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The relationship of demographic and psychosocial variables to pain-related outcomes in a rural chronic pain population

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Abstract

Rural residency and low socioeconomic status (SES) are associated with increased likelihood of chronic pain. Other demographics are also differentially associated with the experience of pain. This study examines the relations between demographic and pain-related variables in a virtually unstudied population of rural Alabama chronic pain patients. One-hundred-and-fifteen patients completed validated measures of pain catastrophizing, depression, pain intensity, pain interference, perceived disability, and life satisfaction. Average age of study participants was 52-years, 79% were female, 74% were African-American, 72% reported annual income between 00,000-12,999, and 61% were unemployed. Although average years of reported education was 12.26, reading level percentile (primary literacy indicant) was 17.33. Cross-sectional multivariate and univariate analyses were conducted to examine associations among demographic and psychosocial variables in relation to various pre-treatment pain-related variables. The mediating role of pain catastrophizing and depression was investigated. Results indicate that race was significantly associated with pain intensity and pain interference, such that African-Americans reported higher scores than White-Americans. Pain catastrophizing was uniquely associated with pain intensity, pain interference, and perceived disability; depression was uniquely associated with pain interference, and life satisfaction. Pain catastrophizing mediated the relation between primary literacy and pain intensity; age effects were differentially mediated by either pain catastrophizing or depression. These analyses provide insight into the specific demographic and psychosocial factors associated with chronic pain in a low-literacy, low-SES rural population.

Introduction

Chronic pain affects over 48 million Americans annually, although this is likely an underestimate; it is well established that pain is both underdiagnosed and undertreated.[42, 94] Furthermore, health, treatment, and ethnicity disparities are well documented across a broad range of samples, settings, and types of pain.[94] The experience of chronic pain varies in relation to a number of demographic variables including race, age, sex, and socioeconomic status (SES).[6,18,61]

Numerous studies have reported that prevalence of chronic pain varies with age; however, the relationship is not linear, with documented prevalence peaking between ages 45 and 65.[3,

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10,81,102] Research regarding age-related phenomenon associated with pain (e.g., depression, interference, disability) is equivocal. Some studies have found pain-related variables increase with age, others have found they decrease, and others have demonstrated stronger similarities than differences across age groups.[e.g.,20,37,51,64,76,88,98,105]

Women are more likely than men to experience chronic pain, reporting greater pain intensity, frequency, and duration.[99] Catastrophizing, a negative mental set about real or anticipated pain, is a robust predictor of pain-related outcomes and is typically higher in women.[26,30,48,54,92,93] Furthermore, compared with men, women with chronic pain are more likely to report depression.[7,40,97]

Race is also an important differentiating factor in the pain experience. Considerable evidence suggests African-Americans report greater pain intensity in acute clinical pain and in heterogeneous chronic pain conditions.[11,16,18,21,28,29,84,85,86,103,104] African-Americans with chronic pain report higher levels of catastrophizing than White-Americans, which may partially explain racial differences in pain perception.[18,31,43,80] Additionally, research indicates a disproportionate number of African-Americans live in rural areas and represent a higher percentage of individuals classified as low-SES.[2,57,63]

SES represents a dynamic, multidimensional construct that is a robust determinant of health. Low-SES has been linked to numerous poor pain-related outcomes, including maladaptive pain beliefs and coping strategies, and more severe distress attributed to pain.[13,14,25,27,72,79] SES is a unique predictor of health, independent of other influential demographic variables including race, age, and sex; furthermore, SES may explain previously reported differences in these factors.[18,32,108]

Although there is a paucity of research investigating rural chronic pain, findings suggest that annual income of less than \$25,000, no high school diploma, and rural residency are associated with a greater likelihood of having disabling chronic pain.[45,66,69] Furthermore, rurality has been associated with low literacy.[46,47,58] General disadvantages of living in rural communities consist of higher poverty rates and unemployment, and an overriding lack of access to treatment resources due to transportation problems and health service deficits.[2,35,41,49,73,78,83] A gap in the literature exists in that limited research has examined the aforementioned demographic variables and the influence of psychosocial factors within a rural setting.

