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Psychological Factors Associated with Chronic Migraine and Severe Migraine-Related Disability: an Observational Study in a Tertiary Headache Center

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Abstract

Objective—To evaluate relationships among modifiable psychological factors and chronic migraine and severe migraine-related disability in a clinic-based sample of persons with migraine.

Background—Evidence evaluating relationships between modifiable psychological factors and chronic migraine and severe migraine-related disability is lacking in people with migraine presenting for routine clinical care.

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Methods—Adults with migraine completed surveys during routinely scheduled visits to a tertiary headache center. Participants completed surveys assessing chronic migraine (meeting criteria for migraine with ≥ 15 headache days in the past month), severe migraine disability (Migraine Disability Assessment Scale score ≥ 21), and modifiable psychological factors [depressive symptoms (Patient Health Questionnaire-9), anxious symptoms (Generalized Anxiety Disorder-7), Pain Catastrophizing Scale and Headache Specific Locus of Control]. Logistic regression evaluated relationships between modifiable psychological factors and chronic migraine and severe migraine disability.

Results—Among 90 eligible participants the mean age was 45.0 (SD = 12.4); 84.8% were women. One-third (36.0%) met study criteria for chronic migraine; half of participants (51.5%) reported severe migraine-related disability. Higher depressive symptoms (OR = 1.99, 95% CI = 1.11, 3.55) and chance HSLC (OR = 1.85, 95% CI = 1.13, 1.43) were associated with chronic migraine. Higher depressive symptoms (OR = 3.54, 95% CI = 1.49, 8.41), anxiety symptoms (OR = 3.65, 95% CI = 1.65, 8.06), and pain catastrophizing (OR = 1.95, 95% CI = 1.14, 3.35), were associated with severe migraine-related disability.

Conclusions—Psychiatric symptoms and pain catastrophizing were strongly associated with severe migraine-related disability. Depression and chance locus of control were associated with chronic migraine. This study supports the need for longitudinal observational studies to evaluate relationships among naturalistic variation in psychological factors, migraine-related disability and migraine chronification.

Keywords

Migraine; Chronic Migraine; Disability; Depression; Anxiety; Locus of Control; Catastrophizing

Migraine is a prevalent, painful, neurologic disorder associated with high levels of disability worldwide (1–3). Migraine often leads to negative consequences in the workplace, resulting in substantial costs at both the individual and societal levels (1, 4). Migraine is also associated with a high social cost (5), including stigma (6) and social withdrawal (7). Migraine can be chronic (≥ 15 headache days per month, ≥ 8 of which are migraine days) or episodic (<15 headache days per month). Although less frequent than episodic migraine, chronic migraine is substantially more burdensome (8). People with migraine who present to tertiary care headache centers tend to have more refractory migraine and experience significant migraine-related burden than their counterparts in the population (9). Migraine symptoms alone are insufficient to account for the variability in migraine-related disability among people with migraine in specialty headache centers. Identification of modifiable psychological factors associated with chronic migraine and severe migraine-related disability in tertiary headache centers could provide treatment targets to improve comprehensive migraine management among people with migraine who are seeking specialty care treatment.

Psychiatric disorders, particularly depression and anxiety, are highly comorbid with migraine (10) and are more prevalent among people with chronic migraine compared to episodic migraine (8). However, even subthreshold increases in depressive and anxious symptoms may be associated with chronic migraine and severe migraine-related disability

(11). For example, depressed mood and poor sleep could interfere with migraine management, even if these symptoms do not rise to the threshold of major depressive or dysthymia disorders. Several studies suggest that increases in depression and anxiety symptoms are associated with higher levels of migraine-related disability, (12–14), although only a few have evaluated these relationships in tertiary care headache centers (15–18).

