in the experience of migraine pain. Acceptance continues to show promise as a way of viewing pain that less then detrimental impact of certain types of thoughts (i.e., catastrophizing), and lead to increased participation in daily life.
REFERENCES


Appraisal, coping, and migraine

*Review of Psychology, 54.*


induced headaches. *Journal of Behavioral Medicine, 10*, 411-423.


Appraisal, coping, and migraine

Hopkins University Press.


headache in the united states. *Journal of the American Medical Association*, 267, 64-69.


APPENDIX A:

INTERNATIONAL HEADACHE SOCIETY DIAGNOSTIC CRITERIA FOR
MIGRAINE WITHOUT AURA
International Headache Society Definition of Migraine Without Aura

1.1 Migraine without aura

Diagnostic criteria:

A. At least five attacks fulfilling B-D

B. Headache 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 (see reference below)
   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

Adapted from Headache Classification Committee of the International Headache Society. Classification and diagnostic criteria for headache disorders, cranial neuralgias, and facial pain. Cephalalgia 1988 (Suppl 7): 1-96
APPENDIX B:

INTERNATIONAL HEADACHE SOCIETY DIAGNOSTIC CRITERIA FOR

MIGRAINE WITH AURA
International Headache Society Definition of Migraine With Aura

1.2 Migraine with aura

Diagnostic criteria:

A. At least two attacks fulfilling B

B. At least three of the following four characteristics:
   1. One or more fully reversible aura symptoms indicating focal cerebral cortical
      and/or brainstem dysfunction
   2. At least one aura symptom develops gradually over more than 4 minutes or two 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 (see reference below)
   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:

ABBREVIATED IHS DIAGNOSTIC INTERVIEW FOR HEADACHE
 STRUCTURED DIAGNOSTIC INTERVIEW FOR HEADACHE

Name:__________________ Date:___________ Age:_______ Sex: M F
Interviewer:_____________________________________________________

2. **Do you get more than one type of headache?**
   ____Yes  ____No
   If yes-
2a. How many? _____ complete a separate interview for each type of headache  #1  #2  #3

   **Never (N) = 0%, Seldom (Sd) = 1-33%, Sometimes (S) = 34-66%, Usually (U) = 67-99%, Always (A) = 100%**

3a. For what proportion of the patient’s HAs is the pain location:
   (1) **Unilateral:** N  Sd  S  U  A  
   (2) **Not Unilateral:** N  Sd  S  U  A

3b. Select all pain locations that apply to this type of headache (you MUST check at least one)
   ____ frontal (A)  ____temporal (B)  ____ occipital (C)  ____orbital (D)  ____supraorbital (E)

3c. Select all that apply:  ____ top of head (F)  ____base of the neck (G)  ____nasal/facial (H)

4. **What is the intensity of pain that you experience with a typical headache of this type? (1-10)**

   0  1  2  3  4  5  6  7  8  9  10
   No Headache  Slightly Painful  Mildly Painful  Painful  Very Painful  Extremely Painful
5. Which of the following describe your headache pain?

<table>
<thead>
<tr>
<th>CHARACTERISTICS OF PAIN</th>
<th>FOR WHAT PROPORTION OF HEADACHES DOES IT OCCUR</th>
<th>IS IT PRESENT THE ENTIRE HEADACHE</th>
<th>AT WHAT INTENSITY OF PAIN DOES IT OCCUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Pulsating</td>
<td>(1) ___ Always ⇔ ___ Usually ⇔ ___ Sometimes ⇔</td>
<td>(2) ___ No ⇔ ___ Yes X</td>
<td>(3) ___ Least ___ Intermediate ___ Worst</td>
</tr>
<tr>
<td></td>
<td>___ Seldom ⇔ ___ Never X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Pressing/tightening (non-pulsating)</td>
<td>(1) ___ Always ⇔ ___ Usually ⇔ ___ Sometimes ⇔ ___ Seldom ⇔ ___ Never X</td>
<td>(2) ___ No ⇔ ___ Yes X</td>
<td>(3) ___ Least ___ Intermediate ___ Worst</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Dull ache</td>
<td>(1) ___ Always ⇔ ___ Usually ⇔ ___ Sometimes ⇔</td>
<td>(2) ___ No ⇔ ___ Yes X</td>
<td>(3) ___ Least ___ Intermediate ___ Worst</td>
</tr>
<tr>
<td></td>
<td>___ Seldom ⇔ ___ Never X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Cap or bandlike</td>
<td>(1) ___ Always ⇔ ___ Usually ⇔ ___ Sometimes ⇔</td>
<td>(2) ___ No ⇔ ___ Yes X</td>
<td>(3) ___ Least ___ Intermediate ___ Worst</td>
</tr>
<tr>
<td></td>
<td>___ Seldom ⇔ ___ Never X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Is your typical headache pain aggravated by routine physical activities? (i.e., walking, lifting, bending, etc.) ___ Yes ___ No

7. In addition to pain, are there other symptoms associated with your headache episodes? ** ask open ended questions and circle answers below, then prompt patient to determine if any other symptoms are present.

