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The Role Of Acceptance In Headache-Related Variables

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THE ROLE OF ACCEPTANCE IN HEADACHE-RELATED VARIABLES

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ABSTRACT

Migraine is a neurologic disorder that causes impairment in many areas of functioning. Migraine sufferers frequently avoid environmental stimuli (triggers) they assume to be associated with migraine onset, which may inadvertently lead to an increase in the potency of some triggers and increase headache frequency over time. Headache patients who instead use acceptance strategies to limit their attempts to control or eliminate/avoid their pain may experience reduced distress and pain-related disability. Studies examining acceptance-based approaches in managing chronic pain conditions have shown favorable results of acceptance on pain intensity, reduced pain-related anxiety and avoidance, and less physical and psychological disability. However, few studies have examined the construct of acceptance among individuals with headache. In order to extend previous research on chronic pain conditions, the purpose of the present study was to investigate the relationship between psychological acceptance and headache-related variables among young adults, a population at increased risk for headache but typically without complications posed by long headache histories and medication overuse. The sample consisted of 2,005 individuals (65% female; mean age = 19.10 years [SD = 2.27]): 839 without headache (42%), 602 with migraine (30%), and 564 with tension-type headache (28%). Acceptance scores distinguished among headache diagnostic groups such that those with lower acceptance were those with more frequent and severe headache disorders. Acceptance explained 10% of the variance ($p < 0.001$) in headache-related disability and 5% of the variance in both headache severity ($p < 0.001$), and headache frequency ($p < 0.001$). These proportions were much smaller

but statistically significant after controlling for gender and comorbid psychiatric symptoms. Although negative associations between acceptance and the headache variables was observed, these were rather modest and indicate that the role of acceptance in headache may be different than originally hypothesized. Limitations and future directions are discussed.

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INTRODUCTION

PRIMARY HEADACHE DISORDERS

Headache disorders are prevalent and a common cause of significant disability (Stovner et al., 2007). The *International Classification of Headache Disorders* (ICHD-2; Headache Classification Committee of the International Headache Society, 2004) classifies headaches not attributable to other disorders as primary headaches, which include migraine and tension-type headache (TTH). A recent meta-analytic review observed a 66% worldwide lifetime prevalence rate for headache in the general population (Stovner et al.), although precise rates by disorder vary as a function of gender and ethnicity.

Migraine is a neurological disorder characterized by recurrent attacks of severe head pain and associated symptoms (Headache Classification Committee of the International Headache Society, 2004). The lifetime prevalence of migraine is 10-12% in the general population (Jette, Patten, Williams, Becker, & Wiebe, 2008; Lipton et al., 2007; Radtke & Neuhauser, 2009; Stovner et al., 2007). Migraine is three times more common among women than men (15-18% vs. 5-6%) and is often viewed as a women's health issue (Radtke & Neuhauser; Lipton et al.). Migraine occurring 15 or more days per month is classified as chronic migraine (CM; Lipton, Scher, Silberstein, & Bigal, 2008; Headache Classification Committee of the International Headache Society, 2004). The prevalence of migraine is highest among Caucasian Americans

and tends to be the lowest among Asian and African Americans (Lipton, Bigal, Hamelsky, & Scher, 2008).

Migraine occurs with specific symptoms distinguishable from those of other headache subtypes. The disorder is characterized by the experience of recurrent headache lasting 4-72 hours if untreated or unsuccessfully treated and must have at least two of the following characteristics: unilateral location, pulsating pain quality, moderate to severe pain intensity, and aggravation by routine physical activity. Migraine also requires nausea and/or vomiting and/or sensitivity to both light (photophobia) *and* sound (phonophobia; Headache Classification Committee of the International Headache Society, 2004).

Migraine has been ranked by the World Health Organization (WHO) among the top 20 diseases worldwide that cause significant disability (Leonardi, Steiner, Scher, & Lipton, 2005; World Health Organization, 2001). Because of its cyclical and often chronic nature, migraine contributes to significant functional impairment spanning occupational, academic, social, and family aspects of life (Buse, Rupnow, & Lipton, 2009; Clarke, MacMillan, Sondhi, & Wells, 1996; Dowson & Jagger, 1999; Leonardi et al.; Linde & Dahlöf, 2004). Compared to non-migraineurs, four times as many migraineurs report frequent disability (>12 days of not being able to perform usual work or everyday activities) resulting from headache (Radtke & Neuhauser, 2009). Lipton et al. (2007) demonstrated that over 50% of migraineurs report severe impairment or require bed rest during their headaches. Migraine is also associated with cognitive deficits such as problems with concentration, comprehension and communication, and both short- and long-term memory impairment (Sas, Arpad, Jozsef, & Vecscei, 2010). Although migraine occurs at high rates and is associated with significant disability and impairment in daily functioning, TTH is even more prevalent and also contributes to significant functional impairment.

Tension-type headache is the most common primary headache disorder among the general population, with a global lifetime prevalence of 46% (Stovner et al., 2007; Lodner & Rizzoli, 2008; Rasmussen, Jensen, Schroll, & Olesen, 1991; Rasmussen, 1995; Schwartz, Stewart, Simon, & Lipton, 1998; Lyngberg, Rasmussen, Jorgensen, & Jensen, 2005). TTH has three subtypes that include infrequent episodic TTH (ETTH) that occurs less than once per month, frequent ETTH that occurs between 1-14 days per month, and chronic TTH (CTTH) that occurs 15 or more days per month (ICHD-II; Lenaerts & Newman, 2008). Prevalence of TTH is higher among Caucasian Americans (43%) than African-Americans (26%), increases with education level, and peaks in the 30 to 39 year-old age group for both men and women (42% and 47%, respectively; Schwartz et al.).

Tension-type headache occurs with symptoms typically opposite to those of migraine. Compared to migraine, TTH pain severity tends to be mild to moderate. Tension-type headaches are characterized by recurrent attacks lasting 30 minutes to 7 days with at least two of the following characteristics: bilateral location, pressing/tightening (non-pulsating) pain quality, mild or moderate pain intensity, and non-aggravation by routine physical activity; an absence of associated nausea or vomiting is also required (Headache Classification Committee of the International Headache Society, 2004). Disability and impairment in functioning are also associated with TTH, such that 8% of ETTH sufferers report lost workdays due to their headaches, while 44% report decreased effectiveness at work, home, or school (Schwartz, Stewart, Simon, & Lipton, 1998). Further, CTTH sufferers report higher levels of daily life stress than non-headache controls (Holroyd et al., 2000). In their study examining correlates of CTTH, Holroyd and colleagues observed that CTTH was frequently associated with impairments in physical (62%), social (57%), and occupational functioning (60%).

Psychiatric Comorbidities and Headache

Both migraine and TTH are associated with co-occuring psychiatric disorders (Breslau, 1998; Breslau & Davis, 1992; Juang, Wang, Fuh, Lu, & Su, 2000; Puca et al., 1999), which compound the burden of these headache disorders. Migraine is associated particularly with major depressive disorder, generalized anxiety disorder, panic disorder, social phobia, and bipolar disorder (Baskin, Lipchik, & Smitherman, 2006; Breslau; Breslau & Davis; Breslau & Davis, 1993; Breslau, Lipton, Stewart, Schultz, & Welch, 2003; Breslau, Shultz, Stewart, Lipton, & Welch, 2001; Hamelsky & Lipton, 2006; Swartz, Pratt, Armenian, Lee, & Eaton, 2000; Wang, Chen, & Fuh, 2010). Specifically, individuals with migraine are 2-3 times more likely to suffer from depression and 3-5 times more likely to suffer from anxiety disorders compared to individuals without migraine (Breslau; Breslau, Davis, Schultz, & Peterson, 1994; Hamelsky & Lipton).

