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# PRIMARY CARE & HEALTH SERVICES SECTION

## *Original Research Article*

# Sex Differences in Pain and Pain-Related Disability among Primary Care Patients with Chronic Musculoskeletal Pain

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### Abstract

**Background. Although previous research suggests women report more severe pain than men, evidence for sex-related differences in pain-related disability is conflicting. Also, the impact of psychological factors on sex differences in disability is uncertain.**

**Objective. The purpose of this study is to assess sex differences in pain-related disability and evaluate whether they are accounted for by psychological factors.**

**Methods. Analysis of baseline data from the Stepped Care for Affective disorders and Musculoskeletal Pain study. Participants included 241 male and 249 female primary care patients with moderately severe persistent pain of the back, hip, or knee. Multivariable log-linear models were used to determine the association between sex and pain-related disability and whether sex differences persisted after adjustment for psychiatric comorbidity and potential psychological mediators.**

**Results. Compared with men, women reported worse pain intensity, greater pain-related interference with function, and more disability days due to pain. They also had worse depression, anxiety, and self-efficacy. Sex differences in pain interference with function and pain disability days remained significant in multivariable models. Depression, poor self-efficacy, and fear of reinjury were independently associated with disability in both men and women.**

**Conclusions. Women report greater pain-related disability than do men, even after controlling for depression, anxiety, and other psychological factors. Pain management strategies that target functional disability may be particularly important in the treatment of women with pain.**

**Key Words. Sex Factors; Pain; Disability; Depression; Primary Care**

### Introduction

Chronic pain is a tremendous burden to individuals and society due to its deleterious effects on quality of life, medical costs, productivity, and disability [1–3]. Women are more likely to report experiencing chronic pain than men [4–7]. Most individual pain symptoms and pain disorders are more prevalent among women [3,4,6,8–14].

Research has established that men and women differ in their pain experience and perceptions [6,15–17]. Studies show that women demonstrate lower experimental pain threshold (i.e., level at which a pain stimulus is perceived) and tolerance (i.e., greatest level of pain which a person is able to tolerate) [3,6,16,18–20], report more musculoskeletal pain symptoms [3,19,21,22], and seek medical

care more often than men [14,23]. Additionally, women experience pain in more bodily areas and report more severe pain with greater frequency and for longer duration when compared with men [3,13,15,21].

Evidence for sex-related differences in disability is conflicting. A literature review [13] and recent consensus report [24] both conclude that women have more pain-related disability than men. A study of elderly osteoarthritis patients by Keefe et al. [25] found female gender to be significantly associated with physical disability. Similar results were found by Scudds and Robertson in their study of senior citizens [7]. However, Hirsch [1] and Keogh [26] found no sex difference in disability when they examined middle-aged chronic pain patients from the United States and the United Kingdom, respectively.

The etiology of sex differences in pain have yet to be resolved. Depression and anxiety disorders are associated with increased pain, greater experimental pain sensitivity, and poorer adjustment to chronic pain [4,13] and both are also more prevalent among women [4,14,21,24,26]. Other psychological factors that have been hypothesized to mediate pain outcomes, such as pain beliefs, coping, and self-efficacy, also appear to differ by sex [13,19,24,27]. Some investigators have postulated that psychological factors may explain observed differences in pain between men and women [3,4,13,14,24,26,27].

Our primary objectives were: 1) to assess sex differences in pain-related disability among patients with chronic musculoskeletal pain, and 2) to assess whether observed sex differences are accounted for by psychiatric or psychological factors. We additionally examined whether associations between psychological variables and pain-related disability differed by sex.

## Methods

### *Study Design and Sample*

We analyzed baseline data collected for the Stepped Care for Affective disorders and Musculoskeletal Pain (SCAMP) study, a randomized clinical trial of pain and depression care management nested within a prospective cohort study. Full details of the study have been previously reported [2]. SCAMP enrolled 500 primary care patients with chronic musculoskeletal pain of the low back, hip or knee, of whom 250 had co-morbid depression.

Subjects were recruited from two urban sites, the Indiana University Medical Group community-hospital affiliated primary care clinics and the Richard Roudebush Veterans Affairs Medical Center general medicine clinics. Potential participants were identified through electronic medical records which were used to create a master list of individuals with *International Classification of Diseases, 9th Revision* (ICD-9) diagnoses of low back pain, osteoarthritis, knee pain, hip pain, or leg pain who had a least one primary care visit within 12 months (the primary care visit did not have to be primarily for pain but was required as an eligibility criterion to ensure that enrolled subjects were receiving ongoing care in our participating clinics).

