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Relations Between Alcohol Use And Migraine Among Young Adults

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RELATIONS BETWEEN ALCOHOL USE AND MIGRAINE AMONG YOUNG ADULTS

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ABSTRACT

Migraine is one of the most prevalent neurological disorders diagnosed throughout the world and can be extremely disabling, with many economic, social, physical and psychological health costs. Many environmental and physiological factors have been shown to precipitate migraine, including stress, hormonal fluctuations (in women), weather events, and changes in sleep and eating habits. In retrospective studies, a sizeable proportion of migraineurs also identify alcohol as a trigger for migraine attacks, but comparatively little research has explored the nature of alcohol consumption (frequency, quantity, type, rate, time of day) in relation to other aspects of migraine. Given limited and conflicting data regarding alcohol use and migraine, the purpose of the current study was to assess whether specific alcohol-related variables differentiate migraineurs from healthy controls and to determine the extent to which these alcohol variables are associated with migraine-related variables. College students are a population of interest because of their high rates of alcohol consumption and the documented high prevalence of migraine during the college years.

The sample consisted of 192 college students with a mean age of 19.84 years (SD = 3.65), with 87 (45.3%) meeting ICHD-II criteria for episodic migraine and 6 (3.1%) for chronic migraine. Migraineurs did not differ significantly on assessed alcohol-related variables compared to controls (F (4,181) = 1.603, p = .176, partial η^2 = .036). A multivariate regression analysis among the migraineurs only found that the primary predictor variables (frequency and quantity of alcohol consumption, severity of alcohol-related negative consequences, and number of binge episodes) in aggregate did not predict the combination of migraine variables (frequency, severity,

and disability; F [12, 204] = 1.326, p = .206). However, a linear regression analysis controlling for anxiety, depression, and gender confirmed that alcohol variables significantly predicted headache-related disability, accounting for 10.6% of unique variance in disability (p <.05), but did not predict migraine severity or frequency in individual analyses. Headache self-efficacy was unrelated to alcohol-related variables. An argument is advanced for similarities between migraineurs and non-migraine controls on alcohol-related variables. Findings extend previous research and suggest the need for future studies exploring the role of alcohol use on migraine via experimental methods.

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CHAPTER 1

INTRODUCTION

Diagnosis of Migraine

Migraine is one of the most prevalent neurological disorders diagnosed throughout the world. Epidemiological data indicate that 18% of women and 6% of men living in the United States have migraine (Fukui et al., 2008; Hu, Markson, Lipton, Stewart, & Berger, 1999; Jette, Patten, Williams, Becker, & Wiebe, 2008). Prevalence of migraine in the United States is comparable to prevalence rates throughout the world, although Europe has higher rates for both men (12%) and women (24%; Leonardi, Musicco, & Nappi, 1998). Migraine is 3 times more common in women than men and for this reason is often regarded as a women's health issue (Jelinski et al., 2006; Lyngberg, Rasmussen, Jorgensen, & Jensen, 2005; Stewart, Lipton, Celentano, & Reed, 1992). Migraine affects individuals throughout life, reaching peak prevalence among individuals aged 25 to 44 (Jette et al., 2008; Lipton et al., 2002). Migraine is associated with numerous negative consequences including significant reduction in quality of life, decreased work performance, increased health care costs, and other practical liabilities (Baskin & Smitherman, 2009; Hu et al., 1999; Lipton, Hamelsky, Kolodner, Steiner, & Stewart, 2000; Pryse-Phillips et al., 1992; Von Korff, Stewart, Simon, & Lipton, 1998). The frequency of migraine and severity of associated negative consequences resulted in the World Health

Organization ranking migraine as one of the top 20 causes of disability worldwide (Leonardi, Musicco, & Nappi, 1998).

The *International Classification of Headache Disorders* (ICHD-2) classifies the most common headache types that are not attributable to secondary causes as primary headaches. Primary headaches include migraine and tension-type headache (TTH), as well as other less common subforms. Migraine is characterized by recurrent attacks of severe headache and associated symptoms of autonomic nervous system dysfunction and may occur with or without aura symptoms (e.g., visual, sensory, or speech symptoms that precede the onset of head pain by no more than 60 minutes). Migraine pain is typically unilateral, pulsating/throbbing in quality, moderate to severe in intensity, and aggravated by routine physical activity. The onset of migraine is usually gradual and typically lasts between 4 and 72 hours. Other common symptoms are nausea, vomiting, and sensitivity to light (i.e. photophobia) and sound (phonophobia) (Lipton, Scher, Silberstein, & Bigal, 2008). Migraine attacks that occur more than 15 days per month meet the criteria for chronic migraine, a rare complication of migraine often associated with overuse of acute migraine pharmacological agents (Lipton, Silberstein, & Dodick, 2008).

Comorbidity of Migraine

Although migraine is conceptualized primarily as a neurological disorder, extant literature confirms a strong association between migraine and co-occurring (comorbid) psychiatric disorders such as major depressive disorder, generalized anxiety disorder, panic disorder, social phobia, and bipolar disorder (Baskin, Lipchik, & Smitherman, 2006; Baskin & Smitherman, 2009; Breslau & Davis, 1992; Breslau & Davis, 1993; Jette, et al., 2008; McIntyre et al., 2006; Oedegaard et al., 2006; Stewart, Breslau, & Keck, 1994; Swartz, Pratt, Armenian, Lee, & Eaton, 2000). Among psychiatric disorders, depressive and anxiety disorders have the

highest rates of comorbidity with migraine, and population studies have found migraineurs to be two to four times more likely to suffer from these conditions than nonmigraineurs (Breslau, Davis, Schultz, & Peterson, 1994; Jette, et al., 2008; Lanteri-Minet, Radat, Chautard, & Lucas, 2005; Merikangas, Angst, & Isler, 1990; Oedegaard, et al., 2006). Among the anxiety disorders specifically, panic disorder and phobias are the most common comorbid disorders (Radat & Swendsen, 2005). More recent research has identified a link also between posttraumatic stress disorder and migraine (Peterlin et al., 2009). Comorbidity is most frequent among individuals suffering from migraine with aura (versus migraine without aura) (Antonaci et al., 2011; Baskin, Lipchik, & Smitherman, 2006; Breslau, 1998) and among those with chronic headache subforms (Heckman & Holroyd, 2006; Zwart et al., 2003).

Comorbidity between migraine and depression was initially thought to be a function of depression occurring in response to living with disabling headaches, but research now indicates that this relationship is bidirectional, with each disorder increasing the risk for onset of the other (Breslau et al., 1994; Breslau, Lipton, Stewart, Schultz, & Welch, 2003). This bidirectional relationship appears specific to migraine and not other forms of severe headache, potentially indicative of a shared etiology (Breslau et al., 2003; Schur, Noonan, Buchwald, Goldberg, & Afari, 2009). Findings in a twin study by Schur et al. (2009) indicate both disorders have a significant genetic basis and suggest future research should explore genetic vulnerability in the shared pathways of the two disorders. A similar bidirectional relationship has been found between migraine and panic disorder (Breslau et al., 2001), suggesting that a common etiology with migraine may occur across multiple psychiatric disorders. Although the pathophysiological mechanisms underlying this comorbidity are poorly understood, deficient serotinergic

availability, hormonal influences, and processes related to central nervous system sensitization have been implicated (Baskin & Smitherman, 2009).

Role of Alcohol and Substance Use in Migraine

Despite growing awareness of the prevalence and impact of mood and anxiety disorders among migraineurs, other psychiatric symptoms remain largely unexplored by comparison. Specifically, few studies have examined relations between substance use and migraine, and the limited existing studies have produced mixed findings. An early study by Breslau, Davis, and Andreski (1991) indicated that migraineurs were at greater risk to develop alcohol and drug abuse and dependence disorders than were individuals without headache. By comparison, a study by Saunders, Merikangas, Low, Von Korff, and Kessler (2008) found only drug dependence to be associated with migraine, while the other substance use disorders were not uniquely related to migraine. Similarly, Breslau and Davis (1993) found illicit drug abuse and dependence to be significantly more common in migraineurs, however alcohol abuse and dependence were not.

Other population-based studies have not observed higher prevalence rates of drug, alcohol, and substance use disorders among migraineurs versus nonmigraineurs (Jette, et al., 2008; Merikangas, Angst, & Isler, 1990; Swartz et al., 2000). In the most recent large-scale study on this topic, Jette et al. examined 36,984 individuals who were administered a structured diagnostic interview for psychiatric disorders and self-reported whether they had been diagnosed with migraine by a physician. Results indicated no difference in 12-month prevalence of drug, alcohol, or substance dependence between migraineurs and nonmigraineurs. Differences in findings between the aforementioned studies may be a result of varying adherence to different DSM substance use disorders criteria as well as ICHD-II criteria for migraine. Earlier studies conducted by Breslau et al. and Merikangas et al. utilized DSM-III criteria for diagnosing

substance use disorders, whereas later studies utilized DSM-IV criteria, the latter of which more strictly defines dependence. Furthermore, Jette et al. and Merikangas et al. did not use ICHD-II criteria for migraine to diagnose migraine, which may have contributed to both studies' null findings regarding differences in prevalence rates between migraineurs and nonmigraineurs.

