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The Relationship Between Pain and Functional Disability in Black and White Older Adults

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Abstract

In this study we examined pain and disability in 115 community-dwelling, urban, older adults (mean age = 74 years; 52% Black, 48% White). Participants completed a survey of pain (pain presence, intensity, locations, and duration) and disability (Sickness Impact Profile). Sixty percent of the sample reported pain; Black and White adults did not differ on any pain variable. In structural equation models controlling for socioeconomic factors and health, pain did not mediate the relationship between race and disability. Race moderated the pain–disability relationship; pain was more associated with disability among Whites than Blacks. This study highlights the need for greater understanding of health disparities between Black and White older adults as they relate to pain and disability.

Keywords

pain; disability; race; aging; health disparities

Pain is a persistent problem in the daily lives of many older community-dwelling adults (American Geriatrics Society, 2002). Approximately 50% of community-dwelling adults have pain (Herr, 2002), which is largely due to the high prevalence of chronic health problems, such as osteoarthritis, in this population (Helme & Gibson, 2001). Acute conditions such as cancer, cardiovascular disease, and other painful medical diseases and syndromes are also prevalent in this age group (Feldt, Warne, & Ryden, 1998). Pain, from both acute and chronic conditions, is a key indicator of physical impairment; it is associated with depression and decreased physical/social functioning and quality of life (Helme & Gibson; Herr).

Recently, researchers have studied racial and/or ethnic differences in the pain experience, finding that African Americans report more pain, have more untreated pain, and have less access to pain medications (Cintron & Morrison, 2006). Others have reported that Black

Americans have more activity limitations due to pain (Green, Baker, Smith, & Sato, 2003). Few of these studies, however, have been conducted in older adult populations. Thus, we sought to investigate the relationships among race, pain, and functional disability in older adults.

In the cascade model (Kahana, Kahana, Namazi, Kercher, & Stange, 1997), based on the classic biopsychosocial approach proposed by Engle (1962), pain is considered a key factor in the progression (or cascade) from chronic illness to social and physical disability among older adults. Kahana et al. posited that pain has a direct effect on disability (indicated by physical and social activity limitations) and that pain is influenced by demographic characteristics (e.g., age, sex, income, education, marital status) and chronic illness. In a different model, the biocultural model of pain, ethnocultural identity is theorized to influence the experience and expression of pain, and provides a framework for considering the role of race in the pain–disability pathway (Bates, 1987; Bates, Edwards, & Anderson, 1993). Thus, we added race to the cascade model as a predictor of pain and disability, and tested it in a sample of community-dwelling older adults (Fig. 1).

In the pain literature, the terms *race* (i.e., ancestry) and *ethnicity* (i.e., culture) are often used interchangeably, although they are conceptually distinct. For this paper, we use the term *race* because participants were asked to self-identify their race on the survey question (as opposed to ethnic identity). In our literature review, however, we employ terms used by authors to describe their research. Thus inconsistencies in language and spelling (e.g., African American hyphenated or not) reflect discrepancies in this literature. When we reference our own data, we use the terms *Black*, recognizing that many Blacks are not of African heritage, and *White*, to reflect racial group identity without reference to heritage, ancestry, or culture.

RELATIONSHIP BETWEEN PAIN AND FUNCTIONAL DISABILITY

There is ample literature to support the relationship between persistent pain and functional disability among older adults. In many studies, functional disability has been measured as limitations in both physical and social ability (Osborne, Jensen, Ehde, Hanley, & Kraft, 2007; Weiner, Rudy, Morrow, Slaboda, & Lieber, 2006; C. S. Williams, Tinetti, Kasl, & Peduzzi, 2006). Others measured functional disability in physical functioning only (R. R. Edwards, 2006; Reyes-Gibby, Aday, Todd, Cleeland, & Anderson, 2007; Scudds & Robertson, 2000). Physical disability typically refers to impaired performance of Instrumental Activities of Daily Living in studies of older adults (R. R. Edwards, 2006; Lichtenstein, Dhanda, Cornell, Escalante, & Hazuda, 1998; Reyes-Gibby, Aday, & Cleeland, 2002). In a study of community-dwelling Canadian seniors, Scudds and Robertson (2000) reported that 73% of respondents had musculoskeletal pain in the 2 weeks prior to the study, and almost 70% had physical disability. They found that pain-related variables, including more painful body locations, higher pain intensity, greater pain frequency, and more pain medications used, were significantly associated with more physical disability. Lichtenstein et al. also reported that pain intensity was strongly associated with limitations in physical functioning among older adults. In a sample of older adults with osteoarthritis, other investigators reported that pain severity was a stronger determinant of physical disability than structural joint changes (as measured by X-ray; Creamer, Lethbridge-Cejku, & Hochberg, 2000).

A number of researchers have found a relationship between social disability and pain (Bookwala, Harralson, & Parmalee, 2003; Cano, Mayo, & Ventimiglia, 2006; McCracken & Eccleston, 2005; C. S. Williams et al., 2006). Typically, social disability was measured with a psychosocial disability subscale of the Sickness Impact Profile (SIP; Cano et al.;

McCracken & Eccleston), Short Form-36 (SF-36; Dawson et al., 2005; De Filippis et al., 2004) or with the Established Populations of Epidemiologic Studies of the Elderly Interview (C.S. Williams et al.). In the study reported by Dawson and colleagues, persistent pain was related to social functioning when measured longitudinally. The authors concluded that hip or knee pain worsened over time in older adults, and pain severity was related to a decline in social functioning. Bookwala and colleagues measured 21 social and leisure activities over 1 month to examine associations with pain, and reported that people with greater osteoarthritis-related pain had more physical and social disability.

RELATIONSHIPS AMONG RACE, PAIN, AND PAIN-RELATED FUNCTIONAL DISABILITY

Over the past decade, there has been a growing interest in understanding differences in the pain experience of Black Americans and Caucasians (C. L. Edwards, Fillingim, & Keefe, 2001). In several laboratory-based studies researchers have reported significant differences in experimental pain sensitivity among African Americans compared to Caucasians (R. R. Edwards, Doleys, Fillingim, & Lowery, 2001; R. R. Edwards & Fillingim, 1999). In another laboratory-based study, Rahim-Williams et al. (2007) demonstrated significant differences in pain tolerance (using cold pressor and thermal pain) between ethnic groups; African American and Hispanic participants showed lower pain tolerance than non-Hispanic White Americans. This study was conducted in a young student volunteer sample.