Potential participants were screened for study eligibility either during scheduled appointments or by telephone. During this eligibility interview, research assistants administered the Brief Pain Inventory (BPI) severity scale, which includes four items that assess the intensity of current, worst, least and average pain in the past week from 0 (no pain) to 10 (pain as bad as you can imagine) [28]. The BPI severity score is the average of the four items. To be eligible, potential subjects were required to have musculoskeletal pain that was 1) located in the low back, hip or knee; 2) persistent for at least 3 months or longer duration; and 3) moderately severe, defined by a (BPI) severity scale score of 5 or greater. The Patient Health Questionnaire-9 (PHQ-9) was administered during the eligibility interview to assess for the presence of clinically relevant depression. The study enrolled 250 patients with clinical depression (PHQ-9 score of $\geq$10 with endorsement of depressed mood and/or anhedonia) and 250 patients with minimal to no depression (PHQ-9 score $\leq$7) [29].

### *Measures*

All measures used in this analysis are from baseline assessments conducted by research assistants using computer-assisted telephone interviews. Pain intensity was assessed using the BPI severity scale (described above). Our primary measure of pain disability was the 7-item BPI interference scale [28]. This scale asks patients to describe how, during the past week, pain has interfered with mood, sleep, work, walking, activity level, relations with others, and enjoyment of life using a 0 (does not interfere) to 10 (completely interferes) rating. The BPI interference score is the average of the seven items.

We secondarily assessed disability using the Graded Chronic Pain Scale (GCPS) [30] pain-related disability days item. GCPS disability days is the patient-reported number of days in the past 3 months that pain has prevented usual activities (potential range 0–90). The GCPS also includes pain intensity and pain-related disability scales that include three intensity items and four disability items, respectively, rated on 0 to 10 scales. GCPS scale scores are the average of the items in the scale, multiplied by 10 for a 0–100 score (higher scores are worse). The Roland Disability Scale was used as an additional measure of pain-specific functional impairment [31].

Depression severity was assessed using the Symptom Checklist-20 (SCL-20) [32], a modified subscale of the Hopkins Symptom Checklist that has been used in other primary care depression trials [33–35]. The checklist items are scored from 0 to 4 and averaged to provide an overall measure of severity; higher scores representing more severe depression. Anxiety was evaluated with the 7-item

Generalized Anxiety Disorder (GAD-7) scale; possible scores range from 0 to 21 with higher values representing more severe anxiety [36].

Pain self-efficacy was measured with the Arthritis Self-Efficacy scale (ASES) [37]. Patients report their degree of certainty to perform specific pain self-management practices on eight items ranging from 1 (very uncertain) to 10 (very certain). Pain beliefs were assessed using four scales from the Survey of Pain Attitudes brief scale (SOPA-B) [38], which assesses four dimensions of pain-related coping. Each item is scored on a 5-point scale ranging from 0 to 4 with higher scores representing better coping on two scales (Pain Control and Emotion) and worse coping on two other scales (Solicitude and Medical Cure). The Tampa Kinesiophobia Scale (TKS) includes 17-items that measure the fear of movement/reinjury [39]. Each item is scored with a 4-point Likert scale ranging from "strongly disagree" to "strongly agree" with higher scores representing more dysfunctional fears. Additional information about measures used in SCAMP has been published previously [2].

*Analysis*

Sex was the main independent variable for all analyses. We used *t*-tests and chi-square tests for bivariate comparisons between men and women. Multivariable log–linear models were used to assess the independent effect of sex on pain-related disability. All data were analyzed using SAS version 9.1.3. Bivariate differences between women and men were tested using Student's *t*-test for continuous variables and chi-square for categorical variables. For our primary dependent variable (BPI interference), group differences are also reported as effect sizes, which is the difference in mean scores between women and men divided by the pooled standard deviation.

The primary dependent variable for our main model was BPI interference score. We also examined pain disability days as a secondary dependent variable. We included the following covariates as potential mediators of pain disability in all models: depression (SCL-20), anxiety (GAD-7), self-efficacy (ASES), and kinesiophobia (TKS), with scale scores entered as continuous variables. We also adjusted for age, race, and education as potential confounders. Sex and race were moderately correlated in this study population, so we examined models with and without race included as a covariate. Results were similar, so we present the race-adjusted models. We did not include clinical site as a covariate because sex and site were highly correlated (96% of women were enrolled from the university clinics and 78% of men were enrolled from the VA clinics). To assess whether differences in disability were accounted for by greater pain intensity among women, we added BPI severity as a covariate in second step models. However, because of the strong interdependency between pain intensity and pain interference, we consider the results of our first step models, in which we adjust for all confounders except pain intensity, our principal multivariable models.