Do you experience any of the following during a headache?

Never (N) = 0%, Seldom (Sd) = 1-33%, Sometimes (S) = 34-66%, Usually (U) = 67-99%, Always (A) = 100%

**HEADACHE SYMPTOM**

a. Loss of appetite: N  Sd  S  U  A
b. Nausea: N  Sd  S  U  A
c. Vomiting: N  Sd  S  U  A
d. Ringing in ears: N  Sd  S  U  A
e. Headache worsened by conversational noise levels (phonophobia): N  Sd  S  U  A
f. Headache worsened by normal light (photophobia): N  Sd  S  U  A
g. Dizziness: N  Sd  S  U  A
h. Scalp tenderness: N  Sd  S  U  A
8. **Interviewer: In your clinical judgment, which of the following symptoms are a predominant feature of this headache type (presume the headache is untreated)?**
   a. Pain Location (select one and one only): (1) ___ unilateral (2) ___ not unilateral
   b. Pain Characteristics (select one and only one):
      (1) ___ pulsating (2) ___ pressing/tightening (non-pulsating) (2) ___ Other: __________

SELECT ALL THAT APPLY OF THE FOLLOWING

c. ___ Nausea
d. ___ Vomiting
e. ___ Headache worsened by conversational noise levels (phonophobia)
f. ___ Headache worsened by normal light (photophobia)

9. **How many days per month do you have headache pain? ____ days**
   9a. **If patient reports 3 or less headache days per month, then get headache rating for the most severe headache. __________**

10. **How many separate headaches do you have per month? _______** (**if headache is unremitting, enter “30”)

11. **How long have they been occurring at this rate? _______ months or _______ years**

12. **Total number of headaches ever experienced? ___ 1 ___ 2-4 ___ 5-9 ___ >10**

13. **How old were you when you first started having problem headaches? (age of onset in years) ______**

14. **Has anything about this headache (except frequency) changed in the last six months? ___ Yes ___ No**

15. **How long does the headache last if untreated or unsuccessfully treated? (** if the patient falls asleep and wakes up without a headache, the duration of the attack is until waking up. Check unremitting headache if patient reports never experiencing a headache of less than 7 days in duration). Indicate Minutes, Hours, Days**

<table>
<thead>
<tr>
<th>UNREMITTING</th>
<th>TYPICAL AVERAGE</th>
<th>TYPICAL MINIMUM</th>
<th>TYPICAL MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>M H D</td>
<td>M H D</td>
<td>M H D</td>
<td>M H D</td>
</tr>
</tbody>
</table>

15a. **Select a category that best represents the range of duration of typical headaches** (check only one)

   ___ (1) 15 to 180 minutes
   ___ (2) 30 minutes to 7 days
   ___ (3) 4 to 72 hours
   ___ (4) more than 72 hours, and headache is continuous throughout the attack or interrupted by headache free intervals lasting less than four hours (interruption during sleep is disregarded.
   ___ (5) more than 7 days

16. **Does this headache have severe unilateral, orbital, supraorbital, and/or temporal pain, and/or does the interviewer suspect a cluster-type headache? ___ Yes ___ No**
   If Yes, go to Appendix 1 and complete #37, 38, and #40 If No, go to #19

17. **Do you ever notice any symptoms before the headache pain begins? ___ Yes ___ No**
   If yes, and if any of the reported symptoms provide evidence of a focal cerebral cortical and/or brainstem dysfunction, then continue and inquire about each aura symptom. If No, go to question #29.
Do you experience any of the following before the headache pain begins? (if any occur assess the length of aura in minutes)

Never (N) = 0%, Seldom (Sd) = 1-33%, Sometimes (S) = 34-66%, Usually (U) = 67-99%, Always (A) = 100%

AURA

<table>
<thead>
<tr>
<th>Symptom</th>
<th>N</th>
<th>Sd</th>
<th>S</th>
<th>U</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Partial loss of sight (scotoma)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circle which eye(s) is/are affected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circle which visual field(s) is/are affected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Scintillation</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>c. Blurred vision</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>d. Fortification spectra (zig-zag lines)</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>e. Double Vision</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>f. Tingling or numbness (parathesias)</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>Circle affected area (select one)</td>
<td>Right</td>
<td>Left</td>
<td>Both</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Weakness (paresis)</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>Circle affected area (select one)</td>
<td>Right</td>
<td>Left</td>
<td>Both</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Uncoordinated movements (ataxia)</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>i. Dizziness (vertigo)</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>j. Ringing in ears (tinnitus)</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>Circle affected ear (select one)</td>
<td>Right</td>
<td>Left</td>
<td>Both</td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. Decreased hearing</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>l. Decreased level of consciousness</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>m. Aphasia or unclassifiable speech</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>n. Poorly articulated speech (dysarthria)</td>
<td>N</td>
<td>Sd</td>
<td>S</td>
<td>U</td>
<td>A</td>
</tr>
</tbody>
</table>