Extant literature has more clearly delineated the relationship between migraine and associated psychiatric disorders. Recent research has revealed a bidirectional relationship between migraine and depression, indicating that the presence of either disorder increases risk of onset for the other (Breslau et al., 1994; Breslau, 1998; Breslau et al., 2000; Breslau et al., 2003). Similarly, a bidirectional relationship has been implicated between migraine and panic disorder (Breslau et al., 2001). These bidirectional relationships are potentially suggestive of shared etiological pathways between migraine and affective disorders (Breslau; Breslau et al.), although the underlying mechanisms remain unclear (Baskin et al., 2006; Baskin & Smitherman, 2009). Baskin and Smitherman suggest that medication overuse, serotonergic dysfunction, hormonal fluctuations, and processes related to central nervous system sensitization are likely mechanisms. Despite uncertainty on shared etiological mechanisms between migraine and psychiatric

comorbidity, these comorbidities are associated with reduced satisfaction with acute migraine treatment, perceived efficacy of treatment, and headache-related quality of life; increased medication overuse; and increased migraine-related disability (Lanteri-Minet, Radat, Chautard, & Lucas, 2005). These findings suggest that the impact of migraine may be reduced if interventions also address psychiatric symptomatology.

Similar to migraine, TTH is associated with multiple psychiatric disorders including depressive and anxiety-related disorders. In a large Italian sample, Puca and colleagues (1999) found that 51% and 21% of ETTH sufferers met criteria for anxiety and depressive disorders, respectively. This study found CTTH sufferers to be at higher risk for psychiatric comorbidities than ETTH sufferers, paralleling other findings that higher frequency headache is associated with highest rates of psychiatric disorders (Juang et al., 2000; Mongini et al., 2006). Puca and colleagues observed that 56% of CTTH patients experienced comorbid anxiety disorders and 45% had comorbid depressive disorders. Generalized anxiety disorder (45%) emerged as the most common anxiety disorder and dysthymia (17%) as the most common mood disorder. The authors cautioned that patients were recruited from tertiary care headache centers and results may only generalize to those with more severe or chronic TTH. Other studies have suggested that female gender is particularly associated with depressive disorders among CTTH patients (Juang et al.). Collectively, these findings suggest that psychological factors are particularly relevant among individuals with both migraine and CTTH.

Coping styles of headache sufferers. In addition to psychiatric disorders, headache is also influenced by other psychological factors including precipitating variables and maladaptive coping styles. Behavioral responses to trigger factors and other headache-related stimuli differ across headache diagnostic groups. For instance, migraineurs are more likely to avoid noise, light,

social activity, and physical activity compared to tension-type headache patients (Scharff, Turk, & Marcus, 1995), likely because these factors aggravate migraine but not TTH. However, when headache severity is taken into account, these differences in behavioral responses dissipate (Scharff et al.). Some coping responses are associated with increased headache-related disability (Ford, Calhoun, Kahn, Mann, & Finkel, 2008). For example, in migraineurs, coping behaviors such as lying down, social withdrawal, negative self-statements, reliance on negative thoughts, wishful thinking, and self-criticism are particularly associated with increased headache intensity, vomiting, and nausea (Ford et al.; Hassinger, Semencuk, & O'Brien, 1999). Headache pain is also influenced by behavioral techniques employed to alleviate pain.

Migraineurs and TTH sufferers employ many nonpharmacological, or behavioral, techniques to cope with pain directly. In a study examining the use of nonpharmacological abortive measures by headache patients, Martins and Parreira (2001) found that migraineurs engaged in more behaviors to reduce headache pain and its associated symptoms than TTH sufferers. Frequently-used behaviors were pressing and applying cold stimuli to the painful site, trying to sleep, changing posture, sitting or reclining in bed, isolation, using symptomatic medication, inducing vomiting, and dietary changes. Migraineurs reported more relief than TTH sufferers when they used symptomatic medications, isolation, applied local pressure, and used local cold pads. Although pain relief is not always attained, these findings suggest that headache sufferers employ many strategies to alleviate the pain and symptoms associated with their headaches (Martins & Parreira).

Experiental avoidance and avoidant coping. Humans use cognitive and affective strategies to avoid unpleasant private experiences (i.e., thoughts, bodily sensations, emotions, and memories; Chawla & Ostafsin, 2007). Experiential avoidance denotes an unwillingness to

remain in contact with aversive private events, typically involving the rigid and inflexible application of escape/avoidance strategies to control the form or frequency of these events (Costa & Pinto-Gouveia, 2011; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Avoidant coping through evading environmental stimuli or suppressing thoughts/emotions thus represents a means of experiential avoidance. Avoidant coping is associated with negative psychological outcomes such as increased psychiatric disorder symptomatology (Chawla & Ostafsin) and psychological distress (Aldwin & Revenson, 1987).

Many of the aforementioned coping strategies used by headache patients are characterized as avoidance strategies (e.g., lying down, social withdrawal) and are associated with the exacerbation of headache pain and related symptoms (Ford et al., 2008; Hassinger, Semencuk, & O'Brien, 1999). Existing data also suggests that both migraineurs (Hassinger et al.) and TTH sufferers (Holm, Holroyd, Hursey, & Penzien, 1986) more commonly use avoidant coping strategies to manage stress and pain than do individuals without headache. In fact, many headache patients are counseled by their providers to avoid triggers putatively associated with onset of their migraines. Furthermore, both migraineurs and TTH sufferers exhibit increased maladaptive coping behaviors and psychiatric symptoms during headache episodes (i.e. avoidance of social and physical activity, more helplessness and hopelessness, and elevated depression and anxiety; Siniatchkin, Riabus, & Hasenbring, 1999).

Recently, evidence has emerged suggesting associations between avoidant coping and poor psychological outcomes. A recent study investigating the mediating effect of experiential avoidance between coping and psychopathology in a chronic pain sample found that low utilization of adaptive coping strategies was associated with psychopathology through differences in processes pertaining to psychological inflexibility (i.e., the rigid dominance of

stereotyped reactions to stimuli across various situations; Bond et al., 2011), of which experiential avoidance is one. Chronic pain patients who utilized more adaptive coping strategies, however, exhibited less depression and stress. The authors suggest that chronic pain patients may achieve better psychological outcomes if they reduce their avoidance and pain-control strategies (Costa & Pinto-Gouveia, 2011). Beyond attempts to avoid pain per se, headache sufferers also employ avoidant strategies to cope with precipitating variables associated with headache onset.

Avoidance of headache triggers. Martin and Macleod (2009) define headache triggers as precipitating factors that precede the headache attack within 48 hours. Some of the most commonly reported triggers include: stress and negative emotions, hormonal factors for females, noise, odors, hunger, certain foods and alcohol, weather, fatigue, and lack of sleep (Kelman, 2007; Martin & Macleod). Schulman and Silberstein (1992) noted the importance of identifying headache triggers and advised practitioners to help patients avoid these triggers. Furthermore, Skaer (1996) maintained that the prevention of migraines was best attained by avoiding precipitating migraine triggers.

Recently, however, the wisdom of counseling patients to avoid triggers has been challenged, as a review by Martin and Macleod (2009) suggested that avoidant coping strategies may ultimately actually increase the potency of some triggers, contributing to more frequent headaches and potentially headache chronification. Specifically, Martin (2000; 2001) found that exposing headache patients to visual stimuli associated with headache onset resulted in desensitization of the associated stimuli, less negative affect, and less head pain in response to the trigger subsequently. Similarly, Philips and Jahanshahi (1985) observed that exposure to noise associated with headache onset reduced pain behavior, whereas avoidance of the trigger was associated with increased intolerance. Martin, Reese, and Forsyth (2006) replicated these

findings using noise as a trigger, contending that exposure to this trigger may be helpful so long as it is not for too long or at too high a level. In light of these accumulating studies, Martin and Macleod argued against avoiding triggers and deem it an ineffective strategy for coping with headaches. The researchers contended that headache sufferers should engage in approach/exposure strategies, to the extent feasible, to manage pain by facilitating desensitization of headache triggers (Martin & Macleod). One such approach consistent with Martin and Macleod's therapeutic contention is the psychological construct of "acceptance."

Acceptance

Acceptance is a psychological construct defined by Hayes and colleagues (1996) as the active contact (non-avoidance) with psychological experiences while behaving effectively in congruence with one's values. Instead of focusing on often counterproductive attempts to change or control undesirable psychological experiences, acceptance-based approaches target more readily changeable domains such as overt behaviors or life situations (Hayes et al.). Specifically, acceptance-based treatments involve changing individual's experiences with psychological events, instead of attempting to change the psychological event itself. Hayes and colleagues described acceptance-based treatments as those that attempt to change the impact of private psychological experiences (e.g, emotions and cognitions) by reducing one's struggle to change the "form, frequency, or situational sensitivity" (p. 1163) of these private experiences. While initially conceptualized in relation to psychiatric disorders, more recently the construct of acceptance has garnered significant attention regarding its relevance to chronic pain.