Headache-related cognitions (catastrophizing) and beliefs (locus of control) are postulated to influence the development of chronic migraine, and migraine-related disability. A few studies have demonstrated relationships between higher pain catastrophizing and increased frequency and duration of migraine attacks (19), higher intensity of headache pain (20) and impairments in functioning and quality of life (21); however, none of these studies evaluated people with migraine presenting for routine clinical care. An older literature search examined relationships between locus of control and headache symptoms and disability in mixed headache samples. In these studies, higher internal locus of control demonstrated associations with lower reported headache-related disability (22), while higher chance locus of control was associated with greater headache intensity (22), increased frequency of headaches, greater levels of headache-related disability (23), and more quality of life impairments (24). Thus, studies evaluating relationships between headache-related cognitions/beliefs and chronic migraine and severe migraine-related disability in people with migraine presenting for routine care in a tertiary headache center are warranted.

The purpose of this study was to examine the relationships between modifiable psychological factors and chronic migraine and severe migraine-related in people with migraine who presented for routine clinical care in a tertiary headache center. We hypothesized that higher levels of maladaptive cognitions (catastrophizing), beliefs (external locus of control), and higher levels of psychiatric symptoms would be associated with chronic (vs. episodic) migraine and severe (vs. low-moderate) migraine-related disability.

Methods

Participants

This study is the first part of a large survey study designed to evaluate variations in psychiatric symptoms and avoidance, and their association with migraine symptoms and disability, in people with migraine presenting for routine care. Consecutive patients were recruited from the waiting room of the Montefiore Headache Center, a tertiary-care headache clinic in the Bronx, NY from May to August, 2014. Participants were included in the study if they had a current physician diagnosis of migraine, currently met International Classification of Headache Disorders (ICHD) criteria for migraine using the validated American Migraine Study (AMS)/American Migraine Prevalence and Prevention (AMPP) Study diagnostic module (2, 25), were aged 18 and older, and had the ability to read English and capacity to consent.

Procedures

Patients were approached by graduate student research assistants in the waiting room of the Montefiore Headache Center. Patients who reported that they met eligibility criteria gave

informed consent and completed surveys while waiting for the appointments. Surveys evaluated migraine symptoms, migraine-related disability, and psychosocial headache-related measures, as well as items developed through expert consensus regarding demographics and other aspects of the headache experienced. Participants who did not complete the questionnaire prior to leaving the clinic were provided with a self-addressed stamped envelope and instructed to mail the questionnaires back to the clinic (n = 8). Participants received a \$10 gift card upon completion of the surveys. The Albert Einstein College of Medicine Institutional Review Board approved this study (#2013-2859). The study was funded by institutional funds provided to the first author.

Measures

Diagnostic Screener—In addition to chart review to obtain physician diagnosis of migraine, all participants completed the AMS/AMPP diagnostic module to confirm migraine diagnosis based on ICHD-2 (26) criteria, which are essentially unchanged in the ICHD-3beta (27). For migraine of any type, sensitivity and specificity of the screener are 100% and 82%, respectively; for chronic migraine specifically, sensitivity and specificity of the screener are 91% and 80%, respectively (25).

Outcome variables

Chronic Migraine: Chronic migraine was assessed using the Migraine Disability Assessment (MIDAS) Additional Question A (28): “On how many days in the last 3 months did you have a headache (if a headache lasted more than 1 day, count each day)?” Previous research demonstrated that responses to MIDAS Question A strongly associate with equivalent composite measures from diary data ($r = 0.70$) (29). This answer was divided by 3 to obtain the average number of headache days per month. This variable was then dichotomized to reflect chronic migraine (≥ 15 days/month) vs. episodic migraine (<15 days/month).

