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Pain Interference, Psychopathology, and General Medical Conditions among Black and White Adults in the US General Population

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Abstract

Objectives—To assess how race might moderate relationships between pain interference and psychopathology and general medical conditions among a nationally representative sample of black and white adults.

Methods—Chi-square tests and multivariable logistic regression analyses were performed on data from the National Epidemiologic Survey on Alcohol and Related Conditions on 32,474 adult respondents (25% black; 75% white), who were categorized according to one of three levels of pain interference (i.e., no/low, moderate, or severe).

Results—Pain interference was associated with race in bivariate analyses ($p < .001$); relative to white respondents, black respondents had lower rates of no/low pain interference (78.9% vs. 80.3%), lower rates of moderate pain interference (6.8% vs. 7.8%) and higher rates of severe pain interference (14.3% vs. 11.9%). Pain interference was associated with past-year Axis-I psychiatric disorders in both black and white respondents ($p < 0.001$) with the largest odds typically observed in association with moderate or severe pain interference. A stronger relationship was observed in black as compared to white respondents between severe pain interference and any Axis-I disorder (OR=1.28, $p < 0.05$) and alcohol abuse or dependence (OR=1.90, $p < 0.05$), and between moderate pain interference and tachycardia (OR=1.69, $p < 0.05$). In contrast, a weaker relationship was observed in black as compared to white respondents between moderate pain interference and any general medical condition (OR=0.70, $p < 0.05$).

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Conclusions—These findings underscore the complexity of race-related disparities in health and suggest the importance of further study of the possible mechanisms underlying the apparent differences between black and white groups in the relationships between pain interference, psychopathology, and general medical conditions.

Keywords

pain; mental disorders; physical disorders; comorbidity; race

1. Introduction

Pain interference, the perceived disruption in functioning resulting from physical pain, is an important focus of assessing and treating pain-related conditions (Kalliomäki et al., 2008). Pain interference is linked with psychopathology and can thwart response to psychiatric treatment (Kroenke et al., 2008, Means-Christensen et al., 2008, Teh et al., 2009). However, few studies have examined, in the general population, the prevalence of pain interference or associated psychiatric and general medical correlates (Barry et al., 2012) and fewer still have examined race-related differences. Such studies may be particularly warranted given documented racial disparities in the U.S. in pain treatment. In comparison to white individuals, black individuals are less likely to be screened for pain or receive optimal pain treatment (Anderson et al., 2009, Institute of Medicine, 2011). Epidemiological studies comparing possible race-related differences in the prevalence and correlates of pain interference have been hampered because public databases frequently omit pain variables and racial identifiers or contain insufficient numbers of minority members to facilitate race-based comparisons (Tait et al., 2004). One exception is the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a nationally representative survey, which both assessed pain interference and oversampled black or African-American respondents.

The purpose of the current study was to extend prior work on pain interference by examining levels of pain interference and associated psychopathology and general medical conditions among black and white NESARC respondents. Given findings from clinical studies about race-related differences in pain, we hypothesized that black respondents would be more likely to report severe pain interference than white ones (Cano et al., 2006, Day and Thorn, 2010). We also hypothesized that race would moderate the relationships between pain interference and psychopathology as well as between pain interference and general medical conditions, with stronger relationships hypothesized in black versus white respondents.

2. Methods

2.1. Sample

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) was conducted by the National Institute on Alcohol Abuse and Alcoholism along with the U.S. Census Bureau, and recruited a nationally representative sample of non-institutionalized U.S. citizens and non-citizens aged 18 years and older (Grant et al., 2003, Grant et al., 2004). To facilitate investigation of alcohol use in minority and young populations, the NESARC over-sampled African-American and Hispanic households and individuals 18 to

24 years of age. Multi-stage cluster sampling was used to identify respondents; census sampling units, households, and then members of households were sequentially sampled. Individuals residing in jails, prisons, or hospitals were excluded; the sample was augmented with members of group living environments, such as shelters, dormitories, group homes, and facilities for housing workers. Weights have been calculated to adjust standard errors for these over-samples, the cluster sampling strategy, and non-responses (Grant et al., 2003).