Additionally, the mixed findings regarding comorbid migraine and substance use disorders may be due in part to the debated precipitating nature of substance use, specifically alcohol use, on migraine. A variety of both external and internal factors can precipitate, or "trigger," migraine attacks (Fukui, et al., 2008; Hauge, Kirchmann, & Olesen, 2010; Kelman, 2007; Van den Bergh, Amery, & Waelkens, 1987). Research on migraine triggers has spanned decades, with the limitation that most studies have utilized retrospective recall, in which migraineurs are asked to indentify environmental and physiological factors they believe may have caused previous attacks (Aamodt, Stovner, Hagen, Brathen, & Zwart, 2006; Fukui, et al., 2008; Hauge, Kirchmann, & Olesen, 2010; Ierusalimschy & Filho, 2002; Kelman, 2007; Peatfield, 1995; Peatfield, Glover, Littlewood, Sandler, & Rose, 1984; Spierings, Ranke, & Honkoop, 2001; Van den Bergh, Amery, & Waelkens, 1987). Kelman asked migraineurs to rate the frequency of triggers precipitating their migraine attacks and found that 75.9% of migraineurs reported experiencing migraine triggers, with 40.4% reporting that triggers precipitated migraine occasionally, 26.7% reporting that triggers precipitated migraine frequently, and 8.8% reporting that triggers precipitated migraine very frequently. The most commonly reported triggers were stress (79.7%), hormones in women (65.1%), not eating (57.3%), and weather changes (53.2%); alcohol was reported as a migraine trigger by 37.8% of the sample. Patients with migraine with aura reported having more triggers, including alcohol, than patients with migraine without aura. Van den Bergh, Amery, and Waelkens asked migraineurs

nondirective questions regarding their migraine history and trigger factors and found that 85% of migraineurs identified at least one trigger for their migraines. The most common triggers identified were alcoholic beverages (51.6%), stress (48.8%), and menstruation in women (48%). Patients who endorsed alcohol as a trigger also reported a significantly greater number of other triggers, in particular food-related triggers, than did those who denied alcohol as a migraine trigger. Despite frequent endorsement of migraine triggers, most existing studies on headache triggers inquires only about broad categories of stimuli (e.g., diet/food, environment/weather, sleep) without attempting to parse out specific individual triggers (e.g., types of food/beverage, particular weather conditions, aspects of sleep).

In an attempt to isolate potential differential precipitation of migraine attacks, many studies have made a distinction between alcohol (all forms), clear spirits, red wine, and white wine (Fukui et al., 2008; Littlewood et al., 1988; Peatfield, 1995). Fukui et al. presented 200 migraineurs with a list of common triggers and asked them to select any items they believed triggered their migraine. They found that all migraineurs reported at least one trigger, with the most common being related to diet (e.g., cheese, chocolate, coffee, aspartame, alcohol) (84.5%), sleep (75.5%), environmental factors (e.g., allergy, pollution, wind, rain, changes in weather, odors) (68.5%), and stress (65%). Alcohol and both red and white wine were included in dietary factors. Thirty-four percent of patients endorsed alcohol as a trigger, 19.5% endorsed red wine as a trigger, and 10.5% endorsed white wine as a trigger. Red wine precipitating migraine was significantly more common in women (22.2%) than men (7.9%). Other research relying on retrospective recall has found migraineurs to be sensitive to alcohol (all forms) as a trigger and more sensitive to red wine than white wine or clear spirits (Peatfield, 1995). Contrastingly, an experimental study by Littlewood et al., in which migraineurs with dietary triggers were

randomly assigned to receive either red wine or a disguised vodka mixture, found that 80% of migraineurs who ingested red wine experienced migraine shortly thereafter, compared with none who received the vodka mixture. Although the differences in results of these studies may be partly attributable to differences in research methodology, these discrepancies may indicate that behavioral differences in consumption underlie the effects of alcohol and wine as migraine triggers. For instance, the results of Littlewood et al. suggest that red wine has a greater precipitating effect than alcohol when consumed at the same frequency and quantity. Whether real-world drinking behaviors among migraineurs reflect these patterns remains unexplored empirically.

Even though the majority of studies indicate similar findings regarding the general presence and nature of alcohol-related triggers, reported prevalence rates of alcohol as a trigger range from 6.1% to 51.5%. These wide differences in trigger endorsement may be influenced by medical advice to avoid known triggers (among clinic patients vs. non-treatment seeking samples), differences in regional attitudes towards alcohol, and the retrospective nature of most prior studies (Hauge, Kirchmann, & Olesen, 2010; Karli, Zarifoglu, Calisir, & Akgoz, 2005; Kelman, 2007; Mannix, Frame, & Solomon, 1997; Nicoletti et al., 2008; Panconesi, 2008; Peatfield, 1995; Spierings, Ranke, & Honkoop, 2001; Van den Bergh, Amery, & Waelkens, 1987). In view of limited knowledge concerning the physiological mechanisms involved in precipitation of migraine, research has begun to focus on genetic vulnerability and neural activation in the presence of triggers. One potential link between alcohol and migraine is the presence (or lack thereof) of the alcohol dehydrogenase-2 genotype (ADH2), an enzyme integral to the metabolism of ethanol (García-Martín et al., 2010). Ethanol itself can potentiate neurogenic inflammatory responses (e.g., arterial vasodilation) that release sensory

neuropeptides from trigeminal neurons, and the trigeminovascular system is widely acknowledged to be the central source of migraine pain (Nicoletti et al., 2008). García-Martín and colleagues found a significantly lower prevalence of the ADH2 genotype among patients with migraine than healthy controls, suggesting the absence of this genotype may be associated with increased risk of migraine attacks after alcohol consumption. Continuing research on alcohol as a trigger factor may shed light on the underlying mechanisms involved in migraine attacks, as well as have implications for how to better manage the disorder (Fukui et al., 2008; Panconesi, Bartolozzi, & Guidi, 2011).

Alcohol Use in Migraineurs

Despite the numerous aforementioned studies indicating a precipitating relationship between alcohol consumption and migraine, little research has been conducted examining relations between specific factors associated with alcohol consumption (e.g., frequency, quantity, type) and clinically-relevant migraine variables beyond a diagnosis (e.g., frequency, intensity, migraine-related disability). Most prior studies exploring the nature of alcohol use among migraineurs have utilized retrospective recall, included large population-based samples not at specific risk of alcohol abuse, and assessed quantity and frequency of consumption only (Aamodt et al., 2006; Molarius, Tegelberg, & Öhrvik, 2008; Yokoyama et al., 2009). For instance, Molarius and colleagues studied migraine in relation to heavy drinking (half a bottle of strong liquor or corresponding amount of wine or beer at the same occasion) and found that 27.8% of female heavy drinkers reported having migraines, compared with 20.6% of women who never drank, although no association between heavy alcohol use and migraine was found for men. Overall, there was an inverse association between heavy alcohol use and migraine, with the prevalence of migraine decreasing as frequency of heavy alcohol use increased (Odds Ratio

[OR] = 1 for non-heavy drinkers, OR = .90 for seldom heavy drinkers, OR = .70 for at least monthly heavy drinkers). Similarly, Aamodt et al. found the prevalence of migraine to be inversely related to units of alcohol consumed over the past 2 weeks (OR = 1 for abstainers, OR = .80 for 1-4 units, OR = .60 for 4-14 units, OR = .50 for > 14 units). Overall, 63% of the sample reported alcohol consumption in the past 2 weeks, with an equal distribution between migraineurs and non-headache controls. Yokoyama et al. (2009) examined specific units of alcohol consumed per day and also found an inverse dose-response relationship for both men (OR of migraine = 1 for non-drinkers, OR = .76 for < 1 unit, OR = .56 for < 2 units, OR = .55 for < 3 units, OR = .51 for ≥ 3 units) and women (OR = 1 for non-drinkers, OR = .77 for < 1 unit, OR = .72 for < 2 units, OR = .39 for < 3 units, OR = .59 for ≥ 3 units). Researchers generally attribute this inverse relationship to migraineurs' avoidance of alcohol, especially in large quantities, because of its potential to trigger an attack as described previously (Aamodt et al., 2006; Molarius, Tegelberg, & Öhrvik, 2008; Panconesi, 2008; Panconesi, Bartolozzi, & Guidi, 2011; Yokoyama et al., 2006).

To better understand alcohol consumption among migraineurs within a clinical setting, Mannix, Frame, and Solomon (1997) reviewed 8 years of medical charts at a specialty headache center and found that 12% of treatment-seeking patients reported drinking more than 1 alcoholic beverage per week. The percentage of migraineurs who consumed alcohol was comparable to the percentage of general medicine patients. Although Mannix and colleagues did not assess quantity of consumption or type of alcohol consumed, their results indicate a lower prevalence of alcohol consumption among treatment-seeking migraineurs than among migraineurs in the general population (31%; Aamodt et al., 2006), perhaps because clinic patients have more severe migraine and receive instructions to avoid common triggers (Fukui et al., 2008; Panconesi,

Bartolozzi, & Guidi, 2011). Further research is needed to better understand relations between alcohol consumption and migraine among different populations, using prospective designs, and assessing the impact of alcohol on other migraine-related variables.

Goals of the Present Study

The aims of the present study were to assess differences in alcohol consumption between migraineurs and non-migraineurs and to examine relations between alcohol consumption/consequences and specific migraine-related variables. In addition, the current study controlled for depression, anxiety, and gender to determine if there were any significant differences in drinking behaviors even after accounting for these factors.