** If you have checked any aura symptoms you must complete the following:

20. What is the time from start of first aura symptom to end of last symptom (in minutes) _____________
21. What is the time from end of all aura symptoms to start of headache? (in minutes) ________________
22. Do you ever experience these symptoms (auras) without a headache following? _____ Yes _____ No
   If yes, get approximate number of auras without headaches in the past year: ___________
23. What best describes the aura symptoms (check all that apply):
   _____ a. at least one aura symptom develops gradually over more than 4 minutes or, 2 or more symptoms occur in succession.
   _____ b. no aura symptoms last more than 60 minutes
   _____ c. headache follows aura with a headache-free interval of less than 60 minutes.
24. Is this headache related to any head injury or trauma? ___ Yes ___ No
   If Yes, go to Appendix 2 and complete #41 and 42.
25. What over the counter medications do you take? ____________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
26. What prescription medications do you take? ________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
27. ** Is the patient's typical daily dose of aspirin or acetaminophen for the past three months (or more) 4 or more tablets? _____ Yes _____ No
34. ** Is the typical daily dose of prescription sedatives or analgesics for the past 3 months (or more) 2 or more tablets?  
   ____ Yes   ____ No

35. ** Has the patient typically used ergotamine 3 or more days per week, used 10 mg. or more of ergotamine per week for the past 3 months (or more):
   ____ Yes   ____ No

36. Do your parents, brothers, or sisters, or children have problem headaches?  ___ Yes   ___ No

36a. Do any of the patient's parents, brothers, sisters, or children have headaches diagnosed by a physician as being migraine?
   ____ Yes   ____ No
APPENDIX 1.

37. **Are any of the following symptoms associated with this headache** (select one)
   a. ______ Red eyes (conjunctival infection)
   b. ______ Tearing or watering eyes
   c. ______ Pupillary constriction
   d. ______ Swollen eyelids
   e. ______ Droopy eyelids
   f. ______ Forehead and facial sweating
   g. ______ Stuffy or runny nose
   h. ______ Other: __________________

38. **How many headaches do you have in a typical headache day?** ____________________________

40. **Select the category that best represents the periodicity of the headache:** (select only one category)
   **a remission phase is defined as a period of at least 14 days with no headache of this type.**
   a. _____ At least two periods of headaches (cluster periods) lasting (untreated patients) from 7
days to one year and separated by remissions (Episodic)
   b. _____ Absence of remission phases for one year or more (Chronic)
   c. _____ Absence of remission periods from onset (Chronic unremitting from onset)
   d. _____ At least one remission period within one year of onset, followed by unremitting course
   for at least one year (Chronic evolved from episodic)
   e. _____ Too early to classify (Periodicity undetermined)

APPENDIX 2.

41. **Were any of these symptoms or test results associated with your head injury?** (select all that apply)
   a. _____ Loss of consciousness
   b. _____ Posttraumatic amnesia lasting more than 10 minutes
   c. _____ Abnormal clinical neurological examination
   d. _____ Abnormal xray of the skull
   e. _____ Abnormal neuroimaging
   f. _____ Abnormal evoked potentials
   g. _____ Abnormal spinal fluid examination
   h. _____ Abnormal vestibular function test
   i. _____ Abnormal neuropsychological testing

42. **How long has the headache continued?** (select most representative category)
   a. _____ headache disappeared within 8 weeks after regaining consciousness (or after trauma if
   there has been no loss of consciousness
   b. _____ headache continued for more than 8 weeks after regaining consciousness (or after trauma
   if there has been no loss of consciousness.

44. **Has the headache frequency increased by 100% (doubled) or more since the trauma?**
   ____ Yes  ____ No
APPENDIX D:

HEADACHE DIAGNOSTIC SYSTEM SAMPLE PRINTOUT
Date: 100199
Patient # 89171

DIAGNOSTIC SUMMARY

1.1 Migraine without aura   Yes

A. At least 5 attacks       Yes
B. Headache attacks lasting 4-72 hours   Yes
C. Headache has at least two of the following characteristics: Yes
   1. Unilateral location  Yes
   2. Pulsating quality   Yes
   3. Moderate or severe intensity Yes
   4. Aggravation by walking stairs or similar routine physical activity Yes
D. During headache at least one of the following: Yes
   1. Nausea        Yes
   2. Vomiting      No
   3. Photophobia and phonophobia No
APPENDIX E:

BACKGROUND INFORMATION QUESTIONNAIRE
Background Information

1. AGE: _____

2. SEX: M    F

3. Current Marital Status:
   ____ Single     ____ Divorced     ____ Separated
   ____ Married/partnered     ____ Widowed

4. Ethnicity:
   ____ Caucasian/white        ____ Latino/Hispanic
   ____ African American/black  ____ Native American
   ____ Asian/Pacific Islander  ____ Other: _________________________

5. Education Level:
   ____ Some high school       ____ Associate's Degree/Vocational Degree
   ____ High school/GED         ____ College Graduate (Bachelor's Degree)
   ____ Some College            ____ Graduate School

