Correlates of Sexual Functioning and Relationship Satisfaction Among Men and Women Experiencing Chronic Pain

Erica Finn, DPscychSc,* Todd G. Morrison, PhD,† and Brian E. McGuire, PhD*

*Clinical Psychology Programme, School of Psychology and Centre for Pain Research, National University of Ireland, Galway, Ireland; †Department of Psychology, University of Saskatchewan, Saskatoon, SK, Canada

Correspondence to: Brian McGuire, PhD, School of Psychology and Centre for Pain Research, National University of Ireland, Galway, Ireland. Tel: +353-91-493266; Fax: +353 91 589699; E-mail: brian.mcguire@nuigalway.ie.

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Abstract

Background. The aims of the study were to 1) examine the prevalence of sexual functioning difficulties in a chronic pain sample; 2) identify correlates of sexual functioning and relationship satisfaction utilizing pain variables (pain severity and pain interference) and psychological variables (mood, pain-related cognitions, self-efficacy, self-esteem, body-image); and 3) investigate possible sex differences in the correlates of sexual functioning and relationship satisfaction.

Method. Two hundred sixty-nine participants were recruited online from chronic pain organizations, websites, social media sites, and discussion forums. Those who met criteria for inclusion were presented with a variety of measures related to pain, sexual functioning, and relationship satisfaction (for those in a relationship), as well as cognitive and affective variables.

Results. Participant mean age was 37 years, and the majority were female, heterosexual, and currently in a relationship. High levels of pain severity and interference from pain, fatigue, depression, anxiety, stress, and body image concerns were reported, along with low levels of self-esteem and pain self-efficacy. In addition, substantial proportions of male (43%) and female (48%) respondents had scores indicative of sexual problems. Exploratory hierarchical regression analyses revealed that, for women, age and relationship satisfaction (which were both treated as covariates) as well as depression emerged as statistically significant correlates of sexual functioning (i.e., women who were older and reported greater levels of depression and less satisfaction with their current relationship indicated poorer sexual functioning). When relationship satisfaction was the criterion measure, age and sexual functioning (again, treated as covariates) and perceived stress emerged as significant (i.e., women who were older, reported poorer sexual functioning, and reported greater perceived stress also indicated being less satisfied with their current relationship). For male participants, age emerged as the only statistically significant correlate of sexual functioning (i.e., older men reported poorer functioning). In terms of relationship satisfaction, self-esteem was the lone significant correlate variable (men who reported lower self-esteem also were less satisfied with their current relationship).

Conclusions. Some sex differences were evident in the variables that predict sexual difficulties and relationship satisfaction among those suffering from chronic pain. Of note is that when psychological variables were considered, pain-specific physical variables (e.g., pain severity and activity limitations) accounted for very little additional variance.

Key Words. Sexual Functioning; Chronic Pain; Depression; Body Image; Self-esteem
Chronic Pain and Sexual Functioning/Relationship Satisfaction

Introduction

Sexual function is a facet of quality of life for most individuals; thus, difficulties with sexual functioning are of both clinical and empirical interest. Sexual dysfunction has been defined as a clinically significant disturbance in the ability to respond sexually or experience sexual pleasure [1]. However, the term sexual dysfunction has been criticized for medicalizing sexuality and referring to an implied normal sexual standard [2]. Sexual problems, in contrast, refer to elements of sexual functioning with which an individual is unhappy but that do not necessarily denote clinical impairment [3]. In the present study, the subjective experience of sexual functioning and sexual problems are of interest, rather than diagnosed/diagnosable sexual dysfunction.

Evidence suggests that, in comparison with members of the general population, persons with chronic pain may be more likely to experience compromised sexual functioning [4–7]. This, in turn, may impact relationship satisfaction. While these studies investigating sexual functioning in the context of chronic pain reveal a high prevalence of sexual difficulties, the link between sexual functioning and pain variables has been inconsistent [8]. Some studies have found reduced sexual functioning to be related to pain severity, greater disability, or duration of pain [8–10] whereas others have found little or no relationship [4,5,11,12].

