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Race, psychiatric comorbidity, and headache characteristics in patients in headache subspecialty treatment clinics

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Objective. This research examined how race, psychiatric comorbidity, and headache characteristics are inter-related in patients with severe headache disorders.
Design. This study used a naturalistic cohort design and assessed 114 Black and 173 White patients receiving treatment in headache subspecialty clinics in Cincinnati, Cleveland, Columbus, and Toledo, OH. Face-to-face interviews yielded headache and psychiatric diagnoses; 30-day daily diaries collected data on headache frequency, severity, and disability; and self-administered surveys obtained data on headache management self-efficacy, headache locus of control, and quality of life.
Results. Compared with Whites, Blacks reported more frequent and severe headaches, were more likely to be diagnosed with depressive disorders, and were more likely to be diagnosed with chronic headaches. White and Black patients diagnosed with both depression and anxiety reported the most frequent headache days per month and the lowest levels of life quality and headache management self-efficacy.
Conclusions. Additional research on race, psychiatric comorbidity, and headache characteristics is needed that can inform culturally contextualized interventions for persons with severe headache disorders.

Keywords: Blacks; headache; psychiatric disorders; migraine; tension-type headache

Introduction

The co-occurrence of a chronic pain and psychiatric disorder (e.g., headache and depression) is known as a 'pain-dyad' (Lindsay and Wyckoff 1981). According to the World Health Organization, pain-dyads are prevalent across a wide range of cultures and illnesses. In a cross-national study conducted in Asia, Africa, Europe, and the Americas, patients in primary care settings who reported persistent pain problems were four times more likely to be diagnosed with a psychiatric disorder than those without pain problems (Gureje *et al.* 1998).

In research conducted in the USA, major depressive disorder (MDD) has been diagnosed in 56% of patients in orthopedic/rheumatology clinics and 27% of patients in primary care clinics (Bair *et al.* 2003). Patients with pain-dyads in clinical settings experience greater social and functional impairment, disability, and unemployment than do patients with just one of the two conditions (Bair *et al.* 2003). Patients with

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pain conditions who are depressed are also less likely to have their psychiatric conditions diagnosed because physicians attribute the patient's somatic symptoms to the pain condition instead of the psychiatric disorder (Kirmayer *et al*. 1993, Greden 2003, Tylee and Gandhi 2005). Furthermore, compared with their non-depressed counterparts, depressed patients with pain conditions respond less favorably to pain management therapies, make more visits to medical providers, and generate greater total medical costs (Bair *et al.* 2003, 2007, Scher *et al*. 2005, Bruce 2008, Boulanger *et al.* 2009, Kroenke *et al*. 2009).

In the USA, there is a concern that a greater proportion of Blacks experience pain-dyads compared with Whites. Among patients with chronic pain conditions, Blacks endorse significantly more symptoms of depression, anxiety, post traumatic stress disorder, and sleep disturbance than do Whites (Green *et al*. 2003a, 2003b). Blacks with pain-dyad conditions are also at greater risk for having their psychiatric disorder(s) under-diagnosed and under-treated. Borowsky (2000) found that Blacks living with chronic health conditions (e.g., asthma, hypertension, and diabetes) were less likely to have their comorbid depressive or anxiety disorder identified than Whites.

Pain-dyads may be particularly problematic in persons with headache disorders. In the USA, persons with migraine headaches are 2.2–5.3 times more likely to be diagnosed with a depressive or anxiety disorder than are persons without migraine (Baskin *et al*. 2006, Lipton *et al.* 2000). Patients in clinical care settings being treated for episodic tension-type headache (ETTH) have a 1-year prevalence rate of 11% for an affective disorder (e.g., depression, anxiety) and 50% of patients with chronic tension-type headaches (TTH) meet the diagnostic criteria for a psychiatric disorder using the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV; Puca *et al*. 1999). Longitudinal research suggests that the comorbid relationship between psychiatric and headache disorders is bidirectional in nature (Breslau *et al.* 2003, Beghi *et al.* 2010). Specifically, the presence of a migraine headache disorder increases the risk for the onset of MDD while a diagnosis of MDD increases the risk for the subsequent development of a migraine disorder (Breslau *et al.* 2003).

The most common types of psychiatric disorders in headache patients are depression, anxiety, and somatoform disorders (Beghi *et al.* 2010). Headache patients with comorbid psychiatric disorders also report greater headache-related disability, more frequent headaches, and poorer quality of life compared to headache patients with no psychiatric conditions (Lipton *et al*. 2000, Guidetti and Galli 2002, Hung *et al*. 2008). Psychiatric comorbidity has also been implicated in episodic headaches evolving into chronic headaches and patients developing medication overuse headaches because of the improper use of analgesics (Gentili *et al*. 2005, Radat *et al*. 2005).

Essentially no research has considered patient race when examining pain-dyads in headache patients; however, psychiatric epidemiologic research with large probability samples suggests that greater prevalence rates of psychiatric disorders exist in Blacks than Whites. The Epidemiological Catchment Area Study found higher prevalence rates of depressive and anxiety disorders in racial-minorities than Whites (Kessler *et al*. 1994, Zhang and Snowden 1999, Turner and Lloyd 2004). Similarly, the National Study of American Life found higher rates of chronic depression in both American Blacks (56.5%) and Caribbean Blacks (56%) compared with Whites (38.6%; Williams *et al*. 2007). Furthermore, Blacks tend to have more chronic and

recurrent forms of major depression than Whites, in part, because they are less likely to seek or receive treatment for their depression (Breslau *et al*. 2006, Williams *et al*. 2007). If these patterns generalize to headache patients, a greater proportion of Black headache patients should evince a psychiatric comorbid condition compared with Whites.