6. Employment status
   ____ Full Time               ____ Retired
   ____ Part Time               ____ Permanent disability
   ____ Not employed/looking for work  ____ Other: _________________________
   ____ Not employed/not looking for work
APPENDIX F:

WEST HAVEN-YALE MULTIDIMENSIONAL PAIN INVENTORY
BEFORE YOU BEGIN, PLEASE ANSWER 2 PRE-EVALUATION QUESTIONS BELOW:

1. Some of the questions in this questionnaire refer to your “significant other”. A significant other is a person with whom you feel closest. This includes anyone that you relate to on a regular or infrequent basis. It is very important that you identify someone as your “significant other”. Please indicate below who your significant other is (check one):

- ☐ Spouse
- ☐ Partner/Companion
- ☐ Housemate/Roommate
- ☐ Friend
- ☐ Neighbor
- ☐ Parent/Child/Other relative
- ☐ Other (please describe):

2. Do you currently live with this person? ☐ YES ☐ NO

When you answer questions in the following pages about “your significant other”, always respond in reference to the specific person you just indicated above.

A.

In the following 20 questions, you will be asked to describe your pain and how it affects your life. Under each question is a scale to record your answer. Read each question carefully and then circle a number on the scale under that question to indicate how that specific question applies to you.

1. Rate the level of your pain at the present moment.

   0 1 2 3 4 5 6

   No pain Very intense pain

2. In general, how much does your pain problem interfere with your day to day activities?

   0 1 2 3 4 5 6

   No interference Extreme interference

3. Since the time you developed a pain problem, how much has your pain changed your ability to work?

   0 1 2 3 4 5 6

   No change Extreme change

   ___ Check here, if you have retired for reasons other than your pain problem

4. How much has your pain changed the amount of satisfaction or enjoyment you get from participating in social and recreational activities?

   0 1 2 3 4 5 6

   No change Extreme change
5. How supportive or helpful is your spouse (significant other) to you in relation to your pain?

0 1 2 3 4 5 6
Not at all supportive  Extremely supportive

6. Rate your overall mood during the past week.

0 1 2 3 4 5 6
Extremely low mood  Extremely high mood

7. On the average, how severe has your pain been during the last week?

0 1 2 3 4 5 6
Not at all severe  Extremely severe

8. How much has your pain changed your ability to participate in recreational and other social activities?

0 1 2 3 4 5 6
No change  Extreme change

9. How much has your pain changed the amount of satisfaction you get from family related activities?

0 1 2 3 4 5 6
No change  Extreme change

10. How worried is your spouse (significant other) about you in relation to your pain problem?

0 1 2 3 4 5 6
Not at all worried  Extremely worried

11. During the past week, how much control do you feel that you have had over your life?

0 1 2 3 4 5 6
Not at all in control  Extremely in control

12. How much suffering do you experience because of your pain?

0 1 2 3 4 5 6
No suffering  Extreme suffering

13. How much has your pain changed your marriage and other family relationships?

0 1 2 3 4 5 6
No change  Extreme change

14. How much has your pain changed the amount of satisfaction or enjoyment you get from work?

0 1 2 3 4 5 6
No change  Extreme change

___ Check here, if you are not presently working.
15. How attentive is your spouse (significant other) to your pain problem?
   0 1 2 3 4 5 6
   Not at all attentive    Extremely attentive

16. During the past week, how much do you feel that you’ve been able to deal with your problems?
   0 1 2 3 4 5 6
   Not at all       Extremely well

17. How much has your pain changed your ability to do household chores?
   0 1 2 3 4 5 6
   No change       Extreme change

18. During the past week, how irritable have you been?
   0 1 2 3 4 5 6
   Not at all irritable       Extremely irritable

19. How much has your pain changed your friendships with people other than your family?
   0 1 2 3 4 5 6
   No change       Extreme change

20. During the past week, how tense or anxious have you been?
   0 1 2 3 4 5 6
   Not at all tense or anxious       Extremely tense or anxious

B.
In this section, we are interested in knowing how your significant other (this refers to the person you indicated above) responds to you when he or she knows that you are in pain. On the scale listed below each question, circle a number to indicate how often your significant other generally responds to you in that particular way when you are in pain.

1. Ignores me.
   0 1 2 3 4 5 6
   Never       Very often

2. Asks me what he/she can do to help.
   0 1 2 3 4 5 6
   Never       Very often

3. Reads to me.
   0 1 2 3 4 5 6
   Never       Very often
4. Expresses irritation at me.
   0  1  2  3  4  5  6
   Never   Very often

5. Takes over my jobs or duties.
   0  1  2  3  4  5  6
   Never   Very often

6. Talks to me about something else to take my mind off the pain.
   0  1  2  3  4  5  6
   Never   Very often

7. Expresses frustration at me.
   0  1  2  3  4  5  6
   Never   Very often

8. Tries to get me to rest.
   0  1  2  3  4  5  6
   Never   Very often

9. Tries to involve me in some activity.
   0  1  2  3  4  5  6
   Never   Very often

10. Expresses anger at me.
    0  1  2  3  4  5  6
    Never   Very often

11. Gets me some pain medications.
    0  1  2  3  4  5  6
    Never   Very often

12. Encourages me to work on a hobby.
    0  1  2  3  4  5  6
    Never   Very often

13. Gets me something to eat or drink.
    0  1  2  3  4  5  6
    Never   Very often

14. Turns on the T.V. to take my mind off my pain.
    0  1  2  3  4  5  6
    Never   Very often
C.

Listed below are 18 common daily activities. Please indicate how often you do each of these activities by circling a number on the scale listed below each activity. Please complete all 18 questions.