Both chronic pain and sexual functioning have been explained in terms of biopsychosocial models [13,14], focusing on the interplay between biological and psychological factors. A complementary theory of both sexual functioning and chronic pain is the cognitive behavioral model. The gold standard of psychological treatment for chronic pain is based on this model [15], as is much of the psychotherapy for sexual dysfunction [16]. Similarly, the few studies of the treatment of sexual dysfunction in chronic pain also utilized this approach [17,18]. However, more empirical work is needed to test predictions originating from this model.

The present study was designed to investigate a biopsychosocial model of sexual functioning in chronic pain. The psychological variables selected for inclusion in this study draw on cognitive behavioral theory as this has been demonstrated as a useful way of formulating chronic pain and designing treatments. Biological factors, such as pain variables and fatigue, were selected to be compared with cognitive variables, including catastrophizing and pain self-efficacy, and affective variables, such as depression and anxiety. While some of these variables have been investigated in the context of sexual functioning in chronic pain [4,8,9,11], the relative impact of psychological variables over pain variables remains unclear. In addition, more self-reflective variables such as self-esteem and body image were hypothesized to enhance the cognitive behavioral model. Less attention has been given to individual differences in self-esteem, which may be an important cognitive diathesis for predicting sexual difficulty and could have implications for the treatment of sexual functioning in the context of chronic pain. Relationship satisfaction, due to its integral association with sexual functioning, is likely an important social contextual factor to take into consideration.

Previous studies support the idea that there are similar correlates for sexual problems and chronic pain. For instance, age is positively associated with risk of chronic pain [19,20] and with risk of sexual difficulties [3,21] such as reduction in sex drive, arousal, fantasy, and sexual satisfaction [9,11,22]. Individuals experiencing chronic pain are at greater risk of psychiatric conditions, especially depression and anxiety [7,20], both of which have been associated with sexual difficulties [8,9,11,23]. Fatigue, which often co-occurs with chronic pain and is a feature of depression and anxiety, also may increase sexual difficulties [5,11,22]. In addition, sexual function has been associated with cognitive processing factors, such as pain catastrophizing and pain self-efficacy, such that those less likely to catastrophize and more likely to be self-efficacious report better sexual functioning [11,12,24]. Finally, while the roles that self-esteem and body image play in sexual functioning among those experiencing chronic pain have received scant empirical attention, studies targeting members of the general population suggest that these variables warrant scrutiny. For example, it has been reported that a reciprocal relationship may exist between self-esteem and sexual difficulties [25], and unfavorable body image has been associated with decrements in sexual functioning, especially among women [26,27].

While sexual functioning may be a factor in relationship satisfaction, it is not clear if the same variables are associated with both and to the same extent. This may be important for treatment of sexual problems vs relationship stress. Similarly, the possible existence of sex differences may warrant consideration. Evidence suggests that there are differences in the prevalence and presentation of both chronic pain and sexual problems for males and females [21,28–31]. Original theories of sexual functioning were based on a male-centric view of the sexual response cycle [32], while newer theories are emerging about female sexual responding [33]. This, in turn, may affect which variables are associated with sexual functioning in men and women.

Much of the research on sexual functioning among persons experiencing chronic pain has 1) exclusively targeted individuals who are married or in relationships [5,10]; 2) focused on particular pain syndromes [5,9,22]; 3) focused exclusively on one sex [24]; and/or 4) utilized a small sample [9,10]. The present study aims to address these limitations by recruiting a heterogeneous sample of persons who report experiencing diverse forms of chronic pain. A further objective was to examine correlates of sexual functioning (specifically, body image and self-esteem) that have been relatively overlooked in chronic pain populations. With sexual functioning and relationship satisfaction as the primary
outcomes, we hypothesized that 1) sexual functioning and relationship satisfaction would be positively correlated with indicators of psychological adjustment (i.e., lower levels of depression, anxiety, and catastrophizing and higher levels of pain self-efficacy, body image satisfaction, and self-esteem); and 2) sexual functioning and relationship satisfaction would be negatively correlated with pain-specific variables (pain intensity and interference). Two further research questions were the following: 3) do indicators of psychological adjustment or pain-specific variables account for more variance in sexual functioning and relationship satisfaction? and 4) are there sex differences in terms of the correlates of sexual functioning and relationship satisfaction? The last research question was exploratory, and thus we had no a priori hypothesis.