Very little is known about associations among race, psychiatric comorbidity, and headache characteristics in headache patients. To date, epidemiologic research has found higher prevalence rates of migraine and TTH in Whites than in Blacks (Lipton *et al.* 2000), although Probable Migraine is believed to be greater in Blacks than in Whites (Silberstein *et al.* 2007a). In persons formally diagnosed with headache disorders, Blacks report greater headache frequency, severity, and chronicity than Whites (Stang *et al*. 1996, Stewart *et al*. 1996, Nicholson *et al*. 2006, Heckman *et al.* 2009a,b).

Racial minorities with chronic health conditions, most notably Blacks and Latino/Latinas, believe that they have less control over their health disorder and that their health is determined primarily by chance and/or 'powerful others' (e.g., God or a higher power). Racial minorities with chronic health conditions also report less self-efficacy to manage their health conditions. Indeed, reduced perceptions of self-efficacy and locus of control have been found in racial minorities across many health conditions, including Type II diabetes (Bell *et al.* 1995), cancer (Sugarek *et al.* 1988, Swinney 2002), and systemic lupus erythematosus (Karlson *et al.* 1997). If these findings generalize to headache disorders, Blacks would be expected to report less self-efficacy and internal locus of control specific to managing their headache disorders and, as a result, Blacks might also report more severe headache characteristics, greater headache disability, and poorer treatment adherence and outcomes.

This study examined racial differences in headache characteristics and rates of psychiatric comorbid conditions in patients seeking medical treatment for severe headache disorders. Specifically, this study examined: (1) if racial differences in rates and types of comorbid psychiatric disorders exist in patients with headache disorders; (2) how race is related to psychiatric disorders in headache patients; (3) how headache chronicity (i.e., episodic vs. chronic) is related to psychiatric comorbidity within each racial group; and (4) how race and psychiatric diagnosis impact headache characteristics uniquely and in combination. By determining if headache characteristics and headache chronicity are associated with psychiatric comorbidity or race, headache practitioners can provide more efficacious treatments for headache patients' pain and psychiatric conditions.

Methods

Study procedures

Between July 2004 and June 2008, 311 patients were recruited into the study from four headache subspecialty treatment clinics in Columbus ($n = 120$), Toledo ($n = 108$), Cleveland ($n = 68$), and Cincinnati, OH ($n = 15$). Study inclusion criteria were: (1) 18 years of age or older; (2) satisfying International Headache Society (IHS) criteria for episodic migraine, chronic migraine, ETTH, chronic TTH, or medication overuse headache; (3) the physician determined that the patient should begin new

preventive headache agents; and (4) written informed consent. This study focused only on the 287 patients who self-identified as Black ($n = 114$) or White ($n = 173$).

Recruitment materials (i.e., brochures and posters) that described the study were distributed to participating clinics for display and distribution to patients. While patients were recruited by site physicians and nurses during the patient's initial clinic visit, only physicians determined patient eligibility. Because racial minorities were underrepresented in all four treatment clinics, all patients from under-represented racial groups who presented for treatment were approached for study enrollment. The larger pool of White patients in participating clinics permitted a recruitment strategy in which only every fifth White patient was approached for enrollment. Eligible patients who volunteered for the study provided written informed consent in the treatment clinic. Patients were assessed at baseline and re-assessed at three follow-ups. The study's methodology is described elsewhere (Heckman *et al.* 2009a, b, 2011). The study was approved by the university's Institutional Review Board, and no adverse events were reported.

Assessment methodologies

Data were collected using four different assessment methodologies: (1) face-to-face headache diagnoses; (2) telephone-based psychiatric interviews; (3) 30-day daily diaries (to assess headache days per month, severity, and disability); and (4) self-administered surveys completed by patient's during the four clinic visits. Each methodology is described below in greater detail. The psychometric attributes of study measures were evaluated using data provided by patients during their initial visit.

Face-to-face headache diagnosis

During their initial interaction, physicians diagnosed patients' headaches disorder(s) using IHS criteria (Headache Classification Committee of the International Headache Society 2004). All patients were given a primary headache disorder diagnosis based on the disorder that was most problematic vis-à-vis frequency (headache days) and severity. The physician also documented each patient's past and current pharmacological headache treatments. Headache disorders were diagnosed as episodic or chronic. Episodic headaches were those that occurred less than 15 days per month while chronic headaches were those that occurred 15 or more days per month.

Telephone-based psychiatric interviews

Psychiatric disorders were diagnosed using the Primary Care Evaluation for Mental Disorders (PRIME-MD; Spitzer *et al.* 2000). The PRIME-MD was administered to all patients by trained research staff during a telephone interview conducted within 2 days after the patient completed his or her baseline visit. The PRIME-MD was used because it was designed specifically for use in primary care settings and yields a subset of diagnoses included in the DSM-IV, including mood and anxiety disorders (American Psychiatric Association 2000).

Thirty-day daily diary

During the interval between their baseline and 1-month follow-up visit, patients completed self-administered, paper-and-pencil daily diaries in which they recorded the frequency and severity of headaches experienced during the 30-day assessment period. Headache frequency was the 'number of days over the 30-day period during which patients experienced a "mild," "moderate," or "severe" headache.' Headache episode severity was assessed for each headache using a 4-point scale (0 – 'no pain,' 1 – 'mild,' 2 – 'moderate,' or 3 – 'severe'). On days when patients did not experience a headache, a value of '0' was recorded. On days when patients did experience a headache, the severity of the headache episode was rated using response options '1' through '3.' Mean headache episode severity was calculated by summing headache severity ratings and dividing this sum by 30. Headache disability was assessed daily for each headache using a 5-point scale (0 – 'no disability' to 4 – 'severe disability'). Headache disability ratings were summed and divided by 30, with higher scores indicating more disabling headaches.