1. Wash dishes.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Mow the lawn.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Go out to eat.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Play cards or other games.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Go grocery shopping.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Work in the garden.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Go to a movie.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Visit friends.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. Help with the house cleaning.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. Work on the car.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. Take a ride in a car.
   0  1  2  3  4  5  6
   Never  Very often

12. Visit relatives.
   0  1  2  3  4  5  6
   Never  Very often

13. Prepare a meal.
   0  1  2  3  4  5  6
   Never  Very often

14. Wash the car.
   0  1  2  3  4  5  6
   Never  Very often

15. Take a trip.
   0  1  2  3  4  5  6
   Never  Very often

16. Go to a park or beach.
   0  1  2  3  4  5  6
   Never  Very often

17. Do a load of laundry.
   0  1  2  3  4  5  6
   Never  Very often

18. Work on a needed house repair.
   0  1  2  3  4  5  6
   Never  Very often
APPENDIX G:

CHRONIC PAIN ACCEPTANCE QUESTIONNAIRE
CPAQ
Directions: below you will find a list of statements. Please rate the truth of each statement as it applies to you. Use the following rating scale to make your choices. For instance, if you believe a statement is ‘Always True,’ you would write a 6 in the blank next to that statement.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never true</td>
<td>Very rarely true</td>
<td>Seldom true</td>
<td>Sometimes true</td>
<td>Often true</td>
<td>Almost always true</td>
<td>Always true</td>
</tr>
</tbody>
</table>

1. I am getting on with the business of living no matter what my level of pain is. _____
2. My life is going well, even though I have chronic pain. _____
3. It’s OK to experience pain. _____
4. I would gladly sacrifice important things in my life to control this pain better. _____
5. It’s not necessary for me to control my pain in order to handle my life well. _____
6. Although things have changed, I am living a normal life despite my chronic pain. _____
7. I need to concentrate on getting rid of my pain. _____
8. There are many activities I do when I feel pain. _____
9. I lead a full life even though I have chronic pain. _____
10. Controlling pain is less important than any other goals in my life. _____
11. My thoughts and feelings about pain must change before I can take important steps in my life. _____
12. Despite the pain, I am now sticking to a certain course in my life. _____
13. Keeping my pain level under control takes first priority whenever I’m doing something. _____
14. Before I can make any serious plans, I have to get some control over my pain. _____
15. When my pain increases, I can still take care of my responsibilities. _____
16. I will have better control over my life if I can control my negative thoughts about pain. _____
17. I avoid putting myself in situations where my pain might increase. _____
18. My worries and fears about what pain will do to me are true. _____
19. It’s a relief to realize that I don’t have to change my pain to get on with my life. _____
20. I have to struggle to do things when I have pain. _____
APPENDIX H:

ACCEPTANCE AND ACTION QUESTIONNAIRE
Below you will find a list of statements. Please rate how true each statement is for you by circling a number next to it. Use the scale below to make your choice.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>never true</td>
<td>very seldom true</td>
<td>seldom true</td>
<td>sometimes true</td>
<td>frequently true</td>
<td>almost always true</td>
<td>always true</td>
<td></td>
</tr>
</tbody>
</table>

