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Sex and Race Differences in Pain Sensitization among Patients with Chronic Low Back Pain

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Abstract

Growing evidence suggests that chronic low back pain (CLBP) is associated with pain sensitization, and that there are sex and race disparities in CLBP. Given the sex and race differences in pain sensitization, this has been hypothesized as a mechanism contributing to the sex and race disparities in CLBP. This study examined sex and race differences in pain sensitization among patients with CLBP as well as the role of catastrophizing as a potential mediator of those differences. We found that compared to males, females required less pressure to produce deep muscle pain and rated mechanical punctate pain as more painful. Compared to non-Hispanic White (NHW) patients, Black patients demonstrated greater pain sensitivity for measures of deep muscle hyperalgesia and mechanical punctate pain. Furthermore, catastrophizing partially mediated the race differences in deep muscle pain such that Black participants endorsed greater pain catastrophizing, which partially accounted for their increased sensitivity to, and temporal summation of, deep muscle pain. Taken together, these results support the need to further examine the role of catastrophizing and pain sensitization in the context of sex and race disparities in the experience of CLBP.

Perspective: This study identifies sex and race differences in pain sensitization among patients with CLBP. Further, it recognizes the role of catastrophizing as a contributor to such race differences. More research is needed to further dissect these complex relationships.

Keywords

chronic low back pain; sex; race; pain sensitization; QST

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Author Contributions:

All authors have made substantial contributions to the conception and design of this manuscript, have assisted in drafting and revising the manuscript, and have read and approved the final manuscript.

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INTRODUCTION

Chronic low back pain (CLBP), one of the most common complaints seen by physicians, is a primary cause of disability in the United States and is associated with between \$100 and \$200 billion in annual costs^{1, 8, 43, 63, 72}. Although some patients with CLBP may have identifiable etiologies, for many there are no discernable mechanisms to account for their pain and dysfunction⁹. There is growing evidence that like other chronic pain conditions, idiopathic CLBP involves changes in the central nervous system that result in pain augmentation^{2, 66, 70}. Indeed, compared to healthy, pain-free individuals, patients with CLBP show increased sensitivity to a variety of mechanical, thermal, and chemical noxious stimuli^{32, 46, 53, 58}. Providing further support for the relationship between central pain augmentation and changes in the central nervous system, Giesecke and colleagues found that patients with persistent back pain demonstrated hyperalgesia at a CLBP-unaffected anatomic site compared to healthy controls, and this increased pain was associated with increased neuronal activation in multiple cortical areas involved in pain processing³³.

Despite consistently high rates of chronic low back pain across the population, there are sex and race disparities in the prevalence and experience of low back pain. Compared to males, there is a greater prevalence of CLBP among females^{1, 52}. Females with back pain also report greater pain intensity than males²⁶. Although the prevalence of CLBP is higher among Whites compared to Blacks^{1, 52}, Black individuals with low back pain report greater pain intensity and worse functional disability^{7, 68}. In addition, there are well-documented sex and race differences in pain sensitization among healthy pain-free individuals; quantitative sensory testing (QST) studies have shown that women (relative to men) and Black participants (relative to non-Hispanic white participants) demonstrate lower pain tolerance and threshold for experimental noxious stimuli^{3, 6, 11, 14, 27–29, 34, 49, 51, 62, 64, 65, 76}. Sex and race differences in the experience of CLBP may be related to sex and race differences in pain sensitivity, however, no studies have yet examined these inter-relationships among patients with CLBP.

Psychosocial factors influence pain experiences both inside and outside the laboratory, and cognitive-emotional processes such as pain-related catastrophizing appear to play an influential role in shaping individual differences in the trajectory of chronic pain symptoms. Patients with chronic low back pain catastrophize more in response to pain than healthy, pain-free individuals⁵⁷, and CLBP patients who are high in catastrophizing are at greater risk for worsening pain and disability⁸¹. Like the sex and race differences in the experience of back pain, there are sex and race differences in pain catastrophizing^{29, 49–51}. Indeed, females and Black individuals catastrophize more in response to pain than do males and Whites, respectively. In addition, catastrophizing has been shown to mediate sex differences in pain sensitivity in both healthy individuals and those with chronic pain as well as race differences in pain sensitivity among healthy, pain-free individuals^{20, 44, 51, 75, 76}. That is, greater catastrophizing is associated with increased pain sensitivity among females and Black individuals compared to males and Whites, respectively. However, these relationships have not been studied in patients with CLBP. The current study aimed to examine sex and race differences in pain sensitization among patients with CLBP and to examine the role of catastrophizing as a potential mediator of those putative group differences. We hypothesized

that (1) females and Black individuals would demonstrate greater pain sensitivity and endorse greater levels of pain catastrophizing than males and Whites, respectively; (2) these differences would be independent of one another, not interactive; and (3) catastrophizing would mediate the assumed sex and race differences in pain sensitivity.