Acceptance and chronic pain. Acceptance of pain involves behaving in a way that reduces attempts to avoid or control pain (McCracken, 1998; McCracken, Vowles, & Eccleston, 2004). McCracken described acceptance of pain as acknowledging the presence of pain,

abandoning counterproductive attempts to control pain, and being able to commit behavioral efforts to living a satisfying life despite pain. Acceptance of pain has been associated with positive long-term patient functioning (McCracken & Eccleston, 2005; McCracken & Vowles, 2008), such that chronic pain patients who are able to pursue their goals and values despite their pain are less distressed and disabled by their pain than individuals who persist in controlling/avoiding their pain (McCracken et al.). These findings suggest that acceptance may be integral to reducing pain-related disability, even if pain itself remains unaltered.

Studies examining acceptance of pain demonstrate acceptance to be associated with lower pain intensity, less pain related anxiety and avoidance, less physical and psychological disability, more daily uptime, and better work status (McCracken, 1998; McCracken & Eccleston, 2003; McCracken, Spertus, Janeck, Sinclair, & Wetzel, 1999). McCracken et al. (2004) found that chronic pain patients high on pain acceptance reported lower pain intensities than individuals low on pain acceptance, concluding that integrating acceptance into clinical practice may be a valuable treatment approach. These studies included primarily patients with chronic musculoskeletal pain conditions such as lower back, lower limb, cervical, upper extremities, and thoracic region pain. Patients with head and face pain comprised a minuscule proportion (approximately 4%) of these samples (McCracken; McCracken & Eccleston). Thus, although acceptance-based approaches have garnered strong indication for the treatment of chronic musculoskeletal pain conditions (Wetherell et al., 2011; Wicksell, Dahl, & Olsson, 2005), few studies have examined the role of acceptance among headache samples.

In addition to acceptance of pain specifically, general psychological acceptance has also been investigated in relation to physical and psychosocial functioning among chronic pain samples (McCracken & Zhao-O'Brien, 2010; McCracken & Velleman, 2010). As with

acceptance of pain, general acceptance is negatively associated with pain-related distress, depression, pain-related anxiety, and physical and psychosocial disability (McCracken & Zhao-O'Brien). Furthermore, McCracken and Velleman observed general acceptance to increase with age in patients with chronic pain. Importantly, general psychological acceptance is a significant predictor of patient functioning uniquely of pain acceptance more specifically (McCracken & Zhao-O'Brien). These findings indicate that, among chronic pain samples, general acceptance is a meaningful psychological construct that independently accounts for variance in patient functioning and disability.

Acceptance and headache. Although not frequently studied among headache patients specifically, acceptance appears to be a psychological construct relevant also to the experience of migraine pain. Chiros (2007) found that higher levels of pain-related acceptance were associated with lower catastrophizing and pain-related interference with migraineurs' daily functioning, as well as with higher activity and the use of fewer daily coping strategies (Chiros; Chiros & O'Brien, 2011). Thus far, however, only two treatment studies have investigated the relationship between headache and acceptance, both of which suggest that promoting acceptance is associated with better patient functioning and outcomes.

Acceptance and Commitment Therapy (ACT) is an evidence-based behavior therapy that integrates acceptance and mindfulness strategies with behavioral change approaches (Hayes, 2004; Hayes, Strosahl, & Wilson, 1999). In a recent study examining the effectiveness of a one-day ACT and migraine education (ACT-ED) workshop, significant improvements were observed in patients' depressive symptoms, general functioning, and migraine-related disability compared to a wait list/treatment as usual group (TAU; Dindo, Recober, Marchman, Turvey, & O'Hara, 2012). The ACT-ED group received one hour of education about migraine (i.e., migraine

pathology, risks for migraine chronification, migraine triggers, treatment of migraine, medication overuse migraine, and contributing lifestyle factors) and four hours of ACT education. The ACT education component focused on teaching patients how to recognize ineffective patterns of behavior, exploring and setting life and health-related goals, and promoting effective and committed action to achieve these goals (Dindo et al.). This study demonstrated that relative to TAU, the ACT intervention was associated with increased general functioning, less headache-related disability, and reductions in depressive symptomatology, although the inclusion of migraine education and lack of a viable comparison condition are limitations.

In order to examine the effectiveness of ACT in reducing headache-related pain, disability, and distress, Mo'tamedi, Rezaiemaram, and Tavallaie (2012) implemented a group-administered ACT intervention among an Iranian, female sample with chronic migraine and CTTH. Mo'tamedi and colleagues utilized a randomized pre-test post-test design with an ACT treatment group and a TAU group. In addition to TAU, participants in the ACT group received weekly ACT sessions for 8 weeks. The ACT sessions entailed specific goals such as discussing difficulty in controlling pain sensations, improving engagement in activities despite pain, decreasing avoidant behaviors, identifying and engaging in personally relevant valued action, and improving mindfulness. They found that ACT significantly reduced disability and affective distress, but not pain itself (Mo'tamedi et al.). Given these promising but limited findings, continued research is needed to clarify the role of acceptance in primary headache disorders and further assess relations with pain-related functioning.

Goals and Hypotheses of the Present Study

The purpose of the present study was to investigate the relationship between general psychological acceptance and headache status and headache-related disability, frequency, and

severity in a young adult sample. A college sample was chosen because migraine is highly prevalent during the young adult years (Bigal, Bigal, Betti, Bordini, & Speciali, 2001; Lipton et al., 2007), associated with significant impairment in functioning and quality of life among these individuals (Smitherman, McDermott, & Buchanan, 2011), and because the headache presentations of younger sufferers are rarely confounded by medication overuse. Consistent with findings within the broader chronic pain literature (Chiros & O'Brien, 2011; McCracken, 1998; McCracken & Vowles, 2008; McCracken et al., 2004; McCracken & Zhao-O'Brien, 2010), the following goals and hypotheses were proposed:

Study Goal 1: To examine acceptance across headache diagnostic groups.

Hypothesis 1a: Individuals with primary headache conditions would demonstrate lower acceptance than those without headache.

Hypothesis 1b: Differences in acceptance would remain after controlling for relevant covariates (e.g., gender and depression/anxiety symptomatology).

Study Goal 2: To examine relations between acceptance and headache-related disability, severity, and frequency.

Hypothesis 2a: Among only those with headache, acceptance would significantly predict headache-related disability, severity, and frequency (i.e., higher acceptance would be associated with lower headache disability, severity, and frequency).

Hypothesis 2b: Acceptance would remain a significant predictor of these headache variables after controlling for relevant covariates.

METHODS

Participants

Undergraduate students 18 years of age or older comprised the study sample. These participants fulfilled ICHD-II diagnostic criteria for chronic migraine (CM), episodic migraine (EM with or without aura), ETTH, or chronic TTH (CTTH), as well as individuals who did not experience headache (i.e., non-headache controls). Because younger adult migraineurs often experience otherwise prototypical migraine attacks that last less than 4 hours (Rains, Penzien, Lipchik, & Ramadan, 2001; Rasmussen, Jensen, & Olseen, 1991), the ICHD-II minimum migraine duration criterion were shortened from 4 hours to 2 hours. Assuming a moderate effect size (f = .25), a power level of 0.80, and an alpha level of 0.05, a total sample size of 200 participants was required.

Materials

Structured Diagnostic Interview for Headache – Revised. The Structured Diagnostic Interview for Headache – Revised (SDIH-II; Andrew, Penzien, Rains, Knowlton, & McAnulty, 1992) is a computerized structured headache diagnostic interview that assesses the presence of primary headache disorders in strict accordance with ICHD-II criteria. The 17 items inquire about headache type, frequency, pain severity, and other diagnostic characteristics and symptomatology. The SDIH-II also provides information about the experience of aura symptoms and cluster headaches and can be used to rule out secondary causes such as posttraumatic

headache (i.e., directly attributable to a head injury) and medication overuse. The original SDIH is accurate in identifying migraine in both clinical and non-clinical populations; the SDIH-R includes minor revision to comport with ICHD-II diagnostic criteria. The SDIH-R is reprinted in Appendix A.