As a secondary analysis, we examined if the relationship between psychological variables and pain-related disability differed by sex. We used sex-stratified log–linear models to test the association between BPI interference as the dependent variable and depression (SCL-20), anxiety (GAD-7), self-efficacy (ASES), and kinesiophobia (TKS) as independent variables. Models were adjusted for age, race, and education.

## Results

As shown in Table 1, the study population consisted of a majority of women (51.8%) and had a racial distribution of 58% white, 38% black, and 4% other. The number of co-morbid illnesses, proportion of individuals employed, and site of pain were similar in women and men. Compared with men, women in the study were slightly younger, more likely to be black, and less likely to have education beyond high school. While there were only modest sex differences in the prevalence of major depression, women had significantly higher SCL-20 and GAD-7 scores than men, representing more severe depression and anxiety.

Women had worse scores on most pain-specific measures as summarized in Table 2. Women reported greater pain intensity as evidenced by their higher mean BPI severity (6.2 vs 5.2, $P < 0.001$) and GCPS intensity (73.0 vs 64.8, $P < 0.001$) scores. In addition, women exhibited greater pain-specific disability as demonstrated by higher BPI interference (6.47 vs 5.27, $P < 0.001$), Roland (16.0 vs13.9, $P < 0.001$), and GCPS disability (61.7 vs 52.9, $P < 0.001$) scores. The difference in BPI interference scores between women and men in terms of effect size was 0.50 (i.e., 1.2 point difference divided by the standard deviation of 2.39 for the total sample of 500 patients). Although women and men reported a similar number of days in the past 3 months during which they experienced pain (81.2 vs 79.7, $P = 0.37$), women had significantly more pain-related disability days (32.5 vs 23.4, $P < 0.001$). SOPA scores, reflecting beliefs regarding pain, also differed between men and women. Women were more likely to acknowledge the emotional aspects of pain and expressed a greater need for empathy. In contrast, men felt somewhat more in control of their pain, yet also had higher expectations for a medical cure. Women had less self-efficacy regarding their pain (ASES) but did not differ from men regarding their fear of movement or reinjury (TKS).

Table 3 shows the results of our multivariable models. Women demonstrated greater pain-related disability (adjusted BPI interference 6.18 [95% CI 5.96–6.39] vs 5.62 [95% CI 5.39–5.86]) than men after adjusting for potential confounders. This 0.56-point difference in adjusted BPI interference scores translates to an effect size of 0.23. When the models were further adjusted for BPI severity in step 2, women still had higher BPI interference scores, although the difference in mean scores was attenuated and no longer statistically significant (6.05 vs 5.76, $P = 0.064$). Women had 5.4 more adjusted pain

**Table 1** Population characteristics

| Patient Characteristic | Male (n = 241) | Female (n = 259) |
|---|---|---|
| Age (years), mean (SD)* | 60.9 (13.6) | 57.2 (13.0) |
| Co-morbid diseases (ranges from 0–9), mean (SD) | 2.59 (1.51) | 2.72 (1.37) |
| HSCL-20 depression (ranges from 0–4), mean (SD)* | 1.21 (0.82) | 1.36 (0.86) |
| GAD-7 anxiety (ranges from 0–21), mean (SD)* | 5.48 (4.50) | 6.54 (5.15) |
| Race, n (%)* | | |
| White | 181 (75) | 110 (42) |
| Black | 50 (21) | 141 (54) |
| Other | 10 (4) | 8 (3) |
| Educational level, n (%)* | | |
| ≤High school | 115 (48) | 190 (74) |
| >High school | 126 (52) | 68 (26) |
| Employment status, n (%)* | | |
| Employed | 60 (25) | 57 (22) |
| Unemployed | 12 (5) | 29 (11) |
| Unable to work | 99 (41) | 63 (24) |
| Retired | 68 (28) | 109 (42) |
| Major depression, n (%) | 95 (39) | 119 (46) |
| Pain treatments, n (%) | | |
| Over-the-counter medications | 73 (30) | 65 (25) |
| Prescribed medications* | 189 (78) | 221 (85) |
| Other treatments | 21 (9) | 29 (11) |
| Pain location, n (%) | | |
| Back | 137 (57) | 140 (54) |
| Leg | 104 (43) | 117 (45) |
| Recruitment site, n (%)* | | |
| Veterans Administration clinics | 189 (78) | 11 (4) |
| University clinics | 52 (22) | 248 (96) |

* Indicates statistical significance at the $P < 0.05$ level.