The current study begins to fill these gaps by reporting a multivariate analysis of pre-treatment characteristics in a rural chronic pain sample. The primary aim was to examine associations among key demographic and psychosocial variables in relation to various pain-related variables. The secondary aim was to explore the ability of affect variables to mediate any demographic-pain variable relations. Catastrophizing and depression were chosen as potential mediators based on past research demonstrating the importance of these factors.[18,30,31,43,44,51,54,65,93,96]

Method

Design

A cross-sectional study was completed with a sample of rural Alabama chronic pain patients who were recruited for potential participation in a treatment outcome study. Multivariate and univariate analyses were conducted, followed by mediation models that were identified based on the observed relations across the independent and dependent variables in the univariate tests. The study was approved by the Institutional Review Board at the University of Alabama.

Setting

Participants were recruited from health clinics in three rural Alabama counties (Pickens, Wilcox, and Walker). Pickens County (882 square miles) is in west-central Alabama, and has a population of nearly 21,000. The county is 43% African-American, and 56% White-American. The patients served at the clinic located in Pickens County are approximately 50% African-American and 50% White-American (very few Hispanics), with 10-20% low-pay or no-pay/uninsured, and 20% adult Medicaid patients.

Wilcox County (883 square miles) is located in south-central Alabama, and has a population of just over 13,000 that is predominantly African-American (71.9%), with 27.5% White-American; more than 40% of the population lives at or below the poverty level. The patients served at the clinic located in Wilcox County are 94% African-American, with 63-65% low-pay or no-pay and uninsured, and 20% adult Medicaid patients. Over 70% of our sample was recruited from this clinic.

Walker County (803 square miles), located in north-western Alabama, has a population of approximately 71,000. The county is predominately White-American (92%), with 6% African-American. The percentage of the population living at or below the poverty level is 16.5%. The number of patients served at the clinic located in Walker County that are uninsured is 34-39%, and 24% are adult Medicaid patients. Information regarding race breakdown specifically pertaining to the patient population for this clinic was unavailable.

Participants

A total of 214 rural chronic pain patients were recruited; of those, 122 met initial eligibility criteria and agreed to be interviewed and assessed, and 115 met the eligibility criteria for the current study. Reasons for not participating included an inability of study staff to contact the patient by telephone (i.e., phone had been disconnected), limited access to transportation to get to the clinic, unavailable due to family/situational demands/responsibilities, and in a small number of cases, a lack of interest after hearing the brief study description. Inclusion criteria were: (1) age 19 years of age or older; (2) at least one diagnosis consistent with chronic pain (due to any cause that is non-malignant); (3) patient report of pain on most days of the month for the previous 3 months. Study exclusion criteria included the following: (1) HIV-related pain and cancer pain because these are associated with malignant disease; (2) significant cognitive impairment, evidenced by a positive screen (score of '0' or '1' or 2 with an abnormal clock draw test') on the Mini-cog; (3) present diagnosis of schizophrenia, bipolar affective disorder, seizure disorder, or substance abuse.[8,59] Demographics were obtained during the interview.

Measures

Demographic variables were gathered from a brief questionnaire that was developed for this research. The variables of interest were race, age, sex, SES (as indicated by annual household income), and primary literacy. The first four variables were obtained from patient report on the demographic questionnaire, but primary literacy was inferred from a measure of reading ability. The various scales used in this research are described in the following.

Primary Literacy and Cognitive Screening—The Wide Range Achievement Test-4 (WRAT-4) reading/word decoding subtest (blue form) was used to assess reading level (primary literacy).[106] The test consists of 33 words of increasing difficulty, and responses are scored for accuracy of pronunciation. Scores are then converted to percentile ranks, which represent the percentage of individuals in the normative sample obtaining scores below a particular standard score.[106] Percentile ranks range from a low of 1 to a high of 99, with 50 indicating the median or “typical” performance.[106] Wilkinson & Robertson report good

internal consistency reliability ($\alpha=.91$), appropriate content validity, and adequate predictive validity.[106]

Cognitive Screening was accomplished with the Mini-Cog, which was developed as a short (2-5 minutes administration time) assessment of cognitive impairment to be used in primary care settings.[8] The Mini-cog utilizes a clock drawing test and a memory recall test of three words with clock drawing as a distracter. The Mini-Cog reportedly has high validity for detecting cognitive impairment in a community sample of ethnolinguistically diverse older adults and in a more homogeneous sample of adults.[8,9]