In some clinical investigations, African Americans with arthritis reported more severe pain compared to Caucasians/Whites (R.R. Edwards et al., 2001; Golightly & Dominick, 2005), but not in others (Ang, Ibrahim, Burant, & Kwoh, 2003; Riley et al., 2002). Based on data from a pain clinic, Green et al. (2003) found that Black Americans reported significantly higher pain intensity, more suffering associated with pain, and more activity limitations due to pain than did White Americans. In a follow-up study using retrospective clinic data, Baker and Green (2005) examined within-race group differences in the pain experience, comparing young Black Americans to older Black Americans and young White Americans to older White Americans. They concluded that younger participants reported higher pain intensity than older participants within each racial group, but found no within group differences in pain suffering or pain-related disability. The pattern of results was not significantly different between Black and White Americans. Other researchers have indicated that health disparities between Blacks and Whites in America are the widest and most persistent when compared to other racial/ethnic groups (Green, Todd, Lebovits, & Francis, 2006). This highlights the importance of investigating similarities and differences between Blacks and Whites in the pain-disability pathway.

Using national survey data, Reyes-Gibby et al. (2007) examined differences in pain prevalence, pain severity, and pain-related activity limitations between non-Hispanic Whites, non-Hispanic Blacks, and Hispanics in a community-based sample of older adults (≥ 51 years). Significant racial/ethnic group differences were noted: Hispanics reported higher prevalence of pain than the other two groups, Hispanics and Blacks reported more severe usual pain, and Blacks reported more activity limitations due to pain than either Hispanics or Whites. These authors noted that socioeconomic characteristics (e.g., Medicaid recipient or lower education level) were significant predictors of severe pain and helped to explain racial/ethnic differences in pain symptoms. Other researchers have concurred, reporting the importance of socioeconomic differences in the pain experience across the adult age range, particularly with regard to dental pain (Riley, Gilbert, & Heft, 2003; Vargas, Macek, & Marcus, 2000). In a telephone survey of community residing adults with persistent pain, Portenoy, Ugarte, Fuller, and Hass (2004) found that non-Hispanic Blacks and Hispanics reported more severe pain than Whites. In addition, participants with low

income and less than a high school education were more likely to report significant pain. Neither race nor ethnicity predicted disabling pain, but minority participants were more likely to have the socioeconomic indicators associated with functionally limiting pain.

These studies suggest that racial/ethnic characteristics are related to the pain experience. Blacks and Hispanics have reported higher levels of pain, and some evidence suggests that they experience more pain-related functional limitations than Whites. Socioeconomic disadvantage appears, in some findings, to be more important than race in predicting disabling pain.

There is evidence that race does matter; people of minority races are more likely to have their pain severity under-estimated by providers, have more under-treated pain, and have less access to opioids for severe pain (Cintron & Morrison, 2006). Given that race and socioeconomic status (SES) are often confounded, these findings may be more attributable to socioeconomic disadvantage, which limits access to health care and resource-rich environments, than to race.

It should be noted that most of the studies reported were conducted with general adult populations, not with older adults. In fact, in studies reporting participants' ages, the upper cutoff was approximately age 65, generally considered the portal into old age in the aging literature (Maddox, 1995). Among Blacks, chronic health conditions (including those typically associated with pain) are noted at an earlier age compared to Whites (Green et al., 2003), so we elected to include adults aged 60 and over in our study.

The few published clinical studies on this topic have focused on samples of adults recruited from pain clinics, which limits generalizability. Very few researchers have examined relationships between pain and disability in Black and White older adults, and even fewer have controlled for socioeconomic and sociodemographic variables (such as income and education; Reyes-Gibby et al., 2007). Given the prevalence of pain among older adults and the rapidly-aging U.S. population, relationships among race, pain experience, and pain-related disability warrant further investigation.

The purpose of the study was to examine relationships among race (Black or White), pain, and functional disability (physical and social functioning) in older adults. We asked the following research questions:

1. Do self-reported pain (pain sites and pain intensity) and disability (physical and social functional limitations) differ between Black and White older adults?
2. Consistent with the cascade model, does pain mediate the relationship between race (Black or White) and disability, after controlling for other sociodemographic (age, sex, marital status, income, and education) and health (number of limiting diagnoses) variables?
3. Does race (Black or White) moderate the relationship between pain and disability, after controlling for other sociodemographic and health variables?

METHOD

Sample and Setting

A convenience sample was recruited from five senior centers and two churches in a large, racially diverse city in the Midwest in 2000. All seniors present in the facility on the day of the survey were invited to participate. Inclusion criteria were: ≥ 60 years old, willing to participate, and able to provide informed consent. Ability to consent was ascertained by explaining the study to potential participants, who were then asked to describe the study.

Participants were excluded if they were unable to explain the study and provide consent or were unable to complete the survey. Because this was a community-based, volunteer sample, very few participants were excluded on this basis (approximately 5% of participants who expressed interest in the study was unable to consent or complete the survey).

A total of 115 community-dwelling older adults completed the survey. The sample was predominantly female, had an age range of 62–95 years, and was almost equally divided between Black and White older adults (see Table 1). As shown in Table 1, Blacks and Whites differed significantly in several sociodemographic and health variables. Black participants were generally older; more likely to be female, unmarried, and have lower levels of education and income; and more Blacks suffered from functionally limiting medical conditions than Whites in this sample. Thus, these variables were included as covariates in the statistical analyses.

Measures

A paper and pencil questionnaire was developed to assess the main study variables. The measures are described below.