METHODS

Participants and Design

Participants were 324 Black and non-Hispanic White (NHW) adults with idiopathic chronic low back pain. They were recruited by email advertising, web and bulletin board announcements in Boston, MA, as well as electronic medical records-based databases. Study inclusion criteria included: the presence of low back pain for at least six months (confirmed by both patient self-report and electronic medical record review), average pain intensity ratings $\geq 3/10$, and low back pain as the primary (i.e., most intense) pain complaint. Potential participants were excluded for pregnancy, severe cognitive impairment, Raynauds Disease, sickle cell anemia, documented neuropathy, a myocardial infarction within the past year, and cancer.

Upon arriving at the laboratory, participants provided informed consent. They then completed a series of questionnaires that assessed demographics, pain ratings, depression, and catastrophizing. After completing questionnaires, participants underwent quantitative sensory testing (QST). Participants were then debriefed and compensated. All procedures were approved by the Brigham and Women's Hospital institutional review board.

Measures

The **Beck Depression Inventory-II (BDI-II)** is a 21-item self-report measure of depression. Participants rate the severity with which they have experienced each symptom in the past two weeks from 0 (not present) to 3 (severe). The BDI-II has been validated in patients with chronic pain³⁸.

The **Pain Catastrophizing Scale (PCS)** is a 13-item self-report measure of cognitive and emotional responses to pain comprised of rumination, magnification, and helplessness⁵⁴. Participants rated how frequently they endorsed various thoughts and emotions related to pain from 0 (not at all) to 4 (all the time). The PCS has strong criterion-related, concurrent, and discriminant validity^{15, 54, 55}.

Participants used a 0 ("no pain") to 100 ("most intense pain imaginable") numeric rating scale to rate their low back pain at the beginning of the laboratory session^{24, 40}. They also provided an average low back pain rating using an 11-point numeric rating scale (NRS) ranging from 0 (no pain) to 10 (worst pain imaginable) for the past week. The NRS is validated for use in chronic pain research^{25, 39}.

Quantitative Sensory Testing

Mechanical pain was assessed using weighted pinprick stimulators^{17, 21, 23}. The lowest-force stimulator that produced a sensation of pain (128 or 256mN for most subjects) was used to apply a train of 10 stimuli to the skin on the dorsum of the hand at the rate of 1 per second.

Participants rated the painfulness of the first, fifth, and tenth stimulus as well as painful after-sensations 15 seconds following the final stimulus using a 0–100 numeric rating scale (“no pain” to “most intense pain imaginable”)^{18, 22}. Temporal summation was calculated by subtracting the pain rating of the first stimulus from that of the tenth. The first, fifth, and tenth pain ratings were also averaged to determine the mean pain intensity rating for the probes.

Response to deep pressure pain was ascertained via cuff pressure algometry (CPA)^{19, 41, 47, 59}. Tonic, deep-tissue, mechanical stimulation was applied using a Hokanson rapid cuff inflator. Using a standard blood pressure cuff wrapped comfortably around the gastrocnemius muscle, pressure was increased at approximately 5 mmHg/s. Participants provided pain ratings every 5 seconds until an intensity level of 40/100 pain was reached. At this point the cuff was deflated. After a recovery period, the cuff was inflated to the previously identified pressure needed to produce 40/100 pain and was maintained at this level for 2 minutes. Participants provided pain intensity ratings (0–100) upon inflation and every 30 seconds for the entire 2 minutes. The participants then provided ratings for any painful after sensations 15 seconds following cuff deflation. Temporal summation was calculated by subtracting the initial pain rating from the pain rating at the 120 second time point. The mean pain intensity rating for the pressure cuff was calculated by averaging the pain ratings from the 30, 60, 90, and 120 second marks.