Pain severity and Pain interference—Pain data were collected via the Wisconsin Brief Pain Inventory (BPI), which consists of 11 items that are rated from 0 to 10.[22] Pain Severity scores were obtained from the mean of four items, in which respondents rate their most severe pain, least severe pain, average pain over the past week, and current pain on an 11-point Likert scale ranging from 0 (*no pain*) to 10 (*pain as bad as you can imagine*). Pain Interference scores were obtained from the seven BPI items that request participants to rate interference due to pain in activities such as mood, sleep, etc. on an 11-point Likert scale ranging from 0 (*no interference*) to 10 (*complete interference*). The BPI has adequate internal consistency ($\alpha = .85$) in a variety of pain populations and concurrent validity with other pain instruments.[22, 109] In the current sample, the pain severity and pain interference scales both had adequate internal consistency ($\alpha = .85$ and $\alpha = .91$, respectively).

Perceived Disability—The Roland-Morris Disability Scale-11 item version (RMDS) provided a self-assessment of limitations due to pain in physical activities, such as dressing, standing, bending, walking, and lifting. [90] Participants endorse items that have been true over the past month, and a total score (range 0 to 11) is obtained by summing the number of items endorsed. The 11-item version correlates well with scores on longer 18 and 24-item versions ($r=.949$ and $r=.929$ respectively) and has been shown to have adequate reliability that is comparable to the 24-item version ($\alpha=.88$), and strong concurrent validity.[90] Adequate internal consistency for the 11-item version was demonstrated in the current sample ($\alpha = .84$).

Depression—The Center for Epidemiological Studies Depression Scale (CES-D), which has been validated for use in chronic pain patients, was used to assess depression.[97] The CES-D consists of 20 items, and respondents are asked to rate the frequency with which each symptom or feeling occurred during the previous 7 days. Item content is rated on a 4-point scale ranging from 0 (*rarely or less than one day*) to 3 (*most or all of the time, 5-7 days*), so that total scores range from 0 to 60. Higher scores indicate greater depression, and a score of greater than 19 is used to denote clinically relevant depressive symptoms.[98] Reliability and validity are reported to be adequate and similar across a variety of samples from the general population.[71] Internal consistency was found to be adequate in the current sample ($\alpha = .90$).

Life Satisfaction—The Quality of Life Scale (QOLS) is a 7-point self-report scale that manifestly assesses life satisfaction in several areas.[17] Total scores range from 7 to 49 with higher scores indicating greater satisfaction. The QOLS has been shown to correlate moderately with distress, and weakly with measures of functioning and pain intensity, indicating the QOLS is measuring a unique construct different than pain or disability. A psychometric analysis of the QOLS showed it to be internally consistent, reliable across time, and representative of a single construct.[17] In the present population, adequate internal consistency of the QOLS was demonstrated ($\alpha = .84$).

Pain Catastrophizing—The Pain Catastrophizing Scale (PCS) was used to assess patient report of catastrophic thinking.[91] The 13-item measure asks respondents to rate, using a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*all the time*), the degree to which they have

certain thoughts and feelings when experiencing pain. A total score for overall catastrophizing is equal to the sum of the raw scores. Higher scores indicate greater use of catastrophic thinking. The PCS has exhibited strong internal consistency ($\alpha=.93$), concurrent and discriminant validity, and high test-retest reliability over a 6 wk period ($r = 0.78$). [67,91,100] Adequate internal consistency was found in the current sample ($\alpha =.94$).

Procedure

Participants who potentially met the eligibility criteria were identified by the physicians and nursing staff at the health clinics. Medical staff gave the identified individuals a brief study description, and those interested were asked to consent to telephone contact by our study staff. Potential participants were then contacted via telephone by a study recruiter, screened for initial eligibility, and received a more detailed description of the project. Participants who satisfied initial entry criteria and were interested in participating were then scheduled for a 90-minute face-to-face interview during which informed consent was obtained and the brief demographic questionnaire was administered. During the interview, the study investigator read all items to each participant and recorded participant responses. This was done because the current population has predominantly low-literacy levels, and the previously validated self-report measures used in the current research are written at a reading grade level ranging between 3.3-12.7 (as assessed by Flesh-Kinkaid Grade Level estimates). The WRAT-4 reading/word decoding subtest was administered using standard procedures.