Pain—The presence, intensity, duration, and locations of pain were assessed. Pain presence was measured with the question, “Do you currently have pain?” Response choices were *yes* or *no*. The intensity of pain (in the most painful location) was assessed via a verbal descriptor scale (VDS), an instrument recommended for measuring pain in older adults (Herr, 2002). This tool measures pain intensity by asking participants to select a word that best describes their present pain ([0] *no pain* to [6] *worst pain imaginable*). This measure has been found to be a reliable and valid measure of pain intensity, and it has demonstrated concurrent validity with other pain intensity scales (Taylor & Herr, 2003). In addition, the VDS is easy to complete, rated as most preferred by older adults relative to other pain intensity measures (Herr & Mobily, 1993), and appropriate for use in African American and White American populations (Taylor & Herr). Participants were also asked to indicate how long they had experienced pain in their most painful location. Responses were coded into <1, 1–5, 6–10, 11–15 years, or more than 15 years. The pain map from the McGill Pain Questionnaire (Melzack, 1975) was used to assess pain locations. Pain locations were scored with a transparent template divided into 36 anatomical areas (Escalante, Lichtenstein, White, Rios, & Hazuda, 1995), and a sum score, indicating number of painful locations, was created. This widely used measure has been validated in several epidemiologic studies and has demonstrated high inter-rater reliability (Escalante et al., 1995; Margolis, Tait, & Krause, 1986).

Functional disability—The SIP Short Form (SIP68), one of the most widely used generic measures of health-related functioning, was used to measure physical and social disability. The SIP, originally developed as a broad measure of health-related behavior (Bergner, Bobbit, Carter, & Gilson, 1981), was reported to be valid and reliable (de Bruin, de Witte, Stevens, & Diederiks, 1992), but it was considered to be too lengthy and burdensome for some older adults to complete. The SIP68 has 68 items with 6 subscales: somatic autonomy, mobility control, psychic autonomy, and communication (mental functioning and verbal communication), social behavior, emotional stability, and mobility range (de Bruin, de Witte, & Diederiks, 1994). Psychometric evaluation of the new instrument has been conducted in several studies of adults with chronic disease and revealed high internal consistency reliability for the total scale, as well as high test-retest reliability over periods ranging from 1 week to 3 months (de Bruin, Diederiks, de Witte, Stevens, & Philipsen, 1997; Nanda, McLendon, Andresen, & Armbrrecht, 2003). The SIP has also demonstrated

high reliabilities when used with Blacks and Whites (Cano et al., 2006). In the present study, three subscales of the SIP68 were used, as described below.

Physical functioning was evaluated based on mobility control and mobility range subscales. The mobility control subscale has 12 questions about the level of control an individual has over his or her body. Items address walking and upper extremity control. The mobility range subscale has nine questions about the range of activities a person does to sustain his or her lifestyle, such as “I stay at home most of the time.” For this study, the mobility control and range subscales were combined to create a 21-item general physical functional disability subscale. Response choices for each item are (1) *yes* or (0) *no*. The SIP physical functioning score is a sum of the number of limitations reported by participants, with a possible range of 0–21; higher scores indicate more functional limitations. The Cronbach’s alpha was .89 in this sample.

Social functioning was assessed via the social behavior subscale of the SIP68, which has 11 questions about a person’s social functioning in relation to others and to the community. Sample questions include, “I am doing fewer social activities with groups of people.” Response choices for each item are (1) *yes* or (0) *no*. The SIP social functioning score is a sum of the number of limitations reported by participants, with a possible range of 0–11; higher scores indicate more social functional limitations. The Cronbach’s alpha was .82 in this sample.

Demographic characteristics—Demographic data were collected with a survey that included items regarding age (in years), sex (coded as 0 = *male* and 1 = *female*), level of education (in years), income, and marital status. Race was measured by the question, “What race do you consider yourself?” Education was assessed with a question that ascertained the highest grade of school completed. Educational level scores were recoded into three groups: 1 = less than 12th grade, 2 = high school graduate, or 3 = some college education or more. Marital status was categorized as married or unmarried. Income was assessed as current annual household income on a 16-point categorical scale and re-categorized into the following four groups: 1 = less than \$10,000, 2 = \$10,000–\$29,999, 3 = \$30,000–49,999, and 4 = \$50,000 or more. Missing data on the income variable (19 cases) were estimated using regression-based imputation analyses (Penn, 2007).

Health conditions—To assess health conditions, participants were asked to respond to the question, “Has a doctor or nurse ever told you that you have the following conditions?” A 24-item medical conditions checklist from the Older Americans Resources and Services (OARS) Multidimensional Assessment, a measure widely used in geriatric research, was used as an indicator of health status (George & Fillenbaum, 1985). An expert panel of four advanced practice nurses reviewed the checklist, and identified 12 medical conditions often associated with disability (including physical and social functional limitations). These were coded as functionally limiting medical conditions for subsequent analyses and included vision impairments (cataracts, diabetic retinopathy, and macular degeneration), cardiovascular conditions (angina, myocardial infarction, stroke, and congestive heart failure), arthritis, diabetes, asthma, cancer, and Alzheimer’s disease. A sum score was created to reflect the total number of functionally limiting medical conditions (potential score = 0–12).

Procedure

Approvals were obtained from the two Institutional Review Boards of the two appropriate institutions, where data were collected and analyzed for this study. All printed materials were written at an eighth grade reading level and printed in 14-point font on white paper to

assist participants in reading the text. Most participants read and completed the survey independently, but a few asked for assistance due to writing difficulties. When participants asked for help, the PI or research assistant read the question and response choices aloud verbatim, and recorded the answer verbatim. No prompts were given. If the participants stated they wanted to stop or appeared to have difficulty completing the survey due to reasons other than physical disability, they were thanked for their time and the survey was discontinued. Upon completion (approximately 30 minutes), participants were compensated with \$10.00.

Statistical Analyses

Descriptive statistics were computed to describe sample characteristics. Chi-square analyses and *t* tests were used to examine relationships between race and pain, pain intensity, and functional disability between racial groups. Structural equation modeling (SEM) was used to examine relationships among race, pain, and functional disability.

Modeling approach—Several guidelines in the literature indicate that the sample size of the current analyses ($N = 115$) was sufficient for the relatively simple measurement and structural regression models planned (Bollen, 1989; Kline, 1998; MacCullum, Browne, & Sugawara, 1996; Quintana & Maxwell, 1999). Analyses for research questions 2 (evaluation of pain as a mediator of race effects in disability) and 3 (race as a moderator of the pain–disability relationship) were conducted as structural equation models in a hierarchical model framework. Pain (indicated by measures of pain intensity and number of pain sites) and disability (indicated by scales of physical and social disability) were estimated as latent constructs. Race effects on pain and disability were estimated controlling for other sociodemographic (age, sex, income, education, and marital status) and health (number of limiting diagnoses) variables, to ensure that race effects were estimated in a way relatively unconfounded with other variables. For research question 3 (which addressed whether race moderated the pain–disability relationship, after controlling for other sociodemographic and health variables), a two-group (Blacks and Whites) structural equation model was conducted. A nested model was used to examine whether the pain–function relationship could be constrained to equality in the two groups.