To better understand the relationship between alcohol consumption and migraine in a non-treatment-seeking community sample, college students served as participants. They are a population of interest due to their high rates of alcohol consumption and binge drinking (≥ 5 drinks in one sitting for men, ≥ 4 drinks in one sitting for women) (Hingson, 2010; Hingson, Heeren, Winter, & Wechsler, 2005; Pedrelli et al., 2011). The 2010 National Health Interview Survey found that 56% of young adults regularly consume alcohol, compared to 51% of middle-aged adults and 38% of elderly adults (Department of Health and Human Services, 2011). Over the past decade, binge drinking has increased among college students, with 45.2% of students reporting consuming five or more drinks in an occasion during the previous 30 days (Hingson, 2010). Approximately 70% of college students consume alcohol on at least one occasion in a 30-day period, with 40-50% consuming enough alcohol to be considered binge drinking (Cranford, Eisenberg, & Serras, 2009; Dawson, Grant, Stinson, & Chou, 2004; O'Malley & Johnston, 2002). Despite frequently-reported negative consequences related to alcohol consumption among this population (Hingson, Zha, & Weitzman, 2009), college students tend to report higher levels of

positive consequences (e.g., feeling relaxed, more romantic, more creative, fitting in with people) than negative consequences (e.g., hangover, missing classes, unplanned sex, trouble with police) related to alcohol use, which likely contribute to their increased relative consumption (Park & Grant, 2005; Slutske, 2005). College students' positive perceptions of consequences may be due to the college culture downplaying the seriousness of negative consequences (Slutske, 2005). Further, research on alcohol and headache among this population is scarce, despite their use as research participants in other studies of headache and their high frequency of both alcohol consumption and migraine. Migraine prevalence significantly increases beginning in young adulthood (Lipton, Bigal, Hamelsky, & Scher, 2008), and existing studies suggest that approximately 25% of college students suffer from migraine (Bigal, Bigal, Betti, Bordini, & Speciali, 2001; Smitherman, McDermott, & Buchanan, 2011).

An ancillary goal of the present study was to assess associations between alcohol consumption and headache self-efficacy among migraineurs. Headache self-efficacy refers to the confidence a person has that he or she can take action to prevent the onset of headache episodes and/or manage headache-related pain and disability (French et al., 2000). Such actions may include avoiding known headache triggers or limiting exposure to such triggers. Recurrent headache sufferers with higher headache self-efficacy exhibit fewer passive coping strategies than their lower self-efficacy counterparts, even after controlling for differences on headache severity, frequency, and chronicity (Martin, Holroyd, & Rokicki, 1993). However, self-efficacy differences between migraineurs as a function of alcohol consumption remain unexplored, despite the fact that individuals with higher headache self-efficacy would be assumed to consume alcohol less frequently than migraineurs with low self-efficacy, presumably because high self-efficacy is associated with avoidance of known triggers.

In summary, the current study explored relations between alcohol consumption/negative consequences and migraine-related variables (frequency, severity, disability, and self-efficacy).

Hypotheses

The following goals and hypotheses were proposed:

Study Goal 1: To examine differences in drinking behaviors and alcohol-related variables between migraineurs and non-headache controls.

Hypothesis 1a: Migraineurs would exhibit specific drinking behaviors that differentiated them from controls, specifically: lower frequency of consumption, lower severity of negative consequences related to alcohol consumption, smaller quantity of consumption, and a lower number of binge episodes.

Hypothesis 1b: These differences in drinking behaviors would remain even after controlling for comorbid anxiety, depression, and gender.

Study Goal 2: To determine if alcohol-related variables are predictive of migraine-related variables.

Hypothesis 2a: Higher frequency of alcohol consumption, greater severity of negative consequences related to alcohol consumption, larger quantity of consumption, and higher number of binge episodes would be significant predictors of increased migraine frequency, severity, and disability.

Hypothesis 2b: High headache self-efficacy would be associated with reduced frequency and quantity of alcohol consumption, number of binge episodes, and severity of negative consequences.

Ancillary Study Goal 3: To determine if prospective self-monitoring indicates a precipitating relationship between alcohol and headache. (This was included as an ancillary study goal for analysis in a related project.)

Hypothesis 3: Alcohol consumption as reported prospectively on self-monitoring forms would be a significant trigger of next-day headache.

CHAPTER 2

METHODS

Participants

Participants were undergraduate students at a southeastern university who received modest course credit for their participation. Participants included individuals who suffered from migraine headaches and healthy controls who did not suffer from any type of primary headache other than episodic tension-type headache (ETTH). Those who met criteria for migraine as defined by the International Classification of Headache Disorders, Second Edition (ICHD-II; International Headache Society, 2004) were assigned to the migraine group. For reasons related to the ancillary study goal, we attempted to recruit individuals for the migraine group who reported four or more headaches days per month. However, we retained the 16 migraineurs (18.2%) who reported one to three headache days per month on the structured diagnostic interview. Individuals who did not endorse any primary headaches other than episodic tension-type headache (ETTH) were assigned to the control group. Assuming a moderate effect size (f^2 = 0.15), a power level of 0.80, and an alpha level of 0.05, a total sample size of 106 participants was required.

Materials

Generalized Anxiety Disorder 7-item Scale. The Generalized Anxiety Disorder 7-item scale (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006) is a self-report measure of anxiety symptoms reflecting DSM-IV-TR (APA, 2000) diagnostic criteria for generalized anxiety disorder. The measure includes seven items, each with a 4-point Likert-type item response ranging from 0 (Not at all) to 3 (Nearly everyday). Overall scores range from 0-21 with scores 5-9 indicating mild anxiety, scores 10-14 indicating moderate anxiety, and scores ≥ 15 indicating severe anxiety. The GAD-7 exhibits good reliability in terms of internal consistency (Cronbach $\alpha = .92$) and test-retest reliability ($r = .82$). The GAD-7 has good convergent validity with the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) ($r = .72$), the Symptom Checklist-90 (SCL-90; Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974) ($r = .74$), and other measures of generalized anxiety symptoms (Spitzer, et. al, 2006). Additionally, the GAD-7 is effective at screening for the presence of other anxiety disorders such as panic disorder, social phobia, and posttraumatic stress disorder (Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007). This measure can be found in Appendix A.

Patient Health Questionnaire-9. The Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) is a self-report instrument used to screen for depression among medical patients, as it reflects the nine DSM-IV-TR (APA, 2000) diagnostic criteria for major depressive disorder. The measure consists of nine items, each with a 4-point Likert-type item response ranging from 0 (Not at all) to 3 (Nearly everyday). An overall score of 5 indicates mild depression, a score of 10 indicates moderate depression, a score of 15 indicates moderately severe depression, and an overall score of 20 indicates severe depression. The PHQ-9 has excellent internal reliability (Cronbach $\alpha = .89$) and test-retest reliability ($r = .84$). Strong construct validity has been shown with the Short-Form General Health Survey (SF-20; Stewart,

Hays, & Ware, 1988) (r = .73), a self-report measure of sick days and symptom-related disability (Kroenke, Spitzer, & Williams, 2001). This measure can be found in Appendix B.

Migraine Disability Assessment Questionnaire. The Migraine Disability Assessment Questionnaire (MIDAS; Stewart, Lipton, Dowson, & Sawyer, 2001) is a 7-item self-report measure of headache-related disability. The first five questions ask respondents to quantify the number of days in the past three months that migraine has limited everyday activities (e.g., school/work, home life, social activities). On these five questions, total scores between 0-5 indicate little or no disability, scores between 6-10 indicate mild disability, scores between 11-20 indicate moderate disability, and overall scores ≥ 21 indicate severe disability. The final two questions on the MIDAS ask about the frequency and intensity of headaches but are not used to derive the total score. The MIDAS has good internal consistency (Cronbach α = .76) and test-reliability (r = .80; Stewart, Lipton, & Sawyer, 1999). High internal consistency and test-retest reliability have been found in both clinical and nonclinical populations (Stewart, et al., 2001; Stewart, Lipton, Kolodner, Liberman, & Sawyer, 1999). The MIDAS also shows strong correlations with physicians' assessments of migraine (r = .69) (Stewart et al., 2001). This measure can be found in Appendix C.

Headache Management Self-Efficacy Scale-25. The Headache Self-Efficacy Scale-25 (HMSE-25; French, et. al, 2000) is a self-report instrument that assesses an individual's confidence in his or her ability to manage headache-related pain. The measure has 25 items, each with a 7-point Likert-type response ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Nine items are reverse-scored. High total scores indicate high belief in one's ability to manage headache-related pain. The HMSE-25 has excellent internal consistency (Cronbach α = .90) and correlates positively with the Headache-Specific Locus of Control Internal subscale (r = .40),

another measure of headache self-management (French, et. al, 2000). This measure can be found in Appendix D.

Daily Drinking Questionnaire. The Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) is a self-report measure of frequency of alcohol consumption. The DDQ inquires about typical weekly alcohol use over the past month and heaviest weekly alcohol use over the past 3 months. The measure consists of two tables inquiring about the number of drinks and number of hours spent drinking per day over these two time periods. To assist in calculation of blood alcohol levels, the DDQ also asks about current height and weight of the respondent. The DDQ inquires also about the number of binge episodes for both men and women in the past month, as well as the number of binge episodes in the past month during a span of two hours or less. Overall scores represent the average number of drinks per week as quantified from the weekly use questions. Total scores ≥ 12 drinks per week indicate high-volume drinkers, 4-11 drinks/weeks moderate-volume drinkers, 2-3 drinks/week low-volume drinkers, and <1 drink/year abstinent or infrequent drinkers (Collins, Parks, & Marlatt, 1985). The DDQ correlates significantly with the Drinking Practices Questionnaire (Cahalan, Cisin, & Crossley, 1969) ($r = .50$, $p = .001$), a longer measure used to assess volume, quantity, and frequency of alcohol consumption. Overall the DDQ is considered a reliable and valid measure of volume, quantity, and frequency of alcohol consumption (Collins, Parks, & Marlatt, 1985). This measure can be found in Appendix E.