The NESARC sample consisted of 43,093 respondents with an overall response rate of 81 percent. For the purposes of the current study, we restricted the sample to 32,474 respondents who self-identified as black or white and provided information about their level of pain interference. Respondents provided informed consent. The current study of publicly accessible, de-identified data from the NESARC was presented to the Yale Human Investigations Committee and exempted from IRB review under federal regulation 45 CFR Part 46.101(b).

2.2. Measures

2.2.1. Sociodemographics—Respondents provided information about their gender (male, female), race (black, white), marital status (married, previously married, never married), education (less than high-school, high-school graduate, some college, college or higher), employment (full-time, part-time, not working), age, and household annual income.

2.2.2. Psychopathology—Trained lay interviewers collected specific DSM-IV Axis-I psychiatric disorder data using the Alcohol Use Disorder and Associated Disability Interview Schedule-DSM-IV version (AUDADIS-IV) (American Psychiatric Association, 2000, Grant et al., 2003). The AUDADIS-IV is a structured diagnostic interview with demonstrated test-retest reliability and has been found to be a useful instrument for detecting psychiatric disorders in community samples (Grant et al., 2003). The NESARC did not assess all DSM-IV Axis-I psychiatric disorders because of concerns about respondent burden and time constraints (Grant et al., 2005). Consistent with prior research (Grant et al., 2009), we used the following psychiatric disorder variables and categories (accessible at <http://pubs.niaaa.nih.gov/publications/NESARCDRM/NESARCDRM.htm>): mood disorders (major depression, dysthymia, mania, hypomania); anxiety disorders (panic disorder without agoraphobia, panic disorder with agoraphobia, social phobia, specific phobia, generalized anxiety disorder); and substance-use disorders (alcohol abuse or dependence, nicotine dependence, drug abuse or dependence). Past-year Axis-I diagnoses with general-medical-condition and substance-use exclusions were used; thus, research diagnoses can be viewed as orthogonal or “primary” as per DSM-IV/DSM-IV-TR guidelines (American Psychiatric Association, 2000, Desai and Potenza, 2008).

2.2.3. Pain Interference—Pain interference was assessed using a subscale from the 12-item short form self-report scale (SF-12) of health-related quality of life (HRQL) (Ware et al., 1996). Similar to previous research, respondents’ answers to the 5-point item: “During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)” were used to classify them into one of three groups: a) “no or low pain interference” (i.e., those reporting their pain interference as “not at all” or “a

little bit”); b) “moderate pain interference” (i.e., those reporting their pain interference as “moderate”); and c) “severe pain interference” (i.e., those reporting their pain interference as “a lot” or “extreme”) (Novak et al., 2009, Barry et al., 2012).

2.2.4. General Medical Conditions—Respondents were asked whether they had experienced in the past year any of the following 11 general medical conditions: angina, tachycardia, myocardial infarction, other heart disease, cirrhosis, other liver disease, stomach ulcer, gastritis, arthritis, arteriosclerosis, and hypertension. For each medical condition reported, respondents were asked whether a physician or other medical professional had diagnosed it. Only general medical conditions which respondents reported were diagnosed by a physician or other medical professional were considered positive (Goldstein et al., 2009).

2.3. Data Analysis

The primary research question concerned differences among black and white respondents in the association between past-month pain interference levels and psychopathology or general medical conditions. Data analyses proceeded in several steps. First, we examined using a series of chi-square tests (χ^2) the associations between pain interference levels and a) race (black and white) and b) sociodemographic characteristics (gender, marital status, education, employment, age, and household annual income), stratified by race (black and white). Second, we examined unadjusted weighted rates of psychiatric disorders and general medical conditions according to pain interference levels (i.e., no or low pain interference [NPI], moderate pain interference [MPI], severe pain interference [SPI]), stratified by race. Third, we fitted a series of multivariable logistic regression models to examine the relationships between any Axis-I disorder and any general medical condition and pain interference within race. We conducted subsequent analyses with subgroupings and individual disorders or conditions to determine the source of significant findings. We adjusted for potentially confounding sociodemographic variables (i.e., gender, marital status, education, employment, age, household annual income). The NPI category was used as a reference level for two sets of adjusted odds ratios: MPI versus NPI and SPI versus NPI. Interaction odds ratios were tested to determine whether the adjusted odds ratios for black respondents were significantly different from those for white respondents. Given the configuration of the study sample and the goal of estimating as accurately as possible the national rates of co-occurring psychiatric disorders and general medical conditions, analyses were performed using NESARC-calculated weights and SUDAAN software (Research Triangle Institute, 2001). Thus, sample proportions are based on weighted percentages. The statistical significance of the interaction term was evaluated with the chi-square test. Statistical significance was set at $p < 0.05$.