**Table 2** Differences between men and women in pain-specific measures

| Pain Measure* | Range† | Male (n = 241) | Female (n = 259) | *P* |
|---|---|---|---|---|
| BPI pain severity | (0–**10**) | 5.24 (1.83) | 6.24 (1.66) | <0.001 |
| BPI pain interference | (0–**10**) | 5.27 (2.42) | 6.47 (2.21) | <0.001 |
| Roland pain disability | (0–**24**) | 13.9 (5.4) | 16.0 (5.4) | <0.001 |
| Graded chronic pain scale | | | | |
| Intensity score | (0–**100**) | 64.8 (17.1) | 73.0 (15.6) | <0.001 |
| Disability score | (0–**100**) | 52.9 (30.2) | 61.7 (28.0) | <0.001 |
| Days with pain in past 3 months. | (0–**90**) | 79.7 (19.9) | 81.2 (20.3) | 0.37 |
| Disability days from pain, past 3 months | (0–**90**) | 23.4 (30.7) | 32.5 (32.1) | <0.001 |
| Arthritis Self-Efficacy Scale | (**1**–10) | 6.03 (2.28) | 5.54 (2.22) | 0.01 |
| Tampa Kinesiophobia Scale | (10–**40**) | 25.3 (6.1) | 25.9 (5.56) | 0.26 |
| Survey of Pain Attitudes | | | | |
| Believes in ability to control pain | (**0**–4) | 2.21 (1.02) | 1.95 (1.14) | 0.01 |
| Acknowledges emotional impact of pain | (**0**–4) | 2.04 (1.28) | 2.31 (1.26) | 0.02 |
| Solicitude (desiring empathy for pain) | (0–**4**) | 1.62 (1.22) | 2.45 (1.25) | <0.001 |
| Medical cure (hope for a pain cure) | (0–**4**) | 2.05 (1.17) | 1.84 (1.21) | 0.04 |

* Scores are given as mean (SD).
† **Bolded** = worst score.

**Table 3** Differences between men and women in pain-specific disability

| Pain-Specific Disability Measure | Male Mean (95% CI) | Female Mean (95% CI) |
|---|---|---|
| BPI Interference Score | | |
| Unadjusted | 5.27 (4.96–5.58) | 6.47 (6.20–6.74) |
| Adjusted* | 5.62 (5.39–5.86) | 6.18 (5.96–6.39) |
| Adjusted*, including BPI pain severity | 5.76 (5.55–5.98) | 6.05 (5.85–6.25) |
| Disability Days (past 3 months) | | |
| Unadjusted | 23.4 (22.8–24.0) | 32.5 (31.8–33.2) |
| Adjusted* | 21.0 (20.3–21.6) | 26.4 (25.8–27.1) |
| Adjusted*, including BPI pain severity | 21.0 (20.4–21.7) | 25.0 (24.3–25.6) |

* Adjusted for sex, race, age, education, HSCL-20 depression, GAD-7 anxiety, ASES, self-efficacy, and TKS kinesiophobia.
ASES = Arthritis Self-Efficacy Scale; GAD-7 = Generalized Anxiety Disorder-7; TKS = Tampa Kinesiophobia Scale.

disability days than men ($P < 0.001$) in the step 1 model, which is a relative increase of more than 25%. This sex-related difference in disability days remained significant even after adjusting for pain severity in the step 2 model.

In sex-stratified models, the pattern of associations between psychological variables and pain-related disability appeared similar for men and women (Table 4). Depression, low self-efficacy, and fear of reinjury were all independently associated with worse pain-related disability for both women and men.

## Discussion

Our analysis of baseline data from the SCAMP study demonstrates a strong association between sex and pain-related disability. Both pain intensity and pain-specific disability were self-reported as worse in women. These findings were consistent across a variety of pain measures. Differences were demonstrable even after controlling for depression, anxiety, and other psychological variables. We also found that the pattern of associations between psychological variables and pain-related disability did not appear to differ by sex; depression, poor self-efficacy, and high fear of reinjury were independently associated with disability in both men and women.