Self-administered surveys

Patients completed self-administered surveys in the clinic during their initial treatment visit. Measures assessed through self-administered surveys are described below:

Demographics. Patients indicated the racial group with which they most identified, their age, gender, number of years of education, current employment status (full-time, part-time, and unemployed), type of health insurance coverage (e.g., health maintenance organization, preferred provider organization, private), and annual income.

Headache Management Self-Efficacy Scale. The 25-item Headache Management Self-Efficacy (HMSE) Scale measured patients' perceived abilities to engage in various strategies to prevent headache episodes and manage headache-related pain and disability. Sample items included: 'There are things I can do to prevent headaches,' 'Once I have a headache, there is nothing I can do to control it,' and 'I can prevent headaches by changing how I respond to stress.' Patients used a seven-point scale to indicate level of agreement (1 – 'strongly disagree' to 7 – 'strongly agree'). Total possible scores ranged from 25 through 175, while total scores observed at baseline ranged from 37 through 146; higher scores indicated greater headache management self-efficacy. The HMSE Scale evidenced good internal consistency in the current study (Cronbach's $\alpha = 0.90$) (French *et al.* 2000).

Migraine-Specific Quality of Life Scale. A 14-item adapted version of the Migraine-Specific Quality of Life (Modified MSQL) Scale assessed the impact of headaches on patients' quality of life. Because the original MSQL items referred only to migraines, the term 'migraine' was replaced with the more general term 'headache' when relevant. For example, the original MSQL item 'In the past 4 weeks, how often have *migraines* interfered with how well you dealt with family, friends and others close to you' was changed to 'In the past 4 weeks, how often have your *headaches* interfered with how well you dealt with family, friends and others close to you.' Each item used

a 6-point scale with potential scores ranging from 14 to 84 (observed scores at baseline ranged from 14 to 84). The MSQL Scale was summed to create an overall index of life quality in which lower scores indicated greater life quality. The measure showed good internal consistency (Cronbach's $\alpha = 0.88$, current study) (Jhingran *et al.* 1998).

Headache-Specific Locus of Control Scale. The 33-item Headache-Specific Locus of Control (HSLC) Scale measured patients' beliefs regarding factors that controlled their headaches. The HSLC Scale contained three subscales that assessed patients' beliefs that their headaches were controlled by their own efforts (Internal subscale, 11 items, possible range = 11–55; observed range at baseline = 11–52; Cronbach's $\alpha = 0.85$), chance circumstances (Chance subscale, 11 items, possible range = 11–55; observed range at baseline = 13–52; Cronbach's $\alpha = 0.82$), and health care professionals (Health Care Professional subscale, possible range = 11–55; observed range at baseline = 17–55; 11 items, Cronbach's $\alpha = 0.83$). Respondents used a five-point scale (1 – 'strongly disagree' to 5 – 'strongly agree') to indicate level of agreement with each item. For all three subscales, higher values indicated greater locus of control ascribed to the target source (VandeCreek and O'Donnell 1992, Martin *et al.* 1990).

Data analytic procedures

Analysis of variance (ANOVA) and χ^2 tests of association examined relationships among race, demographic characteristics, and psychosocial variables assessed at baseline and headache characteristics assessed through daily diaries completed during the 30 days after the baseline visit. Post hoc analyses (e.g., descriptive statistics, tests of independent proportions) were conducted following significant ANOVA and χ^2 analyses to interpret relationships. Unadjusted logistic regression analyses and odds ratios (ORs) and the 95% confidence interval ($CI_{95\%}$) associated with the OR examined associations between race and the presence of specific psychiatric conditions (e.g., MDD, dysthymia; 0 – no; 1 – yes) at baseline. Adjusted logistic regression analyses tested if these associations remained significant after controlling for variables on which Blacks and Whites differed at baseline. Chi-squared (χ^2) tests of association examined whether, and how, the relationship between headache chronicity (episodic vs. chronic headaches) and psychiatric comorbidity differed by race at baseline. Finally, multivariate analysis of covariance (MANCOVA) tested how race and psychiatric comorbidity were related to headache characteristics assessed at baseline (i.e., headache-management self-efficacy, locus of control, and quality of life) and during the 30 days following the patient's baseline visit (i.e., headache frequency, severity, and disability). The MANCOVA tested the two main effects for 'Race' and 'Psychiatric Condition' and the 'Race × Psychiatric Condition' interaction. All analyses were performed using SPSS Version 17.0 (SPSS Inc. 2008).

Results

Differences at baseline between Whites and Blacks

As shown in Table 1, the average patient was 36.6 years of age, female (87.8%), and had completed 13.9 years of education. Annual income among patients was

Table 1. Means, proportions, and differences between White and Black patients in socio-demographic and headache characteristics at baseline; mean ± SD.