3. Results

Participants' ages ranged from 18 to 90 years ($M = 46.4$, $SE = 0.2$); 47.5% were men ($n=13,767$) and 52.5% were women ($n=18,707$). More than one-half (61.4% [$n=16,121$]) of the sample was married, 87.6% ($n=27,860$) had graduated high school, and 53.0% ($n=16,492$) reported working full-time. A minority of the sample (26.7% [$n=6,760$])

reported an annual household income of at least \$70,000 (weighted percentages provided). Twenty-five percent of respondents self-identified as black (n=8,157) and 75% as white (n=24,317). In comparison to white respondents, black respondents were more likely to be female (56.4% vs. 51.9%), have never married (35.0% vs. 17.8%), have less than a high school level of education (19.5% vs. 11.3%), be younger (42.4 years old vs. 47.0 years old), and to have an annual household income below \$20,000 (32.3% vs. 18.5%) (all p 's<.01).

Associations between pain-interference levels and sociodemographic characteristics were largely similar for black and white respondents (Table 1). The NPI, as compared to the MPI and SPI groups, more frequently acknowledged having never married, having at least a college level of education, being employed full-time, being younger, and having an annual household income of at least \$70,000.

3.1. Pain Interference

The majority (n=25,480; 78.5%) of respondents reported no or low levels of pain interference. Significant race differences in pain interference were observed ($p<.001$); relative to white respondents, black respondents had lower rates of no/low pain interference (78.9% vs. 80.3%), lower rates of moderate pain interference (6.8% vs. 7.8%) and higher rates of severe pain interference (14.3% vs. 11.9%).

3.2. Pain Interference and Psychopathology

Table 2 summarizes the patterns of associations observed between pain-interference levels and psychiatric morbidity among black and white respondents. Significant associations between pain-interference levels were observed for any Axis-I disorder, any mood disorder, any anxiety disorder, and any substance-use disorder in both black and white respondents. Differences were suggested between black and white respondents within three of the contributing categories in the Axis-I disorder domain (mood disorder, anxiety disorder and substance-use disorder): the associations between pain interference levels and hypomania, social phobia, and alcohol abuse or dependence were significant at $p<0.05$ for white but not for black respondents.

Adjusted odds ratios from multivariable models investigating the strength of associations between psychiatric disorders and pain-interference-level groups are presented for black and white respondents, using same-race NPI group as the reference group (Table 3). In both black and white respondents, the odds of any Axis-I disorder, any mood disorder, any anxiety disorder, and any substance-use disorder were elevated in association with severe pain interference, and the odds of any Axis-I disorder were elevated in association with moderate pain interference. Additionally, in white but not black respondents, the odds of any mood disorder and any anxiety disorder were elevated in association with moderate pain interference. Interactions analyses indicated different relationships for black and white respondents for two psychiatric disorders: stronger relationships were observed in black as compared to white respondents between severe pain interference and any Axis-I disorder (OR = 1.28, $p<0.05$), and alcohol abuse or dependence (OR = 1.90, $p<0.05$).

3.3. Pain Interference and General Medical Conditions

As summarized in Table 2, general medical conditions occurred more frequently at increasing levels of pain interference among both black and white respondents. The most frequently reported general medical conditions by NPI, MPI, and SPI groups were arthritis and hypertension. With the exception of any liver disease among white respondents, higher (as opposed to lower) levels of pain interference were associated with greater past-year prevalence of general medical conditions among black and white respondents. As summarized in Table 3, interaction analyses yielded significant race-related differences in the relationship between pain interference and general medical conditions. Compared to white respondents, black respondents exhibited a weaker relationship between moderate pain interference and any general medical condition ($OR=0.70$, $p<0.05$) and a stronger relationship between moderate pain interference and tachycardia ($OR=1.69$, $p<0.05$).