Acceptance and Action Questionnaire-II. The Acceptance and Action Questionnaire-II (AAQ-2; Hayes et al., 2004; Bond, Hayes, Baer et al., 2011) is a 7-item measure that assesses the construct of general psychological acceptance. Items reflect the respondents' willingness to remain in contact with private experiences such as emotions, thoughts, bodily sensations, or urges without attempting to alter or avoid them. (Sample items include: ''It's OK if I remember something unpleasant," and ''I worry about not being able to control my worries and feelings"). Items incorporate Likert-type responses from 1 (never true) to 7 (always true), with lower scores indicating greater psychological acceptance. The AAQ-II is internally consistent, demonstrates expected correlations with measures of avoidant coping and emotional distress (Bond et al.), and has demonstrated reliability and validity among patients with chronic pain (McCracken and Zhao-O'Brien, 2010). The mean alpha coefficient across six standardization samples is .84 (.78–.88), and the 3- and 12-month test–retest reliabilities are .81 and .79, respectively (Bond et al.). The AAQ-II is reprinted in Appendix B.

Headache Impact Test. The Headache Impact Test (HIT-6; Kosinski, Bayliss, & Bjourner, 2003) is a self-report measure used to assess headache-related disability. This brief measure is reliable and valid for use in screening and monitoring patients' headaches in clinical research. High reliability has been demonstrated with internal consistencies ranging from .82 to .92, and test-retest reliability was good at .77 (Kosinski et al.). The HIT-6 is a valid tool for

differentiating headache impact across diagnostic and headache severity groups (Yang, Rendaus-Baum, Varon, & Kosinski, 2010). The HIT-6 is reprinted in Appendix C.

Depression Anxiety Stress Scale. The 21-item version of the Depression Anxiety Stress Scale (DASS-21; Lovibond & Lovibond, 1995) is a reliable and valid measure used to assess changes in negative affective states. The DASS-21 has been used successfully among a variety of samples, including adolescents (Willemsen, Markey, Declercq, & Vanheule, 2010), inpatient clinical groups (Ng et al., 2007), elderly pain patients (Wood, Nicholas, Blyth, Asghari, & Gibson, 2010), and undergraduate college students (Osman et al., 2012). This measure contains three subscales pertaining to Depression (i.e., characterized by a loss of self-esteem and incentive, and low perceived probability of attaining subjectively important life goals), Anxiety (i.e., enduring state of anxiety and the acute response to fear), and Stress (i.e., state of persistent arousal and tension). In a college sample, reliability for the DASS-21 subscales have been found to be good at $\alpha = 0.85$ for the Depression subscale, $\alpha = 0.81$ for the DASS-Anxiety subscale, and $\alpha = 0.88$ for the Stress scale (Osman et al.). The DASS-21 subscales have demonstrated good convergent validity with scales assessing similar constructs (Norton, 2007; Antony, Bieling, Cox, Enns, & Swinson, 1998; Lovibond & Lovibond; Osman et al.). The DASS-21 is reprinted in Appendix D.

Procedure. Individuals included in the study completed the aforementioned measures as part of a larger online survey battery in exchange for modest course credit. Participants who denied experiencing headache comprised the non-headache control group. Individuals who experienced cluster headache, secondary headaches due to head injury, or medication overuse were excluded, as were those who reported headache but whose headache diagnosis could not be adequately determined. Survey respondents were also excluded from this study if they did not

complete the entire battery or evidenced suspect effort (i.e., defined as completing the 600+ item survey in less than 30 minutes, or above the 90th percentile of completion time; see Smitherman & Kolivas, 2013).

Statistical Analyses. Data were first checked for violation of statistical assumptions. Pearson correlations (for continuous variables) and chi-squared analyses (for gender) were utilized to assess potential relationships among gender, depression symptomatology, anxiety symptomatology, headache-related disability, headache severity, and headache frequency. These analyses were conducted to identify covariates for subsequent analyses. An ANOVA was utilized to determine if differences in psychological acceptance existed among the various headache and non-headache groups. A similar ANCOVA, using previously-identified covariates, was used to determine if any observed differences remained after controlling for other variables related to acceptance. Next, three individual linear regressions were performed to examine whether acceptance "predicted" headache-related disability, severity, and frequency, which were also repeated after controlling for relevant covariates.

RESULTS

Data Analytic Assumptions. Preliminary analyses of the data revealed violations of statistical assumptions relevant to obtaining valid results of the parametric tests. Specifically, the Levenne, Welch, and Brown-Forsythe statistics were significant ($p < 0.05$) and thus revealed violation of the assumptions of normality and equal variances of AAQII scores between those who endorsed headache and those who did not. Therefore, the data were transformed logarithmically per the recommendations of Tabachnick and Fidell (2007) and Howell (2007). Statistical analyses were executed on both the original and transformed data, but there were no significant differences in the results. Hence, only analyses with the original (i.e., non-transformed) data are reported. Levenne's statistic indicated that the data violated the assumption of equal variances of AAQII scores between those who endorsed headache and those who did not. Therefore, results of Levenne's test are reported when equal variances were not obtained.

Demographics and Descriptive Statistics. The initial sample was comprised of 4,723 participants. Many of these participants were excluded from further evaluation as they did not provide headache data (n = 544), failed to complete the entire battery (n = 337), were less than 18 years of age (n = 18), or evidenced suspect effort (n = 472). Upon examining the remaining 3,352 participants' data, additional participants were excluded as they reported cluster headache (n = 44), secondary headache due to head injury (n = 131), medication overuse headache (n = 6), or whose headache data were incomplete or precluded a clear headache diagnosis (n = 1,166). The retained sample included 2,005 participants, was predominantly female (n=1297; 64.7%),

and had a mean age of 19.10 (*SD* = 2.27), with a range of 18 to 55 years. Regarding ethnicity, the majority of the sample identified as White (79.1%), followed by African American (14.6%), Asian (2.1%), Multiracial (1.8%), Hispanic or Latino (1.8%), and other ethnicities (0.6%). Among individuals with headache, the average headache frequency was 6.39 days per month (*SD* = 5.38) and average headache severity was 4.61 (*SD* = 1.81) on a 10-point scale. Regarding headache diagnostic status, 839 (42.0%) of the sample evidenced no headache diagnosis, 107 (5.3%) CM, 341 (17.0%) EM without Aura, 154 (7.7%) EM with Aura, 36 (1.8%) CTTH, and 538 (26.3%) ETTH (see Table 1).

Acceptance, Headache-Related Variables, and Psychiatric Symptoms. Sixty-five participants with headache diagnoses lacked AAQ-II data and were excluded from statistical analyses involving the AAQ-II. Correlation analyses among the entire sample indicated significant correlations between acceptance and many of the variables of interest. Specifically, depression ($r = 0.54$, $p < 0.001$) and anxiety ($r = 0.49$, $p < 0.001$) symptomatology were strongly correlated with acceptance, such that higher AAQ-II scores (lower acceptance) were associated with higher reports of depression and anxiety symptoms. Moreover, a point biserial correlation indicated that gender was significantly correlated with acceptance (r_{pb}= 0.08; p<0.001), such that males evidenced greater acceptance (i.e., lower AAQ-II scores) than females (M = 17.96 vs 19.41, respectively; t (1,938) = 3.505). As such, gender, depression and anxiety symptomology were used as covariates in subsequent analyses.

Regarding diagnostic subgroup differences, the omnibus ANOVA indicated a significant main effect for acceptance as a function of diagnostic status, $F(5, 1934) = 22.43$, $p < 0.001$. Tukey HSD post-hoc tests revealed many significant differences in acceptance among the headache and non-headache diagnostic subgroups (see Table 2). Non-headache controls and

participants with ETTH had the highest levels of acceptance (i.e., lowest scores on the AAQ-II), and the lowest levels of acceptance were exhibited by those who experienced EM with Aura, CM, and CTTH, who did not differ significantly from one another. However, the ANCOVA controlling for gender, depression, and anxiety among these diagnostic subgroups revealed that the main effect of acceptance remained statistically significant for fewer subgroups after accounting for these covariates, $F(5, 1854) = 4.47$, $p < 0.001$, although the effect size was quite small (partial $\eta^2 = 0.01$). Specifically, after considering gender and psychiatric symptomatology, subgroup differences in acceptance only remained between non-headache controls and those with either EM without Aura or CM (see Table 3).