Migraine-related disability: The MIDAS is a 5-item survey designed to measure functional disability in the lives of people with migraine (28). Items ask about the number of days in the past three months when people with migraine were unable to accomplish tasks in three domains (work, home, and social/recreation) due to migraine. Previous studies have shown the questionnaire to have good internal consistency ($\alpha = 0.76$), excellent test-retest reliability ($r = 0.80$), and good construct validity when the total score was compared with a reference diary-based measure of disability ($r = 0.63$). Additionally, the total score correlated with physician assessment of the need for medical care for their patients ($r = 0.69$), suggesting that the questionnaire is useful for clinical settings (29). This score was dichotomized to reflect the clinical cut-off for severe migraine-related disability (MIDAS Score ≥ 21) vs. low to moderate migraine-related disability (MIDAS Score < 21).

Psychiatric Symptoms

Depressive Symptoms: Patient Health Questionnaire – 9 (PHQ-9): The Patient Health Questionnaire (PHQ) is a validated self-report measure consisting of the Diagnostic and Statistical Manual – IV diagnostic criteria for depression (30). The PHQ-9 is the 9-item depression portion of the PHQ (31). Each of the items is rated from 0 to 4, with total scores

ranging from 0 to 27. Total scores were used in the analyses. The PHQ-9 demonstrated excellent internal ($\alpha = 0.86\text{--}0.89$) and test-retest reliability ($r = 0.84$). The measure has demonstrated good criterion and construct validity (31).

Anxiety Symptoms: Generalized Anxiety Disorder – 7 (GAD-7): The Generalized Anxiety Disorder – 7 (32) is a self-report measure of Diagnostic and Statistical Manual – IV diagnostic criteria for Generalized Anxiety Disorder. Each of the seven items is rated from 0 to 3, with total scores ranging from 0 to 21. Total scores were used in the analyses. The GAD-7 demonstrated good internal consistency ($\alpha = 0.92$) and test-retest reliability ($r = 0.83$). The measure also had good criterion and construct validity (32).

Headache-Related Cognitions and Beliefs

Pain Catastrophizing Scale (PCS): The Pain Catastrophizing Scale (33) is a 13-item self-report measure designed to convey a participant's characteristic level of pain-related, catastrophic thinking during painful experiences. The measure consists of three subscales, which are Rumination (4 items), Magnification (3 items) and Helplessness (6 items). Participants are asked to recall a painful experience and to rate the extent to which the thoughts and emotions listed in each item had occurred. We used the headache version of the scale previously validated by Holroyd and colleagues for headache pain, in which all instances of "pain" are replaced with "headache" (13). Further, coding error led to the use of a 4-point response scale (1 "not at all," 2 "to a slight degree," 3 "to a moderate degree," 4 "all the time") as opposed to a 5-point response scale published in the original version (0 "not at all," 1 "to a slight degree," 2 "to a moderate degree," 3 "to a great degree," 4 "all the time") with higher scores indicating higher levels of catastrophizing. The original and headache versions of the PCS have been well validated across both experimental studies and clinical samples and have demonstrated strong internal consistency and test-retest reliability (21, 33). In this sample, PCS scores demonstrated a comparable factor structure and internal consistency ($\alpha = 0.94$) as the original version (34), leading us to believe that the modified response options did not change the psychometrics of the scale.

Headache Specific Locus of Control (HSLC): The Headache Specific Locus of Control (23) is a 33-item measure designed to assess the extent to which individuals with recurrent headache expect the occurrence, worsening, and improvement of their headaches are influenced primarily by their own behavior, by chance or fate, or by the actions of medical professionals. Items are coded on a 5-point Likert-type scale ranging from "strongly disagree" to "strongly agree." It contains three subscales, which include Internal, Chance, and Medical Professionals. Each subscale demonstrated good internal consistency ($\alpha = 0.80\text{--}0.89$) and adequate 3-week test-retest reliability ($r_s = 0.72\text{--}0.78$). Subscales also demonstrated significant expected relationships with related measures (23).

Analysis

Descriptive statistics for all relevant variables are reported. An individual participant's data was included in descriptive statistics only if he/she had completed every item. The sample is described using clinical norms for all available measures (migraine outcomes and psychiatric symptoms). Variable distributions were examined for normality.