Rutgers Alcohol Problem Index. The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) is a self-report measure of negative alcohol-related consequences. The measure includes 23 items, each with a 5-point Likert-type item response (0 = never, 1 = 1-2 times, 2 = 3-5 times, 3 = 6-10 times, 4 = more than 10 times) indicating the frequency of alcohol use or

alcohol-related consequences in the last 28 days. Higher scores indicate more problematic drinking, and total scores ≥ 8 imply clinically-significant alcohol-related problems (Neal, Corbin, & Fromme, 2006). The RAPI has excellent internal consistency (Cronbach α = .92) and test-retest reliability ranging from .89 to .92 (Neal, Corbin, & Fromme, 2006; White & Labouvie, 1989). Overall the RAPI has moderate convergent validity (White & Labouvie, 1989) and is comparable to the Young Adult Alcohol Consequences Questionnaire (YAACQ; Read, Kahler, Strong, & Colder, 2006) and Personal Experience Screen Questionnaire (PESQ; Orenstein & Davis, 1995), other measures assessing alcohol-related problem behaviors. The RAPI is one of the most commonly used measures for assessing problematic alcohol use with college-aged samples (Holleran & Jung, 2008; Neal, Corbin, & Fromme, 2006; Orenstein & Davis, 1995). This measure can be found in Appendix F.

Anxiety Sensitivity Index-3. The Anxiety Sensitivity Index-3 (ASI-3; Taylor, et. al, 2007) is a self-report instrument that assesses three distinct factors of anxiety sensitivity, or the fear of benign arousal-related physical symptoms due to their presumed negative consequences: physical, cognitive, and social concerns. The measure consists of 18 items, each with a 5-point Likert-type item response ranging from 0 (Very little) to 4 (Very much). High scores indicate higher anxiety sensitivity. The ASI-3 has adequate reliability for the total score (ρ = .90), the Physical Concerns subscale (ρ = .84), the Cognitive Concerns subscale (ρ = .86), and the Social Concerns subscale (ρ = .80) (Osman, et al., 2010). Anxiety Sensitivity Index-3 items exhibit good internal consistency (Cronbach α= .88), and the subscales' internal consistency ranges from adequate to good (Physical = .81, Cognitive = .91, Social = .79). The ASI-3 has been validated among both clinical and non-clinical samples, as well as among international samples in Canada, France, Mexico, the Netherlands, Spain, and the United States (Taylor, et. al, 2007).

The ASI-3 shows positive correlations with the Symptom Assessment-45 (SA-45; Osman, et al., 2010), the Positive and Negative Affect Schedule (PANAS; Osman, et al., 2010), and the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988), other measures assessing features of anxiety and psychopathology. This measure can be found in Appendix G.

Demographic Questionnaire. The Demographic Questionnaire included questions assessing basic demographic information such as age, gender, and race/ethnic identity, as well as ratings of general health. This measure can be found in Appendix H.

Structured Diagnostic Interview for Headache – Revised. The Structured Diagnostic Interview for Headache - Revised (SDIH-R; Andrew, Penzien, Rains, Knowlton, & McAnulty, 1992) is a well-validated structured diagnostic interview for determining the presence of primary headache disorders, with modifications to comport precisely with current ICHD-II criteria (IHS, 2004), with the exception that the minimum required migraine duration of four hours was reduced to two hours in light of data that younger adult migraineurs often have otherwise prototypical attacks lasting fewer than four hours (Rains, Penzien, Lipchik, & Ramadan, 2001). The SDIH-R consists of 17 items asking about various headache features as well as appendix questions to assess aura symptoms and cluster headache, and to rule out secondary headache causes such as medication overuse and post-traumatic headache. This measure can be found in Appendix I.

Daily Headache Self-Monitoring Form. The Daily Headache Self-Monitoring Form adapted for this study (Rhudy, Penzien, & Smitherman, 2009) afforded daily recording of pain intensity levels, disability, stress, sleep variables, medication use, alcohol use, nicotine use, and menstruation among individuals with migraine. The form consists of 7 grids, one for each day of the week. Each grid has 5 rows corresponding to every hour of the day for recording headache,

headache-related disability, stress, sleep, and alcohol. Headache, disability, and stress are each rated on intensity scales ranging from 0 (No) to 10 (Extremely/completely). Respondents record ratings for these variables twice daily. For sleep and alcohol, respondents check each hour box that pertains to the time during which these activities occurred and also record the number of alcoholic beverages consumed and cigarettes smoked since their last headache, disability, and stress ratings (twice daily). Sleep amount and sleep quality are rated once daily. This measure can be found in Appendix J.

Procedures

Participants were recruited via campus flyers seeking individuals with migraine and through an online screening survey linked from the Psychology Department website. Individuals reporting migraine symptoms were emailed an invitation to participate in the study. Those who agreed to participate met individually with a clinical psychology graduate student for written informed consent and administration of the SDIH-R for migraine diagnostic confirmation. Participants without migraine or with a headache disorder other than episodic tension-type headache were excluded from the migraine group. Once a diagnosis of migraine was confirmed, participants completed the aforementioned questionnaires and subsequently self-monitored headache and alcohol variables for a 2-week period. They returned at the end of two weeks to turn in the self-monitoring forms and completed the questionnaires a second time. Individuals denying problem headaches or screening negative for migraine on the online screener comprised the control group and provided written informed consent and completed the aforementioned questionnaire measures in one administration (i.e., control participants did not complete daily self-monitoring).

Statistical Analyses

In order to test the first hypothesis, which sought to compare migraineurs and controls on specific drinking variables as assessed by data from the DDQ and RAPI, a MANOVA was conducted. A series of univariate follow-up ANOVAs of specific variables from Hypothesis 1a was conducted. Subsequently, a series of univariate follow-up ANCOVAS of variables from Hypothesis 1b were conducted to determine if observed relationships remained after controlling for relevant covariates. In addition to comparing migraineurs and healthy controls on specific drinking variables, the current study sought to "predict" migraine frequency, severity, and headache-related disability using alcohol-related variables. Multivariate regression analyses were conducted to determine the amount of variance in headache frequency (from SDIH-R), severity (from SDIH-R), and disability (MIDAS) predicted by frequency and quantity of alcohol consumption, severity of negative consequences related to alcohol consumption, and number of binge episodes. Subsequent linear regressions, individualized by criterion variable, were then conducted in order to determine the amount of variance predicted by drinking variables from Hypothesis 2a. Additional linear regression analyses were conducted to determine the amount of variance in frequency and quantity of alcohol consumption, severity of negative consequences related to alcohol consumption, and number of binge episodes predicted by headache self-efficacy.

CHAPTER 3

RESULTS

Participant Demographics and Migraine Prevalence

Three hundred and twenty participants were candidates for the study based on their response to the flyers or survey responses. Subsequently, 128 were excluded for lack of headache data (20), suspect effort on the screening survey (22), other identified headache diagnoses that could function as confounds (probable TTH = 35, cluster headache = 3, chronic TTH = 2, medication overuse headache = 1, probable migraine = 4, posttraumatic headache = 4, and control participants with identified migraine = 28). Fourteen participants screened positive for migraine but did not meet criteria upon interview and thus were excluded from the study. After deleting nine multivariate outliers (described below), the remaining analyzed sample consisted of 192 young adults (72.9% female) with a mean age of 19.84 years (*SD* = 3.65). The majority (75.5%) of the sample was Caucasian, 17.7% were African American, 4.2% were Asian, 1.0% were Hispanic/Latino, and 1.6% were of other ethnicities. Regarding migraine, 93 participants (48.4%) met ICHD-II diagnostic criteria for migraine: 87 (93.5%) with episodic migraine and 6 (6.5%) with chronic migraine. Eighty-seven percent of migraineurs were female, and 27 participants (29%) reported experiencing aura. Average headache frequency for migraineurs was 6.72 days/month (*SD* = 4.74). They reported an average headache-related disability score of

26.49 (*SD* = 21.49) on the MIDAS and headache self-efficacy score of 97.74 (*SD* =21.46) on the HMSE-25. The majority (71.0%) of migraineurs endorsed moderate to severe migraine-related disability on the MIDAS. Fifty-one percent of migraineurs obtained scores (92-115) indicative of moderate self-efficacy on the HMSE-25. Gender distribution significantly differed between migraineurs and controls, such that migraineurs were more likely to be female (87.1% vs. 59.6%, $p < .001$). As shown in Table 1, migraineurs also obtained significantly higher scores than controls on the GAD-7 (*M* = 6.40 [*SD* = 4.27] v. 3.86 [*SD* = 3.66], $p = .034$), but only trended toward significance in obtaining higher depression scores on the PHQ-9 (*M* = 6.42 [*SD* = 4.66] v. 4.06 [*SD* = 4.05], $p = .10$). As proposed initially these variables were controlled for using ANCOVAS in later analyses.

Data Analytic Assumptions

Histograms and descriptive statistics (i.e., skewness, kurtosis) were used to assess data analytic assumptions for the main total scores of interest (RAPI, DDQ, PHQ-9, GAD-7) and found satisfactory. Levene's test of equality of error variances confirmed that homogeneity of variance was met for all main criterion variables. Migraine and control participants were then assessed for multivariate outliers on the main total scores of interest by group using Mahalanobis distance: nine multivariate outliers (5 control, 4 migraine) were found using a conservative $p < .001$ cutoff and thus were removed prior to subsequent analyses.