Characteristic	Overall ($n = 287$)	Whites ($n = 173$)	Blacks ($n = 114$)	χ^2 F	p-value
Age	36.6 ± 10.4	35.6 ± 10.2	38.4 ± 10.5	4.2	0.041
Years of education	13.9 ± 2.2	14.3 ± 2.1	13.5 ± 2.2	7.9	0.005
Being female	87.8% (252/287)	85.2% (147/173)	92.1% (105/114)	2.7	0.095
Annual income below $40,000	67.3% (193/287)	65.4% (113/173)	70.7% (81/114)	0.7	0.393
SES factor score (income, education, employment status)	0.087	0.117	–0.176	5.3	0.022
Diagnosed with chronic migraine (with aura)	6.0% (17/287)	6.4% (11/173)	5.4% (6/114)	0.1	0.710
Diagnosed with chronic migraine (without aura)	18.4% (53/287)	17.5% (30/173)	19.6% (22/114)	0.2	0.656
Diagnosed with episodic migraine (with aura)	18.4% (53/287)	19.9% (34/173)	16.1% (18/114)	0.7	0.418
Diagnosed with episodic migraine (without aura)	54.4% (156/287)	59.6% (103/173)	46.4% (53/114)	4.8	0.029
Diagnosed with chronic TTH	19.1% (55/287)	17.0% (29/173)	22.3% (25.114)	1.3	0.262
Diagnosed with ETTH	6.0% (17/287)	3.5% (6/173)	9.8% (11/114)	4.8	0.029
Diagnosed with medication overuse headache	11.3% (32/287)	7.6% (13/173)	17.0% (19/114)	5.9	0.015
Headache days/month[a]	17.2 ± 7.8	16.3 ± 7.9	18.9 ± 7.5	4.9	0.028
Headache episode severity[a]	1.67 ± 0.4	1.62 ± 0.3	1.77 ± 0.5	7.2	0.008
Headache disability[a]	1.93 ± 0.6	1.88 ± 0.5	2.02 ± 0.6	2.9	0.092

Note: F-ratios compared mean differences; χ^2 compared proportions.
[a]Assessed through 30-day daily diaries at treatment initiation.

$0–20,000 (33.1%), $20,001–40,000 (34.9%), $40,001–60,000 (19.0%), $60,001–80,000 (6.3%), $80,001–100,000 (4.5%), and greater than $100,000 (2.2%). The modal headache diagnosis was episodic migraine without aura (54.4%). The average patient experienced headaches on 17.2 days during the past month.

One-way ANOVA and χ^2 analyses identified differences between the 173 White and 114 Black patients at baseline. Table 1 shows that Whites were younger and had completed more years of education than Blacks ($p < 0.05$). Whites reported higher socioeconomic status (SES) values than did Blacks based on a factor score consisting of 'Annual Income,' 'Years of Education,' and 'Employment Status' ($p < 0.05$). Whites were more likely to be diagnosed with episodic migraine without aura, while Blacks were more likely to be diagnosed with ETTH ($p < 0.05$). Blacks were also more likely to be diagnosed with medication overuse headaches ($p < 0.05$).

Table 1 also shows that Blacks experienced more headache days per month and more severe headaches than Whites ($p < 0.05$). Chi-squared tests of association also found a relationship between race and the chronicity of the patients' primary headache diagnosis (not shown in Table 1). Specifically, 56% of Blacks, but only 42% of Whites, had a primary headache diagnosis that was chronic in nature (e.g., chronic

migraine, chronic TTH; $p = 0.04$). Blacks and Whites did not differ in employment, annual income, health insurance coverage, or number of years with headaches (all p's > 0.10).

Table 2 shows the proportion of Black and White patients diagnosed with various psychiatric disorders. Strong evidence suggested that Blacks (40.4%) were more likely than Whites (24.1%) to be diagnosed with MDD, OR $= 2.13$ ($CI_{95\%}$ 1.27–3.58), and dysthymia (33 vs. 15.3%, respectively); OR $= 2.73$ ($CI_{95\%}$ 1.53–4.87). Weak evidence suggested that Blacks (7.3%) were more likely than Whites (2.4%) to be diagnosed with Minor Depressive Disorder, OR $= 3.28$ ($CI_{95\%}$ 0.97–11.20). When logistic regression analyses were re-conducted controlling for age and years of education completed, only one statistically significant relationship remained. Evidence suggested that Black patients were twice as likely as White patients to be diagnosed with dysthymia, $OR_{Adj} = 2.0$ ($CI_{95\%}$ 1.05–3.79).

Associations among race and psychiatric disorders at baseline

Z-tests of independent proportions (Bruning and Kintz 1968) examined the relationship between race and psychiatric comorbidity. In this analysis, four 'Psychiatric Condition' groups were created: (1) No Psychiatric Condition; (2) MDD-only; (3) Anxiety-only [i.e., Generalized Anxiety Disorder (GAD) or Anxiety Disorder-NOS]; and (4) both MDD and Anxiety (MDD + Anxiety). Strong evidence suggested that Whites (40.0%) were more likely than Blacks (24.1%) to be diagnosed with no psychiatric disorder, $z = 2.89$, $p = 0.01$, while Blacks (43.5%) were more likely than Whites (27.9%) to be diagnosed with MDD + Anxiety, $z = 2.71$, $p = 0.009$ (see Figure 1 for rates of psychiatric disorders by race).

Table 2. Proportions of White and Black patients with headache diagnosed with psychiatric comorbid conditions at baseline.

Psychiatric disorder	Whites ($n = 173$)	Blacks ($n = 114$)	Unadjusted OR (95% CI)	Adjusted OR[a] (95% CI)
Major depressive disorder (MDD)	24.1% (42/173)	40.4% (46/114)	2.13* (1.27, 3.58)	1.57 (0.89, 2.79)
Partial remission of MDD	22.9% (40/173)	22.0% (25/114)	0.95 (0.53, 1.69)	1.01 (0.53, 1.95)
Dysthymia	15.3% (26/173)	33.0% (38/114)	2.73* (1.53, 4.87)	2.00** (1.05, 3.79)
Minor depressive disorder	2.4% (4/173)	7.3% (8/114)	3.29** (0.97, 11.20)	2.20 (0.58, 8.34)
Panic disorder	6.5% (11/173)	11.0% (13/114)	1.79 (0.76, 4.21)	1.47 (0.57, 3.79)
GAD	15.3% (26/173)	20.2% (23/114)	1.40 (0.75, 2.62)	1.26 (0.62, 2.53)
Anxiety disorder (not otherwise specified)	23.5% (41/173)	33.0% (38/114)	1.60 (0.94, 2.73)	1.92 (1.07, 3.47)
Probable alcohol use/ dependence	5.3% (9/173)	5.5% (6/114)	1.04 (0.36, 3.01)	2.04 (0.58, 7.16)

[a]Adjusted for race-related differences in age and education.
*$p < 0.05$; **$p < 0.01$.