Results of the linear regression analyses among those with a headache diagnosis indicated that acceptance was significantly associated with each of the headache-related variables. Specifically, lower scores on the AAQ-II (i.e., higher levels of acceptance) were associated with less headache-related disability (B = 0.311, $p < 0.001$), headache severity (B = 0.043, $p < 0.001$), and headache frequency (B = 0.133, $p < 0.001$). Acceptance explained 10% of the variance ($p < 0.001$) in headache-related disability, and 5% of the variance in both headache severity ($p < 0.001$) and headache frequency ($p < 0.001$). Additionally, after controlling for covariates, greater acceptance remained a statistically significant, yet modest, "predictor" of less headache-related disability, accounting for 1.6% of incremental variance ($\beta = 0.16$, $p < 0.001$). General psychological acceptance also accounted for modest unique proportions of variance in headache severity ($\Delta R^2 = 0.01$, $\beta = 0.14$, $p < 0.001$) and headache frequency ($\Delta R^2 = 0.01$, $\beta = 0.09$, $p < 0.05$).

DISCUSSION

The current study examined relationships between general psychological acceptance and headache-related variables (i.e. headache-related disability, headache severity, and headache frequency) among a young adult sample of headache sufferers. This is a population of interest because of their high prevalence of migraine and ETTH (Bigal, Bigal, Betti, Bordini, & Speciali, 2001); associated impairment in academic performance and quality of life (Bigal, Bigal, Betti, Bordini, & Speciali, 2001; Smitherman, McDermott, & Buchanan, 2011); and because the headache histories of younger sufferers are unlikely to be complicated by years of medication overuse.

Acceptance scores distinguished among those with and without headache, and among headache diagnostic groups. In the present study, the presence of any headache disorder other than ETTH, was associated with less general psychological acceptance compared to those without headache. Consistent with Dindo and colleagues' (2012) finding that acceptance of headache pain was associated with reduced headache-related disability, greater general psychological acceptance was observed among those with the less frequent and disabling diagnosis of ETTH. Ancillary analyses supported the distinction that our ETTH sufferers had less severe head pain than those with migraine ($p < 0.001$), as well as significantly less headache-related disability than the other headache groups ($p < 0.001$). Additionally, regardless of headache diagnosis, psychological acceptance was most strongly related to headache disorders involving a high frequency of attacks, such that individuals who experienced CTTH and CM

evidenced the lowest acceptance among the entire sample. Even after accounting for psychiatric symptomatology, significant differences in acceptance remained among some of the headache diagnostic groups. This suggests that acceptance may be an important factor when considering the quality of life of individuals who experience headaches, as our data demonstrated that individuals who experience headache have a greater propensity to dwell on past aversive experiences, which is associated with negative impact on engagement in many areas in life (e.g. functioning at work, school, and home). Notably, this propensity was greatest among those with headache conditions characterized by high-frequency attacks.

The construct of psychological acceptance per se has not been examined in the context of a headache sample. However, researchers examining general psychological acceptance in a general chronic pain sample observed that psychological acceptance contributed to patient functioning independent of acceptance of pain itself (McCracken & Zhao-O'Brien, 2010). General psychological acceptance and acceptance of pain are two differing constructs that may have different contributions to the functioning of individuals experiencing pain conditions. For instance, McCracken and Martinez (2011) examined the underlying processes of psychological flexibility and concluded that general psychological acceptance had both a significant and unique role in improvement of chronic pain patients' functioning beyond those accounted for by acceptance of pain. As acceptance of pain has a narrow focus on individuals' attitudes towards pain only, general acceptance denotes individuals' willingness to experience a broader array of psychological events (e.g. aversive thoughts and bodily sensations). This distinction may be important in the experience of disability related to headaches, as experiential avoidance of phenomena less overtly related to pain may prompt greater and more frequent avoidance

behaviors. Taken together, these findings illuminate general psychological acceptance as a distinctly relevant construct to explore in chronic pain samples.

Acceptance has garnered empirical support as a relevant construct within the broader chronic pain literature (Chiros & O'Brien, 2011; McCracken, 1998; McCracken & Vowles, 2008; McCracken, Vowles, & Eccleston, 2005; McCracken et al., 2004; McCracken & Zhao-O'Brien, 2010; Veehof, Oskam, Schreurs, & Bohlmeijer, 2011), and acceptance-based treatments have been associated with less headache-related disability in headache samples (Dindo et al., 2012; Mo'tamedi et al., 2012). In investigating the effects of a guided internet-delivered ACT intervention for individuals with chronic pain, Burhman and colleagues (2013) found increases in acceptance of chronic pain among a small subsample of headache sufferers, which were also associated with reduced pain-related distress, anxiety, and depressive symptoms. Overall, acceptance-based interventions appear both efficacious and effective in reducing pain as well as psychiatric symptoms among individuals with chronic musculoskeletal pain. Similar to studies on acceptance among chronic pain samples, this study provides support for a role of general psychological acceptance among those with a variety of primary headache disorders.

Greater general psychological acceptance was indeed significantly associated with less headache-related disability, severity, and frequency across all headache sufferers, although the effect sizes were modest. The ACT headache treatment studies in the literature thus far have not measured general psychological acceptance, so there is no way of examining whether general acceptance levels changed during the course of treatment in these studies (Dindo et al., 2012; Mo'tamedi et al., 2012). Although a negative association between acceptance and the headache variables was observed, the modest results from the current study raise the possibility that general psychological acceptance may be less relevant than other constructs in accounting for

headache-related variables. Acceptance of pain specifically is perhaps a more relevant factor in chronic head pain, although we did not include a measure of pain acceptance for comparative purposes. Additionally, gender and psychiatric symptomatology accounted for greater variance in all of the headache-related variables than did acceptance, although both gender and psychiatric symptoms were associated with acceptance. Constructs such as locus of control and self-efficacy for managing pain may account for larger proportions of variance in headache variables than acceptance, although this hypothesis awaits empirical verification. Other possibilities are that general psychological acceptance operates as a partial mediator or moderator between headache and disability, or between headache pain and comorbid psychiatric symptomatology. Thus, while this study has shown a modest but significant role for psychological acceptance in headache, further studies are needed to explore the specific ways in which psychological acceptance impacts headache, changes as a function of treatment, and predicts clinically-relevant outcomes.

Limitations and Future Directions

Although the present study contributes to the understanding of the role of psychological acceptance within the context of a headache sample, several methodological limitations exist. First, the current study utilized a cross-sectional research design and statistical methods that do not lend themselves to making inferences of causality. As such, changes in psychological acceptance may or may not produce changes in the other variables. A second limitation involves the fact the current study utilized a college sample of participants. Although these young adults provide benefits in terms of having less complicated headache histories than treatment-seeking older adults, findings may not generalize to the older or treatment-seeking headache populations. Stronger relations between acceptance and the headache variables might have been obtained had a more severe, treatment-seeking sample of headache patients been utilized. Finally, as

previously mentioned, the measure of acceptance used in this study is not specific to acceptance of chronic pain itself.

Perhaps if a measure of pain acceptance were utilized, such as the chronic pain acceptance questionnaire (CPAQ; McCracken, 1998), more robust results would have been observed and specific aspects of the experience of headache pain quantified. Assessing the utility of a measure such as the CPAQ in headache pain would prove valuable, as musculoskeletal pain involves differential influences of peripheral versus central nervous system processes. At present a measure of acceptance of headache pain does not exist; however, future studies could focus on developing such a measure as headache pain may be experienced differently than chronic musculoskeletal pain (e.g., headache pain is often more intermittent and unpredictable than musculoskeletal pain). Additionally, future research could utilize a longitudinal experimental design allowing for the manipulation of general psychological acceptance via brief analogue interventions or a more complete ACT-based protocol, in order to study directly the causal effects of altering acceptance on headache variables. Such a design would ideally employ a clinical sample of treatment-seeking headache patients of broader age groups and may yield favorable results regarding general acceptance and headache-related variables. As this study is the beginning of this line of research in headache, future designs can best clarify the role of acceptance in individuals with primary headache disorders.