Methods

Participants and Procedure

Recruitment for this cross-sectional study was completed online through chronic pain organization websites, support groups, Facebook pages, and discussion forums. The major chronic pain organizations of various English-speaking countries were approached, and a Google search was utilized to identify further support sites. Moderators were approached, unless it was clear that this was unnecessary. Due to the measures utilized, English-speaking websites and groups were targeted.

The sample recruited was 269 participants with pain lasting three months or longer, as per the International Association for the Study of Pain’s (IASP’s) definition of chronic pain [34]. Inclusion criteria were that participants needed to be older than age 18 years; currently experiencing chronic pain; and sexually active at some point in their lives, either alone through self-stimulation or with a partner.

Interested parties were directed to a secure Survey Monkey link where the questionnaire was hosted between January and March 2014.

All respondents were informed that their involvement in the survey was strictly confidential, no self-identifying details were being gathered (i.e., their anonymity was safeguarded), and they could terminate their involvement at any point in time. Prospective respondents were then instructed to complete a screening questionnaire to ensure they met the inclusion criteria.

Following this, demographic details and information on pain duration and onset were assessed. Participants were then directed to the survey. The presentation of measures was counterbalanced as researchers have found that sizeable proportions of respondents will engage in careless responding when completing online surveys [35].

However, any respondent with more than 10% missing items was removed from the analysis; for those with fewer missing items, scores were prorated. Those who were excluded and completed demographic information did not differ from the retained sample in terms of age, sex, pain duration, or education. See Figure 1 for participant flow through the study.

Following completion of the survey, participants were directed to a debriefing document that outlined the central objectives of the study and provided contact details for the researchers as well as relevant support organizations, if needed. The study was approved by the Research Ethics Committee affiliated with the senior author’s host institution. No compensation of any kind was offered.

Measures

Body Image

A slightly amended version of the Body Image Scale (BiS) [36] was used (i.e., with permission from the
corresponding author, the word “pain” was employed instead of “disease” for several items). The scale consists of 10 items scored on a four-point Likert-type scale (0 = not at all; 3 = very much). Higher scores reflect greater dissatisfaction with one’s physical appearance. The BIS appears to possess satisfactory scale score reliability and validity [36,37]. In the current sample, Cronbach’s alpha coefficients were 0.91 (95% confidence interval [CI] = 0.90–0.93) and 0.86 (95% CI = 0.80–0.91) for women and men, respectively.

Pain Severity and Interference from Pain

Pain severity and interference from pain were measured using the Brief Pain Inventory (BPI) [38]. Both severity and interference items are scored on a scale from 0 to 10 and were represented by the mean scores of relevant items. This instrument has demonstrated reliability and validity in a variety of pain conditions across cultures and languages [39] and is widely used in epidemiological studies and assessments of pain treatment [40]. Mild, moderate, and severe levels of pain are represented by scores between 1 and 4, 5 and 7, and 8 and 10, respectively [38]. A score of 5 or higher on the interference scale has been used to represent pain that interferes with functioning [38].

Sexual Functioning

The Changes in Sexual Functioning Questionnaire—Short Form (CSFQ-14) [41] consists of 14 items and employs a five-point Likert-type scale to rate respondents’ sexual behaviors and desire (1 = never/no enjoyment; 5 = every day/great enjoyment). Separate male and female versions were utilized, with higher scores denoting better sexual functioning (i.e., lower levels of sexual difficulty). The CSFQ-14 yields a total scale score, a single item measuring pleasure, and three scale scores representing the phases of the sexual response cycle (desire, arousal, and orgasm). Scores of 41 or higher for females and 47 or higher for males represent satisfactory sexual functioning [41]. Several studies provide evidence attesting to the psychometric integrity of the CSFQ-14 [41,42]. For the current sample, Cronbach’s alpha coefficients were 0.90 (95% CI = 0.88–0.92) for women and 0.88 (95% CI = 0.83–0.92) for men.