Race, headache chronicity and psychiatric disorders

A considerable amount of research has found that persons with chronic headache conditions report more psychiatric comorbidity than do persons with acute headache disorders. However, this research has typically combined White and Black patients and ignored how race may contribute to the relationship between headache chronicity and psychiatric comorbidity. Capitalizing on this sample's racial diversity, the present study examined if the relationship between headache chronicity and psychiatric comorbidity was consistent across White and Black headache patients.

Chi-squared tests of association examined the relationship between headache chronicity and psychiatric comorbidity in Whites and, separately, Blacks. No statistically significant relationship was found between headache chronicity and psychiatric condition in Whites, $p = 0.39$. However, evidence suggested that headache chronicity and psychiatric condition were related in Blacks, $p = 0.04$. Specifically, Blacks whose primary headache diagnosis was episodic in nature were more likely to have no psychiatric disorder (36.1%) while Blacks who had headaches that were chronic in nature were more likely to be diagnosed with MDD + Anxiety (53.1%; see Figure 2).

MANCOVA testing associations among race, psychiatric comorbidity, and headache characteristics

A 4×2 between-subjects MANCOVA was performed on eight dependent variables related to headache characteristics and headache management abilities: headache days per month, headache episode severity, headache disability, headache management self-efficacy, headache-specific quality of life, and the three headache management locus of control subscales. Adjustment was made for age and years of education completed. The independent variables were race (White and Black) and psychiatric comorbidity status (None, MDD-only, Anxiety-only, and MDD + Anxiety). MANCOVA assesses the effects of the independent variables on the combined set of dependent variables (i.e., the multivariate test) and the effects of each independent variable on each dependent variable. The partial η^2 statistic was provided for each main effect to characterize the proportion of variance in the dependent variable

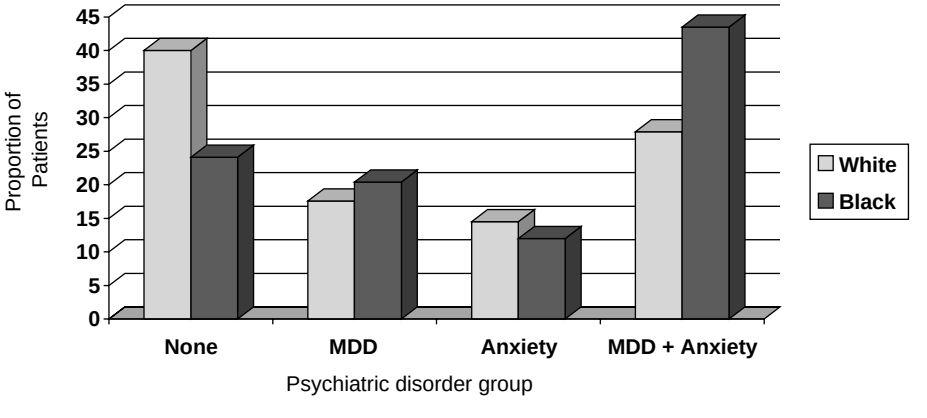

Figure 1. Proportion of patients diagnosed with a psychiatric diagnosis by race.