1. My thoughts can be dangerous. 1 2 3 4 5 6 7
2. It is normal to sometimes feel unhappy. 1 2 3 4 5 6 7
3. I can do things that are important to me even when I'm feeling unhappy. 1 2 3 4 5 6 7
4. I can move towards important goals, even if I don't feel good about myself. 1 2 3 4 5 6 7
5. My thoughts and feelings get in the way of my success. 1 2 3 4 5 6 7
6. If I have mean or nasty thoughts, then I am a mean or nasty person. 1 2 3 4 5 6 7
7. I try to achieve my goals, even if I am uncertain that I can. 1 2 3 4 5 6 7
8. I try hard not to have bad feelings. 1 2 3 4 5 6 7
9. I work towards things I value, even though at times I feel uncomfortable or uncertain. 1 2 3 4 5 6 7
10. The greater my worries or anxieties become, the more concerned I get for my well-being. 1 2 3 4 5 6 7
11. I take action on a problem, even when I fear I may get it wrong. 1 2 3 4 5 6 7
12. The way I feel in a situation usually determines the actions that I take. 1 2 3 4 5 6 7
13. It's OK for me to have thoughts and feelings that I don't like. 1 2 3 4 5 6 7
14. I am not very aware of what occurs around me. 1 2 3 4 5 6 7
15. I can set a course in my life and stick to it, even if I have doubts. 1 2 3 4 5 6 7
16. Anxiety is bad. 1 2 3 4 5 6 7
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>never true</strong></td>
<td><strong>very seldom true</strong></td>
<td><strong>seldom true</strong></td>
<td><strong>sometimes true</strong></td>
<td><strong>frequently true</strong></td>
<td><strong>almost always true</strong></td>
<td><strong>always true</strong></td>
<td></td>
</tr>
<tr>
<td>17. My painful experiences and memories make it difficult for me to live a life that I would value.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>18. I often catch myself daydreaming about things I've done and what I would do differently next time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>19. I am in control of my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>20. If I get bored of a task, I can still complete it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>21. Worries get in the way of my success.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>22. If I feel uncertain, I can still make a choice and take action.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>23. If I promised to do something, I'll do it, even if I later don't feel like it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>24. I stop taking care of my responsibilities when I feel anxious or uncomfortable.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>25. I try hard to avoid feeling anxious or jittery.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>26. In order to achieve my goals, I will not avoid people or places that may upset me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>27. Having some worries will not prevent me from living a fulfilling life</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>28. I should not always believe my reactions and judgments.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>29. It seems like most people are handling their lives better than I am.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>30. I need to control my feelings in order to handle my life well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>31. In order for me to do something important, I first have to have all my doubts worked out.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>32. My thoughts and feelings do not get in the way of how I want to live my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>never true</td>
<td>very true</td>
<td>seldom true</td>
<td>sometimes true</td>
<td>frequently true</td>
<td>almost always true</td>
<td>always true</td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>I can’t stand feeling sad or guilty.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>34.</td>
<td>It’s OK if I remember something unpleasant.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>35.</td>
<td>If an unpleasant memory comes into my head, I try to get rid of it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>36.</td>
<td>I try to avoid thoughts and feelings that cause difficulty in my daily life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>37.</td>
<td>I try hard to control the physical reactions that I experience in my body (e.g., heart racing, sweating).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>38.</td>
<td>I would rather achieve my goals than avoid unpleasant thoughts and feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>39.</td>
<td>Emotions cause problems in my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>40.</td>
<td>I’m afraid of my feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>41.</td>
<td>My painful memories prevent me from having a fulfilling life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>42.</td>
<td>When I feel uneasy, I do whatever I can to get rid of those feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>43.</td>
<td>I do not have to control my thoughts and feelings to be successful.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>44.</td>
<td>I don’t avoid situations that make me feel jittery.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>45.</td>
<td>I don’t have to get rid of scary or unhappy images that come to my mind.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>46.</td>
<td>If I notice myself breathing quickly, then something is wrong</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>47.</td>
<td>My mind is often on “automatic pilot”, not fully involved in what I am doing in the moment.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>48.</td>
<td>I worry about not being able to control my worries and feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>49.</td>
<td>It’s OK to feel sad or anxious.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
APPENDIX I:

COPING STRATEGIES QUESTIONNAIRE
Coping Strategies Questionnaire-Revised

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

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never do that</td>
<td>Sometimes do that</td>
<td>Always do that</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When I feel pain........

1. I try to feel distant from the pain, almost as if the pain was in somebody else’s body.
2. I try to think of something pleasant.
3. It’s terrible and I feel it’s never going to get any better.
4. I tell myself to be brave and carry on despite the pain.
5. I tell myself that I can overcome the pain.
6. It’s awful and I feel that it overwhelms me.
7. I feel my life isn’t worth living.
8. I pray to God it won’t last long.
9. I try not to think of it as my body, but rather as something separate from me.
10. I don’t think about the pain.
11. I tell myself I can’t let the pain stand in the way of what I have to do.
12. I don’t pay any attention to it.
13. I pretend it’s not there.
14. I worry all the time about whether it will end.
15. I replay in my mind pleasant experiences in the past.
16. I think of people I enjoy doing things with.
17. I pray for the pain to stop.
18. I imagine that the pain is outside of my body.
19. I just go on as if nothing happened.
20. Although it hurts, I just keep on going.
21. I feel I can’t stand it anymore.
22. I ignore it.
23. I rely on my faith in God.
24. I feel like I can’t go on.
25. I think of things I enjoy doing.
26. I do something I enjoy, such as watching TV or listening to music.
27. I pretend it’s not a part of me.
1. How able are you to decrease your pain?  

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cannot decrease At all</td>
<td>Can Decrease Completely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. How much control do you have over your pain?  

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Control</td>
<td>Complete Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX J:

CHRONIC PAIN COPING INVENTORY
During the past week, how many days did you use each of the following at least once in the day to cope with your pain? (Note: You may have used some of these coping strategies that you did not have pain to prevent or minimize pain in the future. Please indicate the number of days you used each strategy FOR PAIN, whether or not you were experience pain at the time).