Data Analysis

We examined sex and race differences among demographic variables (e.g., education, employment) using a series of independent samples t-tests and Chi Square analyses. Further, because the potential impact of socioeconomic status on QST outcomes, we conducted a series of analyses of variance (ANOVAs) examining education and employment status differences among all QST variables. Associations between QST responses, clinical pain, catastrophizing, depression, and age were assessed using Pearson correlations. To examine sex and race differences in pain catastrophizing and QST responses, we conducted a series of Analyses of covariance (ANCOVAs). We then used Preacher and Hayes’ bootstrapping procedure and the SPSS Process Macro^{60, 61} to conduct a series of bias-corrected bootstrapped mediation analyses using 10,000 bootstrapped resamples. This bootstrapping procedure is nonparametric and does not assume the indirect effects are normally distributed. To examine the role of catastrophizing as a potential mediator of the race differences in QST responses, we created mediation models for each QST outcome variable for which there were race differences and an association with catastrophizing. Mediation models were considered significant if zero was not contained within the 95% confidence intervals^{60, 61}. All participant characteristic variables that were significantly correlated with QST outcomes at the $p < .05$ level were included in ANCOVA and mediation models. Given the number of analyses conducted, to reduce the rate of Type I error, we used a Bonferroni correction for all ANCOVA models ($.05/8 = .006$).

RESULTS

Participant Characteristics

The sample consisted of 324 participants (47% female, 27% Black; see Table 1) approximately 46 years of age with an average pain at the time of the visit at 46/100. Compared to females, males were older ($t_{316} = -2.79, p < .01$), more likely to use opioid pain medications [$X^2(1) = 36.43, p < .01$], and less likely to have a college education [$X^2(1) = 7.19, p < .05$; see Table 2]. There were no significant sex differences in current pain ratings, average low back pain severity, depressive symptoms, catastrophizing, education, or employment. The distribution of sex did not differ significantly between races [$X^2(1) = 3.42, n.s.$]. Compared to NHW participants, Black participants were older ($t_{323} = -2.49, p < .05$), endorsed greater depressive symptoms ($t_{323} = -4.07, p < .01$) and catastrophizing ($t_{323} = -8.74, p < .01$), and were more likely to use opioid pain medications [$X^2(1) = 10.01, p < .01$], to have less education [$X^2(1) = 20.90, p < .01$], and to be unemployed [$X^2(1) = 7.38, p < .01$].

Associations Between Participant Characteristics, Catastrophizing, and QST Responses

Results of Pearson correlations indicated that older age was associated with greater temporal summation of deep muscle pressure pain ($r = .135; p < .05$). Opioid use was associated with requiring greater pressure to produce moderate deep muscle pressure pain ($r = .129; p < .05$) as well as lower pain intensity ratings for mechanical punctate probes ($r = -.126; p < .05$). Catastrophizing was associated with requiring less cuff inflation to produce moderate pain ($r = -.262$) as well as higher ratings for pressure pain aftersensations ($r = .233$), higher pain intensity ratings for mechanical punctate probes ($r = .183$), and greater temporal summation for both deep muscle pain ($r = .209$) and mechanical punctate pain ($r = .166; p < .01$; see Table 3). Pain ratings at the time of the study visit were associated with greater temporal summation for mechanical punctate pain ($r = .161; p < .01$), while average low back pain severity over the last week was associated with greater deep muscle pain intensity ratings ($r = .159$) and pressure pain painful after sensations ($r = .147; p < .05$). Pain and depression were not otherwise associated with any QST outcomes. Results of a series of ANOVAs examining education and employment status differences in QST outcomes indicated that unemployed participants required less pressure to produce deep muscle pressure pain ($t_{322} = -2.27, p < .05$) and provided greater pain ratings for deep muscle pain aftersensations ($t_{154} = 2.22, p < .05$) and mechanical punctate probes ($t_{168} = 2.29, p < .05$).

Race and Sex Differences in QST Responses

Results of a series of 2 (race) by 2 (sex) analyses of covariance (ANCOVAs) are provided below. Results indicated that there were main effects of sex for mechanical punctate painful aftersensations (no covariates included) and inflation pressure needed to produce moderate pain (controlling for opioid use and employment status). Compared to males, female participants rated aftersensations from the mechanical punctate stimulus as more painful ($F_{1,314} = 24.48, \eta^2 = .07$) and required less cuff inflation pressure to produce moderate levels of pain ($F_{1,310} = 25.24, \eta^2 = .08$; see Table 4). Furthermore, there were significant effects of race for all QST variables except painful aftersensations from the pressure cuff. That is, compared to NHW participants, Black participants provided higher pain intensity ratings for mechanical punctate probes ($F_{1,310} = 7.02; \eta^2 = .11$; controlling for opioid use), deep muscle