4. Discussion

To our knowledge, this study is the first to systematically investigate, in a nationally representative U.S. sample, differences between black and white adults in the associations between levels of pain interference and both psychopathology and general medical conditions. The findings generally support our hypotheses that black respondents would be more likely than white respondents to report severe levels of pain interference and that the relationships between pain interference and both psychopathology and general medical conditions would differ by race.

4.1. Pain Interference

Our finding that black (as compared to white) respondents exhibit higher rates of severe pain interference extends those from prior studies documenting that black patients with chronic pain experience higher levels of pain severity and disability than their white counterparts (Edwards et al., 2001, Green and Hart-Johnson, 2012) and draws further attention to the extant disparity in pain-related healthcare in the U.S. whereby black individuals are less likely than white ones to be screened for pain or to receive optimal pain treatment (Anderson et al., 2009, Institute of Medicine, 2011). High levels of pain interference (which was more likely to be exhibited by black compared to white respondents) may lead clinicians to discount patient reports (Chibnall et al., 1997) and occasion stereotypes by providers that compromise clinical decision-making (Tait and Chibnall, 2014).

4.2. Pain Interference, Psychopathology, and General Medical Conditions

The elevated rates of mood, anxiety, and substance-use disorders among both black and white respondents with moderate or severe pain interference corroborate findings from previous epidemiological (Scudds and Ostbye, 2001, McWilliams et al., 2003, McWilliams et al., 2004, Thomas et al., 2007, McWilliams et al., 2008, Ohayon and Schatzberg, 2010) and clinical studies (Bair et al., 2004, McWilliams et al., 2008, Means-Christensen et al., 2008). The current study also extends prior NESARC investigations that documented the correlates of pain interference among those with bipolar-I disorder (Goldstein et al., 2009) or non-medical use of prescription opioids (Novak et al., 2009) by examining racial differences in psychopathology and general medical conditions that accompany moderate or severe pain

interference. Multivariate analyses revealed race-related differences in the relationships between pain interference and both psychopathology and general medical conditions, although the temporal associations between these variables among black and white respondents are currently unclear and merit further investigation. The stronger relationships in black compared to white respondents between severe pain interference and any Axis-I disorder, and alcohol abuse or dependence may largely be driven by alcohol-use disorders. This finding raises questions regarding the etiology of the relationship (e.g., whether there is a stronger propensity in black compared to white individuals to consume more alcohol in response to painful conditions, whether alcohol-related effects (perhaps inflammation) leading to pain might be more prominent in black individuals, or whether other factors linking alcohol use and pain might be stronger in black relative to white individuals).

The relationship between moderate pain interference and tachycardia poses similar etiological questions that are beyond the scope of cross-sectional data analyses. It was noticeable that a stronger relationship between moderate pain interference and tachycardia existed in black compared to white respondents, despite the weaker relationship between moderate pain interference and any medical conditions. While the occurrence of tachycardia may result in moderate pain interference, it is also possible that individuals from different racial backgrounds respond differently to moderate pain interference (e.g., medications used, diet) and, thus, may be at differential risk for developing medical conditions, generally, or tachycardia, specifically. Regardless of etiology, the findings highlight the challenges faced by providers in redressing racial disparities in pain management. Overall, our findings support the need for improved screening and interventions by mental health and primary care providers in assessing and treating pain as well as addressing racial disparities in pain management. Study findings also support the importance of initiatives such as the NIH Pain Consortium Center of Excellence in Pain Education to address existing deficits in pain-related training among providers in the U.S. (Elman et al., 2011, Doorenbos et al., 2013). Since black individuals are more likely than white individuals to seek treatment for mental health issues from providers in primary care rather than psychiatry (Snowden and Pingitore, 2002), coordination between both disciplines may be especially critical to providing black individuals with optimal treatment for pain (as well as for psychopathology).

4.3. Limitations

Several potential study limitations are worth noting. The cross-sectional design limits statements regarding causation among study variables. Pain interference was assessed using a single item from the SF-12; although this measure has been used in prior epidemiologic and community studies (Blyth et al., 2004, Thomas et al., 2007, Goldstein et al., 2009, Novak et al., 2009, Barry et al., 2012), it is not a comprehensive measure of pain interference. Further investigation of the psychiatric and general medical condition correlates of pain interference may benefit from a more comprehensive measure of pain interference (e.g., West Haven-Yale multidimensional Pain Inventory (Kerns et al., 1985); Brief Pain Inventory-Short Form (Cleeland, 1991)). The NESARC did not exhaustively assess Axis-I disorders or general medical conditions because of concerns about response burden. Consequently, certain diagnoses of potential clinical relevance to levels of pain interference were not assessed, including sleep-wake disorders and sexual dysfunctions.