<table>
<thead>
<tr>
<th>Number of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

1. Imagined a calming or distracting image to help me relax
2. Ignored the pain
3. I took a rest
4. I got support from a friend
5. Asked someone to do something for me
6. Reminded myself that things could be worse
7. Avoided using part of my body (e.g., hand, arm, leg)
8. Focused on relaxing my muscles
9. Sat on the floor, stretched, and held the stretch at least 10 seconds
10. Told myself things will get better
11. I got support from a family member
12. I rested as much as I could
13. I talked to someone close to me
14. Called a friend on the phone to help me feel better
15. Thought about all the good things I have
16. Asked for help with a chore or task
17. Told myself my pain will get better
18. I didn't let the pain interfere with my activities
19. Engaged in aerobic exercises (exercise that made my heart beat faster) for at least 15 minutes
20. Limited my walking because of pain
21. Just didn't pay attention to the pain
22. Walked with a limp to decrease the pain
23. Meditated to relax
24. Lay on my back, stretched, and held the stretch for at least 10 seconds
25. Held part of my body (e.g., arm) in a special position
26. Asked for help in carrying, lifting, or pushing something
27. Exercised to improve my overall physical condition for at least 5 minutes
28. Talked to a friend or family member for support
29. Reminded myself that there are people who are worse off than I am
30. Limited my standing time
31. Lay down on a bed
32. Avoided some physical activities (lifting, pushing, carrying)
33. Used self-hypnosis to relax
34. I just kept going
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35.</td>
<td>Stretched the muscles where I hurt and held the stretch for at least 10 seconds</td>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>Avoided activity</td>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.</td>
<td>Went into a room by myself to rest</td>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.</td>
<td>Used deep, slow breathing to relax</td>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td>Exercised to strengthen the muscles in my back for at least 1 min</td>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.</td>
<td>Asked someone to get me something (e.g., medicine, food, drink)</td>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>Did not let the pain affect what I was doing</td>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42.</td>
<td>Lay down on a sofa</td>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX K:

PAIN CATASTROPHIZING SCALE
Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

0 – not at all 1 – to a slight degree  2 – to a moderate degree  3 – to a great degree  4 – all the time

When I’m in pain ...

1. I worry all the time about whether the pain will end. ____
2. I feel I can’t go on. ____
3. It’s terrible and I think it’s never going to get any better. ____
4. It’s awful and I feel that it overwhelms me. ____
5. I feel I can’t stand it anymore. ____
6. I become afraid that the pain will get worse. ____
7. I keep thinking of other painful events. ____
8. I anxiously want the pain to go away. ____
9. I can’t seem to keep it out of my mind. ____
10. I keep thinking about how much it hurts. ____
11. I keep thinking about how badly I want the pain to stop. ____
12. There’s nothing I can do to reduce the intensity of the pain. ____
13. I wonder whether something serious may happen. ____
APPENDIX L:

DAILY DIARY
**Did you have a headache today?**  YES  NO

**Do you think it was a migraine headache?**  YES  NO

**How painful was your headache?** (circle one)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slightly Painful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extremely Painful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Applicable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**How stressful was it to have your headache?** (circle one)

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not at all</td>
<td>Slightly Stressful</td>
<td>Extremely Stressful</td>
<td>Not Applicable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**To what extent did your headache pain interfere with your daily activities?**

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Slightly</td>
<td>A Great Deal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Which of these strategies did you use **today to cope with your headache pain**? Include strategies you used to prevent or minimize pain, even if you did not have pain at that time.

1. Limited my standing time .......................................................... YES  NO
2. I rested as much as I could .......................................................... YES  NO
3. Asked for help in carrying, lifting, or pushing something ............... YES  NO
4. Focused on relaxing my muscles ................................................... YES  NO
5. Did not let the pain affect what I was doing .................................. YES  NO
6. Exercised to improve my overall physical condition for at least 5 minutes........................................................................ YES  NO
7. I got support from a friend ............................................................ YES  NO
8. Reminded myself that there are people who are worse off than I am .......................... YES  NO
9. I think of things I enjoy doing ....................................................... YES  NO
10. I feel like I can’t go on ................................................................. YES  NO
11. I ignore it ....................................................................................... YES  NO
12. I imagine that the pain is outside my body ................................... YES  NO
13. I tell myself that I can’t let the pain stand in the way of what I have to do ........... YES  NO
14. I pray for the pain to stop ............................................................ YES  NO

Rate each of the following statements as they relate to your experience **today**.

<table>
<thead>
<tr>
<th></th>
<th>Not at all True</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I would gladly sacrifice important things in my life to control my headache pain better.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>There are many activities I do when I feel headache pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>I avoid putting myself in situations where my pain might increase.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>I lead a full life even though I have chronic headache pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>Keeping my headache pain level under control takes first priority whenever I’m doing something.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>Controlling pain is less important than any other goals in my life.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>I have what it takes to control my headache pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

If you had a headache today, please complete the following three questions about your headache.

