

## PAIN & AGING SECTION

# More than Hurt Feelings: The Wear and Tear of Day-to-Day Discrimination in Adults with Chronic Pain

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### Abstract

**Objective.** To examine the extent to which self-reported experiences of discrimination are associated with pain interference among men and women with chronic non-cancer pain. **Methods.** Data are from the Study of Midlife in the United States (MIDUS) Refresher Cohort. The analytic sample consisted of 207 adults with chronic pain ( $54.2 \pm 12.8$  years; 53.6% female) who completed the Major Experiences of Discrimination and Everyday Discrimination scales. Regression analyses examined cross-sectional relations between discrimination and pain interference. **Results.** On average, the level of pain interference was moderate in the sample (mean = 3.46, standard deviation = 2.66; observed range 0–10). Approximately a third of respondents reported at least one major discriminatory event in their lifetime, while 22% reported three or more discriminatory lifetime events. Everyday discrimination scores averaged  $14.19 \pm 5.46$  (observed range 0–33). With adjustment for sociodemographics, physical health, cognitive and psychological factors, social isolation, and loneliness, everyday discrimination was associated with increased pain interference ( $B = 0.099$ ; 95% confidence interval [CI]: 0.02 to 0.17). **Conclusion.** These findings add weight to the importance of day-to-day experiences of interpersonal discrimination by documenting independent associations with functional interference in adults with chronic pain.

**Key Words:** Everyday Discrimination; Chronic Pain; Pain Interference; Disability

### Introduction

It is estimated that 70 million Americans—more than the number affected by diabetes, heart disease, and cancer combined—suffer from chronic non-cancer pain [1]. With an increased prevalence among persons 65 years of age and over [2], chronic pain constitutes a significant health burden, not just in terms of pain-related health care expenditures, but also in terms of the inestimable costs to families' and individuals' daily living and quality of life. A general measure of chronic pain disability [3], pain interference (the extent to which pain intrudes in

one's daily life), is associated with greater disability, sleep impairment, and psychosocial difficulties [4–6], as well as an increased prevalence of mental health disorders, including depression, anxiety, and substance abuse [7, 8].

Biopsychosocial models highlight the role of stressful life events in the experience of chronic pain [9, 10]. Furthermore, emerging evidence suggests that repeated experiences of discrimination may be a source of chronic stress that can lead to the onset and exacerbation of psychological and physical difficulties associated with chronic pain [11, 12]. Whereas *major discrimination*

refers to acute, episodic experiences of discrimination across a variety of life domains, such as being unfairly denied a promotion or being unfairly prevented from moving into a neighborhood, *everyday discrimination* captures the range of chronic, day-to-day experiences of discrimination, such as being followed around in stores or being treated with less courtesy or respect than others [13, 14]. A study of African American veterans found that experiences of major discrimination were associated with higher levels of pain severity and interference [11]. An analysis of the National Latino and Asian American Study found that everyday interpersonal discrimination was a significant predictor of chronic back and neck problems [12]. Additionally, findings from a recent prospective analysis of middle-aged adults demonstrated that greater perceived discrimination was associated with an increased likelihood of developing chronic pain [15]. Taken together, these findings suggest that greater reported levels of major institutional and day-to-day interpersonal discrimination contribute to chronic pain morbidity.

The association of discrimination and pain interference has not been investigated extensively. Both major and day-to-day experiences of discrimination have been associated with greater clinical pain interference [11, 15, 16], but a key scientific question is whether these different forms of discrimination are independent, each contributing to increased risk of poor outcomes among individuals with chronic pain. We therefore investigated the associations of major and day-to-day interpersonal discrimination with pain interference in a sample of adults with chronic pain. Given that pain interference evaluations are affected by negative emotionality [7, 17], cognitive functioning [18, 19], and perceived social support [6, 20], we also assessed the extent to which discrimination is associated with pain interference above and beyond shared variance with neuroticism, anxiety and depressive symptoms, cognitive functioning, and objective and subjective measures of social isolation.