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Table 1

Sample Demographics, Psychiatric Symptomatology, and Headache Diagnostic Status

	No Headache Diagnosis n = 839 (42%)	**Migraine n = 602 (30%)**			**Tension-Type Headache n = 564 (28%)**	
		Chronic Migraine	Episodic Migraine w/Aura	Episodic Migraine w/o Aura	Chronic TTH	Episodic TTH
Age	19.00 (2.19)	19.02 (1.67)	19.42 (3.25)	19.04 (1.72)	19.17 (1.65)	19.24 (2.50)
Female	456 (54.4)	97 (90.7)	121 (78.6)	258 (75.7)	28 (77.8)	337 (63.8)
Caucasian	676 (80.6)	88 (82.2)	121 (78.6)	247 (72.4)	31 (86.1)	423 (80.1)
DASS-21 Depression	4.51 (6.38)	9.48 (10.20)	8.78 (8.40)	6.23 (7.43)	8.65 (11.17)	4.89 (5.76)
DASS-21 Anxiety	3.93 (5.22)	8.71 (8.16)	8.34 (7.59)	6.26 (6.52)	7.61 (7.30)	4.61 (4.80)
Headache Days/Month	2.45 (2.42)	18.03 (3.80)	6.46 (3.65)	5.79 (3.89)	18.11 (4.38)	4.66 (3.00)
Headache severity (0-10)	2.71 (1.62)	6.04 (1.31)	5.92 (1.46)	5.57 (1.63)	4.39 (1.40)	3.85 (1.26)
Hit-6	42.39 (6.15)	60.86 (6.61)	59.70 (7.46)	55.93 (7.98)	55.29 (7.63)	47.48 (7.07)

Values are mean (SD) or frequency counts (%).

Table 2

ANOVA Post-Hoc Results for AAQ-II Groups Means (SD)

	No Headache	**Chronic Migraine**	**Episodic Migraine w/Aura**	**Episodic Migraine w/o Aura**	**Chronic TTH**	**Episodic TTH**
AAQ-II Score	17.23^{a} (8.15)	23.53^{b} (10.45)	22.42^{bc} (9.23)	20.47^{c} (9.14)	23.75^{bc} (10.47)	18.25^{a} (7.89)

Means with different superscripts differ significantly at $p < .05$ (Tukey HSD).

Table 3

ANCOVA Results for AAQ-II Group Marginal Means Controlling for Gender, Depression and Anxiety Symptoms (SE)

	No Headache	**Chronic Migraine**	**Episodic Migraine w/Aura**	**Episodic Migraine w/o Aura**	**Chronic TTH**	**Episodic TTH**
AAQ-II Score	18.13^{a}	20.53^{bc}	19.91^{abc}	19.74^{bc}	21.18^{abc}	18.73^{abc}
	(0.26)	(0.74)	(0.61)	(0.40)	(1.23)	(0.32)

Estimated marginal means with different superscripts differ significantly at $p < .05$.

LIST OF APPENDICES

APPENDIX A: STRUCTURED DIAGNOSTIC INTERVIEW FOR HEADACHE

Structured Diagnostic Interview for Headache – Revised (Brief Version)

Patient Name:	**Age:**	**Sex:** M F
Patient ID:	**Interviewer:**	**Date:** / /

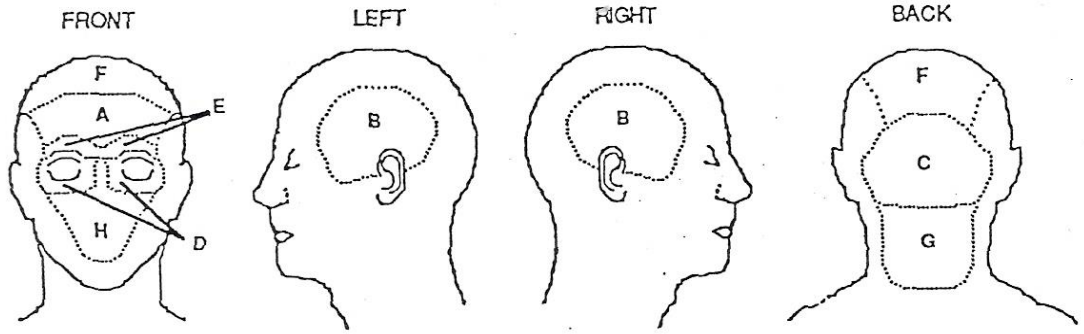
The following items are selected from the long version of the Structured Diagnostic Interview for Headache (SDIH). The SDIH is part of the Headache Evaluation and Diagnostic System (HEDS) which includes software for data entry and diagnostic decision-making. These materials are intended to facilitate diagnosis of selected recurrent, benign headaches according to both IHS (2004) and Ad Hoc Committee (1962) diagnostic criteria. Optimal use of this interview requires expertise with the diagnostic classifications and familiarity with the computer software and manual that accompany the interview.

1. Does the patient get more than one type of headache? ☐ Yes ☐ No
   (Complete a separate brief interview form for each type of headache) Headache #1 #2 #3

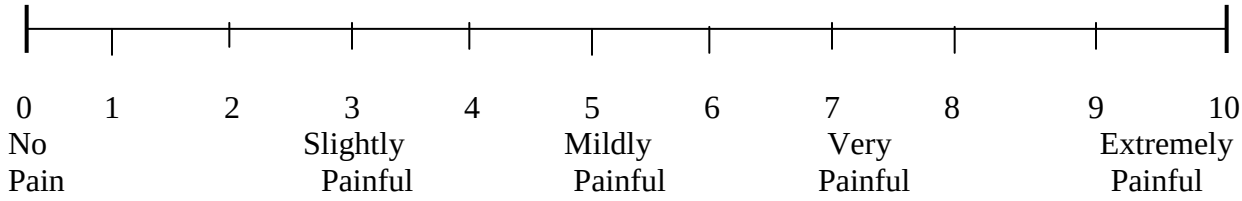
2. Select all pain locations that apply to this type of headache: ***(You must check at least one)***

   ☐ frontal (A) ☐ temporal (B) ☐ occipital (C) ☐ orbital (D) ☐ supraorbital (E)

3. Select all that apply: ☐ top of head (F) ☐ base of neck (G) ☐ nasal/facial (H)



4. What is the intensity of pain that the patient experiences with a typical headache? ____
(Indicate rating from 0-10)



5. Which of the following symptoms are a "predominant feature" of this headache type (presume that the headache is untreated)?

   Pain Location ***(Select only one)***: ☐ Unilateral ☐ Not Unilateral

   Pain Features ***(Select only one)***: ☐ Pulsating ☐ Pressing/Tightening (non-pulsating) ☐ Other

6. How often does the patient experience this type of headache pain? ____ d w m y
   (Indicate frequency in x per day, week, month, or year)

7. How long have these headaches been occurring at this rate? ____ months years
8. What is the total number of this type of headache ever experienced: ☐ 1 ☐ 2-4 ☐ 5-9 ☐ ≥10 ____
   (Indicate total number experienced)
9. How long does this headache last if untreated or unsuccessfully treated? (If patient falls asleep and wakes up without headache, duration of attack is until waking up. Check unremitting if patient reports never experiencing headache less than 7 days in duration).
   (Indicate duration in minutes, hours, or days)

   ☐ Unremitting **OR**

   ____ m h d Typical Average ____ m h d Typical Minimum ____ m h d Typical Maximum

10. Has anything about this headache (except freq.) changed in the last 6 months? ☐ Yes ☐ No
    If **YES**, explain: _____

---

11. Is the patient's typical headache pain aggravated by routine physical activities (i.e., walking, lifting, bending, etc.)?
    ☐ Yes ☐ No

12. Do any of the following symptoms occur with this headache?

    ☐ Loss of appetite/Anorexia
    ☐ Headache worsened by conversational noise levels (phonophobia)

☐ Headache worsened by normal light (photophobia)
☐ Nausea ***(Indicate intensity)*** ☐ Mild ☐ Moderate ☐ Severe
☐ Vomiting ***(Indicate intensity)*** ☐ Mild ☐ Moderate ☐ Severe

13. Does the patient ever experience symptoms before this headache pain begins? ☐ Yes ☐ No
If **YES**, and if any of the reported symptoms provide evidence of focal cerebral cortical, and/or brainstem dysfunction, complete **Appendix 1**
If **NO**, skip to #14

14. 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**, complete **Appendix 2**
If **NO**, skip to #15

15. Does the patient use any medications to relieve headache pain? ☐ Yes ☐ No
If **YES**, complete #15a, #15b, #15c
If **NO**, skip to #16