The sex-related differences in disability appear clinically significant. Regarding our primary measure—the BPI interference score—a 1-point difference is considered clinically significant [40]. Prior to adjustment for potential confounders, the average score for women on the 0–10 point BPI interference scale in women was 1.2 points higher than in men. After adjustment in the step 1 model for potential confounders, women had a 0.56-point greater score. The effect size for these unadjusted and adjusted differences is 0.50 and 0.23, which represent moderate and small clinical differences, respectively [41]. Also, women reported 5.4 more disability days in the past 3 months, even after adjusting for potential confounders. This represents more than a 25% greater number of pain-related disability days in women compared with men.

Our study findings are consistent with those of other investigators [3,6,8,24,25]. A consensus report by Greenspan et al. [24] concluded that women are more likely than men to experience disability for the same pain condition. Keefe et al. [25] also found that sex was significantly associated with pain and disability, with women

**Table 4** Association between Psychological Variables and BPI Pain Interference in Women and Men*

| | Women | | | Men | | |
|---|---|---|---|---|---|---|
| Variable | Beta (SE) | T-value | *P*-value | Beta (SE) | T-value | *P*-value |
| Depression (HSCL-20) | 1.18 (0.22) | 5.43 | <0.001 | 1.44 (0.22) | 6.51 | <0.001 |
| Anxiety (GAD-7) | –0.02 (0.03) | –0.70 | 0.49 | –0.03 (0.04) | –0.64 | 0.52 |
| Self-efficacy (ASES) | –0.18 (0.06) | –3.15 | 0.002 | –0.22 (0.06) | –3.81 | <0.001 |
| Kinesiophobia (TKS) | 0.09 (0.02) | 4.30 | <0.001 | 0.07 (0.02) | 3.92 | <0.001 |

* Multivariable models were run separately for women and men and are adjusted for age, race, and education.
ASES = Arthritis Self-Efficacy Scale; GAD-7 = Generalized Anxiety Disorder-7; SCL-20 = Symptom Checklist-20; TKS = Tampa Kinesiophobia Scale.

reporting higher levels of pain and disability than men. However, contradictory findings have been reported. Hirsh [1] reported that disability was more directly related to pain in men than in women. Keogh [26] found no significant association between sex and disability, but reported that the association between depression and disability was stronger for women than for men.

Several factors may account for the differences between our findings and those of Hirsh and Keogh. The most important may be the patient population. Both Hirsh and Keogh enrolled subjects from specialty populations (pain and rheumatology clinics, respectively). Their patients may have had more complicated pain conditions (e.g., severe rheumatologic disorders, fibromyalgia, refractory pain conditions) or disorders of greater severity, duration, complexity, or disability than the patients with low back, hip, and knee pain recruited from in primary care in our SCAMP study.

One strength and distinction of our study is that it was conducted in primary care clinic patients. While most prior studies examining the relationship between sex and pain have been conducted in patients seen either in pain or in other sub-specialty clinics [1,6,15,16,19,20,25,26,42], the majority of patients with chronic pain receive treatment predominantly or exclusively in primary care. A second strength of our study is the sample size of 500 participants, larger than that of a number of previous studies, thus allowing for a richer analysis. Third and most importantly, we rigorously assessed psychiatric comorbidity (depression and anxiety) and pain-specific psychological factors (self-efficacy, kinesiophobia), allowing us to control for these potential mediators and thereby better differentiating the independent association between sex and pain disability.

Our study has several limitations. First, the cross-sectional nature of our analysis precludes conclusions about the directionality of relationships between variables. Second, sex and clinical site were so strongly correlated in our sample (i.e., the majority of men were enrolled from the VA clinics and most women were enrolled from the university clinics) that multicollinearity precluded entering both variables in the regression models. Thus, our particular study cannot distinguish to what degree the findings related to sex may, at least in part, be due to other differences between clinical sites (e.g., between veteran and urban underserved patients). Third, sex was also correlated with race, (54% of women were black and 75% of men were white); however, adjustment for race did not change our results, suggesting that our findings related to sex are not strongly confounded by race. Fourth, vulnerable populations were over-represented at the clinic sites from which subjects were enrolled. The generalizability of our results would be strengthened by verification in other primary care clinic populations.

In conclusion, even after controlling for psychiatric co-morbidities, potential psychological mediators, and pain severity, women report more pain-related disability than do men. Pain management strategies that target functional disability may be particularly important in the treatment of women with pain. For men and women, identification and management of depression, poor self-efficacy, and reinjury fears may be helpful therapeutic strategies to reduce pain-related disability.

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