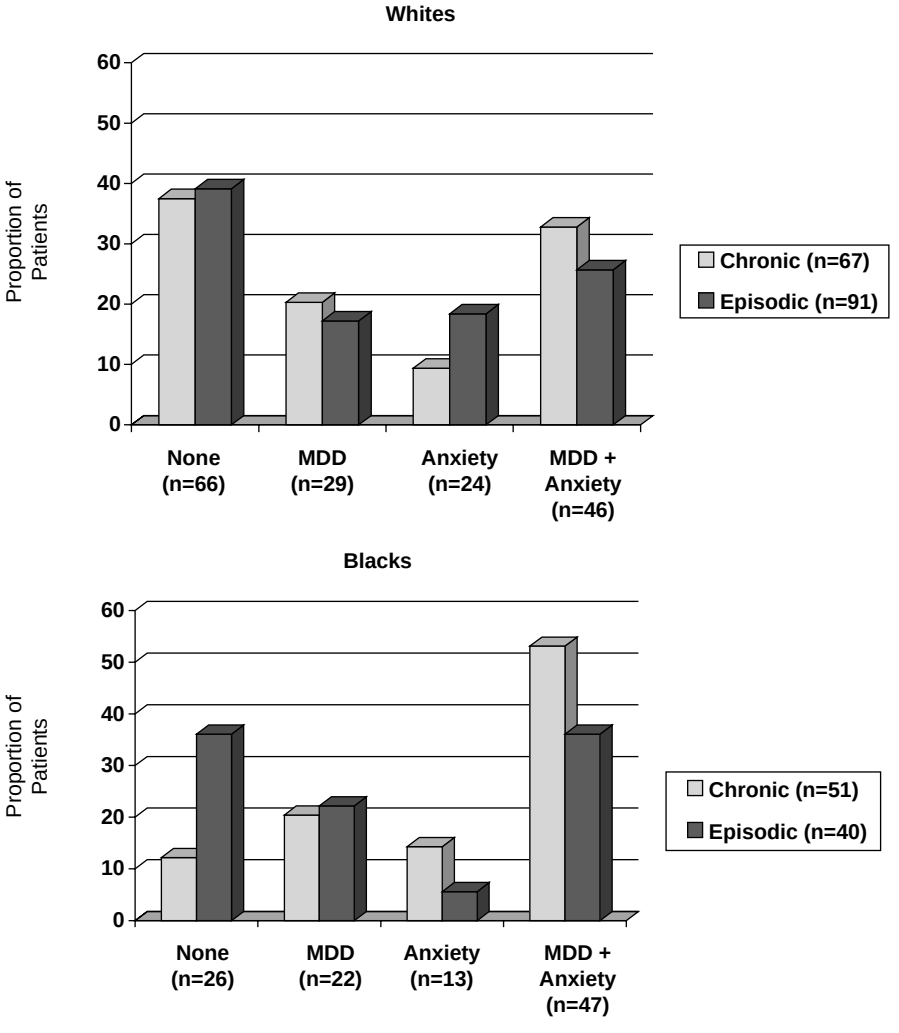

Figure 2. Proportion of patients diagnosed with chronic or episodic headaches by psychiatric diagnosis by race.

associated with the independent variable of interest (minus the variation in the dependent variable associated with other independent variables in the model).

SPSS MANOVA was used to conduct the main analysis. Prior to conducting the MANCOVA, all relevant statistical assumptions were examined. Analyses assessing assumptions related to normality and linearity yielded satisfactory results. No univariate outliers were identified at $p < 0.01$. Two pairs of dependent variables were correlated between $r = 0.30$ and $r = 0.40$, those being headache management self-efficacy and internal locus of control, $r(n = 250) = 0.39$, $p = 0.001$ and headache management self-efficacy and chance locus of control, $r(n = 244) = -0.43$, $p = 0.001$. However, all other pairwise correlations among dependent variables were less than $r = 0.30$ (or less than 10% of shared variance), suggesting that multicollinearity was not problematic.

The MANCOVA found a significant multivariate effect for 'Psychiatric Condition,' $F(24, 374) = 2.35$, $p = 0.001$, Wilks' $\lambda = 0.67$, partial $\eta^2 = 0.127$, no multivariate effect for 'Race,' $F(8, 129) = 1.1$, $p = 0.36$, Wilks' $\lambda = 0.94$, partial $\eta^2 = 0.64$, and no multivariate 'Race by Psychiatric Condition' interaction, $F(24, 374.7) = 0.8$, $p = 0.66$, Wilks' $\lambda = 0.86$, partial $\eta^2 = 0.05$. As shown in Table 3, there were univariate main effects for 'Psychiatric Condition' on four dependent variables: headache days per month, headache management self-efficacy; headache-specific quality of life; and the Internal Control subscale of the Locus of Control scale (described below).

Headache days

A main effect for 'Psychiatric Condition' was found on headache days, $F(3, 136) = 2.75$, $p = 0.045$, partial $\eta^2 = 0.057$. Tukey's post hoc comparisons revealed evidence suggesting that patients diagnosed with MDD + Anxiety [mean (M) = 19.54] reported significantly more headache days per month than patients with no psychiatric condition ($M = 14.82$), $p = 0.02$.

Table 3. Headache characteristics by race and psychiatric conditions, means adjusted for age and education.

Variable	Potential range	Patient race	None	MDD	Anxiety	MDD + anxiety
Headache days/month[b,d]*	0–30	Whites	14.52	17.15	18.22	18.69
		Blacks	15.12	18.76	23.26	20.40
Headache episode severity[d]	0–3	Whites	1.58	1.66	1.69	1.62
		Blacks	1.55	1.66	1.69	1.76
Headache disability[d]	0–4	Whites	1.81	1.87	1.97	1.97
		Blacks	1.85	1.97	1.95	2.16
Headache management self-efficacy[b]*	25–175	Whites	96.49	92.13	96.28	88.55
		Blacks	81.62	98.91	113.20	84.84
Headache-specific quality of life[b,e]**	14–84	Whites	37.08	48.40	49.03	52.50
		Blacks	39.26	45.94	40.13	54.08
Headache-specific internal Locus of Control[b]**	11–55	Whites	28.95	31.62	34.31	34.86
		Blacks	31.02	30.55	41.34	35.57
Headache-specific health care professional Locus of Control[b]**	11–55	Whites	32.70	33.84	35.15	35.19
		Blacks	31.83	31.44	33.04	34.31
Headache-specific chance Locus of Control[b]**	11–55	Whites	30.63	35.84	38.33	36.85
		Blacks	36.40	29.22	31.90	37.49

[a]Main effect for 'Race.'
[b]Main effect for 'Psychiatric Group.'
[c]Race × Psychiatric Group interaction.
[d]Data collected through 30-day daily diaries.
[e]Lower scores indicate higher quality of life.
*$p < 0.05$; **$p < 0.01$.

Headache management self-efficacy

A main effect for 'Psychiatric Condition' was found on headache management self-efficacy, $F(3, 166) = 2.74$, $p = 0.046$, partial $\eta^2 = 0.057$. Tukey's post hoc comparisons found evidence suggesting that patients diagnosed with Anxiety-only ($M = 104.70$) reported significantly greater headache management self-efficacy than patients diagnosed with MDD + Anxiety ($M = 86.69$), $p = 0.047$.

Internal control subscale of the Headache-Specific Locus of Control Scale

A main effect for 'Psychiatric Condition' was found on the Internal Control subscale of the Headache-Specific Locus of Control Scale, $F(3, 136) = 4.51$, $p = 0.005$, partial $\eta^2 = 0.090$. Tukey's post hoc comparisons found evidence suggesting that patients with no psychiatric comorbidity ($M = 29.98$) reported less internal locus of control than patients diagnosed with Anxiety-only ($M = 37.82$, $p = 0.02$) and patients diagnosed with MDD + Anxiety ($M = 35.22$, $p = 0.006$).