Migraine and Drinking Variables

As shown in Table 2, migraineurs reported having an average of 6.99 (*SD* = 9.52) drinks per week (vs. 9.55 [*SD* = 10.12] for controls), drinking on 1.55 (*SD* = 1.53) days per week (vs. 1.94 [*SD* = 1.54] for controls), and engaging in 2.35 (*SD* = 3.54) binge episodes during the past month (vs. 2.79 [*SD* = 3.64] for controls). The overall MANOVA comparing groups on specific

drinking-related variables was nonsignificant, F (4,181) = 1.603, p = .176, partial η^2 = .036. Although the MANOVA was nonsignificant, an ANOVA was performed on individual items to aid in interpretation. Only scores on the RAPI differed significantly between groups, F (1, 189) = 3.945, p = .048, partial η^2 = .020. However, after controlling for covariates an ANCOVA revealed this relationship to be no longer significant, F (1, 188) = .014, p = .906, partial η^2 = .000, with gender accounting for a significant portion of the variance, F (1,188) = 4.002, p = .049, partial η^2 = .045. Group differences on the number of days drinking per week approached significance, F (1, 186) = 3.515, p = .062, partial η^2 = .019. However, an analysis of covariance rendered this relationship to be non-significant, F (1, 186) = 2.834, p = .096, partial η^2 = .033, with PHQ-9 scores accounting for a significant amount of the variance, F (1,186) = 4.587, p = .035, partial η^2 = .053. No significant differences were found between groups on number of drinks consumed per week, F (1, 186) = 3.188, p = .076, partial η^2 = .017, or number of binge episodes in the past month, F (1, 190) = .728, p = .395, partial η^2 = .004.

Headache-Related Variables

In the multivariate regression analysis among the migraineurs only, primary predictor variables (frequency and quantity of alcohol consumption, severity of alcohol-related negative consequences, and number of binge episodes) were entered simultaneously to predict headache frequency, severity, and disability. Using Wilks' criteria, the overall model examining the combined criterion variables was not significant, F (12, 204) = 1.326, p = .206. Individual linear regression analyses (i.e., separate for each criterion variable) controlling for gender, anxiety, and depression were nevertheless run to aid in interpretation. Linear regression analysis confirmed that frequency and quantity of alcohol consumption, severity of alcohol-related negative consequences, and number of binge episodes significantly predicted headache-related disability

as measured by the MIDAS, together accounting for 10.6% of unique variance in disability ($p < .05$; see Table 3). Within this regression, only the number of binge episodes contributed significantly to headache-related disability, however ($p = .007$). Despite their relationship with headache-related disability, alcohol-related variables did not predict migraine frequency or intensity. Subsequent linear regression analyses were run to determine if headache-self efficacy was predictive of frequency and quantity of alcohol consumption, negative consequences related to alcohol consumption, and number of binge episodes. Results indicated headache-self efficacy was not a significant predictor of any of these alcohol-related variables (all R^2s < 0.2%).

CHAPTER 4

DISCUSSION

The present study sought to identify associations between alcohol-related behaviors and migraine frequency, intensity, disability, and self-efficacy so as to gain insight into the relationship between alcohol and migraine among non-treatment-seeking young adults. With the first study goal, we examined potential differences in alcohol-related behaviors between migraineurs and healthy controls. With the second study goal, we explored potential relationships between the alcohol-related variables and headache frequency, intensity, and disability. In the third study goal, we investigated whether or not headache self-efficacy was associated with the alcohol-related behaviors reported by migraineurs. The present study also took into account the contributions of gender and depression/anxiety symptomatology in relation to migraine and alcohol consumption. Young adults were chosen as a population of interest because of their high rates of migraine (Bigal et al., 2001; Lipton et al., 2008), alcohol consumption and binge drinking (Hingson, 2010; Hingson et al., 2005; Pedrelli et al., 2011), and psychiatric comorbidities (Kessler et al., 2005; Smitherman, McDermott, & Buchanan, 2011). Conclusions from the current study are consistent with aspects of some previous studies on alcohol use in migraineurs and provide new information regarding specific alcohol-related behaviors and migraine-related variables.

Alcohol Consumption

Overall, migraineurs did not differ from non-migraine controls in the quantity or frequency of alcohol consumption, the number of alcohol-related negative consequences, or the number of binge episodes in the past month. Our adherence to an a priori power analysis defends against inadequate sample size as a contributing factor to these null findings. Similarities in alcohol consumption between individuals with and without migraine are consistent with a general conclusion of the Aamodt et al. (2006) study that found equal percentages of migraineurs and non-headache controls reporting alcohol consumption within the past two weeks, and provide new findings by highlighting similarities in frequency of consumption. Despite an early study by Breslau and colleagues (1991) that found migraineurs to be at a greater risk for alcohol abuse and dependence disorders compared to non-headache individuals, our findings did not reflect these group differences. Rather, our findings are supported by results of several large-population based studies that found no differences in prevalence of alcohol abuse and dependence between migraine and non-migraine controls (Breslau & Davis, 1993; Jette et al., 2008; Takeshima et al., 2004). As such, the bulk of existing evidence does not appear to support the notion that migraineurs are at increased risk for alcohol use problems.

The similarities between groups may be a function of the college environment. Consuming alcohol with peers is a common college experience reported by 70% of undergraduates (Cranford et al., 2009). Students with migraines may not allow their migraines to interfere with this aspect of their college experience and thus drink alcohol despite the fact that they occasion headaches. This argument is strengthened by findings from a study on drinking behaviors and expectations among 231 college students that observed alcohol norms were predictive of alcohol consumption regardless of negative expectations about physiological

impairment related to alcohol use (Wood, Nagoshi, & Dennis, 1992). Another possible explanation may be that alcohol does not trigger these (and perhaps other) migraineurs' headaches and therefore does not directly affect drinking behaviors. Although approximately one-third of migraineurs endorse alcohol as a trigger (Kelman, 2007), studies on alcohol as a trigger for migraine have been conducted predominantly among treatment seeking headache patients. Prevalence rates of alcohol as trigger may be lower among this non-treatment-seeking sample, although this was not specifically queried as part of the present study.

The fact that the number of negative consequences related to alcohol consumption did not significantly differ between the groups could be due to the similar, moderate quantity of alcohol consumption reported by both groups. Moderate levels of alcohol use have been found to be associated with low to moderate negative consequences related to alcohol use (Collins et al., 1985; White & Labouvie, 1989), and overall, both groups reported low to moderate negative consequences. Additionally, migraineurs may have viewed the type of consequences assessed by the RAPI differently than controls. The consequences assessed by the RAPI pertain to interactions with peers, family members, and the law, as well as interference with job and school oriented work. Although migraineurs may have had difficulties regarding job and school performance, they may not have attributed these difficulties to their alcohol consumption. For example, migraineurs might attribute the impairments "Not able to do homework or study for a test" and "Missed a day (or part of a day) of school or work" to their headaches rather than alcohol consumption, and thus endorse this statement on the MIDAS but not the RAPI. Future studies are warranted to confirm this latter hypothesis. In summary, migraineurs did not differ from controls on any of the assessed alcohol-related variables, which confirms results of larger studies and provides new findings regarding specific alcohol behaviors.

Migraine Frequency, Intensity, and Disability

While the alcohol-related variables in aggregate did not predict the combination of migraine variables, headache-related disability was predicted by alcohol consumption and negative consequences. This finding indicates that consuming alcohol, especially in large quantities within one sitting, is associated with taking more days off from school/work, decreased productivity, and missing social or leisure activities due to headache. A possible explanation for this finding is that sleep mediates this relationship, such that consuming alcohol leads to poorer sleep (increased slow wave sleep and decreased REM sleep [Ebrahim, Shapiro, Williams, & Fenwick, 2013]), which then affects attendance and performance at work and school. Supporting this notion, Singleton and Wolfson (2009) found that sleep mediated the relationship between alcohol use and academic performance in college students. Students who consumed alcohol reported poorer sleep quality, greater daytime sleepiness, and more missed classes. Similarly, sleep disturbances have repeatedly been shown to be negatively associated with migraines and headache-related disability (Fukui et al, 2008; Kelman & Rains, 2005; Walters, 2011). However, sleep was not assessed as part of the present study but is a needed area for future studies to address.

The lack of a relationship between alcohol-related variables and headache frequency is consistent with findings from a longitudinal study of 307 migraineurs that found no relationship between alcohol consumption and onset of migraine attack or headache frequency (Nicolodi & Sicuteri, 1999). The non-significant relationship between alcohol consumption and headache frequency and intensity may be a function of the type of alcohol consumed. In an experimental study by Littlewood et al. (1988), red wine but not a vodka mixture was found to trigger headaches, indicating that the type of alcohol is a relevant factor. Furthermore, Trotter (1982)

found 47.2% of college students regularly drink beer compared to 32.4% drink liquor and 20.4% drink wine, indicating that many college students do not regularly consume the type of alcohol experimentally shown to trigger migraine. Another possible explanation could be that these migraineurs did not drink frequently or regularly enough to influence their headaches. This argument is strengthened by the results of Molarius and colleagues' (2008) study, which found a higher prevalence of migraine among female heavy drinkers than moderate drinkers and non-drinkers. Considering that our headache group consisted predominantly of female moderate drinkers, our results might differ if individuals who drank more frequently had been oversampled.

Headache Self-efficacy

Headache self-efficacy refers to the belief that an individual can prevent or manage a headache episode through deliberate behaviors (French et al., 2000). Avoiding known triggers is one action that individuals take to prevent headache episodes from occurring and is often advice given in medical settings (Fukui et al., 2008; Panconesi et al., 2011). For this reason, we expected that headache self-efficacy would be inversely associated with frequency and quantity of alcohol consumption. The lack of this predicted relationship may be a result of the moderate levels of confidence reported by the majority of this sample. While these migraineurs perceive they have the ability to prevent or manage their migraines at times, perhaps their self-efficacy is not high enough for them to believe that altering alcohol consumption would have any beneficial impact on headache. Another possible explanation is that these migraineurs do not believe alcohol causes their headaches, and consequently do not view avoidance of alcohol as a useful prevention strategy. Future research is needed to better understand the potential relationship between headache self-efficacy and alcohol, an area that has not been thoroughly explored.