Logistic Regression was used to examine relationships among psychological variables (PHQ-9, GAD-7, PCS and HSLC) and outcomes of chronic migraine (≥ 15 days/month) and severe migraine-related disability (MIDAS Score ≥ 21). Odds ratios and 95% confidence intervals are reported. Scores on psychological variables were standardized to simplify interpretation of Odds Ratios.

Multiple imputation was used to account for missing data in the logistic regressions. Multiple imputation used linear regression to impute item-level data for the two outcome variables and each criterion variable, using age, gender, and all outcome and criterion variables as predictors in five imputed datasets. Sensitivity analyses were performed using 1) original data, 2) multiple imputation using only outcome and criterion variables as predictors (e.g., removing age and gender as covariates) and 2) multiple imputation using only the bi-variate criterion-outcome pairs as predictors (e.g., removing all covariates from imputation). Sensitivity analyses produced no changes in significance of results. Multiple imputation procedures typically produced more conservative estimates than original data. Therefore, pooled statistics from the five imputed datasets derived from the multiple imputation analysis with all covariates are reported. For all analyses, less than 8% of data points were imputed. Analyses were conducted using SPSS v 21 and 22. All tests were two-tailed, with alpha set at .05.

Results

Participant Characteristics

Of the 110 participants consented, a total of 95 participants returned the surveys. Subsequent medical record review revealed that five participants did not have a current physician diagnosis of migraine, yielding a total eligible sample of 90 participants. Participants had a mean age of 45.0 (SD = 12.4) and were predominantly White, Non-Hispanic (80.0%) women (84.8%) who were married (60.7%) with children (54.4%). Approximately half of participants had a graduate degree (50.6%), a quarter a college degree (24.4%), with the remainder having some college or technical training (14.6%) or a high school diploma or less (10.1%). The majority of participants were either employed full-time (55.6%), retired (10.0%), or disabled (8.9%). Eighty-nine out of 90 participants had health insurance. On average, participants reported being 21.4 years old (SD = 10.4) when they experienced their first migraine. Demographic characteristics are presented by chronic migraine status (chronic migraine vs. episodic migraine) and headache-related disability category (severe vs. low to moderate) (Table 1); given the small cell sizes due to a small n, adjustment of regression models by covariates was not appropriate.

The majority of patients (97.8%) were at a follow-up visit when they completed the study. All participants had a physician diagnosis of migraine recorded in the electronic health record. Twenty-two percent of patients reported experiencing visual aura half the time or more during headache episodes. The most frequent medical comorbidities recorded in the electronic health record included hypertension (7.8%), diabetes (6.7%), hyperlipidemia (6.7%), back pain (6.7%), hypothyroidism (5.6%), asthma (4.4%) and sinusitis (4.4%). The most frequent psychiatric and behavioral comorbidities recorded in the electronic health

record included depression (26.7%) and major depressive disorder (4.4%), anxiety state (17.8%), insomnia (10.0%) and unspecified sleep disturbance (7.8%).

One-third of the sample (36.0%) currently met criteria for chronic migraine based on self-reported data. Approximately half of the sample (51.5%) reported severe headache-related disability (MIDAS score = 21) (Table 2). The average PHQ-9 score ($M = 5.5$, $SD = 4.9$) fell in the “mild” range of depression severity. According to clinical cut-offs, approximately half of the sample (56.5%) fell in the none-minimal range, 21.3% fell in the mild range, and 22.2% fell in the moderate to severe range of depression severity on the PHQ-9. The average GAD-7 score ($M = 3.7$, $SD = 4.0$) fell in the “none-minimal” range of anxiety severity. According to clinical cut-offs, approximately two-thirds of the sample (67.5%) fell in the none-minimal range of anxiety severity on the GAD-7, 21.7% fell in the mild range, and 10.8% fell in the moderate to severe range of anxiety severity on the GAD-7.