Headache-Specific Quality of Life

A main effect for 'Psychiatric Condition' was found on Headache-Specific Quality of Life, $F(3, 136) = 7.03$, $p = 0.001$, partial $\eta^2 = 0.134$. Tukey's post hoc comparisons found strong evidence suggesting that patients with no psychiatric condition ($M = 38.17$) reported significantly better quality of life than patients diagnosed with MDD-only ($M = 47.17$, $p = 0.001$), patients diagnosed with Anxiety-only ($M = 44.58$, $p = 0.02$), and patients diagnosed with MDD + Anxiety ($M = 53.29$, $p = 0.001$). Patients diagnosed with Anxiety-only ($M = 44.58$) also reported significantly better quality of life than patients diagnosed with MDD + Anxiety ($M = 53.29$, $p = 0.003$).

Discussion

This study found evidence suggesting that: (1) Black headache patients report more frequent and severe headaches and are more likely to be diagnosed with Medication Overuse Headaches; (2) Black headache patients are more likely to be diagnosed with major depressive disorder, partial remission of major depressive disorder, and dysthymia; (3) Black headache patients are more likely to be diagnosed with both MDD + Anxiety while Whites are more likely to be diagnosed with no psychiatric conditions; (4) headache chronicity is related to psychiatric comorbidity in Blacks but not Whites; and (5) patients with MDD + Anxiety report the most headache days per month and have the lowest levels of headache-specific quality of life and headache management self-efficacy.

Previous reports from this study (Heckman *et al*. 2009a, b) and others (Lipton *et al*. 2001, Silberstein 2007b) showed that Blacks diagnosed with headache disorders reported more frequent and severe headaches than their White counterparts, particularly when the effects of psychiatric comorbidity were not covaried. Blacks might experience more frequent and severe headaches than Whites because: (1) the headaches they experience are, in fact, more frequent and severe than those experienced by Whites; (2) Blacks are more sensitive to pain and have lower pain

thresholds, thus headaches that are theoretically equivalent in severity are rated more severe by Blacks (Woodrow 1972, Walsh 1989, Edwards 1999, Sheffield 2000); or (3) higher rates of depression in Black patients lead to heightened perceptions of pain and/or impair Black patients' abilities to control their headache pain.

Evidence from this study also suggested that Black patients are more likely than White patients to be diagnosed with Medication Overuse Headaches. It is possible that, because headache disorders in this group are less likely to be detected and diagnosed in primary care settings (where the majority of headache disorders are treated; Nicholson *et al.* 2006), Blacks may have resorted to self-medication strategies to manage their headaches. While there may be many reasons for medication overuse, Blacks may attempt to self-manage because of less frequent healthcare visits and poorer overall quality of that medical care (American College of Physicians 2010). This finding underscores the need for primary care and headache practitioners to identify headache disorders in this population and to provide education in the use of acute headache agents to reduce the risk of developing 'rebound' headaches.

Blacks were more likely than Whites to be diagnosed with major depression, partial remission of major depression, and dysthymia. After controlling for racial differences in age and education, Blacks were still twice as likely as Whites to be diagnosed with dysthymia. These findings are consistent with past research in which Blacks in the USA being treated for pain in clinical settings reported elevated rates of depression (Green *et al*. 2003a, 2003b, Baker and Green 2005). While comorbid relationships between headache disorders and psychiatric conditions have been well documented in the general headache population (Lipton *et al.* 2001), this is the first study to demonstrate that Blacks in headache subspecialty treatment clinics are more likely to have depressive disorders. These findings also speak to the need for headache treatment practitioners in all areas of the world to assess for comorbid psychiatric conditions in headache patients.

Potential mechanisms that might explain the comorbid link between headache and psychiatric disorders include shared neurobiological mechanisms (e.g., a low platelet serotonin concentration, increased urinary 5-hydroxytryptamine, or greater levels of 5-hydroxyindole acetic acid; Ferrari *et al*. 1989) or shared psychological vulnerabilities, such as hyper-arousal, hyper-vigilance, or being overly attentive to somatic cues (Asmundson 2002). These mechanisms, however, are unlikely to fully explain the higher rates of psychiatric disorders observed in Black headache patients in this study.

Interestingly, even after controlling for race-related differences in age and education, Black headache patients still evidenced a greater rate of dysthymic disorder compared with Whites. This disparity is consistent with the psychiatry literature in which rates of dysthymia, a DSM-based depressive diagnosis that is less severe (but more chronic) than depression, are higher in Blacks than in Whites in the general population. In fact, the consistently higher rate of dysthymic disorder found in Blacks and Hispanics in the USA has been referred to as 'cultural dysthymia,' a common psychological reaction to recurrent experiences of racism and social inequities (National Advisory Mental Health Council 1998, Clark *et al.* 1999, Williams and Harris-Reid 1999). Racism and discrimination, defined as 'ideologies of superiority and negative attitudes and beliefs about outgroups, as well as differential treatment of members of those groups by individual and societal

institutions' (Williams and Harris-Reid 1999, p. 310), are part of daily life for many Blacks and its presence can generate stress and, oftentimes, depression, and anxiety (Clark *et al.* 1999).