## Methods

### Participants

Data for the present study came from the Study of Midlife in the United States (MIDUS) Refresher Cohort collected between 2012 and 2016. The overarching goal of the MIDUS Refresher study was to replenish the original MIDUS I baseline cohort by recruiting a national probability sample of adults to explore behavioral and psychosocial factors that impact health and well-being. Respondents were selected through random digit dialing from the 48 contiguous U.S. states to constitute a nationally representative sample of adults. All participants were noninstitutionalized, English-speaking adults who were surveyed via telephone and completed self-administered questionnaires that included assessments of

health and psychosocial measures (MIDUS Refresher website: <http://midus.wisc.edu/refresher>). Because MIDUS Refresher is a multi-project study, sample sizes varied depending on which project (Survey, Cognitive, Biomarker) included measurement of each variable. For the present study, respondents were included in the analyses if they endorsed having chronic pain (i.e., “pain that persists beyond the time of normal healing and has lasted from a few months to many years”) and had data for sociodemographics, physical health, cognitive factors, psychological factors, and interpersonal factors. Two-hundred seven participants provided complete data for the present analysis. Comparison of the analytic sample and those omitted from analysis for incomplete data indicated that the analytic sample had significantly higher levels of education,  $t(909) = 5.07$ ,  $P < 0.0001$ , and income,  $t(866) = 5.42$ ,  $P < 0.05$ , than those in the larger chronic pain sample. There were no significant differences between the two samples in the distribution of age, gender, or race. With regard to differences in variables within the MIDUS Refresher projects, there were no significant differences between the two samples in reported levels of pain interference, major discrimination, or everyday discrimination. Furthermore, the two samples did not differ in any of the primary physical health, cognitive, psychological, or interpersonal covariates. The final analytic sample included 207 adults: 96 men (46.4%) and 111 women (53.6%). The average age was 54.15 years (standard deviation = 12.77), and the majority (81%) were White.

## Measures

### Pain Interference

We assessed participants' pain interference across five domains (general activity, mood, relationships with others, sleep, and enjoyment of life during the past week) with the Brief Pain Inventory (BPI) [21]. Pain interference in each of these domains was rated on an 11-point Likert scale from 0 (not at all) to 10 (completely). Items were averaged to obtain an overall score for chronic pain interference, with higher scores reflecting greater interference (Cronbach's  $\alpha = 0.92$ ).

### Daily Interpersonal Discrimination

The nine-item Detroit Area Study Everyday Discrimination Scale [22] was used to assess participants' reports of everyday interpersonal discrimination. Respondents reported on the frequency of various forms of interpersonal discrimination in their daily lives. Items included being treated with less courtesy or respect than others; receiving poorer service than others at restaurants or stores; being called names, insulted, threatened, or harassed; having people act afraid of the respondent; having people act as if the respondent was dishonest, not smart, or not as good as they were. The frequency of each type of mistreatment was assessed on a four-point

scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often). Responses to the nine items were summed to yield a total score, with higher scores reflecting greater daily interpersonal discrimination (Cronbach's  $\alpha = 0.92$ ).

### Major Discrimination

Participants' reports of major discrimination were assessed across 11 settings that included academics (discouraged from continuing education, denied scholarship), employment (not hired or promoted, fired), financial services (denied a bank loan, prevented from renting or buying a home, given inferior service or medical care), and experiences of social hostility (forced out of a neighborhood, hassled by the police) [23]. Because of high skewness in the data, we calculated a summary index of lifetime mistreatment by recoding responses into three categories (none, 1–2 instances, 3 or more instances), similar to previous MIDUS studies of discrimination [24, 25]. Cronbach's alpha was not calculated because this scale is based on causal indicators whose intercorrelations may be positive, negative, or zero [26].