Future investigations of the psychiatric correlates of pain interference might benefit from the inclusion of measures that assess these diagnoses. Findings from the NESARC may not generalize to individuals seeking or enrolled in treatment.

5. Conclusions

Despite these limitations, this study represents an initial investigation of differences in the pattern of psychiatric and medical comorbidity associated with varying levels of pain interference among black and white adults in the U.S. The strong associations across study groups between moderate or severe pain interference and a range of Axis-I disorders as well as general medical conditions emphasize the importance of the routine assessment of psychopathology in patients with pain interference and, conversely, pain interference in patients seeking treatment for psychiatric disorders. Our findings underscore those from prior studies indicating that further investigation of race-related differences in pain interference is warranted, including systematic examination of the extent to which these differences are mediated or moderated by socioeconomic status and other factors (e.g., stress, access to healthcare, genetics) (Portenoy et al., 2004, Meghani et al., 2012, Bekanich et al., 2014, Robbins et al., 2015).

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Table 1

Sociodemographic characteristics of black and white respondents by pain interference levels.^{1/}

Characteristics	Black Respondents					White Respondents				
	No/Low Pain n=6,220 ²	Moderate Pain n=591 ²	Severe Pain n=1,346 ²	χ ²	p	No/Low Pain n=19,260 ²	Moderate Pain n=2,001 ²	Severe Pain n=3,056 ²	χ ²	p
	%	%	%			%	%	%		
<i>Gender</i>				12.04	<0.001				25.02	<0.001
Male	45.3	38.5	36.9			50.6	57.3	57.5		
Female	54.7	61.5	63.1			49.4	42.7	42.5		
<i>Marital status</i>				16.29	<0.001				38.56	<0.001
Married	42.7	44.4	39.5			65.1	62.6	60.4		
Previously married	19.9	31.7	33.5			15.7	25.5	27.5		
Never married	37.4	23.9	27.0			19.2	11.9	12.1		
<i>Education</i>				8.72	<0.001				27.65	<0.001
Less than HS	16.6	26.3	32.0			9.0	18.1	22.1		
HS graduate	32.1	29.5	33.7			29.2	32.9	34.3		
Some college	33.8	32.5	24.9			31.8	30.7	28.0		
College or higher	17.5	11.7	9.4			30.0	18.3	15.6		
<i>Employment</i>				24.03	<0.001				54.40	<0.001
Full time	61.0	37.3	29.3			57.9	36.3	28.6		
Part time	9.6	10.3	5.8			11.4	10.1	7.0		
Not working	29.4	52.4	64.9			30.7	53.6	64.4		
Age (mean age ± SE) ³	40.5±0.3	49.2±0.8	49.6±0.6	132.81 ⁴	<0.001	45.2±0.2	54.3±0.5	54.4±0.4	293.6 ⁴	<0.001
<i>Household annual income</i>				10.90	<0.001				33.30	<0.001
\$0–19,999	28.3	39.3	51.4			15.5	25.6	33.7		
\$20,000–34,999	22.4	23.4	19.9			18.0	22.8	22.5		
\$35,000–69,999	33.6	28.1	21.6			35.2	32.1	27.6		
\$70,000+	15.7	9.2	7.1			31.3	19.5	16.2		

^{1/}Proportions in table represent weighted percentages, stratified by race

²Ns represent actual number in each category

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Numbers represent weighted mean values, stratified by race
3
4
For the continuous variable of age, we conducted a Wald F test

Table 2

Prevalence of psychiatric diagnoses and medical conditions by pain interference severity among black and white respondents.