Limitations and Future Directions

While this study is strengthened by its large sample size, adherence to ICHD-II diagnostic criteria, consideration of comorbid psychological disorders, and assessment of multiple aspects of alcohol-related behaviors, limitations exist. One limitation is the reliance on retrospective reports of alcohol consumption using self-report questionnaires. While adherence to a structured diagnostic headache interview and ICHD-II diagnostic criteria are strengths, daily diary data on alcohol consumption and interview-based diagnoses of alcohol-use disorders would have further strengthened the present study, although assessing alcohol-use diagnoses was not a goal of this study. The aforementioned ancillary study will use self-monitoring data to extend the present findings and test additional hypotheses related to alcohol use and triggering of migraine using time-series analyses. In light of this limitation, future studies seeking to further explore the alcohol-migraine relationship could experimentally manipulate alcohol consumption and assess potential effects on subsequent migraine. Although both the DDQ and RAPI are reliable and valid measures of alcohol use and consequences, respectively, future studies could utilize a longitudinal design to more accurately assess alcohol consumption over a longer period of time. As noted earlier, an additional limitation was that comorbid sleep disorders were not assessed, despite the fact that sleep is often comorbid with and influences alcohol use/problems (Johnson & Breslau, 2001) and that only 11% of college students report consistent good sleep quality (Brown, Buboltz, & Soper, 2002; Buboltz, Brown, & Soper, 2001). Future studies should assess relations between alcohol use and sleep among college migraineurs but incorporate interactions between alcohol and sleep to predict headache occurrence and disability. A final limitation is the unknown generalizability of these findings to older adult migraineurs and treatment-seeking patients. This limitation is a function of our interest in young adult migraineurs due to their disproportionately higher rates of alcohol use/abuse compared to the general population

(O'Malley & Johnston, 2002). However, the use of a sample known for reporting alcohol use was beneficial in gaining insight into the potential effects of specific drinking variables on migraine.

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APPENDIX

Table 1

Group Differences on Psychiatric Symptomatology and Gender

	Migraineurs ***M (SD)***	**Controls** ***M (SD)***	***P Value***
PHQ-9 (depression)	6.42 (4.66)	4.06 (4.05)	.105
GAD-7 (anxiety)	6.40 (4.27)	3.86 (3.66)	.034*
Gender (female vs. male)	81 vs. 12	59 vs. 40	.000**

- *$p < .05$*
- *** $p < .01$ using Chi-squared test*

Table 2

ANCOVA Results Examining Group Differences on Drinking Variables

	Migraineurs *M (SD)*	**Controls** *M (SD)*	*F Value*	*P* **value**	**partial** η^2
Days per week drinking	1.55 (1.54)	1.94 (1.52)	2.834	.096	.033
Drinks per week	7.13 (9.64)	9.37 (10.08)	3.188	.076	.017
Binge episodes in past month	2.39 (3.61)	2.63 (3.44)	.728	.395	.004
RAPI total score	3.78 (5.91)	5.32 (6.65)	.014	.906	.000

Table 3

Alcohol Variables as Predictors of Migraine Variables

	F value	*B*	*P value*	*Model R^2 (Adjusted R^2)*	*Unique R^2*
Overall Model 1 (Frequency)	**1.358**		**.236**	**.113 (.030)**	**.046**
RAPI		-.092	.529		
Frequency		-.870	.246		
Quantity		.118	.434		
Number of binges		-.077	.778		
Overall Model 2 (Intensity)	**.921**		**.495**	**.075 (-.006)**	**.043**
RAPI		.026	.556		
Frequency		.251	.271		
Quantity		-.076	.096		
Number of binges		.092	.266		
Overall Model 3 (Disability)	**2.571**		**.019***	**.187 (.115)**	**.106***
RAPI		-1.159	.067		
Frequency		-2.588	.417		
Quantity		.036	.955		
Number of binges		3.175	.007**		

*$p < .05$ **$p < .01$

APPENDIX A: GAD-7

GAD-7

Over the last **two weeks**, how often have you been bothered by the following problems**:** (*circle the number that applies to you*)

	Not at all	**Several days**	**More than half the days**	**Nearly every day**
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3
If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?	*Not difficult at all*	*Somewhat difficult*	*Very difficult*	*Extremely Difficult*
Total (For health professionals only) = _____				

APPENDIX B: PHQ-9

PHQ-9

Over the last **two weeks**, how often have you been bothered by any of the following problems**:**
(*circle the number that applies to you*)

	Not at all	**Several days**	**More than half the days**	**Nearly every day**
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3
If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?	*Not difficult at all*	*Somewhat difficult*	*Very difficult*	*Extremely Difficult*
Total (For health professionals only) = _____				

APPENDIX C: MIDAS

MIDAS

Please answer the following questions about ALL your headaches you have had over the last 3 months. Write in your answer for each question below.

1. On how many days in the last 3 months did you miss work or school because of your headaches?

_____ days

2. How many days in the last 3 months was your productivity at work or school reduced by half or more because of your headaches?
(Do not include days you counted in question 1 where you missed work or school.)

_____ days

3. On how many days in the last 3 months did you NOT do household work because of your headaches?

_____ days

4. How many days in the last 3 months was your productivity in household work reduced by half of more because of your headaches?
(Do not include days you counted in question 3 where you did not do household work.)

_____ days

5. On how many days in the last 3 months did you miss family, social or leisure activities because of your headaches?

_____ days

6. On how many days in the last 3 months did you have any headache?
(If a headache lasted more than 1 day, count each day)

_____ days

7. On a scale of 0 - 10, on average how painful were these headaches?
(where 0 = no pain at all and 10 = pain as bad as it can be)

_____ days

APPENDIX D: HMSE-25

HMSE-25

Instructions: You will find below a number of statements related to headaches. Please read each statement carefully and indicate how much you agree or disagree with the statement by circling a number next to it. Use the following scale as a guide:

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1	2	3	4	5	6	7

1)	I can keep even a *bad* headache from disrupting my day by changing the way I respond to the pain.	1	2	3	4	5	6	7
2)	When I'm in some situations, nothing I do will prevent headaches.*	1	2	3	4	5	6	7
3)	I can reduce the intensity of a headache by relaxing.	1	2	3	4	5	6	7
4)	There are things I can do to reduce headache pain.	1	2	3	4	5	6	7
5)	I can prevent headaches by recognizing headache triggers.	1	2	3	4	5	6	7
6)	Once I have a headache there is nothing I can do to control it.*	1	2	3	4	5	6	7
7)	When I'm tense, I can prevent headaches by controlling the tension.	1	2	3	4	5	6	7
8)	Nothing I do reduces the pain of a headache.*	1	2	3	4	5	6	7
9)	If I do certain things every day, I can reduce the number of headaches I will have.	1	2	3	4	5	6	7
10)	If I can catch a headache before it begins I often can stop it.	1	2	3	4	5	6	7
11)	Nothing I do will keep a mild headache from turning into a bad headache.*	1	2	3	4	5	6	7
12)	I can prevent headaches by changing how I respond to stress.	1	2	3	4	5	6	7
13)	I can do things to control how much my headaches interfere with my life.	1	2	3	4	5	6	7
14)	I <u>cannot</u> control the tension that causes my headaches.*	1	2	3	4	5	6	7
15)	I can do things that will control how long a headache lasts.	1	2	3	4	5	6	7
16)	Nothing I do will keep a bad headache from disrupting my day.*	1	2	3	4	5	6	7

17)	When I'm not under a lot of stress I can prevent many headaches.	1	2	3	4	5	6	7
18)	When I sense a headache is coming, there is nothing I can do to stop it. *	1	2	3	4	5	6	7
19)	I can keep a *mild* headache from disrupting my day by changing the way I respond to the pain.	1	2	3	4	5	6	7
20)	If I am under a lot of stress there is nothing I can do to prevent headaches.*	1	2	3	4	5	6	7
21)	I can do things that make a headache seem not so bad.	1	2	3	4	5	6	7
22)	There are things I can do to prevent headaches.	1	2	3	4	5	6	7
23)	If I am upset there is nothing I can do to control the pain of a headache.*	1	2	3	4	5	6	7
24)	I can control the intensity of headache pain.	1	2	3	4	5	6	7
25)	I can do things to cope with my headaches.	1	2	3	4	5	6	7

APPENDIX E: DDQ

DDQ

What's a Standard Drink?

One 12 oz. can, bottle, or glass of beer

One 5 oz. glass of wine

One mixed drink containing one shot of liquor

The questions below ask about your alcohol consumption. The first set of questions ask about a typical week of drinking over the past month, and the second set ask about your heaviest week of drinking over the past 3-months.

1) For the **past month,** fill in for each calendar day the number of standard drinks you **usually drink** on that day **during a typical week**, and the number of hours over which you consume this amount (i.e., the time from 1st sip to last sip). When we say one drink, we mean 12 oz. of beer, 5 oz. of wine, or 1.5 oz. of hard liquor (see picture on the left). Malt liquor is stronger than regular beer, so one 40 oz. Malt Liquor beverage such as Colt 45 counts as 5 standard drinks. Fill in an amount for each of the 7 days. If you do not typically drink on a given day, fill in 0 for that day.

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
# of drinks usually consumed							
# of hours							

2) Next, fill in for each calendar day the number of standard drinks you had on that day **during your heaviest drinking week over the past 3 months**, and the number of hours over which you consumed that amount.