Statistical Analyses

Missing data were imputed using the multiple imputation algorithm from PRELIS 2.54.[50] The scores that were missing on a few items ($< 0.2\%$) from otherwise completed scales were replaced by imputed values before summing to obtain total scores, and these item values were used in computation of internal consistency reliabilities (α coefficients). Total RMDS scores were imputed for four cases with completely missing RMDS data, and the RMDS α coefficient was computed from the 111 cases with complete data.

SPSS version 16.0 was used in analysis of the data from the self-report scales and demographic variables.[89] Pearson product moment correlations were used to determine bivariate relations among pain-related variables. Two separate Multivariate Analysis of Covariance (MANCOVA) models were examined. In the first MANCOVA model, a main effects only model was specified that tested for main effects of race, age, sex, income, and WRAT percentile on PCS, CESD, BPI Intensity, BPI Interference, RMDS, and QOLS score. Race and sex were included in the model as dichotomous between-subjects factors, while age, income, and WRAT percentile were entered as continuous variables. Sex and race were coded so that higher values were assigned to women and African-Americans. In the second MANCOVA model, a main effects only model was specified investigating race, age, sex, income, WRAT percentile, PCS, and CESD score on BPI Pain Intensity, BPI Pain Interference, RMDS, and QOLS score. In this model, PCS and CESD were included as continuous variables; all other independent variables were treated identically to the first MANCOVA model described above. Disability seeking status was included as a blocking factor in both models due its high collinearity with each of the self-report scales. For disability application, "seeking disability" was coded higher than "on disability" or "not on or not seeking disability," which were coded the same. For all multivariate analyses, tests of the F statistic for each independent variable were examined as omnibus tests. In order to reduce the likelihood of Type I error, univariate analyses of covariance (ANCOVAs) were only examined if the multivariate omnibus test was significant. The assumptions for these models were checked and confirmed. Although WRAT percentile was positively skewed, the models are robust to such violations.

The mediational role of pain catastrophizing and depression was examined using the bootstrapping technique (with $n=5000$ bootstrap re-samples).[70] Bootstrapping is a nonparametric re-sampling procedure that makes no assumptions about the shape of the distributions of the variables or the sampling distribution of the statistic. The bootstrapping sampling distributions are empirically generated and the indirect effects are calculated in the re-samples. This way, point estimates and confidence intervals are estimated for the indirect effects. As a stringent test of the hypotheses, point estimates of indirect effects are significant in the case zero is not contained within the confidence interval.

Mediation models to test the proposed mediators of pain catastrophizing and depression were identified based on the relations observed across the independent and dependent variables for each of the MANCOVA and subsequent ANCOVA models. Referencing the paths depicted in Figure 1, it was determined that: 1) the independent variable was significantly related to the dependent variable (direct path c); 2) the independent variable was significantly related to the proposed mediator (path a); and 3) that each proposed mediator was significantly related to the dependent variable (path b) while controlling for the effects of the independent variable. The indirect effect is represented by the product of the coefficients ($a \times b$).

Results

Summary data from the 115 participants are presented in Tables 1 and 2. Table 1 also gives the mean and standard deviation of the WRAT percentile scores, which were used in the data analyses. Table 2 presents means and standard deviations for the six self-report scales. Table 3 shows Pearson product-moment correlations for the 6 scales and the 6 demographic variables that were analyzed in this research.

The first MANCOVA model tested for race, age, sex, income, and WRAT percentile differences in PCS, CESD, BPI Pain Intensity, BPI Pain Interference, RMDS, and QOLS scores, while controlling for disability seeking status. The MANCOVA omnibus test indicated a significant multivariate main effect for age (Wilk's $\lambda = .86$, $F(6,103) = 2.92$, $p = .01$) and WRAT percentile (Wilk's $\lambda = .86$, $F(6,103) = 2.72$, $p = .02$). No main effect was found for race (Wilk's $\lambda = .90$, $F(6,103) = 2.02$, $p = .07$), sex (Wilk's $\lambda = .97$, $F(6,103) = .69$, $p = .65$) or income (Wilk's $\lambda = .94$, $F(6,103) = 1.08$, $p = .38$).