15a. How long has the patient been using the medication(s) to relieve headache pain? ____ d w m y
(Indicate duration in days, weeks, months, or years)

15b. What is the frequency of medication use? ____days per week ____days per month ____ times per day

15c. Did this headache develop or markedly worsen during medication overuse? ☐ Yes ☐ No
If **YES**, complete **Appendix 3**
If **NO**, skip to #16

16. Is this headache related to any head injury or trauma? ☐ Yes ☐ No
If **YES**, complete **Appendix 4**
If **NO**, skip to #17

17. Is this headache suspected to be attributed to a physical or other neurological disorder? ☐ Yes ☐ No

APPENDIX 1	**Migraine Aura Symptoms**

1. How many aura attacks has the patient experienced? ____

2. What best describes the aura symptoms? ***(Select all that apply)***

- ☐ At least one aura symptom develops gradually over more than 4 minutes, **AND/OR** 2 or more symptoms occur in succession over 4 minutes
- ☐ Each aura symptom lasts longer than 4 minutes but less than 60 minutes
- ☐ Headache begins during aura **OR** follows aura with a headache-free interval of less than 60 minutes

3. Indicate which of the following aura symptoms are present during this type of headache: ***(Select all that apply)***

X	SYMPTOM	X	SYMPTOM
☐	Partial loss of sight (scotoma)	☐	Uncoordinated movements (ataxia)
☐	Scintillation	☐	Dizziness (vertigo)
☐	Blurred vision	☐	Ringing in ears (tinnitus)
☐	Fortification spectra (zig-zag lines)	☐	Decreased hearing acuity
☐	Double vision	☐	Decreased level of consciousness
☐	Tingling or numbness (paresthesias)	☐	Aphasia or unclassifiable speech
☐	Weakness (paresis)	☐	Poorly articulated speech (dysarthria)
☐	Other:	☐	Other:

APPENDIX 2 — Cluster Headache Symptoms

1. Have the headaches occurred in cluster periods? ☐ Yes ☐ No
   If **YES**, complete #1a
   If **NO**, skip to #2

   1a. What is the total number of cluster periods experienced? ____

   1b. What is the duration of cluster periods? ____ d w m y ***(Indicate duration in days, weeks, months, or years)***

2. Are the headaches separated by remission periods? ☐ Yes ☐ No
   If **YES**, complete #2a

If **NO**, skip to #3

2a. What is the duration of remission periods? ____ d w m y ***(Indicate duration in days, weeks, months, or years)***

3. Indicate which of the following symptoms are present, as well as side affected, during this type of headache: ***(Select all that apply)***

X	SYMPTOM	SIDE	X	SYMPTOM	SIDE
☐	Red eyes (conjunctival injection)	R L	☐	Forehead and facial sweating	R L
☐	Tearing of the eyes (lacrimation)	R L	☐	Pupillary constriction (miosis)	R L
☐	Nasal congestion	R L	☐	Drooping eyelids (ptosis)	R L
☐	Runny nose (rhinorrhoea)	R L	☐	Eyelid swelling (oedema)	R L
☐	Restlessness or agitation		☐	Other:	

APPENDIX 3 — Medication-Overuse Headache Symptoms

1. Has the patient withdrawn from the overused medication? ☐ Yes ☐ No
   If **YES**, complete #1a and #1b
   If **NO**, skip to #2

   1a. Did headache resolve or revert to its previous pattern within 2 months after discontinuation of overused medication?
   ☐ Yes ☐ No

   1b. Has medication overuse ceased within the last 2 months, but headache has not resolved or reverted back to its previous pattern? ☐ Yes ☐ No

2. Has intake of ergotamine, triptan, opioid **OR** combination of ergotamine, triptan, opioid, or analgesic occurred on 2 or more days per week, for 10 or more days per month, for greater than 3 months ***(Must not have combination overuse of any single class alone)***?
   ☐ Yes ☐ No

If **YES**, indicate drug(s): ☐ ergotamine ☐ triptan ☐ opioid ☐ analgesic
_____

3. Has the patient's intake of analgesic occurred on 2 or more days per week, for 15 or more days per month, for greater than 3 months? ☐ Yes ☐ No
If **YES**, indicate drug: _____

4. Has the patient's intake of combination analgesics occurred on 2 or more days per week, for 10 or more days per month, for greater than 3 months? ☐ Yes ☐ No

If **YES**, indicate drugs:
_____

5. Has the patient's intake of medication other than ergotamine, triptan, analgesic, or opioid occurred on a regular basis for greater than 3 months? ☐Yes ☐ No
If **YES**, indicate drug: _____

APPENDIX 4	Post-Traumatic Headache Symptoms

1. Was there a loss of consciousness associated with head trauma? ☐ Yes ☐ No
   If **YES**, complete #1a
   If **NO**, skip to #2

   1a. What was the duration of unconsciousness? ____ m h d ***(Indicate duration in minutes, hours, or days)***

2. Is head injury attributed to whiplash? ☐ Yes ☐ No
   If **YES**, skip #5 through #8
   If **NO**, complete #3 through #8

3. Did headache develop within 7 days after head trauma (or after regaining consciousness)? ☐ Yes ☐ No

4. How long has the headache continued? ***(Select most representative category)***
   ☐ Resolves within 3 months after head trauma
   ☐ Persists for greater than 3 months after head trauma
   ☐ Persists but 3 months have not passed since head trauma

5. Did coma develop? ☐ Yes ☐ No
   If **YES**, indicate severity on Glasgow Coma Scale: ☐ GCS <13 *[moderate/severe]* ☐ GCS ≥13 *[mild]*

6. Did post-traumatic amnesia develop and continue for longer than 48 hours? ☐ Yes ☐ No

7. Did symptoms/signs develop diagnostic of a concussion? ☐ Yes ☐ No

8. Were abnormal neuroimaging results attained suggestive of a traumatic brain lesion? ☐ Yes ☐ No

APPENDIX B: ACCEPTANCE AND ACTION QUESTIONNAIRE-2

AAQ-2

Below you will find a list of statements. Please rate the truth of each statement as it applies to you. Use the following scale to make your choice:

1-Never True, 2-Very Seldom True, 3-Seldom True, 4-Sometimes True, 5-Frequently True, 6-Almost Always True, 7-Always True

1. My painful experiences and memories make it difficult for me to live a life that I would value.
2. I'm afraid of my feelings.
3. I worry about not being able to control my worries and feelings.
4. My painful memories prevent me from having a fulfilling life.
5. Emotions cause problems in my life.
6. It seems like most people are handling their lives better than I am.
7. Worries get in the way of my success.

Bond et al., 2011; in the public domain.

APPENDIX C: HEADACHE IMPACT TEST

HIT-6

This questionnaire was designed to help you describe and communicate the way you feel and what you cannot do because of headaches.

To complete, please <u>circle one answer for each question</u>.

1) When you have headaches, how often is the pain severe?

Never Rarely Sometimes Very Often Always

2) How often do headaches limit your ability to do usual daily activities including household work, work, school, or social activities?

Never Rarely Sometimes Very Often Always

3) When you have a headache, how often do you wish you could lie down?

Never Rarely Sometimes Very Often Always

4) In the past 4 weeks, how often have you felt too tired to do work or daily activities because of your headaches?

Never Rarely Sometimes Very Often Always

5) In the past 4 weeks, how often have you felt fed up or irritated because of your headaches?

Never Rarely Sometimes Very Often Always

6) In the past 4 weeks, how often did headaches limit your ability to concentrate on work or daily activities?

Never Rarely Sometimes Very Often Always

From Kosinski et al., 2003, in the public domain.

APPENDIX D: DEPRESSION, ANXIETY, STRESS SCALE

DASS-21

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement. The rating scale is as follows:

0 Did not apply to me at all, 1 Applied to me to some degree, or some of the time,

2 Applied to me to a considerable degree, or a good part of time,

3 Applied to me very much, or most of the time

1 I found it hard to wind down

2 I was aware of dryness of my mouth

3 I couldn't seem to experience any positive feeling at all

4 I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)

5 I found it difficult to work up the initiative to do things

6 I tended to over-react to situations

7 I experienced trembling (eg, in the hands)

8 I felt that I was using a lot of nervous energy

9 I was worried about situations in which I might panic and make a fool of myself

10 I felt that I had nothing to look forward to

11 I found myself getting agitated

12 I found it difficult to relax

13 I felt down-hearted and blue

14 I was intolerant of anything that kept me from getting on with what I was doing

15 I felt I was close to panic

16 I was unable to become enthusiastic about anything

17 I felt I wasn't worth much as a person

18 I felt that I was rather touchy

19 I was aware of the action of my heart in the absence of physical excertion (eg, sense of heart rate increase, heart missing a beat)

20 I felt scared without any good reason

21 I felt that life was meaningless

Lovibond & Lovibond (1995); in the public domain.