pressure pain ($F_{1,315} = 7.94, \eta^2 = .03$; no covariates), and aftersensations for mechanical punctate ($F_{1,314} = 25.68, \eta^2 = .08$; no covariates) pain. Black participants demonstrated greater temporal summation for both mechanical punctate pain ($F_{1,313} = 11.03, \eta^2 = .03$; controlling for pain at the time of visit) and deep muscle pressure pain ($F_{1,314} = 11.53, \eta^2 = .04$; controlling for age) compared to NHW participants. Compared to NHW participants, Black participants required less cuff inflation pressure to produce moderate levels of pain ($F_{1,310} = 8.22, \eta^2 = .03$; controlling for opioid use and employment status). Black participants also endorsed greater catastrophizing than NHW participants ($F_{1,309} = 52.01, \eta^2 = .14$; controlling for opioid use, age, pain at the time of visit, and depression). There were no sex by race interactions ($p > .05$).

Mediation

Mediation analyses for sex differences in QST variables were not conducted because there were no sex differences in catastrophizing. The role of catastrophizing as a potential mediator of the race differences in QST variables was assessed. Results of the analyses indicated that controlling for sex, opioid use, and employment status, catastrophizing accounted for 14% of the variance in the amount of pressure required to produce moderate deep muscle pain and significantly mediated the relationship between race and cuff inflation pressure such that Blacks endorsed greater catastrophizing which was associated with requiring less pressure to produce moderate deep muscle pain (see Figure 1). Controlling for age, catastrophizing accounted for 5% of the variance in deep muscle pain temporal summation and partially mediated the relationship between race and deep muscle pain temporal summation such that Black participants engaged in more catastrophizing which was associated with greater temporal summation of deep muscle pain (see Figure 2). Catastrophizing was not a significant mediator of the relationships between race and painful aftersensation ratings, mean pain ratings, or temporal summation of mechanical punctate pain (all CIs include 0).

DISCUSSION

Growing evidence suggests that CLBP is associated with pain sensitization^{2, 66, 70}, and that there are sex and race disparities in CLBP^{1, 7, 26, 52, 68}. Given the sex and race differences in pain sensitization, this has been hypothesized as a mechanism contributing to the sex and race disparities in CLBP. This study examined sex and race differences in pain sensitization among patients with CLBP as well as the role of catastrophizing as a potential mediator of those differences. As expected, we found that compared to NHWs, Blacks demonstrated greater pain sensitivity for several measures of deep muscle hyperalgesia as well as mechanical punctate pain. However, there were only sex differences in two measures of pain sensitivity; compared to males, females required less pressure to produce deep muscle pain and rated aftersensations of mechanical punctate pain as more painful. Collectively, the present study suggests that, among patients with chronic pain, race differences in suprathreshold mechanical pain sensitivity are at least as robust as sex differences, which is consistent with prior reports⁵⁶.

The identified race differences across various deep muscle pain and mechanical punctate pain measures were consistent with our hypotheses as well as the current literature. According to a recent meta-analysis, Black individuals demonstrate a lower pain tolerance and provide higher pain intensity ratings across experimental stimuli compared to their NHW counterparts⁴⁵. Specifically, Black participants report higher pain ratings for mechanical punctate pain compared to non-Hispanic NHWs. However, the evidence for race differences in pressure pain sensitivity has been mixed, with some studies suggesting no race differences while others indicate that Black individuals demonstrated a lower threshold for pressure pain⁴⁵. It is important to note, however, that previous studies have used a standard pressure algometer to induce pressure pain. Our study is novel in that it used cuff pressure algometry to identify such differences.

In addition to race differences across QST outcomes, we also found race differences in opioid use. There are mixed findings in the literature with regard to race differences in opioid use. While there are well-documented disparities in the prescription of opioids³⁷, results from 1999–2012 NHANES data suggest there are no differences in opioid use between Black and non-Hispanic White individuals³⁰. In our sample, Black participants were more likely to be using prescription opioid medications. Perhaps the race differences in opioid prescribing seen in other parts of the country can be explained, in part, by the link between race and socioeconomic status. Indeed, patients from poorer areas are less likely to receive opioids⁴². However, Boston is a relatively affluent city with minorities having a median income above the poverty line⁷⁹. Thus, opioid prescribing patterns may differ as a result.