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
# of drinks during heaviest week							
# of hours							

3) Please provide the following information which is necessary to estimate your blood alcohol level

What is your current weight? _____ lbs.

What is your height? Feet _____ Inches_____

QUESTIONS FOR MALES ONLY

1. IN THE PAST MONTH How many times have you had 5 or more drinks (in one sitting or occasion) ____ times

2. How many times IN THE PAST MONTH have you had 5 or more drinks in 2 hours or less? ____ times

QUESTIONS FOR FEMALES ONLY

1. IN THE PAST MONTH How many times have you had 4 or more drinks (in one sitting or occasion) ____ times

2.How many times IN THE PAST MONTH have you had 4 or more drinks in 2 hours or less? ____ times

APPENDIX F: RAPI

RAPI

Instructions: Indicate (by circling) if any of the following have happened to you during the last 28 days while you were using alcohol, or because of your alcohol use. When marking your answers, us the following code:

0 = never 1 = 1-2 times 2 = 3-5 times 3 = 6-10 times 4 = more than 10 times

1. Not able to do your homework or study for a test	0 1 2 3 4
2. Got into fights, acted bad or did mean things	0 1 2 3 4
3. Missed out on other things because you spent too much money on alcohol	0 1 2 3 4
4. Went to work or school drunk	0 1 2 3 4
5. Caused shame or embarrassment to someone	0 1 2 3 4
6. Neglected your responsibilities	0 1 2 3 4
7. Relative avoided you	0 1 2 3 4
8. Felt that you needed MORE alcohol than you used to use in order to get the same effect	0 1 2 3 4
9. Tried to control your drinking by trying to use only at certain times of the day or certain places	0 1 2 3 4
10. Had withdrawal symptoms, that is felt sick because you stopped or cut down drinking	0 1 2 3 4
11. Noticed a change in your personality	0 1 2 3 4
12. Felt you had a problem with alcohol	0 1 2 3 4
13. Missed a day (or part of a day) of school or work	0 1 2 3 4
14. Tried to cut down or quit drinking	0 1 2 3 4
15. Suddenly found yourself in a place you could not remember getting to	0 1 2 3 4
16. Passed out or fainted suddenly	0 1 2 3 4
17. Had a fight, argument, or bad feeling with a friend	0 1 2 3 4
18. Had a fight, argument, or bad feeling with a family member	0 1 2 3 4

19. Kept drinking when you promised yourself not to	0 1 2 3 4
20. Felt you were going crazy	0 1 2 3 4
21. Had a bad time	0 1 2 3 4
22. Felt physically or psychologically dependent on alcohol	0 1 2 3 4
23. Was told by a friend or neighbor to cut down on drinking	0 1 2 3 4

APPENDIX G: ASI-3

ASI-3

Please circle the number that best corresponds to how much you agree with each item. If any items concern something that you have never experienced (e.g., fainting in public), then answer on the basis of how you think you might feel *if you had* such an experience. Otherwise, answer all items on the basis of your own experience. Be careful to circle only one number for each item and please answer all items.

	Very little	A little	Some	Much	Very much
1. It is important for me not to appear nervous.	0	1	2	3	4
2. When I cannot keep my mind on a task, I worry that I might be going crazy.	0	1	2	3	4
3. It scares me when my heart beats rapidly.	0	1	2	3	4
4. When my stomach is upset, I worry that I might be seriously ill.	0	1	2	3	4
5. It scares me when I am unable to keep my mind on a task.	0	1	2	3	4
6. When I tremble in the presence of others, I fear what people might think of me.	0	1	2	3	4
7. When my chest feels tight, I get scared that I won't be able to breathe properly.	0	1	2	3	4
8. When I feel pain in my chest, I worry that I'm going to have a heart attack.	0	1	2	3	4
9. I worry that other people will notice my anxiety.	0	1	2	3	4
10. When I feel "spacey" or spaced out I worry that I may be mentally ill.	0	1	2	3	4
11. It scares me when I blush in front of people.	0	1	2	3	4
12. When I notice my heart skipping a beat, I worry that there is something seriously wrong with me.	0	1	2	3	4
13. When I begin to sweat in a social situation, I fear people will think negatively of me.	0	1	2	3	4
14. When my thoughts seem to speed up, I worry that I might be going crazy.	0	1	2	3	4
15. When my throat feels tight, I worry that I could choke to death.	0	1	2	3	4
16. When I have trouble thinking clearly, I worry that there is something wrong with me.	0	1	2	3	4
17. I think it would be horrible for me to faint in public.	0	1	2	3	4
18. When my mind goes blank, I worry there is something terribly wrong with me.	0	1	2	3	4

Source: Taylor, S. et al. (2007). Robust dimensions of anxiety sensitivity: Development and initial validation of the Anxiety Sensitivity Index-3. *Psychological Assessment, 19.*

APPENDIX H: DEMOGRAPHIC QUESTIONNAIRE

Demographic Questionnaire

Please tell us a little bit about yourself. This information is of course completely confidential.

Age:_____

Sex:_____ (male/female)

Race: (*check one*)

_____ Caucasian
_____ Afro-American
_____ Latin American/Hispanic
_____ Asian
_____ Other

What was your highest level of education? (*check one*)

_____ did not finish high school
_____ graduated high school
_____ some college/university
_____ completed university
_____ post-graduate degree

Marital status: (*check one*)

_____ single (never married)
_____ married
_____ divorced/separated
_____ widowed

Please rate your overall health: (*check one*)

_____ excellent
_____ very good
_____ good
_____ fair
_____ poor

In the past 3 months, how many days of work have you missed because of illness or feeling poorly?

_____ days or _____ I am not currently employed

In the past 3 months, how many days of school have you missed because of illness or feeling poorly?

_____ days

In the past 3 months, how many days were you unable to carry on your usual function at home because of illness or feeling poorly?

_____ days

In the past 3 months, about how many medical visits have you made (include visits to your regular doctor, specialists, and Urgent Care or Emergency Room)

_____ visits

Are you currently taking any medications for a psychiatric condition, or seeing a mental health practitioner?

_____ Yes _____ No

Are you currently being treated for any psychiatric condition by a physician or by a mental health practitioner?

_____ Yes _____ No

Please rate your **current** level of anxiety and depression using the following scale:
(*circle one number on EACH scale*)

	None					Very little		Moderate				Severe				Unbearable
Feelings of **Anxiety**	0	1	2	3	4	5	6	7	8	9	10					
Feelings of **Depression**	0	1	2	3	4	5	6	7	8	9	10					

Has a physician ever diagnosed you with migraine headaches?

_____ Yes _____ No

If you have been diagnosed with migraines before, on average how many migraines headaches do you have each month?

_____ migraine headaches per month

APPENDIX I: STRUCTURED DIAGNOSTIC INTERVIEW FOR HEADACHE

Structured Diagnostic Interview for Headache – Revised (Brief Version)

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

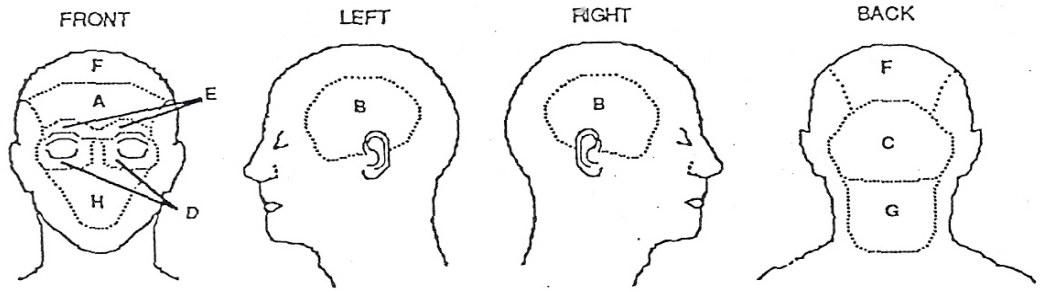
The following items are selected from the long version of the Structured Diagnostic Interview for Headache (SDIH). The SDIH is part of the Headache Evaluation and Diagnostic System (HEDS) which includes software for data entry and diagnostic decision-making. These materials are intended to facilitate 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

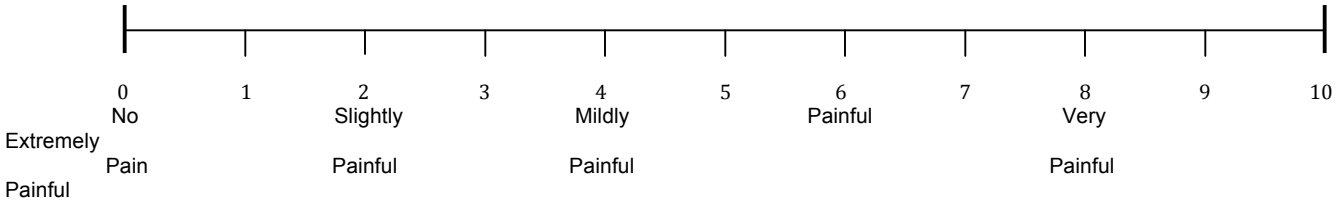
2. Select all pain locations that apply to this type of headache: ***(You must check at least one)***

   ☐ 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 J: DAILY SELF-MONITORING FORMS

DAILY HEADACHE SELF-MONITORING FORM

NAME: | **PATIENT ID NUMBER**

DIRECTIONS: Two times each day, please rate your headache intensity, disability level, and stress using the rating scales below. Mark the times that you were sleeping or drinking alcohol by coloring (or putting x) in the boxes. You may indicate ½ hour increments by coloring ½ of a box (or use slash). Also, record ratings of sleep amount and sleep quality, and whether you are menstruating. Answer questions underneath the boxes pertaining to alcohol and cigarette use.