Separate ANCOVAs were examined to determine the nature of the multivariate effects in regards to the specific criterion variables. See Table 4 for the results of the first set of ANCOVAs conducted. Older participants reported significantly higher QOLS ratings, and lower PCS, CESD, BPI Intensity and BPI Interference scores, in comparison to younger participants. Age was not a significant predictor of RMDS. For WRAT percentile, univariate tests were significant for PCS and approached significance for BPI Intensity such that lower reading levels were associated with higher PCS scores and a tendency towards higher BPI Intensity scores. WRAT percentile was not associated with any other criterion variables.

The second MANCOVA model tested for differences in race, age, sex, income, WRAT percentile, PCS, and CESD score in pain-related variables (while controlling for disability seeking status). The MANCOVA omnibus tests indicated a significant multivariate main effect for race (Wilk's $\lambda = .91$, $F(4,103) = 2.68$, $p = .04$), WRAT percentile (Wilk's $\lambda = .89$, $F(4,103) = 3.05$, $p = .02$), PCS (Wilk's $\lambda = .82$, $F(4,103) = 5.63$, $p < .001$), and CESD (Wilk's $\lambda = .63$, $F(4,103) = 15.36$, $p < .001$). No significant main effect was found for age (Wilk's $\lambda = .95$, $F(4,103) = 1.35$, $p = .26$), sex (Wilk's $\lambda = .98$, $F(4,103) = .62$, $p = .65$), or income (Wilk's $\lambda = .95$, $F(4,103) = 1.40$, $p = .24$).

To determine the nature of the multivariate effects demonstrated in the second MANCOVA model, separate ANCOVAs were examined. See Table 5 for the second set of ANCOVA

results. Univariate tests indicated that African-Americans reported significantly higher BPI Intensity and BPI Interference scores compared to White-Americans. A non-significant tendency was found for African-Americans to report higher QOLS ratings than White-Americans. Primary literacy was not significantly associated with any criterion variables; however, the univariate test for BPI Interference approached significance. Participants who reported higher PCS scores also reported significantly higher BPI Intensity, BPI Interference, and RMDS ratings. No significant difference was found based on PCS score for QOLS ratings. Univariate tests indicated that CESD was negatively associated with QOLS and positively associated with BPI Interference, such that participants who reported more depressive symptoms also reported lower life satisfaction and higher pain interference ratings. Depression was not significantly associated with RMDS or BPI Intensity.

Given the observed relations in the ANCOVA analyses, five mediation models were identified that met the assumptions asserted by Baron and Kenny (1986).[5] In the first model (see Table 6), PCS was examined as a mediator of the relation between WRAT percentile and BPI Pain Intensity. After controlling for PCS score, the effect of WRAT on BPI Pain Intensity was reduced to non-significance; pain catastrophizing significantly mediated the WRAT-pain intensity relation.

In the second mediation model (see Table 6), PCS was examined as a mediator of the age to BPI Pain Intensity relation. After controlling for PCS score, the effect of age on BPI Pain Intensity was reduced to non-significance; pain catastrophizing significantly mediated the age-pain intensity relation.

Mediation was tested to further examine the relations between the independent variables of age, PCS, and CESD score with the dependent variable of BPI Pain Interference (see Table 6). After controlling for PCS score, the effect of age on BPI Pain Interference was reduced to non-significance; pain catastrophizing significantly mediated the age-pain interference relation. After controlling for CESD score, the effect of age on BPI Pain Interference was again reduced to non-significance; thus, depression also significantly mediated of the relation between age and pain interference.

Given the observed relations between the predictor variables of age and CESD with the outcome variable QOLS, mediation was tested to investigate whether depression mediated age related differences in life satisfaction (see Table 6). After controlling for CESD score, the effect of age on QOLS was reduced to non-significance; depression significantly mediated the age-life satisfaction relation.