	Black Respondents					White Respondents				
	No/low pain N=6,220 ^f	Moderate Pain N=591 ^f	Severe Pain N=1,346 ^f	χ ²	p	No/low pain N=19,260 ^f	Moderate Pain N=2,001 ^f	Severe Pain N=3,056 ^f	χ ²	p
	%	%	%			%	%	%		
Any Axis I disorder	25.3	34.5	37.9	14.65	<0.0001	30.3	37.0	39.3	33.35	<0.0001
Any mood disorder	7.4	12.9	15.2	13.12	<0.0001	8.2	13.6	15.1	42.64	<0.0001
Major depression	5.1	9.3	12.4	13.23	<0.0001	6.4	10.8	12.0	37.04	<0.0001
Dysthymia	1.3	3.1	4.6	9.17	0.0003	1.4	3.1	4.5	27.88	<0.0001
Mania	1.4	2.6	4.3	5.18	0.0082	1.3	2.5	3.4	16.31	<0.0001
Hypomania	1.4	2.4	1.3	0.95	0.3910	1.2	1.5	0.7	3.93	0.0244
Any anxiety disorder	9.0	14.4	16.8	14.07	<0.0001	10.5	16.7	17.6	38.66	<0.0001
Panic disorder without agoraphobia	1.0	3.7	3.3	8.79	0.0004	1.8	4.2	4.9	22.69	<0.0001
Panic disorder with agoraphobia	0.01	0.1	0.2	0.90	0.4107	0.04	0.1	0.1	0.77	0.4660
Social phobia	1.8	3.3	2.7	1.81	0.1723	2.7	3.8	5.2	17.32	<0.0001
Specific phobia	6.3	8.4	12.0	10.82	0.0001	6.9	9.8	10.3	15.27	<0.0001
Generalized anxiety disorder	1.3	3.9	4.4	8.14	0.0007	1.6	4.1	5.0	31.99	<0.0001
Any substance use disorder	15.0	17.3	21.3	6.29	0.0032	20.0	22.1	23.8	7.74	0.0010
Alcohol abuse or dependence	6.6	7.7	8.2	1.01	0.3686	9.4	7.6	7.1	6.86	0.0020
Nicotine dependence	9.1	12.5	16.8	12.17	<0.0001	13.3	17.4	19.5	24.66	<0.0001
Drug abuse or dependence	2.4	1.4	2.9	1.78	0.1770	1.9	1.8	2.2	0.42	0.6585
Any general medical condition	28.3	56.2	65.3	43.13	<0.0001	28.8	63.4	64.7	108.72	<0.0001
Any heart condition	4.3	16.1	21.6	37.30	<0.0001	5.5	17.2	23.7	89.28	<0.0001
Angina	2.2	9.3	14.5	29.41	<0.0001	2.2	9.3	13.2	72.40	<0.0001
Tachycardia	1.9	9.7	12.4	30.01	<0.0001	2.7	8.6	13.3	76.09	<0.0001
Myocardial infarction	0.4	2.3	3.4	13.90	<0.0001	0.5	1.8	3.4	26.80	<0.0001
Other heart disease	1.2	5.4	7.7	22.23	<0.0001	1.9	6.8	9.7	60.72	<0.0001
Any liver disease	0.5	1.0	2.7	17.80	<0.0001	0.7	0.4	1.3	7.22	0.0015
Cirrhosis	0.1	0.2	1.3	3.55	0.0343	0.1	0.3	1.1	7.72	0.0010

	Black Respondents					White Respondents				
	No/low pain N=6,220 ^f	Moderate Pain N=591 ^f	Severe Pain N=1,346 ^f	χ^2	p	No/low pain N=19,260 ^f	Moderate Pain N=2,001 ^f	Severe Pain N=3,056 ^f	χ^2	p
	%	%	%			%	%	%		
Other liver disease	0.4	0.8	1.9	4.25	0.0184	0.3	1.0	1.6	15.75	<0.0001
Any stomach condition	4.2	10.9	15.0	29.70	<0.0001	4.0	10.3	14.2	73.40	<0.0001
Stomach ulcer	1.5	5.0	6.9	17.78	<0.0001	1.5	4.0	6.4	42.39	<0.0001
Gastritis	3.0	9.1	11.3	21.64	<0.0001	3.0	8.0	10.7	55.90	<0.0001
Arthritis	10.0	34.9	41.4	48.90	<0.0001	13.3	42.9	46.2	109.55	<0.0001
Arteriosclerosis	0.5	1.0	3.8	14.46	<0.0001	1.1	3.9	6.1	44.82	<0.0001
Hypertension	19.9	38.9	45.4	33.48	<0.0001	16.1	31.7	35.5	78.44	<0.0001

^f Ns represent actual number in each category. Bold values indicate statistically significant results (p<0.05).