While we anticipated sex differences across experimental measures, females in this study differed from males on only two measures of pain sensitization: pressure required to produce moderate deep muscle pain and pain intensity ratings for mechanical punctate stimuli. The sex difference in pressure to produce deep muscle pain is aligned with previous findings indicating that males consistently demonstrate a higher pressure pain threshold and tolerance compared to females^{36, 65}. Likewise, our findings replicate research from a pain-free sample demonstrating that females provide higher pain intensity ratings for mechanical punctate pain⁶⁷. However, we did not find sex differences in temporal summation or aftersensation ratings for mechanical punctate pain, which is inconsistent with previous literature examining healthy pain-free individuals⁶⁷. It is possible that the general pain sensitization experienced across patients with CLBP eliminated any sex differences that are present within the general, pain-free population.

We also sought to examine the role of catastrophizing as a potential mediator of sex and race differences in pain sensitization. Previous studies have suggested that catastrophizing mediates observed sex and race differences in experimental pain responses among healthy individuals^{49, 51, 75, 77} as well as the sex differences in clinical arthritis pain⁴⁴. In the current study, there were no sex differences in catastrophizing. However, there were notable race differences in catastrophizing with Black participants endorsing greater levels of catastrophizing than NHWs. Further, higher levels of pain catastrophizing were associated with less pressure required to produce moderate deep muscle pain, greater temporal summation and aftersensations of deep muscle pain, and greater pain ratings and temporal

summation for mechanical pain ratings across all participants. This is consistent with Taub and colleagues' findings suggesting that catastrophizing is associated with central sensitization of pain among patients with CLBP⁷⁸. We also found that catastrophizing accounted for the race differences in deep muscle pain. That is, Black participants endorsed greater pain catastrophizing which partially accounted for their requiring less pressure to produce deep muscle pain as well as greater pain ratings and temporal summation for deep muscle pain.

Catastrophizing, a passive coping strategy involving magnification, rumination, and helplessness cognitions, is thought to augment pain perception through increased attention to painful stimuli as well as a greater emotional response to pain^{12, 13, 31}. Indeed, neuroimaging research has demonstrated that catastrophizing is associated with altered anticipatory brain responses⁴⁸ and with amplified pain-related activity in the dorsolateral prefrontal, insula, rostral anterior cingulate, premotor, and parietal cortices during mild pain, areas associated with the attentional and affective aspects of pain^{35, 69}. Taken together with our findings, this may help explain the race differences observed in the experience of CLBP. It is possible that Black individuals' increased frequency of catastrophizing results in enhanced pain sensitization through attentional and emotional response mechanisms. This, in turn, may be associated with the greater pain intensity and worse functional disability experienced by Black patients with CLBP^{7, 68}.

Our results have important clinical implications. The association between catastrophizing and poor pain outcomes is well documented in the literature⁸⁰. However, according to the communal coping model of catastrophizing, individuals may engage in catastrophizing to secure social or interpersonal resources, to alter the expectations of others, reduce performance demands, or manage interpersonal conflict^{73, 74}. As different cultural groups exhibit varying degrees of collectivist orientation¹⁰, catastrophizing may be more subject to social reinforcement in particular groups, which could contribute to racial/ethnic differences in catastrophizing. Despite the goal of increasing social support, there is evidence that catastrophizing is not only associated with greater pain and worse physical functioning^{16, 71}, but is also associated with perceived punishing responses from significant others^{4, 5}. Thus, it may be important to not only reduce catastrophic thinking to improve pain outcomes but to also provide social skills such that patients can secure social support and assistance from others. Future studies of group differences in catastrophizing may benefit from also assessing social support.

Several limitations should be considered when interpreting these findings. First, we examined only two (mechanical) modalities of quantitative sensory testing: cuff pressure algometry and punctate pain. Although these testing modalities were sufficient to detect race and sex differences in pain sensitization, they are not comprehensive. Thus, future studies should attempt to replicate these findings using other experimental modalities (e.g., heat, pain, cold pain, conditioned pain modulation). Additionally, this study was cross-sectional and thus we cannot identify causal relationships between the variables of interest. Future studies should consider a longitudinal approach to examine baseline race differences in catastrophizing and future development of pain sensitization. Furthermore, we were not able to investigate other aspects of catastrophizing such as its bi-directional association with the

social environment such as social support. Finally, we did not have data regarding potential selection biases in our sample, or regarding patients' pain impact, workers' compensation status, comorbidity, previous treatment history, or sleep limiting the generalizability of our findings to other samples. Future studies should consider these important patient characteristics in their analyses of sex and race differences in CLBP.