Psychiatric Symptoms

Univariate Odds Ratios describing the relationships between psychiatric symptoms and headache beliefs and cognitions and outcomes of either chronic migraine or severe migraine-related disability are presented in Table 3. For every increase of 1 SD in depressive symptoms (PHQ-9 score), the odds of reporting chronic migraine increased by 1.99 (95% CI = 1.11, 3.55; Table 3). Anxiety symptoms (GAD-7 score) were not significantly associated with chronic migraine.

For every increase of 1 SD in depressive symptoms (PHQ-9 score), the odds of reporting severe migraine-related disability increased by 3.54 (95% CI = 1.49, 8.41; Table 3). For every increase of 1 SD in anxiety symptoms (GAD-7 score), the odds of reporting severe migraine-related disability increased by 3.65 (95% CI = 1.65, 8.06; Table 3).

Headache Beliefs and Cognitions

For every increase of 1 SD in Chance HSLC (the belief that nothing can control migraine onset and course), the odds of reporting chronic migraine increased by 1.85 (95% CI = 1.13, 3.03; Table 3). No other HSLC scale was significantly associated with chronic migraine. Pain catastrophizing (PCS) was not significantly associated with chronic migraine.

For every increase of 1 SD in pain catastrophizing (PCS score), the odds of reporting severe migraine-related disability increased by 1.95 (95% CI = 1.14, 3.35; Table 3). The HSLC scales were not significantly associated with migraine-related disability.

Discussion

This study evaluated the relationship between modifiable psychological factors (psychiatric symptoms, cognitions and beliefs) and chronic migraine and severe migraine-related disability in a tertiary headache clinic.

Psychiatric Symptoms

Psychiatric symptoms demonstrated strong relationships with severe migraine-related disability such that higher depressive and anxiety scores were associated with increased odds

of severe migraine-related disability. In fact, every increase of 5 points on the PHQ-9 (depressive symptoms) and 4 points on the GAD-7 (anxiety symptoms) was associated with over 3.5-fold increased odds of reporting severe migraine-related disability. Further, every increase of 5 points on the PHQ-9 was associated with two-fold increased odds of reporting chronic (vs. episodic) migraine.

This study provides continuing evidence that depression and anxiety are not only migraine comorbidities, but that among people with migraine, the presence of even relatively small elevations in levels of depressive and anxiety symptoms are associated higher migraine frequency and migraine-related disability (8, 12). Levels of depression and anxiety were relatively low in this sample. However, as this study demonstrates, people with migraine who also experience depressive and anxiety symptoms, even at modestly elevated clinically significant levels, are at disproportionate risk for high levels of migraine-related disability; further, people with migraine who also experience depressive symptoms are at disproportionate risk for chronic migraine.

Robust reductions in headache symptoms and related disability have been observed in depressed and anxious people with headache across studies examining preventive headache treatments (e.g., 35), which argues against waiting to treat migraine until depression and anxiety or symptoms are resolved. However, treatment of any clinically-significant depressive and anxiety symptoms alongside migraine would likely improve the clinical care of people with migraine. Cognitive Behavioral Therapy (CBT) is an evidence-based behavioral treatment designed to effect change through modifying maladaptive beliefs and cognitive patterns. CBT specific to depression, anxiety, and migraine have demonstrated to improve outcomes for these conditions (36, 37). CBT treatments to reduce depressive and anxious symptoms are similar in many ways, and yet also differ in scope and content when compared with CBT targeting migraine symptoms specifically. Recent literature has begun to address questions about how to modify existing CBT treatments to address people with migraine and comorbid psychiatric disorders (38). Intervention development efforts, and a series of early-stage randomized clinical trials, are warranted to identify potentially effective methods of addressing elevated psychiatric symptoms in people with migraine.