### Covariates

Sociodemographics, physical health, and cognitive, psychological, and interpersonal covariates were included in models to account for confounding influences. Sociodemographic covariates included age (in years), gender (reference: male), household income (in quintiles), and highest educational level completed (1 = high school or less; 2 = some college or above). Physical health covariates included self-reported number of chronic conditions, prescription medication use for pain in the prior month (yes/no), and global sleep quality (Pittsburgh Sleep Quality Index) [27]. Psychological and cognitive covariates included depression (Center for Epidemiologic Studies Depression Scale) [28] and anxiety symptoms (Mood and Anxiety Symptom Questionnaire) [29], neuroticism (moody, nervous, worrying, calm [reversed]), and executive and episodic memory (Brief Test of Adult Cognition by Telephone) [30]. Interpersonal covariates included social isolation and loneliness. For social isolation, an index was created by assigning one point if the respondent had less than monthly contact (including face-to-face, telephone, or written/e-mail contact) with each of children, other family members, and friends. Scores ranged from 0 to 3, with higher scores indicating greater social isolation. Loneliness was assessed with the UCLA Loneliness Scale [31].

### Statistical Analysis

Regression analyses examined the association between self-reported experiences of discrimination and pain interference, with adjustment for the effects of covariates described above. Six models were fitted in all. In the base model, pain interference scores were regressed separately on day-to-day discrimination and lifetime discrimination,

with omission of any covariates. This model provides a comparison of results obtained through the use of multiple predictors with those obtained from simpler, univariate analyses in which the outcome is regressed separately on each predictor variable [32]. Model 1 included both day-to-day and major discrimination. Model 2 included adjustments for sociodemographic factors (gender, age, income, education). Model 3 added physical health covariates (sleep quality, chronic conditions, pain medication). Psychological (depression, anxiety, neuroticism) and cognitive factors (executive and episodic memory) were added in Model 4, and interpersonal factors (social isolation and loneliness) were included in Model 5. Analyses were performed in SPSS (version 26.0; IBM Corp., Armonk, NY, USA).

## Results

### Preliminary Analyses

Table 1 summarizes the characteristics of participants and levels of covariates included in the regression models. On average, the level of pain interference was moderate in the sample (mean = 3.46, standard deviation = 2.66; observed range 0–10). Approximately a third of respondents reported at least one major discriminatory event in their lifetime, while 22% reported three or more discriminatory lifetime events. Of the 22% of respondents reporting three or more lifetime events, 68.9% were White, 24.4% were Black or African American, and 6.7% belonged to other racial groups. The most common forms of major discrimination reported were not being hired for a job (33.3%), not being given a promotion (27.1%), and being discouraged from seeking higher education (19.3%). Daily interpersonal discrimination scores averaged  $14.19 \pm 5.46$  (observed range 0–33). The most common reasons for daily discrimination were gender (36.9%), followed by age (28.8%) and height/weight (26.1%). Finally, major discrimination and daily discrimination variables were positively correlated with one another ( $r = 0.53$ ,  $P < 0.01$ ).

### Main Analyses

Results from the base model (Model 0) in which pain interference was regressed separately on daily interpersonal discrimination and lifetime discrimination indicated that daily discrimination ( $B = 0.157$ , 95% confidence interval [CI]: 0.09 to 0.22) was associated with higher levels of pain interference. Furthermore, analyses incorporating dummy-coded variables for major discrimination indicated that pain interference scores were higher among respondents reporting three or more instances of major discrimination than among those reporting zero instances of major discrimination ( $B = 1.467$ , 95% CI: 0.53 to 2.40). As shown in Table 2, the association between daily discrimination and pain interference was maintained when major discrimination was added to Model 1