VITA

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University of Mississippi, University, MS
Master of Arts, Clinical Psychology (May, 2014)

University of Mississippi, University, MS
Bachelor of Arts, Psychology (May 2011)
Minor: Biology

Clinical Experience:

University of Mississippi Office of Student Disability Services (August 2013-January 2014)
University, Mississippi

Position: Verification Specialist
Duties: Met with students registered with the office to make semester accommodation requests, conducted intake interviews with new and prospective students with disabilities, maintained up-to-date contact with pending students, researched current trends in disability services, collaborated with other campus departments to create activities to promote disability awareness

University of Mississippi Counseling Center (August 2013-May 2014)
University, Mississippi

Position: Graduate Therapist August 2013-Present
Duties: Administered individual and group psychotherapy, therapy planning, maintained accurate treatment progress notes, planned intervention to achieve treatment goals, attended weekly supervision meetings
Supervisor: Marc Showalter, Ph.D.

University of Mississippi Psychological Assessment Team (August 2013-May 2014)
University, Mississippi

Position: Graduate Assistant
Duties: Administered comprehensive psychological assessments (e.g. intelligence, academic achievement, personality, and diagnostic interviews) to determine contributors of academic difficulties
Supervisor: Scott Gufstafson, Ph.D.

University of Mississippi Psychological Services Center (May 2012-Present)
University, Mississippi
Position: Graduate Therapist
Duties: Individual psychotherapy (CBT), plan for therapy, document treatment progress notes, plan intervention to achieve treatment goals, and attend weekly supervision meetings
Supervisor: Todd A. Smitherman, Ph.D.

North Mississippi Regional Center (August 2012-May 2013)
Oxford, Mississippi
Position: Psychology Intern
Duties: Psychological evaluations to determine eligibility of individuals referred for services, parental feedback, adaptive behavior assessments, functional behavior assessments, behavioral programming, attend interdisciplinary team meetings, individual psychotherapy with clients diagnosed with intellectual and/or developmental disabilities, group therapy with clients diagnosed with intellectual and/or developmental disabilities, and collected and integrated pertinent data into comprehensive psychological reports
Supervisor: Scott Bethay, Ph.D.

Research Assistantships:

Clinical Health Psychology Laboratory (August 2010-Present)
University of Mississippi, University, Mississippi
Topics: Migraine and psychiatric comorbidity, behavioral interventions for headache, health psychology/behavioral medicine, anxiety and depression in pain patients
Duties: Co-author writing projects, brainstorm research ideas, assist with research projects, administer headache interviews to determine headache diagnosis, administer instructions for headache self-monitoring, attend weekly meetings, data collection (survey administration), and data entry
Supervisor: Todd A. Smitherman, Ph.D.

Biology Laboratory (May 2008-May 2011)
University of Mississippi, University, Mississippi
Topics: Behavioral Neuroscience
Duties: Literature reviews, harvested tissues from animal subjects, cryostat machine, nissl stained tissues, fresh froze tissues using dry ice, microscopy suite to confirm mechanical lesions, administration of isoflurane gas, behavioral experiments, data collection, and data entry
Supervisor: Lainy B. Day, Ph.D.

North Mississippi Regional Center (August 2010-December 2010)

University, Mississippi

Topics: Intellectual and developmental disabilities
Duties: Prepared and presented a case study; observed individuals with intellectual and/or developmental disabilities, collected data, reviewed records, and interacted with individuals who have intellectual disabilities
Supervisor: Scott Bethay, Ph.D.

Teaching Experience:

University of Mississippi, Department of Psychology (January 2011-May 2011)
University, Mississippi

Position: Undergraduate Teaching Assistant
Duties: Taught self-management skills to undergraduate students related to intimate relationships, substance use, time management, and effective communication; attended weekly meetings to enhance teaching skills; and organized activities to assist in the conceptualization of topics discussed in class
Supervisor: Alan M. Gross, Ph.D.

Professional Certifications:

Best Practices in Teaching Online (2013), University of Mississippi
American Red Cross Disaster Training in Psychological First Aid (2011), University of Mississippi

Manuscripts:

Hamer, J. (2010). Estradiol does not Improve Motor Deficits after Cerebellar Lesions. *The Ronald E. McNair Post-Baccalaureate Achievement Program Journal*, *14*, 31-33.

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Walters, AB, **Hamer, JD,** Smitherman, TA. (2014). Sleep disturbance and affective comorbidity among episodic migraineurs. *Headache*, *54*, 116-124.

In preparation

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Presentations:

Oral Presentations

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Walters, A.B., **Hamer, J.D.**, & Smitherman, T.A. (2013, June). *Sleep Disturbance and Affective Comorbidity Among Episodic Migraineurs*. Poster presented at the annual conference of the International Headache Society and American Headache Society, Boston, Massachusetts.

Davis, R. E., Peck, K. R., **Hamer, J. D.**, & Smitherman, T. A. (2012, June). *Relation between*

alcohol use and migraine among a college sample. Poster presented at the annual convention of the American Headache Society, Los Angeles, California.

Walters, A. B., **Hamer, J. D.**, Houle, T. T., & Smitherman, T. A. (2012). Anxiety sensitivity and headache triggers. [Published abstract]. *Headache, 52,* 911-912.

Walters, A. B., Smitherman, T. A., Davis, R. E., Townsend, E. A., **Hamer, J. D.**, & Blann, K. R. (2011). Sleep hygiene and psychiatric comorbidity in episodic migraineurs. [Published abstract]. *Headache*, *51* (Suppl. 1), S63.

Walters, A. B., Davis, R. E., **Hamer, J. D.**, Townsend, E. A., Blann, K. R., Schulenberg, S. E., & Smitherman, T. A. (2011, November). *Relations between migraine, psychological variables, and meaning in life in a college population.* Poster presented at the annual convention of the Association for Behavioral and Cognitive Therapies, Toronto, Canada.

Hamer, J., Stinson, G.W., Sobecki, W., & Day, L.B. (2010). *Estradiol does not produce coordination improvements after cerebellar lesions*. Poster presented at the annual convention of the Society for Neuroscience, Program No. 206.10/LLL45. Online Neuroscience Meeting Planner. San Diego, California.

Hamer, J., Stinson, G.W., Sobecki, W., & Day, L.B. (2010). *Estradiol does not produce coordination improvements after cerebellar lesions.* Poster presented at the annual convention of the Association of Southeastern Biologists, *57* (2), 158. Asheville, North Carolina.

Stinson, G.W., **Hamer, J.**, & Day, L.B. (2010*). Effects of estrogen on recovery of spatial function after cerebellar lesion.* Poster presented at the anual convention of the Association of Southeastern Biologists, *57* (2), 156. Asheville, North Carolina.

Stinson, G.W., **Hamer, J.**, Coltharp, M., Parrot, N., & Day, L.B. (2009). *Effects of estrogen on recovery of spatial function after cerebellar lesion.* Presented at the annual conference of the Society for Neuroscience, Program No. 786.14. Online Neuroscience Meeting Planner. Chicago, Illinois.

Professional Activites:

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Cultural Connections Club (C3) Graduate Student Facilitator (2013), University of Mississippi
Post-Doctoral Student Search Committee (2012), University of Mississippi, *Biology (Behavioral Neuroscience) Lab*
Out of the Darkness Suicide Prevention Awareness Walk Committee (2011), University of Mississippi, *American Foundation for Suicide Prevention*
Ronald E. McNair Scholar (Summer 2010-present), University of Mississippi
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Grant Support:

University of Mississippi, Division of Student Life, Student Development Grant, $300 (2010)

NIH-NCRR, *Mississippi Functional Genomics Network Undergraduate Research Grant* (05/2009-04/2010). $4,000.

NIH-NCRR, *Mississippi Functional Genomics Network Undergraduate Research Grant* (05/2008-08/2008). $4,000.

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