Catastrophizing

Catastrophizing is a maladaptive cognitive pattern often targeted in CBT, including CBT for headache disorders (39), as well as in CBT for depression (40) and anxiety (41). In this study, higher pain catastrophizing was associated with severe migraine-related disability, confirming previous studies cross-sectional studies (13, 19–21). CBT for headache disorders, including migraine, has demonstrated efficacy to reduce pain catastrophizing (39, 42). Future interventions designed to target migraine and elevated depression and/or anxiety symptoms could reduce catastrophizing as a central focus, given the shared emphasis of catastrophizing across CBT protocols for the treatment migraine and symptoms of depression and anxiety.

Locus of Control

Higher chance HSLC, the belief that nothing can control the onset and course of migraine attacks and/or headaches, was associated chronic migraine. This is consistent with the single previous study demonstrating associations between high chance HSLC and higher headache frequency in a mixed headache sample (23). In this cross-sectional study, we cannot comment on the direction of the relationship between chance HSLC and chronic migraine; plausible theories could explain either direction of this relationship.

This association may be partially related to patient beliefs about migraine trigger factors (exposures which are thought to increase the probability of headache over a relatively brief, clinically relevant time window in a person who has migraine) (43). It is possible that people with episodic migraine, who experience less frequent headaches, may find it plausible to identify factors that seem associated with headache onset, thereby gaining a sense that control of migraine is possible (low chance HSLC). On the other hand, people with chronic migraine (and therefore very frequent headaches) may find it more difficult to identify plausible factors that seem associated with headache onset, or become overwhelmed with perceived factors associated with headache onset, potentially contributing to higher beliefs that their headaches are controlled only through chance or fate.

It is also possible that the belief that headaches are uncontrollable contributes to the development of chronic migraine. Persons with high chance HSLC may use migraine treatments less optimally, or respond more poorly to strategies for migraine management, increasing the likelihood of migraine chronification. Previous research suggests higher chance HSLC is associated with utilization of maladaptive headache coping strategies (23). Future research should utilize longitudinal designs to evaluate the direction, and possible mediators, of the relationship between chance HSLC and chronic migraine.

Neither internal nor healthcare professional HSLC was associated with chronic migraine and severe migraine-related disability. It is possible that the belief that one is able to exert control over migraine attacks, and the belief that one's doctor is able to exert control over migraine attacks, do not play a role (or play only a small role) in the experience of migraine. Further studies should attempt to discern a) whether current measurement of internal and healthcare professional HSLC adequately captures these constructs, b) how these beliefs impact the experience of migraine, and c) how these beliefs influence treatment outcomes.

Limitations and Future Directions

This study was conducted in a headache subspecialty care center, where patients with disabling and frequent migraine are likely over-represented in comparison with the general population. One third of our sample met criteria for chronic migraine, making the sample representative of tertiary care settings, but not representing the distribution of migraine in the general population. Despite limitations regarding generalizability, subspecialty care is an ideal setting for examining these relationships because resources are more likely to be available for interventions. Understanding modifiable factors associated with migraine-related disability and symptoms in this population could improve the treatment of a large cross-section of the most disabled people with migraine.

This sample consisted of predominantly White adult women with a high level of education and health insurance presenting to a tertiary care headache center. These results may not generalize to other groups of people with migraine. In particular, the high level of education represented in this tertiary care sample suggests that the participants may have had access to more resources for treatment of migraine and any psychological distress than people with migraine who have lower levels of education, and are treated in less specialized settings.

The GAD-7 was used to assess anxiety symptoms. This measure is well-validated and commonly used in both research and clinical practice. However, it is based on the Diagnostic and Statistical Manual criteria for Generalized Anxiety Disorder, whose hallmark clinical symptom is excessive worry. Results may not generalize to symptoms of other anxiety disorders. Generalized Anxiety Disorder has demonstrated a relationship with migraine; however, Panic Disorder, whose hallmark clinical symptom is recurrent panic attacks, is more strongly associated with migraine than GAD (10). Future studies examining psychiatric symptoms in migraine should include a diversity of measures of anxiety symptoms.