1. I worried all the time about whether the pain would end. .................. 0 | 1 | 2 | 3 | 4 | 5 | 6 |
2. I kept thinking about how much it hurts. ........................................... 0 | 1 | 2 | 3 | 4 | 5 | 6 |
3. I felt I couldn’t stand it anymore. ................................................... 0 | 1 | 2 | 3 | 4 | 5 | 6 |
APPENDIX M

INFORMED CONSENT:
Title of Research: The role of acceptance in appraisal and coping with migraine headaches

Investigators: Christine Chiros, M.A.
William H. O'Brien, Ph.D.
Department of Psychology
Bowling Green State University

Purpose/Benefits: You are invited to be in a research study on the ways people think about and cope with headache pain. As part of my graduate student work on my doctoral degree in the psychology department I am studying how men and women who get migraine headaches view their headache pain. This study is being conducted for my dissertation. About 80 men and women who get migraine headaches will be in the study. There are several possible benefits to being in this study. You may understand your headaches better as a result of completing the study. There are also benefits to migraine headache sufferers in general. Participation in this study will lead to an increased understanding of how people view and cope with their headaches. The results of this research study will help us find new ways to help people not have as many problems related to their headaches, which will improve their quality of life. Learning more about how people view and respond to their headache pain will be helpful in developing ways to help migraine headache sufferers be able to limit how much headache pain gets in the way of doing what is important to them (for example, going to work or spending time with others). Participants will be give $25.00 for their participation in this study. Bowling Green State University psychology students have a choice of receiving either $25.00 monetary compensation, or three experimental credits.

Procedure: This study involves several parts. The first part involves meeting with me and completing a packet of surveys. These surveys ask about basic background information (for example, age, gender) and about thoughts and feelings you may have about your headaches. I estimate that it will take up to 30 minutes to fill out the surveys. The second part involves completing a short list of questions daily (also known as a daily diary) for four weeks. This part has questions about thoughts and feelings you may have about your headache pain. I expect the daily diary to take up to two minutes per day. You will be asked to complete the diary every night for 28 days. I will also call you once per week during the daily diary part of the study to answer any questions you may have and see how the study is going for you. The calls should last no more than a couple of minutes. I will give you postage-paid envelopes to send in the diary at the end of the first, second, and third weeks. When we meet the second time, at the end of the study, you will spend about 30 minutes completing the second packet of surveys. You will be compensated for your participation at the end of this session. If you are interested, I will also give you information about places you can go to get help for your headaches.

You must be at least 18 years of age in order to participate in this study. You must experience at least five moderately to severely painful headaches per month. People who are taking medications daily in order to prevent migraine headaches are not eligible to be in this study. Participation in this study is completely voluntary.
**Time required:** The estimated total length of time for your participation in this study is 2-2.5 hours
- 30 minutes for the first set of questionnaires
- 56 minutes for the daily diary (2 minutes times 28 days)
- 30 minutes for the second set of questionnaires and receiving your payment
- 6 minutes (2 minutes times three weekly phone calls)

**Risks:** The expected risks to you are no greater than those normally encountered in daily life. It is possible you will notice your headache pain more at times, because I will be asking you to think about your headache experience in order to answer questions. To minimize the discomfort and interference this may cause, I am asking people to complete the daily diary at the end of the day.

**Your Rights as a Participant:**

**Confidentiality:** Information you provide will remain confidential and your identity will not be revealed. I will protect the confidentiality of you as a participant and your responses throughout the study and publication of study results. Only the members of the research team, Christine Chiros and William H. O'Brien, will have access to the information you provide. Your identity will not be revealed in any published results. Personal information (like your name and phone number) will be kept in a locked file that only I have access to. Records from this study that contain information about you will not identify you by name and will be strictly safeguarded. You will be assigned a four-digit participant identification number which will appear on all of your research materials. I will keep all research files in a locked file cabinet in my office.

**Other Rights:** Your participation in this study is entirely voluntary. You have the right to leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. You have the right to have all questions about this study answered by me. You can ask for a summary or copy of results of the study. You will be provided with a copy of this informed consent document to keep for your records.

**Contact Information:**
If you have any questions or comments about this study, you can contact me at (651) 285-1669 or chiroscc@bgnet.bgsu.edu. You can also contact my project advisor with any questions or comments at (419)372-2974 or wobrien@bgnet.bgsu.edu. Please note that email is not 100% secure, so someone intercepting your e-mail could have access to your questions or comments.

If you have any questions about the conduct of this study or your rights as a research participant, you may contact the Chair of Bowling Green State University’s Human Subjects Review Board at (419) 372-7716 (hsrb@bgsu.edu) if you have any more concerns.

**Voluntary Consent Statement:** To the best of my knowledge I am not suffering from any impairment or disease that might interfere with my participation in this study. I have read the information in this form or it has been read to me, and I have been told of its contents. Any questions I have about the study have been answered to my satisfaction. If I have any other
questions about this study, I may contact Christine Chiros (651)285-1669 or Dr. William O'Brien (419)372-2974. I have been informed that I will receive a copy of this informed consent, and that I may also request a copy of the signed informed consent if I wish.

Name: ______________________________________ Phone: _________________
(Printed name)

______________________________________ Date: __________________
(Signature of participant)

______________________________________ Date: __________________
(Signature of investigator)