The covariance matrices were analyzed, and maximum likelihood was used as the estimation method because it has been found to be a robust estimation procedure (Hoyle & Panter, 1995; Quintana & Maxwell, 1999). Moreover, full-information maximum likelihood estimation was used, such that each parameter was based on all available data, so no listwise deletion of missing cases was required. Overall model fit was evaluated with incremental fit indices (Hu & Bentler, 1995). Each fit index compares the estimated model to a null (no predictor) model and is generally expected to exceed .90 (Hoyle & Panter, 1995). Individual parameter estimates provided by the program were examined, including the nonnormed fit index (NNFI), the normed fit index (NFI), the relative fit index (RFI), the comparative fit index (CFI), and the incremental fit index (IFI; Bentler, 1989; Bentler & Bonett, 1980; Marsh, Balla, & McDonald, 1988). Chi-square statistics are also reported, with smaller values generally indicative of better reproduction of the input correlation matrix among measures; however, since Chi-square is often inflated by small departures from normality and increasing sample sizes, it was not evaluated as a primary indicator of fit (Tabachnick & Fidell, 2007). Although all models were conducted in covariance metric, results are presented as completely standardized solutions for ease of interpretation.

RESULTS

Descriptive Findings

Pain—Sixty percent of the sample reported experiencing pain. See Table 2 for description.

Functional disability—In this sample, 66 (57.4%) participants reported having physical limitations in at least one item on the physical mobility subscale of the SIP. The most frequently reported limitations were related to walking, such as walking more slowly ($n = 58, 50.4\%$), going up and down stairs more slowly ($n = 56, 48.7\%$), and walking shorter distances ($n = 52, 45.2\%$). In addition, 71 (61.7%) participants indicated they had limitations in at least one area of the social behavior subscale. The most commonly reported social limitations were going out for entertainment less often ($n = 53, 46.1\%$) and doing hobbies and recreation for shorter periods ($n = 52, 45.2\%$). Mean scores for both subscales are presented in Table 2.

Differences in Pain and Disability by Race

Pain—Chi-square analysis and t tests were conducted to examine the association between the presence of pain and race (Black or White); no statistically significant association was found ($\chi^2 = 2.32, df = 1, p = .09$). Blacks and Whites did not differ significantly in intensity ($t = -1.14, df = 44, p = .26$) or duration of self-reported pain ($\chi^2 = 3.68, df = 3, p = .30$), or in the number of pain locations reported ($t = -1.12, df = 67, p = .23$; see Table 2).

Disability—With regard to functional disability, significant differences between Blacks and Whites were noted for both physical limitations ($t = -5.24, df = 113$) and social limitation subscales ($t = -4.03, df = 113$). In both domains, Blacks reported significantly more functional limitations than did Whites (see Table 2).

Pain as a Mediator of the Race–Disability Relationship, Controlling for Sociodemographic and Health Variables

In structural equation models, criteria for mediation can be evaluated simultaneously. Analyses for this question were conducted in three steps. In step one, a fully recursive model was estimated with seven singly-indicated exogenous variables (age, sex, education, income, marital status, number of limiting diagnoses, and race [dichotomously coded as 0 = *White* and 1 = *Black*]). Each of these variables was allowed to have direct effects on both the latent constructs of pain (pain sites + pain intensity) and disability (physical + social functional limitations). In addition, a path was specified from pain to disability; such that the exogenous variables could also have indirect effects on function, mediated through pain. All possible correlations among the seven exogenous predictors were freely estimated. The fit of this first model was generally good: $\chi^2(15) = 24.16, p = .06$, NNFI = .92, NFI = .95, RFI = .82, IFI = .98, CFI = .98. Along with a non-significant Chi-square statistic, the fit indices were uniformly excellent. Chi-square statistics were used to permit a nested model test with the subsequent model.

In step two, a reduced-form equation was estimated in which the path from race to pain was eliminated. Based on the previous descriptive analyses, we expected that race and pain would not be related. Thus, a statistical comparison of the two nested models would provide a test of whether any of the race effect on disability was mediated through pain. The fit of this second model was virtually identical to the preceding model: $\chi^2(16) = 25.79, p = .06$, NNFI = .92, NFI = .95, RFI = .82, IFI = .98, CFI = .98. A nested model test (Chi-Square difference between models) revealed that the elimination of the race-pain path did not significantly reduce model fit: $\chi^2(1) = 1.63, p = .20$. Thus, while race was a significant direct predictor of disability, pain did not mediate the relationship between race and disability.

In a third step, we noted that, after controlling for all exogenous variables, the unique relationship between race and disability was no longer statistically significant. Therefore, we eliminated the direct path from race to disability and recomputed the model. Again, the fit of this model was virtually unchanged: $\chi^2(17) = 28.45, p = .04$, NNFI = .92, NFI = .94, RFI = .88, IFI = .98, CFI = .97. A nested model test between the second and third models showed that elimination of the race–disability path did not significantly worsen the model fit ($\chi^2[1] = 2.66, p = .10$). We also compared this final reduced model to the original model (in which race had direct effects on both pain and disability), and the elimination of all direct effects of race did not significantly reduce the model fit ($\chi^2[2] = 4.29, p = .12$).

The final accepted model, with standardized coefficients, is shown in Figure 2. Significant coefficients are indicated in bold text. Additional findings from the model indicated that having more functionally limiting medical diagnoses was associated with increased pain; no other demographic or socioeconomic variables showed significant direct effects on pain. Males and those with lower education and more functionally limiting diagnoses had significantly more functional disability. In addition, more pain was associated with significantly more disability. The model explained 16% of the reliable variance in pain, and 61% of the reliable variance in disability.