Discussion

Within the current study, rurality captured a triple disparity in that the sample was predominantly low-SES, African-American females. Based on past literature, these demographic characteristics are largely representative of rural populations and correspond with elevated risk for poor psychosocial and pain-related outcomes.[2,11,18,35,36,45,49,57,61,63,65,66,69,73,85,92,104] Compounding this preponderance of demographic risk factors are the disparities inherent in residing in a rural locality. Within rural populations, general health care system issues and the burden of living with chronic pain are amplified by numerous barriers, including: geographical isolation, access difficulties due to transportation problems (i.e., lack of family car or public transportation), severe professional shortages, hospital closures, and medical services that are limited and narrow in range and scope.[41,78,83] This study provides insight into a collection of specific factors that are associated with the experience of chronic pain within a rural setting. The unique contributions of key demographic and

psychosocial variables across a number of pain-related outcomes were examined, and potential mechanisms for disparities by demographic stratification were explored.

Results indicated that race uniquely predicted pain outcomes such that African-Americans reported significantly higher pain intensity and pain interference ratings in comparison to White-Americans. While this finding is consistent with some past research,[e.g.,18,84,74,85] it is discordant with other research that suggests race differences may be conditional upon intervening factors.[2,18,31,43,57,63,80,108] Within this context, it is of particular interest that race was also associated with primary literacy; African-Americans obtained significantly lower reading scores than White-Americans. It is possible that race differences are at least partially accounted for by reading level. Since we did not hypothesize these relations on an a priori basis we did not conduct these analyses.

Past research suggests that race differences may be better accounted for by affective variables. [18,31,43,80] In our sample, no direct association between race and negative affect was found. Results did indicate a non-significant tendency for African-Americans to report higher life satisfaction than White-Americans. Thus, life satisfaction in African-Americans may be a protective factor against negative affectivity.

Primary literacy often drives health literacy related to specific medical conditions and poor health literacy has been linked to a variety of negative health outcomes.[1,4,23,77,107] In the current study, low reading levels were associated with elevated pain intensity and catastrophizing scores. This is consistent with past research that has linked low educational attainment to maladaptive pain-coping strategies (including high pain catastrophizing).[14, 27,72,79] Importantly, catastrophizing was found to mediate the primary literacy to pain intensity relation in the present results. Cano and colleagues (2006) have suggested that numerous pain-coping strategies (i.e. distraction, reinterpretation) may be dependent upon cognitive skills that are potentially enhanced by higher education and primary literacy levels. [14]

While the findings of past research regarding age have been inconsistent, multiple research groups have found that older age groups report better pain-related outcomes than both younger and middle age groups.[e.g.,19,38,39,52,76,81,82,95] In the current study, the initial analyses supported these past findings in that as age increased, perceived life satisfaction also increased, and catastrophizing, depression, pain intensity, and pain interference decreased. However, when catastrophizing and depression were included in the multivariate model as predictor variables, these age-related findings became non-significant, suggesting that the pain-related dependent variables were more strongly associated with catastrophizing and depression than with age per se.

The concomitant findings that pain catastrophizing mediated both the age to pain intensity, and the age to pain interference relations are both important and potentially meaningful. One possible explanation for these findings lies in McCracken's (1998) speculation that with age, chronic pain becomes an expected and more accepted experience, thus, older patients tend to catastrophize less.[62] Furthermore, our results suggest that reduced catastrophizing corresponds with lower pain ratings and less reported interference due to pain. While the exact nature of the relations among these variables cannot be determined from the present data, targeting pain catastrophizing in the treatment of chronic pain may have important implications in alleviating pain, and in reducing interference due to persistent pain.