Table 3

Association between psychiatric diagnoses, medical conditions, and pain interference severity among black and white respondents.

	Black Respondents		White Respondents		Interaction OR Black vs. White Respondents	
	MPI vs. NPI	SPI vs. NPI	MPI vs. NPI	SPI vs. NPI	MPI vs. NPI	SPI vs. NPI
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	IOR (95% CI)	IOR (95% CI)
Any Axis I disorder	1.58 (1.22–2.04)	1.78 (1.50–2.11)	1.30 (1.14–1.49)	1.39 (1.23–1.57)	1.21 (0.91–1.61)	1.28 (1.05–1.56)
Any mood disorder	1.41 (0.92–2.16)	1.45 (1.09–1.93)	1.30 (1.06–1.60)	1.35 (1.16–1.57)	1.09 (0.69–1.71)	1.07 (0.78–1.47)
Major depression	1.38 (0.86–2.21)	1.67 (1.23–2.26)	1.28 (1.03–1.59)	1.33 (1.13–1.56)	1.08 (0.66–1.77)	1.26 (0.90–1.75)
Dysthymia	1.60 (0.82–3.12)	1.80 (1.07–3.01)	1.42 (0.97–2.08)	1.82 (1.35–2.46)	1.13 (0.53–2.42)	0.99 (0.55–1.76)
Mania	1.26 (0.57–2.78)	1.72 (0.99–2.99)	1.24 (0.84–1.82)	1.42 (1.07–1.88)	1.02 (0.43–2.39)	1.21 (0.65–2.24)
Hypomania	1.99 (0.96–4.13)	0.94 (0.42–2.13)	1.39 (0.84–2.30)	0.60 (0.34–1.06)	1.44 (0.59–3.50)	1.58 (0.61–4.09)
Any anxiety disorder	1.23 (0.91–1.66)	1.34 (1.05–1.71)	1.33 (1.15–1.55)	1.29 (1.11–1.50)	0.92 (0.66–1.29)	1.04 (0.79–1.36)
Panic disorder without agoraphobia	2.52 (1.13–5.64)	1.59 (0.94–2.70)	1.67 (1.20–2.31)	1.59 (1.16–2.17)	1.51 (0.63–3.65)	1.00 (0.57–1.75)
Panic disorder with agoraphobia	2.76 (0.13–60.39)	2.55 (0.19–34.84)	0.97 (0.09–9.94)	0.97 (0.21–4.45)	2.84 (0.06–138.78)	2.62 (0.19–36.52)
Social phobia	1.37 (0.67–2.77)	0.89 (0.52–1.50)	1.03 (0.76–1.39)	1.31 (1.04–1.65)	1.33 (0.62–2.83)	0.68 (0.38–1.18)
Specific phobia	1.03 (0.73–1.46)	1.44 (1.11–1.87)	1.17 (0.96–1.42)	1.13 (0.96–1.34)	0.89 (0.59–1.32)	1.27 (0.95–1.69)
Generalized anxiety disorder	1.83 (0.85–3.90)	1.67 (0.98–2.83)	1.69 (1.21–2.36)	1.83 (1.37–2.44)	1.08 (0.47–2.47)	0.91 (0.52–1.58)
Any substance use disorder	1.28 (0.94–1.74)	1.65 (1.35–2.02)	1.15 (0.99–1.34)	1.29 (1.13–1.48)	1.11 (0.79–1.55)	1.28 (1.00–1.63)
Alcohol abuse or dependence	1.49 (0.96–2.31)	1.79 (1.25–2.57)	0.93 (0.74–1.18)	0.95 (0.75–1.19)	1.60 (0.95–2.68)	1.90 (1.22–2.94)
Nicotine dependence	1.38 (0.98–1.96)	1.83 (1.42–2.36)	1.23 (1.05–1.45)	1.39 (1.20–1.59)	1.12 (0.77–1.64)	1.32 (0.98–1.78)
Drug abuse or dependence	0.60 (0.24–1.50)	1.11 (0.59–2.09)	0.88 (0.58–1.34)	1.05 (0.75–1.48)	0.68 (0.25–1.82)	1.06 (0.52–2.16)
Any general medical condition	1.98 (1.54–2.53)	3.08 (2.52–3.76)	2.82 (2.48–3.20)	2.93 (2.59–3.31)	0.70 (0.54–0.91)	1.05 (0.83–1.33)
Any heart condition	2.56 (1.87–3.48)	3.33 (2.61–4.25)	2.11 (1.83–2.44)	2.98 (2.61–3.40)	1.21 (0.86–1.69)	1.12 (0.85–1.46)
Angina	2.71 (1.79–4.10)	3.98 (2.98–5.32)	2.69 (2.21–3.28)	3.64 (3.05–4.34)	1.01 (0.65–1.57)	1.10 (0.79–1.52)
Tachycardia	3.36 (2.19–5.16)	3.80 (2.83–5.10)	1.99 (1.62–2.43)	2.94 (2.50–3.47)	1.69 (1.07–2.67)	1.29 (0.93–1.79)
Myocardial infarction	3.04 (1.06–8.77)	4.27 (2.61–6.97)	1.80 (1.17–2.77)	3.22 (2.28–4.55)	1.69 (0.56–5.14)	1.33 (0.75–2.35)
Other heart disease	2.66 (1.70–4.16)	3.57 (2.43–5.25)	2.19 (1.74–2.77)	3.03 (2.51–3.66)	1.22 (0.74–1.99)	1.18 (0.77–1.80)
Any Liver Disease	1.45 (0.38–5.48)	3.30 (1.73–6.30)	2.33 (1.34–4.03)	3.45 (2.31–5.15)	0.62 (0.14–2.78)	0.96 (0.46–2.01)
Cirrhosis	0.85 (0.09–8.25)	4.83 (1.65–14.10)	1.71 (0.54–5.47)	4.53 (2.28–8.99)	0.50 (0.04–6.31)	1.07 (0.28–4.00)