Fatigue

The Fatigue Severity Scale (FSS) [43] appears to be one of the most commonly used indicators of fatigue [44,45]. It consists of nine items that are scored on a seven-point Likert-type scale (1 = disagree; 7 = agree), with higher scores reflecting greater levels of fatigue. A total cutoff score of 36 has been recommended [46–47]. The psychometric properties of the FSS are well established [44]. In the current sample, Cronbach’s alpha coefficients were 0.92 (95% CI = 0.91–0.94) for women and 0.94 (95% CI = 0.91–0.96) for men.

Anxiety and Depression

The Hospital Anxiety and Depression Scale (HADS) [48] is a 14-item measure, scored on a four-point Likert-type scale (i.e., 0 = not at all; 3 = most of the time), and is widely used in pain studies [23,24]. It assesses depression and anxiety (seven items per scale), with cutoff scores greater than 8 being proposed to signify clinical levels of anxiety and depression [48]. The HADS has been shown to possess good scale score reliability and validity [49]. For the current sample, Cronbach’s alpha coefficients for the HADS-A were 0.83 (95% CI = 0.80–0.86) for women and 0.76 (95% CI = 0.66–0.85) for men. Alpha coefficients for the HADS-D were 0.82 (95% CI = 0.78–0.85) for women and 0.77 (95% CI = 0.67–0.85) for men.

Pain Catastrophizing

The Pain Catastrophizing Scale (PCS) [50] measures frequency of catastrophic thinking about pain [50]. It contains 13 items and employs a five-point Likert-type response format (0 = not at all; 4 = all the time). The scale yields a total score, with a cutoff of 30 representing clinical levels of catastrophizing [51]. Higher scores represent more of the construct. Available evidence suggests that the PCS has satisfactory scale score reliability and validity [52]. Cronbach’s alpha coefficients in the current study were 0.95 (95% CI = 0.94–0.96) for women and 0.94 (95% CI = 0.92–0.96) for men.

Pain Self-efficacy

The 10-item Pain Self-Efficacy Questionnaire (PSEQ) [53] examines confidence in performing activities (e.g., household chores), despite one’s level of pain. Items are scored on a seven-point scale (0 = not at all confident; 6 = completely confident), with higher scores indicating greater self-efficacy. Researchers have found that scores on the PSEQ display good test-retest reliability [53,54] and construct validity [54,55]. For the current sample, Cronbach’s alpha coefficients were 0.92 (95% CI = 0.91–0.94) for women and 0.94 (95% CI = 0.92–0.96) for men.

Perceived Stress

The Perceived Stress Scale–10 item version (PSS-10) [56] assesses the perceived unpredictability and uncontrollability of stress as well as one’s ability to cope with stressors experienced in the preceding month [56]. The PSS-10 uses a five-point Likert-type scale (0 = never; 4 = fairly often), with higher scores indicating greater stress.
Published norms from a national sample of over 2,000 Americans produced mean PSS-10 scores of 12.1 for men and 13.7 for women [57]. However, no cutoff scores have been suggested. Available evidence indicates that the PSS-10 possesses good psychometric properties [56,57]. In the current sample, Cronbach’s alpha coefficients were 0.89 (95% CI = 0.87–0.91) and 0.89 (95% CI = 0.85–0.93) for women and men, respectively.