As with all cross-sectional studies, the measures relied on patient insight and one-time retrospective self-report. Future studies should use prospective headache diaries to obtain less biased estimates of headache frequency. Daily measures of migraine-related disability may also serve to reduce bias from retrospective recall. In particular, daily measures would assist with the identification of people with or at risk for medication overuse, a key behavioral factor in the progression of migraine; because this study did not include diary data, we were limited in our ability to reliably ascertain medication overuse headache. Further, long-term follow-up using daily measures of migraine-related disability and frequency would allow for prospective longitudinal examination of the impact of headache-related beliefs, cognitions and psychiatric symptoms on future migraine-related disability and the transformation from episodic to chronic migraine. A coding error led to using a 4- rather than 5-point response scale for the PCS. Internal consistency and factor analysis broadly suggest the scale as used in the current study has similar psychometric characteristics to the original. However, results should be interpreted with caution; further, this change in scaling precludes our ability to compare levels of catastrophizing in this sample to established clinical cut-offs. As with many survey studies, some participants either failed to complete several items across the surveys, or completed items in an ambiguous manner. Traditionally, these individuals would have been removed from the data prior to each pair-wise analysis. However, multiple imputation allowed us to retain all eligible participants in the main study analyses by creating multiple possible estimates of missing data, and pool results across imputed data sets.

In conclusion, depressive and anxious symptoms were strongly associated with severe migraine related disability, which lends support to the regular use of screening tools (such as the PHQ-9 and GAD-7 described in this study) to assess clinically relevant psychiatric symptoms in people with migraine as part of comprehensive clinical care. Pain catastrophizing, which is a core target of CBT for migraine, depression and anxiety, was also associated with severe migraine-related disability. This suggests pain catastrophizing could be an important treatment target for combined behavioral treatments designed to reduce

migraine and psychiatric symptoms. This study supports the need for longitudinal observational studies to establish relationships among naturalistic variation in psychological factors, migraine-related disability and migraine chronification. This study also supports the need for randomized clinical trials designed to assess psychological mediators of effective behavioral interventions.

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Abbreviations

ICHD	International Classification of Headache Disorders
AMS	American Migraine Study
AMPP	American Migraine Prevalence and Prevention
MIDAS	Migraine Disability Assessment
PHQ-9	Patient Health Questionnaire – 9
GAD-7	Generalized Anxiety Disorder – 7
PCS	Pain Catastrophizing Scale
HSLC	Headache-Specific Locus of Control
CBT	Cognitive Behavioral Therapy

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Participant Characteristics

Table 1

Demographic	Total		Chronic Migraine Status		Migraine-Related Disability	
	M (SD) or N (%)	M (SD) or N (%)	Chronic M (SD) or N (%)	Episodic M (SD) or N (%)	Severe M (SD) or N (%)	Low-Moderate M (SD) or N (%)
Age	45.0 (12.4)	43.4 (12.6)	43.4 (12.6)	45.9 (12.3)	43.6 (12.2)	43.6 (12.2)
Gender						
Female	77 (85.6%)	26 (81.3%)	26 (81.3%)	51 (89.5%)	33 (94.3%)	29 (87.9%)
Male	13 (14.4%)	6 (18.8%)	6 (18.8%)	6 (10.5%)	2 (5.7%)	4 (12.1%)
Race/Ethnicity						
White, Non-Hispanic	70 (77.8%)	26 (81.3%)	26 (81.3%)	43 (75.4%)	29 (82.9%)	24 (72.7%)
Hispanic	10 (11.1%)	1 (3.1%)	1 (3.1%)	9 (15.8%)	3 (8.6%)	4 (12.1%)
Black, Asian, Other, Non-Hispanic	10 (11.1%)	5 (15.6%)	5 (15.6%)	5 (8.8%)	3 (8.6%)	5 (15.2%)
Education [‡]						
High School or Less	9 (10.1%)	5 (15.6%)	5 (15.6%)	4 (7.1%)	0 (0.0%)	3 (9.4%)
Some College/Technical School	13 (14.6%)	1 (3.1%)	1 (3.1%)	12 (21.4%)	6 (17.1%)	5 (15.6%)
College Graduate	22 (24.4%)	12 (37.5%)	12 (37.5%)	10 (17.9%)	10 (28.6%)	7 (21.9%)
Graduate Degree	45 (50.6%)	14 (43.8%)	14 (43.8%)	30 (53.6%)	19 (54.3%)	17 (53.1%)
Marital Status [‡]						
Single	28 (31.5%)	13 (40.6%)	13 (40.6%)	15 (26.8%)	15 (42.9%)	7 (21.2%)
Married	54 (60.7%)	16 (50.0%)	16 (50.0%)	37 (66.1%)	16 (45.7%)	25 (75.8%)
Live with Domestic Partner	1 (1.1%)	1 (3.1%)	1 (3.1%)	0 (0.0%)	1 (2.9%)	0 (0.0%)
Separated/Divorced/Widowed	6 (6.7%)	2 (6.3%)	2 (6.3%)	4 (7.2%)	3 (8.6%)	1 (3.0%)