Depression significantly mediated both the age to life satisfaction and the age to pain interference relations, indicating that these pain-related factors are strongly influenced by negative affectivity. Within the context of the symptoms of depression, it is interesting to consider that as depression is associated with aches and pains, feelings of lethargy, disinterest

in activities that were previously pleasurable, and irritability, the potential interplay of these factors may lead to the patient's interpretation of increased interference due to persistent pain and decreased life satisfaction. Thus, to improve overall quality of life and reduce pain interference, it may be advantageous to routinely assess for depression, and when appropriate, to target the treatment approach towards not only the alleviation of pain, but also depressive symptoms. Notably, previous research has found that poorer outcomes are associated with the treatment of pain when underlying depression goes undiagnosed and untreated.[87]

In the present sample, pain catastrophizing was the only independent variable that uniquely predicted perceived disability after controlling for the demographics and depression. Although extant research often fails to control for confounding factors, this association is consistent with previous studies.[e.g.,24,55,60,96] Notably, past research suggests that functional disability is associated with loss of independence and the need for costly interventions and care.[15,101] Thus, multidisciplinary treatment aimed towards reducing pain catastrophizing may offset both the costs of chronic pain and also the negative trajectory from the experience of a chronic pain condition to functional disability.[12]

In previous research, SES and sex have consistently been reported to predict pain-related outcomes. For example, numerous researchers have found an association between income and health status indicants, and a plethora of research indicates that females report significantly greater pain sensitivity and negative affectivity in comparison to males.[e.g.,7,26,30,33,34,40,48,53,56,68,75,92,99] Thus, based on past literature, the lack of SES and sex differences across the criterion variables in the present study is seemingly contradictory. However, given that nearly three-quarters of the sample had an income of less than \$13,000 and were mostly unemployed, such drastic poverty may function as a leveling factor. Furthermore, it may be that downward drift (as opposed to income per se) is an important underlying factor that may drive the differential SES outcomes noted in past research. Thus, given the current sample was drawn from a larger rural population that is generally representative of low-SES, the economical changes associated with the onset of chronic pain may not be as appreciable. It is possible that previously reported sex differences are better accounted for by other variables, including race, psychosocial variables, and disability seeking status.

While a major strength of this study is the insight it provides into a virtually unstudied, high risk population, paradoxically, the sample's demographic homogeneity is a potential limitation. Future studies should be directed towards investigating rural chronic pain samples that have more diversity in terms of SES indicants, and variability in factors such as race and sex. Another potential limitation pertains to the interview procedure in that all self-report questionnaire items were read to participants. It is possible that this approach produced participant reactivity such that participants under- or over-reported symptoms. The cross-sectional, exploratory nature of this study is also a limitation in that the research design precludes investigation into causality. The underlying reasons for the associations found in the present analyses remain yet to be fully understood. Additionally, to determine whether rurality itself is a predictor of poorer pain outcomes, it would be important to compare the findings of this low-SES, rural population, with an urban population of similar demographic make-up.

This study examined the pre-treatment demographic and psychosocial characteristics of a unique, virtually unstudied rural chronic pain population. The results reported herein underscore the biopsychosocial nature of chronic pain and the necessity for a multidisciplinary treatment approach that is sustainable within rural communities. However, equitable access to healthcare continues to be a critical policy issue. A paradox within the healthcare system presently exists in that the people most vulnerable and needing of treatment in America are currently the most underserved. Continued research within rural communities may lead to more effective, specific, and culturally sensitive interventions designed to alleviate the suffering and

functional limitations associated with living with chronic pain. Since treatment disparities for pain management are pervasive, a more thorough understanding of the salient, changeable psychosocial variables associated with rural populations will likely enhance and motivate a movement toward reducing and eventually eliminating treatment disparities.

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Figure 1. Paths tested to examine the mediating role of pain catastrophizing and depression

Demographics**Table 1**

Variable	Mean (SD)	%
Age	51.93 (+/- 13.11)	
Sex		
Male		21
Female		79
Race		
White-American		26
African-American		74
Disability Status		
On disability		43
Seeking disability		24
Not on, not seeking		33
Income		
\$0 to \$12,999		72
\$13,000 to \$24,999		15
\$25,000 to \$49,000		12
\$50,000 & above		1
Employment Status		
Employed		14
Unemployed		61
Retired		20
Home-maker		4
Student		1
Education	12.26 (+/-2.48)	
WRAT %tile (primary literacy)	17.33 (+/- 20.94)	
Primary Pain Type		
Low back pain		44
Arthritis		33
Headache		5
Soft tissue/muscle pain		4
Pelvic pain		4
Other		10