Pain as a Moderator of the Race–Disability Relationship, Controlling for Sociodemographic and Health Variables

To examine whether race moderated the relationship between pain and disability, a two-group model was conducted. The sample was split into Black and White sub-samples. Age, sex, education, income, marital status, and limiting diagnoses were treated as exogenous variables and were allowed to have direct effects on pain and disability. A path from pain to disability was again specified, so that sociodemographic and health variables could have both direct and indirect (mediated through pain) effects on disability. To facilitate group comparisons, invariant indicator loadings on the pain and disability factors were assumed. Two model steps were estimated. In Step 1, the pain–disability path was constrained to equality in Black and White groups; the fit of this model was good: $\chi^2(29) = 44.08, p = .04$, NNFI = .85, NFI = .89, IFI = .96, CFI = .95. In Step 2, the pain–disability path was allowed to vary between groups; the fit of this model was $\chi^2(28) = 38.52, p = .09$, NNFI = .88, NFI = .90, IFI = .97, CFI = .97. The difference between the two models was not significant [$\chi^2(1) = 5.56, p = .01$], indicating that a hypothesis of invariant pain–disability relationships in Black and White participants was not supported. Race moderated the pain–disability relationship. The standardized pain–disability path was .81 in Whites and .18 in Blacks. To verify that these differences reflected true trends in the data and were not just disattenuated artifacts of the modeling procedure, we inspected the original bivariate correlations between the pain and disability indicators separately for the two race groups. These correlation coefficients are shown in Table 3; values in the left two columns are for Blacks and in the right two columns, for Whites. Even when attenuated by measurement error and at the indicator level, pain had a much stronger relationship with disability in Whites than in Blacks.

DISCUSSION

These findings highlight important information about relationships among pain, race, and disability in community-dwelling older adults. Pain is a common problem, and its high prevalence (60%) in this sample of individuals over 60 years of age is consistent with epidemiological studies of pain (Reyes-Gibby et al., 2007). Pain was significantly associated with greater functional disability in both physical and social functional domains, highlighting the important real-world consequences of living with pain.

Contrary to previous research, race was not related to pain in this sample. In bivariate analyses, Black and White participants were equally likely to report experiencing pain and described equivalent pain intensity, pain duration, and number of pain locations. This lack of a significant association between race and pain persisted after controlling for demographic, health, and socioeconomic indicators in structural equation models.

There are several possible explanations for these discrepant findings. First, studies supporting racial differences in pain have been primarily laboratory-based. In these investigations, Blacks consistently report more pain than Whites (Edwards & Fillingim, 1999; Rahim-Williams et al., 2007). Laboratory pain, however, is intrinsically different from clinical pain, because it is experimentally induced with a known stimulus type and amount, is short-term acute pain, and is scheduled to end within a relatively short time frame. This is markedly different from pain associated with a disease condition or medical procedure (e.g., post-surgical pain) in which the course of the pain is often less predictable and, especially among older adults, more persistent (e.g., arthritic pain). Second, the few published investigations of relationships between race and pain have focused on younger populations, and results have been equivocal (C. L. Edwards et al., 2001). Third, most researchers have investigated racial differences in pain clinic populations. These individuals, by definition, have persistent and/or severe pain that has not responded to usual care, and it has been documented that Blacks are under-treated for pain relative to non-Blacks (Cintron & Morrison, 2006; Green, Baker, & Ndao-Brumblay, 2004), a fact likely to have exacerbated their pain experience. Consequently, Blacks who seek specialized treatment from a pain clinic are likely to have substantially worse pain than their White peers. Therefore, differences in pain experience between Blacks and Whites using pain clinics may be more pronounced than in the general population. Fourth, the finding that Black or White race was not associated with pain in this study may reflect measurement differences. In this study, we examined the role of race—as measured by self declared racial category of Black or White—and not ethnicity. It may be that ethnicity or ethnic identity, as noted by Rahim-Williams et al. (2007), is a more important predictor of pain. This is a potentially important distinction that should be addressed in future research. Finally, it is possible that in non-clinical populations, differences between racial groups in the experience of pain are less important than differences within racial groups. Future researchers should examine variability in the pain experience within racial groups, as suggested by Baker and Green (2005).

While race was unrelated to pain in this study, it had an association with disability, with Blacks reporting disproportionately more physical and social disability than Whites. This undoubtedly reflects socioeconomic and health disparities between these two racial groups; Blacks had lower education and income, were older, and had more functionally limiting diagnoses than did Whites. Findings reflect the ongoing health and socioeconomic disparities between Blacks and Whites in the literature (Betancourt, 2006; Portenoy et al., 2004; D. R. Williams, 2005), and this is supported by results of the structural equation models. When race, socioeconomic, demographic, and health variables were considered simultaneously, race no longer had a significant direct effect on disability in this sample. This indicates that race is less important in predicting disability in older adults than the socioeconomic disparities for which Black or White race is a proxy. Because race was unrelated to both the dependent variable (disability) and the mediator (pain) in these models, no evidence supported pain as a mediator in the race–disability relationship. The cascade model, used as the theoretical foundation for this study, did not explain the pathway from race or other sociodemographic variables to pain and disability outcomes. Instead, only the presence of more functionally limiting medical conditions was significantly associated with pain, a finding that is consistent with other studies (Leong, Farrell, Helme,&Gibson, 2007). More theoretical work is needed to understand and explain the mechanisms by which race

and other sociodemographic indicators influence pain and disability in older adult populations.

There was a robust relationship between pain and disability in this study. This relationship persisted in both the bivariate and multivariate analyses. Even after controlling for SES and health factors, more pain was associated with greater physical and social limitations. This finding highlights the importance of pain in the daily lives of older adults and the need to effectively assess and treat pain to avoid exacerbating or causing functional or social limitations.

The relationship between pain and disability differed for Blacks and Whites. Race was a significant moderator of the pain–disability relationship; that is, the impact of more pain (greater severity and number of painful body locations) on physical and social limitations was worse for Whites than for Blacks. This may reflect racial group differences in the experience of living with pain and other health conditions throughout the lifespan; Blacks may be more used to living with adversity, and pain may be less salient factor in their daily functioning. The health disparities literature indicates that Black adults experience the onset of chronic diseases, including those associated with disability, at a younger age than Whites (Geronimus, 2001). Consequently, disability may be normalized in the daily experience of Blacks and less likely to be attributed to pain. In contrast, the effect of pain on functional status in Whites may be more noticeable because it is a more recent phenomena and an obvious deviation from their normal condition. These differential findings may also reflect differences in coping strategies and coping effectiveness, as well as other possible characteristics such as hardiness and resilience.