Relationship Satisfaction

The seven-item Relationship Assessment Scale (RAS) [58] measures satisfaction in intimate relationships [58]. Items are scored on a five-point Likert scale (1 = very low satisfaction; 5 = very high satisfaction), with higher scores indicating greater relationship satisfaction [59]. Only participants in a relationship (N = 225) completed the RAS. Average scores at or below 3.5 for men and 3.0 for women may indicate greater relational distress and dissatisfaction [58]. Published research suggests that the RAS possesses good psychometric characteristics such as test-retest reliability and construct validity [58–60]. For the current sample, Cronbach’s alpha coefficients were 0.92 (95% CI = 0.91–0.94) for women and 0.89 (95% CI = 0.83–0.94) for men.

Self-Esteem

Considered a gold standard measure of self-esteem, the Rosenberg Self-Esteem Scale (RSES) [61] contains 10 items and uses a four-point Likert-type scale (0 = strongly disagree; 3 = strongly agree). Higher scores denote greater levels of self-esteem, with scores lower than 15 potentially signifying low self-esteem [62]. The psychometric properties of the RSE have been well established cross-culturally [63]. Cronbach’s alpha coefficients, with the current sample, were 0.90 (95% CI = 0.88–0.92) and 0.87 (95% CI = 0.81–0.91) for women and men, respectively.

Statistical Analysis

Percentages and means were used to determine basic demographic information about the sample. Scale score reliability coefficients (i.e., an estimate of internal consistency) were computed for all multi-item measures in which summed scores were calculated. Means also were used to contextualize participants’ scores on key measures: scoring below the midpoint for a given scale suggested lower levels of the construct in question whereas scoring above suggested greater levels. To determine associations among variables (see hypotheses 2 and 3), correlation coefficients were calculated, with separate correlations presented for male and female participants. This information allows the reader to understand the magnitude and direction of the associations among the variables of interest (e.g., pain severity and sexual functioning). Finally, hierarchical multiple regression analysis was used to identify the statistically significant correlates of the two outcomes of interest: sexual functioning and relationship satisfaction. Where appropriate, principal component analysis (PCA), which assists with data reduction, was used to identify groups of variables that could be entered, in blocks, as “predictor variables.” To ensure that hierarchical multiple regression was appropriate, various diagnostic tests were conducted. For example, Cook’s and Mahalanobis distances were used to detect multivariate outliers. The largest Cook’s coefficient was 0.083, which is well below the critical value of 1.0, and none of the Mahalanobis values were statistically significant (P < 0.001). Variance inflation factors were below the suggested cutoffs of 10 (i.e., maximal VIF = 2.82). Thus, the data appeared to satisfy key assumptions for multiple regression analysis.

Results

Participants

Demographic information of participants is presented in Table 1. In an open question, participants identified their own views about the primary cause of their chronic pain, including 1) specific diseases such as arthritis,
Ehlers-Danlos syndrome, fibromyalgia, and endometriosis (30.5%, N = 82); 2) stress and tension (30.5%, N = 82); or 3) physical trauma (23%, N = 62). Approximately 97% (N = 261) of the sample reported pain in more than one part of the body, with the lower back being the most common primary site (77.7%, N = 209). The mean length of time in pain was 10.59 years (SD = 9.13 years, range = 4 months to 62 years).

Scale Score Reliability Coefficients

Cronbach’s alpha coefficients, as well as their 95% confidence intervals, were computed for male and female respondents. All Cronbach’s alpha values were satisfactory (i.e., lowest alphas were 0.76 and 0.82 for males and females, respectively).

Descriptive Information for Variables

Inspection of mean scale scores revealed that participants reported modest levels of body image dissatisfaction; moderate levels of pain severity; high levels of interference from pain; moderate levels of sexual difficulties; and high levels of fatigue. Additionally, they evidenced clinically significant levels of anxiety and depression; moderate levels of pain catastrophizing; low levels of pain self-efficacy; high levels of stress; high levels of relationship satisfaction; and low levels of self-esteem. Based on established cutoff scores, sizeable proportions of the sample appeared to be in the clinical range on indices of pain interference, sexual difficulties, fatigue, anxiety, depression, pain catastrophizing, and self-esteem. A smaller proportion had scores denotative of relational distress and dissatisfaction. A series of independent sample t tests, using a Bonferroni-adjusted probability value (P = 0.004), were conducted to identify possible sex differences. Two statistically significant findings were noted: 1) females reported greater body dissatisfaction (t (102.51) = 3.19, P = 0.002, d = 0.45); and 2) males reported better sexual functioning (t (267) = 4.54, P < 0.001, d = -0.70).