Despite these limitations, our study provides new insights into the race and sex differences in the experience of CLBP. We found both race and sex differences in deep muscle hyperalgesia as well as mechanical punctate pain such that Black participants and females experience greater pain sensitization compared to NHW participants and males, respectively. Further, we found that Black participants' greater degree of pain-related catastrophizing partially accounts for their increased sensitivity for deep muscle hyperalgesia. The present findings support the need to further examine the role of catastrophizing and sensitization in the context of race and sex disparities in the experience of CLBP.

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Highlights

- We examined race and sex differences in pain sensitivity in patients with CLBP.
- There were race and sex differences in deep muscle and mechanical punctate pain.
- Catastrophizing contributed to race differences in deep muscle pain.
- Further research is needed to better understand these complex relationships.

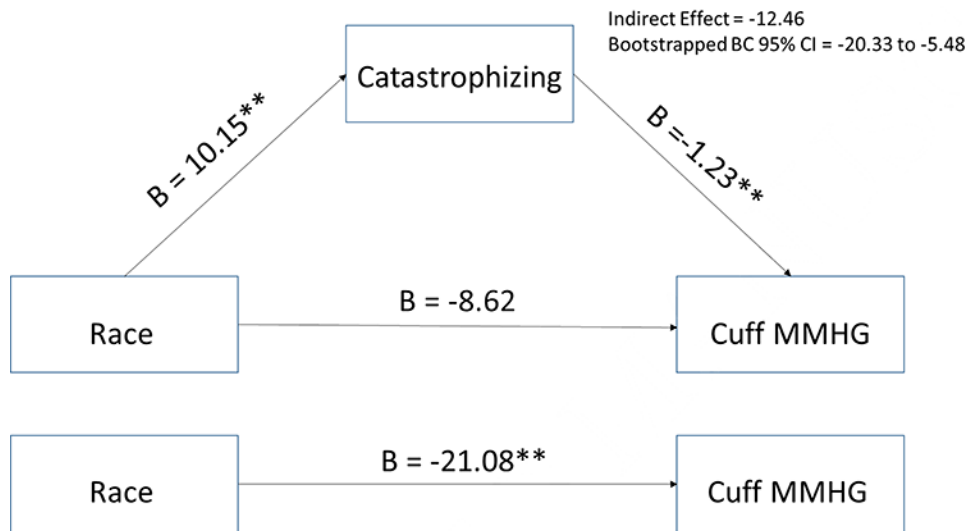


Figure 1. The mediating effect of catastrophizing in the relationship between race and mmHg needed to produce moderate deep muscle pain controlling for sex, opioid use, and employment status.
 ** $p < .01$

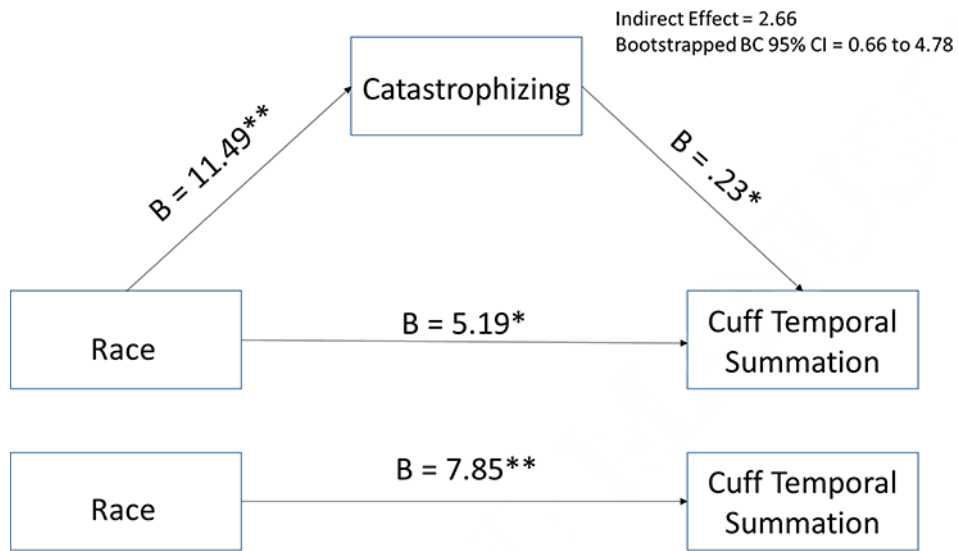


Figure 2. The mediating effect of catastrophizing in the relationship between race and cuff temporal summation controlling for age.
 * $p < .05$; ** $p < .01$

Table 1.