**Table 1.** Characteristics of the study sample

Variable	Mean $\pm$ SD or n (%)
Age, y	54.15 $\pm$ 12.77
Gender	
Men	96 (46.4%)
Women	111 (53.6%)
Ethnicity	
White	168 (81.2%)
Black/African American	19 (9.2%)
Native American	3 (1.4%)
Asian/Pacific Islander	4 (1.9%)
Other	13 (6.3%)
Household income, US\$, median (Q1, Q3)	70,500 (38,125, 110,312)
Educational level	
High school or less	33 (15.9%)
Some college or above	174 (84.1%)
Pain interference	3.46 $\pm$ 2.66
Major discrimination	
None	96 (46.4%)
1–2 instances	66 (31.9%)
3 or more instance	45 (21.7%)
Daily discrimination	14.19 $\pm$ 5.46
Sleep quality (PSQI)	6.83 $\pm$ 3.49
Number of chronic conditions	4.12 $\pm$ 3.82
Depression (CESD)	10.93 $\pm$ 8.67
Anxiety	37.05 $\pm$ 9.78
Neuroticism	2.25 $\pm$ 0.70
Cognitive functioning (BTACT)	0.158 $\pm$ 0.985
Social isolation	1.46 $\pm$ 0.69
UCLA Loneliness	13.34 $\pm$ 4.71

SD = standard deviation; Q = quartile; PSQI = Pittsburgh Sleep Quality Index; CESD = Center for Epidemiological Studies Depression; BTACT = Brief Test of Adult Cognition by Telephone.

( $B = 0.145$ , 95% CI: 0.09 to 0.22). Adding sociodemographic factors (Model 2), physical health covariates (Model 3), psychological and cognitive factors (Model 4), and interpersonal factors (Model 5) did not alter the pattern of results. The association between day-to-day interpersonal discrimination and pain interference was attenuated but remained significant across all models. The final model accounted for approximately 36% of the variance in pain interference scores. No significant effects emerged for major discrimination and pain interference.

### Supplemental Analyses

Parallel analyses tested for possible interactions between day-to-day interpersonal discrimination and major sociodemographic factors. There was no evidence that the association between daily discrimination and pain interference scores varied as a function of age ( $B = 0.002$ , 95% CI:  $-0.00$  to  $0.01$ ), gender ( $B = -0.024$ , 95% CI:  $-0.15$  to  $0.11$ ), income ( $B = 0.040$ , 95% CI:  $-0.00$  to  $0.08$ ), education ( $B = 0.006$ , 95% CI:  $-0.01$  to  $0.02$ ), or race ( $B = 0.104$ , 95% CI:  $-0.04$  to  $0.25$ ).

### Discussion

Growing evidence suggests that chronic exposure to discrimination is linked with increased risk of chronic pain

[11, 15]. The findings of the present study suggest that day-to-day experiences of interpersonal discrimination at older ages are associated with increased pain interference. Contrary to expectations, experiences of major discrimination were unrelated to pain interference in the present data. Although a prior study reported evidence of an association between major discrimination and pain interference [11], the possibility of shared variance with indices of everyday discrimination was not addressed. Notably, we found that the effect of everyday discrimination remained significant after controlling for major discrimination as well as a broad range of sociodemographic and psychosocial factors, indicating that although statistical adjustment for these confounding factors attenuated the association between everyday discrimination and pain interference, they do not completely explain the effect in the present data.

The mechanisms underlying the association between daily discrimination and pain interference merit further investigation. Two general sets of factors may be involved. First, chronic exposure to discrimination is associated with a range of biological processes, including increased cortisol output, higher concentration of inflammatory cytokines, and cardiovascular and metabolic dysregulation [33, 34]. These processes, in turn, may contribute to increased chronic pain disability and