Several limitations of this study should be noted. First, we examined the role of race, measured by racial category, not ethnicity. Our convenience sample of modest size, recruited from churches and senior centers in one urban metropolitan area in the Midwest, limited to those able to participate in community-based activities, may have excluded housebound or more functionally impaired older adults. The non-randomly selected sample was not fully representative of the older adult population. Finally, several variables might have been overlooked in this cross-sectional study. Participants were not asked, for example, if they had taken pain medications prior to being interviewed about their pain, potentially altering their pain descriptions. If analgesics were used (but not assessed), the prevalence of pain reported in this study is an underestimate, and the impact of pain on disability may actually be more pronounced than we detected.

Findings from this study indicate that race, reflected by Black or White identification, did not influence characteristics of pain in a general, non-clinic population of older adults. Pain had negative consequences for daily functioning of this population, a finding more apparent in Whites than Blacks. This emphasizes the need for better understanding of health disparities between older adults of different races as these disparities relate to pain and disability. It also highlights the need for more comprehensive assessment of ethnicity and cultural identity to fully understand the pain experiences of older adults.

REFERENCES

- American Geriatrics Society Panel on Persistent Pain in Older Persons. Clinical practice guidelines: The management of persistent pain in older persons. *Journal of the American Geriatrics Society* 2002;50:1–20. [PubMed: 12028236]
- Ang DC, Ibrahim SA, Burant CJ, Kwok CK. Is there a difference in the perception of symptoms between African Americans and Whites with osteoarthritis? *Journal of Rheumatology* 2003;30:1305–1310. [PubMed: 12784407]

- Baker TA, Green CR. Intra-race differences among Black and White Americans presenting for chronic pain management: The influence of age, physical health, and psychosocial factors. *Pain Medicine* 2005;6:29–38. [PubMed: 15669948]
- Bates MS. Ethnicity and pain: A biocultural model. *Social Science and Medicine* 1987;24:47–50. [PubMed: 3823996]
- Bates MS, Edwards WT, Anderson KO. Ethnocultural influences on variation in chronic pain perception. *Pain* 1993;52:101–112. [PubMed: 8446431]
- Bentler, PM. EQS structural equations manual. Los Angeles: BMDP Statistical Software; 1989.
- Bentler PM, Bonett DG. Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin* 1980;88:588–606.
- Bergner M, Bobbit RA, Carter WB, Gilson BS. The Sickness Impact Profile: Development and final evaluation of a health status measure. *Medical Care* 1981;19:787–805. [PubMed: 7278416]
- Betancourt JR. Eliminating racial and ethnic disparities in health care: What is the role of academic medicine? *Academic Medicine* 2006;81:788–792. [PubMed: 16936481]
- Bollen, KA. Structural equations with latent variables. New York: Wiley Interscience; 1989.
- Bookwala J, Harralson TL, Parmelee PA. Effects of pain on functioning and well-being in older adults with osteoarthritis of the knee. *Psychology and Aging* 2003;18:844–850. [PubMed: 14692869]
- Cano A, Mayo A, Ventimiglia M. Coping, pain severity, interference, and disability: The potential mediating and moderating roles of race and education. *The Journal of Pain* 2006;7:459–468. [PubMed: 16814685]
- Cintron A, Morrison RS. Pain and ethnicity in the United States: A systematic review. *Journal of Palliative Medicine* 2006;9(6):1454–1473. [PubMed: 17187552]
- Creamer P, Lethbridge-Cejku M, Hochberg MC. Factors associated with functional impairment in symptomatic knee osteoarthritis. *Rheumatology* 2000;39:490–496. [PubMed: 10852978]
- Dawson J, Linsell L, Zondervan K, Rose P, Carr A, Randall T, et al. Impact of persistent hip or knee pain on overall health status in elderly people: A longitudinal population study. *Arthritis and Rheumatism* 2005;53:368–374. [PubMed: 15934104]
- de Bruin AF, Diederiks JPM, de Witte LP, Stevens FCJ, Philipsen H. Assessing the responsiveness of a functional status measure: The Sickness Impact Profile versus the S IP68. *Journal of Clinical Epidemiology* 1997;50:529–540. [PubMed: 9180645]
- de Bruin AF, de Witte LP, Diederiks JPM. The Sickness Impact Profile: SIP68 a short generic version: First evaluation of the reliability and reproducibility. *Journal of Clinical Epidemiology* 1994;47:863–871. [PubMed: 7730889]
- de Bruin AF, de Witte LP, Stevens F, Diederiks JPM. Sickness Impact Profile: The state of the art of a generic functional status measure. *Social Science and Medicine* 1992;35:1003–1014. [PubMed: 1411695]
- De Filippis LG, Gulli S, Caliri A, D'Avola G, Lo Gullo R, Morgante S, et al. Factors influencing pain, physical function and social functioning in patients with osteoarthritis in Southern Italy. *International Journal of Clinical Pharmacology and Research* 2004;24:103–109.
- Edwards CL, Fillingim RB, Keefe F. Race, ethnicity and pain. *Pain* 2001;94:133–137. [PubMed: 11690726]
- Edwards RR. Age differences in the correlates of physical functioning in patients with chronic pain. *Journal of Aging and Health* 2006;16:56–69. [PubMed: 16470966]
- Edwards RR, Doleys DM, Fillingim RB, Lowery D. Ethnic differences in pain tolerance: Clinical implications in a chronic pain population. *Psychosomatic Medicine* 2001;63:316–323. [PubMed: 11292281]
- Edwards RR, Fillingim RB. Ethnic differences in thermal pain responses. *Psychosomatic Medicine* 1999;61:346–354. [PubMed: 10367615]
- Engle, G. Psychological development in health and disease. Philadelphia: Saunders; 1962.
- Escalante A, Lichtenstein MJ, White K, Rios N, Hazuda HP. Reliability and validity of a method for scoring the pain map of the McGill Pain Questionnaire for use in epidemiologic studies of the elderly. *Aging: Clinical Experimental Research* 1995;7:358–366.