Participant Characteristics

Characteristics	n (%)
Age, mean (SD)	45.8 (11.8)
Pain at Visit, mean (SD)	45.5 (22.2)
Low Back Pain in Last Week, mean (SD)	5.5 (1.9)
Depression, mean (SD)	10.9 (9.1)
Catastrophizing, mean (SD)	18.0 (11.9)
Opioid Use	
Using Opioids	109 (34)
Not Using Opioids	213 (66)
Sex	
Male	170 (53)
Female	149 (47)
Race	
White	234 (73)
Black	85 (27)
Education	
Less than College Graduate	143 (44)
College Graduate or Above	181 (56)
Employment	
Employed	112 (35)
Unemployed	212 (65)

Table 2.

Race and Gender Differences in Participant Characteristics

	Male	Female	χ^2/t	White	Black	χ^2/t
Sex, n (%)						3.43
Male				102 (69)	47 (31)	
Female				132 (78)	38 (22)	
Age, mean (SD)	48 (10)	44 (13)	-2.79**	45 (12)	49 (11)	-2.49*
Pain at Visit, mean (SD)	45 (22)	46 (22)	0.21	44 (22)	49 (23)	-1.48
Low Back Pain in Last Week, mean (SD)	5.5 (1.8)	5.5 (2.1)	-0.21	5.4 (1.9)	5.7 (1.9)	-0.75
Depression, mean (SD).	11 (9)	10 (9)	-1.27	10 (9)	14 (10)	-4.07**
Catastrophizing, mean (SD)	18 (11)	18 (12)	-0.25	15 (11)	27 (11)	-8.74**
Opioid Use, n (%)			36.43**			10.01**
Using Opioids	73 (50)	30 (18)		68 (29)	41 (48)	
Not Using Opioids	74 (50)	140(82)		166 (71)	44 (52)	
Education, n (%)			7.19**			20.90**
Less than College Graduate	77 (52)	63 (37)		87 (37)	56 (65)	
College Graduate or Above	71 (48)	107(63)		151 (63)	30 (35)	
Employment, n (%)			0.42			7.38**
Employed	100(68)	109(64)		166(70)	46(54)	
Unemployed	48 (32)	61 (36)		72 (30)	40 (46)	

*
p<.05**
p<.01

Table 3.

Pearson Correlations Between Clinical Outcomes and QST Measurements

	Cuff MMHG	Mean Cuff Intensity Ratings	Cuff Temporal Summation	Cuff Aftersensations	Mean Probe Intensity Ratings	Probe Temporal Summation	Probe Aftersensations	Catastrophizing
Age	-.035	-.020	.135*	-.037	-.041	.005	-.089	.126*
Opioid Use	.129*	-.070	-.015	-.039	-.126*	-.081	.028	.223**
Pain At Visit	-.104	.011	-.062	.055	.088	.161**	.099	.313**
Mean Low Back Pain in Last Week	-.084	.159*	.050	.147*	.133	.096	.111	.374**
Depression	-.053	-.056	.006	.131	.077	.086	-.003	.601**
Catastrophizing	-.262**	.126	.209**	.233**	.183**	.166**	.118	1.00

*
p<.05**
p<.01

Table 4.

Significant Sex and Race Differences in QST Outcomes

QST Measure		Mean (SD)
Cuff mmHg	Male	174 (60)
	Female	135 (55)
	White	158 (57)
	Black	141 (68)
Mean Cuff Pain Intensity	White	40 (14)
	Black	45 (15)
Cuff Temporal Summation	White	7 (18)
	Black	16 (21)
Mean Probe Pain Intensity	White	22 (15)
	Black	34 (21)
Probe Temporal Summation	White	14 (15)
	Black	22 (24)
Probe Aftersensations	Male	4 (6)
	Female	8 (14)
	White	4 (8)
	Black	11 (17)
Catastrophizing	White	15(11)
	Black	26(11)