Total N = 90, Chronic Migraine N = 32, Episodic Migraine N = 57, Severe Migraine-Related Disability N = 35, Low-Moderate Migraine-Related Disability N = 33;

[‡]Total N = 89, Chronic Migraine N = 32, Episodic Migraine N = 56, Severe Migraine-Related Disability N = 35, Low-Moderate Migraine-Related Disability N = 32

Table 2

Descriptive Statistics

Variable	N (%) or M (SD)
<u>Outcomes</u>	
Chronic Migraine Status (n = 89)	
<i>Episodic Migraine (days/month < 15)</i>	57 (64.0%)
<i>Chronic Migraine (days/month ≥ 15)</i>	32 (36.0%)
MIDAS (n = 68)	
<i>Low to Moderate Disability (score < 21)</i>	33 (48.5%)
<i>Severe Disability (score ≥ 21)</i>	35 (51.5%)
<u>Psychiatric Symptoms</u>	
Depressive Symptoms (PHQ-9; n = 85)	5.5 (4.9)
Anxiety Symptoms (GAD-7; n = 83)	3.7 (4.0)
<u>Headache Beliefs and Cognitions</u>	
Pain Catastrophizing Scale (PCS) (n = 83)	23.9 (9.7)
<u>Headache Specific Locus of Control (HSLC)</u>	
Internal Subscale (n = 86)	34.6 (7.9)
Chance Subscale (n = 83)	28.7 (7.2)
Health Care Professional Subscale (n = 82)	35.6 (5.3)

Table 3
Univariate Odds Ratios Between Psychological Factors and Chronic Migraine and Severe Migraine-Related Disability

	Odds Ratio or <i>r</i>	95% CI or <i>p</i> -value
Chronic Migraine vs. Episodic Migraine		
Depressive Symptoms (PHQ-9)	1.99	1.11, 3.55
Anxiety Symptoms (GAD-7)	1.22	0.70, 2.12
Catastrophizing (PCS)	1.22	0.79, 1.88
HSLC		
Internal [‡]	0.84	0.52, 1.30
Chance	1.85	1.13, 3.03
Medical Professional	0.91	0.58, 1.43
Severe vs. Low to Moderate Migraine-Related Disability[‡]		
Depressive Symptoms (PHQ-9)	3.54	1.49, 8.41
Anxiety Symptoms (GAD-7)	3.65	1.65, 8.06
Catastrophizing (PCS)	1.95	1.14, 3.35
HSLC		
Internal [‡]	1.42	0.90, 2.24
Chance	1.62	0.92, 2.88
Medical Professional	0.78	0.49, 1.25

[‡]Higher scores, lower Internal HSLC;

[‡]Severe MIDAS Score (> 21) vs. Low to Moderate MIDAS Score (<21).