	Black Respondents		White Respondents		Interaction OR Black vs. White Respondents	
	MPI vs. NPI	SPI vs. NPI	MPI vs. NPI	SPI vs. NPI	MPI vs. NPI	SPI vs. NPI
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	IOR (95% CI)	IOR (95% CI)
Other liver disease	1.43 (0.32–6.43)	2.95 (1.33–6.54)	2.42 (1.37–4.26)	3.43 (2.20–5.34)	0.59 (0.12–3.04)	0.86 (0.36–2.04)
Any stomach condition	1.91 (1.27–2.89)	2.48 (1.94–3.16)	1.88 (1.57–2.26)	2.51 (2.14–2.94)	1.02 (0.65–1.59)	0.99 (0.74–1.31)
Stomach ulcer	2.33 (1.27–4.26)	2.64 (1.78–3.90)	1.84 (1.37–2.48)	2.61 (2.08–3.28)	1.26 (0.65–2.46)	1.01 (0.65–1.58)
Gastritis	2.22 (1.36–3.65)	2.61 (2.00–3.42)	1.94 (1.55–2.41)	2.52 (2.10–3.02)	1.15 (0.67–1.98)	1.04 (0.76–1.43)
Arthritis	3.11 (2.39–4.04)	4.06 (3.37–4.90)	3.27 (2.91–3.67)	3.67 (3.28–4.10)	0.95 (0.72–1.26)	1.11 (0.89–1.37)
Arteriosclerosis	1.05 (0.44–2.51)	4.32 (2.66–7.02)	2.01 (1.45–2.77)	3.19 (2.47–4.12)	0.52 (0.21–1.34)	1.35 (0.81–2.26)
Hypertension	1.62 (1.27–2.07)	2.17 (1.79–2.64)	1.48 (1.31–1.68)	1.76 (1.56–1.98)	1.10 (0.85–1.41)	1.24 (0.99–1.54)

Adjusted for gender, marital status, education, employment, age, household annual income. NPI=no/low pain interference, MPI=moderate pain interference, SPI=severe pain interference. OR=odds ratio, IOR=interaction odds ratio, CI=confidence interval. Bold values indicate statistically significant results ($p<0.05$).