- Feldt KS, Warne MA, Ryden MB. Examining pain in aggressive cognitively impaired older adults. *Journal of Gerontological Nursing* 1998;24:14–22. [PubMed: 10392090]
- George LK, Fillenbaum GG. OARS methodology: A decade of experience in geriatric assessment. *Journal of the American Geriatrics Society* 1985;33:607–615. [PubMed: 4031339]
- Geronimus AT. Understanding and eliminating racial inequalities in women's health in the United States: The role of the weathering conceptual framework. *Journal of American Medical Women's Association* 2001;56:133–136.
- Golightly YM, Dominick KL. Racial variations in self-reported osteoarthritis symptom severity among veterans. *Aging: Clinical and Experimental Research* 2005;17:264–269. [PubMed: 16285190]
- Green CR, Baker TA, Ndao-Brumblay SK. Patient attitudes regarding healthcare utilization and referral: A descriptive comparison in African and Caucasian Americans with chronic pain. *Journal of the National Medical Association* 2004;96:31–42. [PubMed: 14746352]
- Green CR, Baker TA, Smith EM, Sato Y. The effect of race in older adults presenting for chronic pain management: A comparative study of Black and White Americans. *The Journal of Pain* 2003;4:82–90. [PubMed: 14622719]
- Green CR, Todd KH, Lebovits A, Francis M. Disparities in pain: Ethical issues. *Pain Medicine* 2006;7:530–533. [PubMed: 17112365]
- Helme RD, Gibson SJ. The epidemiology of pain in elderly people. *Clinics in Geriatric Medicine* 2001;17:417–431. [PubMed: 11459713]
- Herr K. Chronic pain: Challenges and assessment strategies. *Journal of Gerontological Nursing* 2002;28:20–27. [PubMed: 11829221]
- Herr KA, Mobily PR. Comparison of selected pain assessment tools for use with the elderly. *Applied Nursing Research* 1993;6:39–46. [PubMed: 8439177]
- Hoyle, RH.; Panter, AT. Writing about structural equation models. In: Hoyle, RH., editor. *Structural equation modeling: Concepts, issues, and applications*. Thousand Oaks, CA: Sage; 1995. p. 158-176.
- Hu, L.; Bentler, PM. Evaluating model fit. In: Hoyle, RH., editor. *Structural equation modeling: Concepts, issues, and applications*. Thousand Oaks, CA: Sage; 1995. p. 76-99.
- Kahana, B.; Kahana, E.; Namazi, K.; Kercher, K.; Stange, K. The role of pain in the cascade from chronic illness to social disability and psychological distress in late life. In: Turk, DC.; Melzack, R., editors. *Handbook of pain assessment*. New York: Guilford; 1997. p. 185-206.
- Kline, R. *Principles and practice of structural equation modeling*. New York: Guilford Press; 1998.
- Leong IY, Farrell MJ, Helme RD, Gibson SJ. The relationship between medical comorbidity and self-rated pain, mood disturbance, and function in older people with chronic pain. *Journal of Gerontology: Medical Sciences* 2007;62A:M550–M555.
- Lichenstein MJ, Dhanda R, Cornell JE, Escalante A, Hazuda HP. Disaggregating pain and its effect on physical functional limitations. *Journal of Gerontology: Medical Sciences* 1998;53A:M361–M371.
- MacCullum RC, Browne M, Sugawara H. Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods* 1996;1:130–149.
- Maddox, GL. *The encyclopedia of aging*. 2nd edn. New York: Springer; 1995.
- Margolis RB, Tait RC, Krause SJ. A rating system for use with patient pain drawings. *Pain* 1986;24:57–65. [PubMed: 2937007]
- Marsh HW, Balla JR, McDonald RP. Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. *Psychological Bulletin* 1988;103:391–410.
- McCracken LM, Eccleston C. A prospective study of acceptance of pain and patient functioning with chronic pain. *Pain* 2005;118:164–169. [PubMed: 16203093]
- Melzack R. The McGill Pain Questionnaire: Major properties and scoring methods. *Pain* 1975;1:277–299. [PubMed: 1235985]
- Nanda U, McLendon PM, Andresen EM, Armbrrecht E. The SI P68: An abbreviated sickness impact profile for disability outcomes research. *Quality of Life Research* 2003;12:583–595. [PubMed: 13677503]

- Osborne TL, Jensen MP, Ehde DM, Hanley MA, Kraft G. Psychosocial factors associated with pain intensity, pain-related interference, and psychological functioning in persons with multiple sclerosis and pain. *Pain* 2007;127:52–62. [PubMed: 16950570]
- Penn DA. Estimating missing values from the General Social Survey: An application of multiple imputation. *Social Science Quarterly* 2007;88:573–584.
- Portenoy RK, Ugarte C, Fuller I, Hass G. Population-based survey of pain in the United States: Differences among White, African American, and Hispanic subjects. *The Journal of Pain* 2004;5:317–328. [PubMed: 15336636]
- Quintana SM, Maxwell SE. Implications of recent developments in structural equation modeling for counseling psychology. *The Counseling Psychologist* 1999;27:485–527.
- Rahim-Williams FB, Riley JL, Herrera D, Campbell CM, Hastie BA, Fillingim RB. Ethnic identity predicts experimental pain sensitivity in African American and Hispanics. *Pain* 2007;129:177–184. [PubMed: 17296267]
- Reyes-Gibby CC, Aday L, Cleeland C. Impact of pain on self-rated health in the community-dwelling older adults. *Pain* 2002;95:75–82. [PubMed: 11790469]
- Reyes-Gibby CC, Aday L, Todd KH, Cleeland CS, Anderson KO. Pain in aging community-dwelling adults in the United States: Non-Hispanic Whites, Non-Hispanic Blacks, and Hispanics. *The Journal of Pain* 2007;8:75–84. [PubMed: 16949874]
- Riley JL, Gilber GH, Heft MW. Socioeconomic and demographic disparities in symptoms of orofacial pain. *Journal of Public Health and Dentistry* 2003;63:166–173.
- Riley JL, Wade JB, Myers CD, Sheffield D, Papas RK, Price DD. Racial/ethnic differences in the experience of chronic pain. *Pain* 2002;100:291–298. [PubMed: 12468000]
- Scudds RJ, Robertson JM. Pain factors associated with physical disability in a sample of community-dwelling senior citizens. *Journal of Gerontology: Medical Sciences* 2000;55A:M393–M399.
- Tabachnick, BG.; Fidell, LS. *Using multivariate statistics*. 5th edn. Boston, MA: Pearson/Allyn & Bacon; 2007.
- Taylor LJ, Herr K. Pain intensive assessment: A comparison of selected pain intensity scales for use in cognitively intact and cognitively impaired African American older adults. *Pain Management Nursing* 2003;4:87–95. [PubMed: 12836153]
- Vargas CM, Macek MD, Marcus SE. Sociodemographic correlates of tooth pain among adults: United States, 1989. *Pain* 2000;85:87–92. [PubMed: 10692606]
- Weiner DK, Rudy TE, Morrow L, Slaboda J, Lieber S. The relationship between pain, neuropsychological performance, and physical function in community-dwelling older adults with chronic low back pain. *Pain Medicine* 2006;7:60–70. [PubMed: 16533199]
- Williams CS, Tinetti ME, Kasl SV, Peduzzi PN. The role of pain in the recovery of instrumental and social functioning after hip fracture. *Journal of Aging and Health* 2006;18:743–762. [PubMed: 16980638]
- Williams DR. The health of U.S. racial and ethnic populations. *Journals of Gerontology: Series B* 2005;60B:53–62.