Table 2
Means and standard deviations of the psychosocial outcomes variables

Variable	Mean (SD)
PCS	32.15 (+/- 14.74)
CESD	20.37 (+/-12.87)
BPI Intensity	6.06 (+/-2.12)
BPI Interference	5.80 (+/-2.72)
RMDS	9.11 (+/-2.51)
QOLS	30.09 (+/- 10.48)

Table 3

Pearson product moment correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12
1. Race	-	-	-	-	-	-	-	-	-	-	-	-
2. Age	.06	-	-	-	-	-	-	-	-	-	-	-
3. Sex	.33**	.15	-	-	-	-	-	-	-	-	-	-
4. WRAT %tile	-.34**	.07	-.05	-	-	-	-	-	-	-	-	-
5. Income	.04	.08	.09	.29**	-	-	-	-	-	-	-	-
6. Dis. Seeking	-.22*	-.27**	.21*	-.04	-.16	-	-	-	-	-	-	-
7. PCS	.00	-.36**	-.08	-.24*	-.17	.30**	-	-	-	-	-	-
8. CESD	-.11	-.31**	-.02	-.07	-.08	.33**	.59**	-	-	-	-	-
9. BPI Intensity	.20*	-.27**	-.11	-.25**	-.00	.23*	.54**	.32**	-	-	-	-
10. BPI Interference	.05	-.28**	-.09	-.03	-.08	.28**	.59**	.56**	.71**	-	-	-
11. RMDS	.07	-.01	-.10	-.09	-.07	.19*	.31**	.14	.50**	.45**	-	-
12. QOLS	.20*	.31**	.06	.05	.037	-.37**	-.46**	-.70**	-.26**	-.44**	-.12	-

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

Table 4
Summary of the results from the first set of ANCOVAs; age and primary literacy differences in pain-related outcomes

Variable	PCS	CESD	Intensity	Interference	RMDS	QOLS
Age	10.66 <i>p</i> =.001	7.31 <i>p</i> =.008	5.23 <i>p</i> =.02	5.69 <i>p</i> =.02	.42 <i>p</i> =.52	6.40 <i>p</i> =.01
WRAT %tile	3.79 <i>p</i> =.05	.63 <i>p</i> =.43	3.28 <i>p</i> =.07	.37 <i>p</i> =.55	.10 <i>p</i> =.76	1.18 <i>p</i> =.28

Notes: The *F* statistic, with 1 numerator and 108 denominator degrees of freedom, is the test statistic reported. All analyses controlled for disability seeking status.

Table 5
Summary of the results from the second set of ANCOVAs; race, primary literacy, pain catastrophizing, and depression differences in pain-related outcomes

Variable	Intensity	Interference	RMDS	QOLS
Race	6.90 $p=.01$	5.04 $p=.03$	1.72 $p=.19$	3.00 $p=.09$
WRAT %tile	1.02 $p=.32$	3.65 $p=.06$	.07 $p=.80$	.42 $p=.52$
PCS	19.96 $p < .001$	16.16 $p < .001$	8.03 $p=.006$	.26 $p=.61$
CESD	.03 $p=.87$	12.33 $p=.001$	.16 $p=.69$	47.65 $p < .001$

Notes: The F statistic, with 1 numerator and 106 denominator degrees of freedom, is the test statistic reported. All analyses controlled for disability seeking status.

Table 6
Summary of mediation results for pain catastrophizing and depression (5000 bootstrap samples)

Independent Variable (IV)	Mediating Variable (M)	Dependent Variable (DV)	Effect of IV on M (a)	Effect of M on DV (b)	Total Effects (c)	Direct Effects (c')	Indirect Effect (a × b)	Confidence Interval ^b
WRAT	PCS	Intensity	-.17	.07	-.03	-.01	-.01 ^a	-.03 to -.001
Age	PCS	Intensity	-.41	.07	-.04	-.01	-.03 ^a	-.05 to -.01
Age	PCS	Interference	-.41	.10	-.06	-.02	-.04 ^a	-.07 to -.02
Age	CESD	Interference	-.31	.12	-.06	-.03	-.03 ^a	-.06 to -.01
Age	CESD	QOLS	-.31	-.54	.24	.08	.17 ^a	.06 to .30

^a Significant point-estimate ($p < .01$)

^b Bias-corrected and accelerated confidence interval