It is clear that psychotherapeutic and/or psychopharmacological interventions are needed to reduce rates of depression and pain symptoms in headache patients, many of whom are Black. While treatments for have focused predominantly on pharmacological interventions (e.g., Stewart *et al.* 1996, Loj and Solomon 2006), psychological interventions show considerable potential for the treatment of chronic pain and comorbid psychiatric disorders, in part because many psychological interventions treat elements common to both disorders. For example, psychological interventions can increase patients' levels of physical activity (which tends to be low in patients with depression and/or headaches) and teach strategies to reduce physiological arousal due to anxiety symptoms commonly experienced by patients with headache and/or psychiatric disorders (e.g., relaxation training; McWilliams 2004). Cognitive-behavioral or interpersonal-based interventions that can (1) reduce both depressive symptoms and headache activity (particularly in Black patients) and (2) provide support, advocacy, and coping resources that can address the plethora of disparate economic, institutional and societal inequities commonly experienced by Blacks in the USA and that may lead to greater rates of headache and psychiatric disorders would be of considerable public health significance.

Previous reports from this research have shown that Black headache patients who are depressed report poorer adherence to prophylactic headache pharmacotherapies (Heckman and Ellis 2011) and miss more treatment appointments in headache subspecialty treatment clinics (Heckman *et al.* 2008). An important line of research that warrants investigation is to determine if psychotherapies that reduce depression in Black headache patients can produce concomitant reductions in headache burden and more consistent adherence to medication regimens and treatment appointments.

The current study also found that while Blacks were no more likely than Whites to receive a primary headache diagnosis that was chronic in nature, Blacks who experienced chronic headaches (e.g., headache attacks that occurred 15 or more days per month) were more likely to receive a comorbid diagnosis of MDD + Anxiety. This finding is consistent with past research showing that the presence of multiple psychiatric disorders is associated with headache disorder persistence over an 8-year period (Guidetti *et al.* 1998). Because of its cross-sectional design, this study cannot determine why chronic headaches are associated with greater psychiatric comorbidity in Blacks (but not Whites). It could be that Black headache patients who have depression may experience difficulty managing their headaches (e.g., poor medication adherence, increased headache triggers such as stress), resulting in more frequent and severe headaches. Conversely, chronic headaches may prevent individuals from obtaining and maintaining employment, fulfilling important roles, and forming and maintaining important social relationships, thereby producing higher levels of psychiatric distress. Future studies that employ longitudinal designs to better determine the cause–effect relationship between psychiatric comorbidity and headache chronicity (particularly in Blacks) can inform more efficacious treatments for these conditions.

To date, much research examining psychiatric comorbidity in headache patients has focused on depressive disorders (Lipton *et al.* 2001, Breslau *et al.* 2003). This study found that anxiety disorders were related to patients' headache characteristics

and several factors related to the treatment of headaches. It is noteworthy that anxious Blacks reported the highest levels of headache management self-efficacy and internal locus of control – even though this group reported the highest level of headache severity and the most headache days per month. The paucity of research in this area makes this pattern of findings difficult to interpret. While past research shows that headache patients with anxiety disorders tend to report more frequent and severe headaches (Schwartz *et al.* 1998), no research has examined how anxiety is related to headache self management or how race might influence the relationship between anxiety and headache self-management. Future research is needed that can inform the provision of treatment of headache patients with comorbid anxiety disorders.

Finally, it is important to note that while Blacks reported more frequent headaches at baseline, there was no multivariate main effect for race when this variable was considered in combination with psychiatric comorbidity (for which there was a main effect in the MANCOVA). The main effect for psychiatric comorbidity indicates that (across both racial groups) headache patients with MDD + Anxiety reported the greatest number of headache days per month, the lowest levels of headache management self-efficacy, and the poorest quality of life levels, albeit the effect sizes of these differences were typically small (i.e., 0.06–0.13). This pattern of findings underscores the important influence of psychiatric comorbidity on headache characteristics. It is important to note that disproportionately more Blacks were diagnosed with MDD + Anxiety, making this group particularly vulnerable to increased headache activity and burden.

The current study has several limitations. All participating headache subspecialty clinics were located in relatively large cities in Ohio; the extent to which study findings generalize to other states and geographic areas (e.g., rural areas) of the USA is unclear. It is also unclear if study findings generalize to headache patients in countries other than the USA. All study data (with the exception of physicians' diagnoses and clinicians' diagnoses of psychiatric conditions) were self-report in nature and susceptible to social desirability, demand characteristics, and recall biases. The study's assessment of headache severity may not have provided a precise estimate of the severity level of patients' headaches. For example, if one patient reported headache severity ratings of '1' every day for 30 days, this would yield a mean of '1,' the same mean that would be reported for patients who reported headache severity ratings of '3' on 10 days and '0's on the remaining 20 days. A more precise method by which to assess headache severity in future studies is needed. The measurement scale of several dependent variables was ordinal in nature. Future research that examines constructs such as headache severity and disability should use continuous scales with a wider response range and that are known to lend themselves favorably to inferential statistics. Analyses did not control for Type I error. This is important to note given the large number of statistical tests performed in the current study. Finally, the sample was a non-probability (i.e., convenience) sample and relatively small.

Key messages

- Study findings underscore the need to identify and treat headache patients with psychiatric disorders, a disproportionate number of whom are Black.

- By 2020, depression is expected to be the most serious health problem (second only to heart disease) affecting the world's population. It is likely that many people throughout the world who are living with depression will also suffer serious headache disorders.
- A potentially innovative line of research that follows logically from this study is the examination of psychotherapies that simultaneously reduce psychiatric symptoms and headache activity in headache patients (particularly Blacks). If psychotherapies tailored for Black headache patients can reduce patients' depressive symptoms and headache activity and promote increases in medication and treatment appointment adherence, interventions of this genre would provide a very significant contribution to the headache treatment literature and the health of the Black community.

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