**Table 2.** Coefficients from models predicting pain interference

	Model 1 B (95% CI)	Model 2 B (95% CI)	Model 3 B (95% CI)	Model 4 B (95% CI)	Model 5 B (95% CI)
<b>Intercept</b>	1.361 (0.35 to 2.36)**	3.370 (1.05 to 5.68)**	4.991 (2.48 to 7.50)***	4.278 (1.26 to 7.30)*	4.166 (1.12 to 7.21)**
<b>Discrimination</b>					
Daily	0.145 (0.09 to 0.22)***	0.137 (0.06 to 0.21)***	0.118 (0.04 to 0.18)**	0.101 (0.03 to 0.17)**	0.099 (0.02 to 0.17)**
Major					
1–2 instances vs 0	–0.059 (–0.89 to 0.78)	–0.149 (–0.97 to 0.68)	–0.059 (–0.89 to 0.78)	–0.059 (–0.89 to 0.78)	–0.059 (–0.89 to 0.78)
3 or more instances vs 0	0.343 (–0.73 to 1.42)	0.130 (–0.94 to 1.20)	–0.219 (–1.21 to 0.78)	–0.165 (–1.15 to 0.81)	–0.184 (–1.17 to 0.80)
<b>Sociodemographics</b>					
Gender (ref: male)		0.103 (–0.60 to 0.81)	–0.395 (–1.06 to 0.27)	–0.408 (–1.06 to 0.24)	–0.447 (–1.11 to 0.22)
Age		–0.006 (–0.03 to 0.02)	–0.018 (–0.04 to 0.01)	–0.020 (–0.04 to 0.01)	–0.021 (–0.05 to 0.01)
Income quintile		–0.392 (–0.65 to –0.13)**	–0.235 (–0.47 to 0.01)	–0.164 (–0.41 to 0.08)	–0.125 (–0.39 to 0.14)
Educational level (ref: high school or less)		–0.616 (–1.59 to 0.36)	–0.256 (–1.16 to 0.65)	0.101 (–0.83 to 1.03)	0.085 (–0.86 to 1.03)
<b>Physical health</b>					
Sleep quality			0.158 (0.06 to 0.25)**	0.143 (0.04 to 0.24)**	0.143 (0.03 to 0.24)**
Chronic conditions			0.030 (–0.06 to 0.13)	0.016 (–0.08 to 0.11)	0.017 (–0.08 to 0.11)
Pain medication use			0.363 (0.19 to 0.52)***	0.327 (0.16 to 0.48)***	0.335 (0.17 to 0.49)***
<b>Cognitive and psychological factors</b>					
Depression				0.036 (–0.03 to 0.10)	0.037 (–0.03 to 0.10)
Anxiety				–0.031 (–0.09 to 0.03)	–0.029 (–0.09 to 0.03)
Neuroticism				0.581 (0.06 to 1.09)*	0.563 (0.04 to 1.07)*
Cognitive functioning				–0.463 (–0.81 to –0.11)*	–0.465 (–0.82 to –0.11)*
<b>Interpersonal factors</b>					
Social isolation					0.203 (–0.31 to 0.72)
Loneliness					–0.012 (–0.11 to 0.08)
R <sup>2</sup>	0.11	0.17	0.31	0.35	0.36
F for change in R <sup>2</sup>	8.08***	3.56**	13.51***	3.22*	0.31

\**P* < 0.05,\*\**P* < 0.01,\*\*\**P* < 0.001.

interference if sustained over time. Second, self-reported experiences of discrimination have been linked with lower levels of health care seeking and utilization [35, 36]. Access to health care that includes multidisciplinary treatment for chronic pain may help postpone the onset of pain-related disability, as well as reduce the risk of chronic physical illness [37].

## Conclusion

The strengths of this analysis include the use of a national probability sample in which it was possible to control for multiple sociodemographic, physical health, and psychosocial indicators. The primary limitation is that the sample was composed predominantly of educated White middle-aged adults. Our findings cannot be assumed to generalize to the broader U.S. population, including racial/ethnic minorities who, relative to Whites, consistently report more experiences of major and day-to-day discrimination [23] and are disproportionately affected by pain severity and disability associated with chronic pain [38, 39]. The interpretation of results is also tempered by the cross-sectional research design, which limits conclusions about the causal direction of the relationship

between discrimination and pain interference. Despite the study limitations, the results of the present study add weight to the importance of day-to-day discrimination by documenting independent associations with pain interference. This complements previous findings [11, 15] and demonstrates robust effects of daily discrimination after controlling for a wide range of potential confounders. Further research will be needed to establish the generalizability of these results to racial and ethnic minority populations with chronic pain.

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