HEADACHE INTENSITY		DISABILITY	STRESS	SLEEP AMOUNT	SLEEP QUALITY
10	EXTREMELY PAINFUL.... My headache is so painful that I can't do anything.	10 COMPLETELY IMPAIRED (Bedrest)	10 EXTREMELY	10 TOO MUCH	10 EXCELLENT
9		9	9	9	9
8	VERY PAINFUL..... My headache makes concentration difficult, but I can perform demanding tasks.	8 SEVERELY IMPAIRED	8 VERY	8	8 VERY GOOD
7		7	7	7	7
6	PAINFUL..... My headache is painful, but I can continue what I am doing.	6 MODERATELY IMPAIRED	6 MODERATELY	6	6 GOOD
5		5	5	5 PERFECT	5
4	MILDLY PAINFUL..... I can ignore my headache most of the time.	4 MILDLY IMPAIRED	4 MILDLY	4	4 FAIR
3		3	3	3	3
2	SLIGHTLY PAINFUL..... I only notice my headache when I focus my attention on it.	2 MINIMALLY IMPAIRED	2 SLIGHTLY	2	2 POOR
1		1	1	1	1
0	NO HEADACHE	0 NO IMPAIRMENT	0 NO STRESS	0 TOO LITTLE	0 VERY POOR

WEEKLY MEDICATION LIST (AND AMOUNT):

MONDAY

DATE:	12a	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12p	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p	11p	TEMP
HEADACHE:																									MENSES Y - N
DISABILITY:																									
STRESS:																									SLEEP AMOUNT
SLEEP:																									
ALCOHOL:																									

Rating 1: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

Rating 2: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

SLEEP QUALITY

TUESDAY

DATE:	12a	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12p	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p	11p	TEMP
HEADACHE:																									MENSES Y - N
DISABILITY:																									
STRESS:																									SLEEP AMOUNT
SLEEP:																									
ALCOHOL																									

Rating 1: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

Rating 2: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

SLEEP QUALITY

WEDNESDAY

DATE:	12a	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12p	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p	11p	TEMP
HEADACHE:																									MENSES Y - N
DISABILITY:																									
STRESS:																									SLEEP AMOUNT
SLEEP:																									
ALCOHOL:																									

Rating 1: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

Rating 2: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

SLEEP QUALITY

NAME:

DIRECTIONS: Two times each day, please rate your headache intensity, disability level, and stress using the rating scales below. Mark the times that you were sleeping or drinking alcohol by coloring (or putting x) in the boxes. You may indicate ½ hour increments by coloring ½ of a box (or use slash). Also, record ratings of sleep amount and sleep quality, and whether you are menstruating. Answer questions underneath the boxes pertaining to alcohol and cigarette use.

HEADACHE INTENSITY		DISABILITY	STRESS	SLEEP AMOUNT	SLEEP QUALITY
10	EXTREMELY PAINFUL.... My headache is so painful that I can't do anything	10 COMPLETELY IMPAIRED (Bedrest)	10 EXTREMELY	10 TOO MUCH	10 EXCELLENT
9		9	9	9	9
8	VERY PAINFUL..... My headache makes concentration difficult, but I can perform demanding tasks	8 SEVERELY IMPAIRED	8 VERY	8	8 VERY GOOD
7		7	7	7	7
6	PAINFUL..... My headache is painful, but I can continue what I am doing.	6 MODERATELY IMPAIRED	6 MODERATELY	6	6 GOOD
5		5	5	5 PERFECT	5
4	MILDLY PAINFUL..... I can ignore my headache most of the time.	4 MILDLY IMPAIRED	4 MILDLY	4	4 FAIR
3		3	3	3	3
2	SLIGHTLY PAINFUL..... I only notice my headache when I focus my attention on it.	2 MINIMALLY IMPAIRED	2 SLIGHTLY	2	2 POOR
1		1	1	1	1
0	NO HEADACHE	0 NO IMPAIRMENT	0 NO STRESS	0 TOO LITTLE	0 VERY POOR

THURSDAY

DATE: 12a 1a 2a 3a 4a 5a 6a 7a 8a 9a 10a 11a 12p 1p 2p 3p 4p 5p 6p 7p 8p 9p 10p 11p

HEADACHE:
DISABILITY:
STRESS:
SLEEP:
ALCOHOL:

TEMP
MENSES Y - N
SLEEP AMOUNT
SLEEP QUALITY

Rating 1: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

Rating 2: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

FRIDAY

DATE: 12a 1a 2a 3a 4a 5a 6a 7a 8a 9a 10a 11a 12p 1p 2p 3p 4p 5p 6p 7p 8p 9p 10p 11p

HEADACHE:
DISABILITY:
STRESS:
SLEEP:
ALCOHOL:

TEMP
MENSES Y - N
SLEEP AMOUNT
SLEEP QUALITY

Rating 1: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

Rating 2: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

SATRUDAY

DATE: 12a 1a 2a 3a 4a 5a 6a 7a 8a 9a 10a 11a 12p 1p 2p 3p 4p 5p 6p 7p 8p 9p 10p 11p

HEADACHE:
DISABILITY:
STRESS:
SLEEP:
ALCOHOL:

TEMP
MENSES Y - N
SLEEP AMOUNT
SLEEP QUALITY

Rating 1: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

Rating 2: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

SUNDAY

DATE: 12a 1a 2a 3a 4a 5a 6a 7a 8a 9a 10a 11a 12p 1p 2p 3p 4p 5p 6p 7p 8p 9p 10p 11p

HEADACHE:
DISABILITY:
STRESS:
SLEEP:
ALCOHOL:

TEMP
MENSES Y - N
SLEEP AMOUNT
SLEEP QUALITY

Rating 1: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

Rating 2: How many alcoholic drinks have you had since the last rating: _____12-oz beers _____ 4-oz glasses of wine _____ 1 ½ oz shots of liquor
How many cigarettes have you smoked since the last rating? ___

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B.A. Psychology, *summa cum laude*: University of Alabama 2010
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PROFESSIONAL MEMBERSHIPS

Association for Behavioral and Cognitive Therapies (ABCT) 2011 – Present
Student Member
American Psychological Association (APA) 2009 – Present
Student Member

HONORS AND AWARDS

Psi Chi National Honor Society in Psychology 2009
Sigma Tau Delta National Honor Society in English 2009
Emerson R. Loomis English Scholarship 2009
Lambda Sigma National Honor Society - Fundraising Committee Chair 2007 – 2008
Alpha Lambda Delta National Honor Society 2007
Phi Eta Sigma National Honor Society 2007
Knights of Columbus Women's Auxiliary Scholarship 2006
Lucy Blankenship Piper Memorial Scholarship 2006 – 2010
University of Alabama Alumni Association Scholarship 2006 – 2010

PUBLICATIONS AND PRESENTATIONS

Poster Presentation

Davis, R. E., & Smitherman, T.A. (2012). Anxiety sensitivity as a predictor of headache frequency and disability among individuals with episodic migraine and tension type headache. [Published abstract]. *Headache, 52,* 911. Poster presented at the annual convention of the American Headache Society, Los Angeles, California.

Davis, R. E., McDermott, M. J., Smitherman, T. A., Gratz, Kim. L., & Tull, M. T. (2011, November). *Migraine among Substance Dependent Individuals in Residential Substance Abuse Treatment.* Poster presented at the annual convention of the Association for Behavioral and Cognitive Therapies, Toronto, Canada.

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.

Walters, A. B., Smitherman, T. A., **Davis, R. E.,** Townsend, E. A., Hamer, J. D., & Blann, K. R. (2011, June). *Sleep hygiene and psychiatric comorbidity in episodic migraineurs.* Poster presented at the annual convention of the American Headache Society, Washington, DC.

Paper Presentations and Panel Discussions

Titcomn, C., Brodsky, S. L., Nagle, J., Guadagno, R., & **Davis, R. E.** (2012, March). *From First Impressions to Verdict: Predictive Pathways in Mock-juror Decision-making*. Paper presented at the annual convention of the American Psychology Law-Society, San Juan, Puerto Rico.

Schulenberg, S. E., **Davis, R. E.,** & Magee, L. J. (2011, June). *Logotherapy and psychological assessment: Integrating theory with research and practice.* Paper presented at the Eighteenth World Congress on Viktor Frankl's Logotherapy, Dallas, TX.

Barnes, R. C., Rogina, J. M., Hutzell R. R., Schulenberg, S. E., Wimberly, C., Winters, M., **Davis, R. E.,** Magee, L. J., & Schnetzer, L. W. (2011, June). Clinical Colloquium at the Eighteenth World Congress on Viktor Frankl's Logotherapy, Committee Member, Dallas, TX.

EDITING AND REVIEWING

Ad Hoc

Headache
Professional Psychology: Research and Practice

CLINCAL EXPERIENCE

The Baddour Center, *Senatiobia, MS* (2011 – Present)
Individual and group cognitive-behavioral therapy for adults living in a residential facility for individuals with intellectual and developmental disabilities.

University of Mississippi Psychological Services Center, *Oxford, MS,* (2011 – Present)
Individual cognitive-behavioral therapy for adult community outpatients with Axis I and II disorders.

University of Mississippi Clinical-Disaster Research Collaborative, *Oxford, MS*, (2010 – 2011)
Worked with the Mississippi Department of Mental Health to collect information regarding the services funded through the Gulf Oil Spill Behavioral Health Grant Program. Examined a broad range of issues, such as stress, anxiety, self-efficacy, purpose in life, and environmental concern, in addition to directly assessing how individuals were affected by the Gulf Oil Spill.

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