FIGURE 1.
Conceptual model.

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$, ^a fixed parameter for solution scaling

Correlations among exogenous predictors:

	(1) Education	(2) Income	(3) Age	(4) Sex	(5) # Limiting Diagnoses	(6) Race	(7) Marital Status
(1)	1.00						
(2)	0.496***	1.00					
(3)	-0.279*	-0.314**	1.00				
(4)	-0.044	-0.246*	0.105	1.00			
(5)	-0.141	-0.160	0.149	0.247*	1.00		
(6)	-0.496***	-0.578***	0.221*	0.190*	0.245*	1.00	
(7)	0.186*	0.565***	-0.247*	-0.331**	-0.140	-0.416***	1.00

FIGURE 2.
Final structural model.

Table 1

Sample Characteristics, Overall (N = 115) and by Race

Characteristic	Category	Total Sample, n (%)	By Race		
			Black, n (%)	White, n (%)	p
Race ^a	Black	60 (52.2%)			
	White	55 (47.8%)			
Sex	Male	26 (22.6%)	9 (15%)	17 (30.9%)	p < .05
	Female	89 (77.4%)	51 (85%)	38 (69.1%)	
Marital status	Married	34 (29.6%)	7 (11.7%)	27 (49.1%)	p < .001
	Unmarried	80 (69.5%)	53 (88.3%)	27 (49.1%)	
	Missing	1 (.9%)	0	1 (1.8%)	
Education	< HS Graduate	38 (33%)	34 (56.7%)	4 (7.3%)	p < .001
	HS Graduate	41 (35.7%)	14 (23.3%)	27 (49.1%)	
	≥ College	35 (30.4%)	12 (20%)	23 (41.8%)	
	Missing	1 (.9%)	0	1 (1.8%)	
Income	Under \$10,000	40 (34.8%)	34 (56.7%)	6 (10.9%)	p < .001
	\$10,000–\$29,999	43 (37.4%)	14 (23.3%)	29 (52.7%)	
	\$30,000–\$49,999	10 (8.7%)	1 (1.7%)	9 (16.4%)	
	Over \$50,000	3 (2.6%)	0	3 (5.5%)	
	Missing	19 (16.5%)	11 (18.3%)	8 (14.5%)	
Age	Mean (SD)	74 (7.3)	76 (7.9)	72 (6.1)	p < .05
Limiting diagnoses	Mean (SD)	1.7 (0.7)	1.9 (0.8)	1.5 (0.7)	p < .01

^aParticipants self-identified their race from eight categories: Black/African American, White/Caucasian, Asian, Native Hawaiian/Pacific Islander, American Indian/Alaskan Native, Hispanic, Arabic, and other (open ended). No respondents selected any category other than Black or White.

Table 2

Description of Pain and Disability, Overall Sample and by Race (N = 115)

	By Race				<i>p</i>
	Category	Total Sample, <i>n</i> (%)	Black (<i>n</i> = 60), <i>n</i> (%)	White (<i>n</i> = 55), <i>n</i> (%)	
Pain					
Pain presence	Yes	69 (60%)	40 (66.7%)	29 (52.7%)	n.s.
	No	46 (40%)	20 (33.3%)	26 (47.3%)	
Pain duration	0	46 (40%)	20 (33.3%)	26 (47.3%)	n.s.
	< 1 year	22 (19.1%)	16 (26.7%)	6 (10.9%)	
	1–5 years	31 (27.0%)	17 (28.3%)	14 (25.5%)	
	6–10 years	8 (7.0%)	4 (6.7%)	4 (7.3%)	
	≥ 11 years	8 (7.0%)	3 (5.0%)	5 (9.1%)	
Pain intensity (range = 0–6)	Mean (<i>SD</i>)	2.9 (1.0)	2.8 (0.8)	3.0 (1.2)	n.s.
# of pain locations (range = 0–8)	Mean (<i>SD</i>)	2.0 (2.5)	1.2 (1.0)	1.0 (1.0)	n.s.
Pain regions ^a	Upper extremities	50 (72.5%)	32 (80.0%)	18 (62.1%)	n.s.
	Lower extremities	26 (37.7%)	16 (40.0%)	10 (34.5%)	n.s.
	Back	23 (33.3%)	13 (32.5%)	10 (34.5%)	n.s.
	Head	7 (10.1%)	4 (10.0%)	3 (10.3%)	n.s.
	Abdomen	9 (13.0%)	4 (10.0%)	5 (17.2%)	n.s.
	Hip	10 (14.5%)	6 (15.0%)	4 (13.8%)	n.s.
Disability					
Physical limitations (scale = 0–21)	Mean (<i>SD</i>)	5.8 (4.1)	7.6 (4.3)	3.9 (3.0)	<i>p</i> < .001
Social limitations (scale = 0–11)	Mean (<i>SD</i>)	4.1 (2.6)	5.0 (2.7)	3.1 (2.2)	<i>p</i> < .001

^aFrequencies are shown for those who reported pain (*n* = 69). Note that participants could report pain in more than one region of the body.

Table 3

Bivariate Correlations Between Pain and Disability Indicators, by Race

	Black (<i>n</i> = 60)		White (<i>n</i> = 55)	
	Physical Limitations	Social Limitations	Physical Limitations	Social Limitations
Pain intensity	.23	.16	.62***	.30*
Pain locations	.13	.08	.59***	.22

*
 $p < .05$.***
 $p < .001$.