Correlation Analysis

Correlation analyses are presented in Table 3, with results for female participants given above the diagonal and those for male participants given below the diagonal.

For female participants, statistically significant correlations were in the predicted directions: Negative correlations were observed between sexual functioning and body image satisfaction, pain interference, pain severity, fatigue, anxiety, depression, and perceived stress. Age also correlated negatively with sexual functioning. In contrast, and as expected, pain self-efficacy, relationship satisfaction, and self-esteem correlated positively with sexual functioning. Among male participants, similar associations were observed: sexual functioning correlated negatively with pain severity, pain interference, depression, anxiety, and body satisfaction. Additionally, an inverse relationship was noted between male participants’ age and their sexual functioning. Although the associations between sexual functioning and self-esteem, pain self-efficacy, and relationship satisfaction were similarly positive for males, they did not meet the conventional cutoff for statistical significance.

Fisher’s r to z transformations were used to identify possible sex differences in the magnitude of the correlations obtained between sexual functioning and the other variables measured in this study. None of the resultant z values were statistically significant (maximal z = 1.39), which suggests that the direction and magnitude of the

Table 2 Descriptive information for key variables

<table>
<thead>
<tr>
<th>Measures</th>
<th>Sex</th>
<th>Mean (SD)</th>
<th>% in clinical range*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIS</td>
<td>Female</td>
<td>16.09 (7.86)**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>12.86 (6.44)**</td>
<td></td>
</tr>
<tr>
<td>BPI-I</td>
<td>Female</td>
<td>6.98 (2.08)</td>
<td>82.2</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>6.88 (2.17)</td>
<td>85.7</td>
</tr>
<tr>
<td>BPI-S</td>
<td>Female</td>
<td>5.60 (1.59)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>5.71 (1.76)</td>
<td></td>
</tr>
<tr>
<td>CSQ</td>
<td>Female</td>
<td>42.31 (10.04)**</td>
<td>48.4</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>49.05 (9.30)**</td>
<td>42.9</td>
</tr>
<tr>
<td>FSS</td>
<td>Female</td>
<td>54.02 (10.73)</td>
<td>93.0</td>
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<tr>
<td></td>
<td>Male</td>
<td>50.63 (12.82)</td>
<td>83.9</td>
</tr>
<tr>
<td>HADS-A</td>
<td>Female</td>
<td>10.87 (4.48)</td>
<td>68.5</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>10.84 (3.77)</td>
<td>76.8</td>
</tr>
<tr>
<td>HADS-D</td>
<td>Female</td>
<td>9.94 (4.05)</td>
<td>62.4</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>10.38 (3.84)</td>
<td>62.5</td>
</tr>
<tr>
<td>PCS</td>
<td>Female</td>
<td>29.50 (13.61)</td>
<td>53.1</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>26.65 (13.09)</td>
<td>41.1</td>
</tr>
<tr>
<td>PSEQ</td>
<td>Female</td>
<td>22.14 (12.09)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>24.87 (13.39)</td>
<td></td>
</tr>
<tr>
<td>PSS</td>
<td>Female</td>
<td>25.58 (7.61)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>24.29 (8.01)</td>
<td></td>
</tr>
<tr>
<td>RAS</td>
<td>Female†</td>
<td>3.94 (1.05)</td>
<td>16.4</td>
</tr>
<tr>
<td></td>
<td>Male‡</td>
<td>4.10 (0.87)</td>
<td>17.9</td>
</tr>
<tr>
<td>RSE</td>
<td>Female</td>
<td>14.25 (6.48)</td>
<td>53.1</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>14.32 (6.44)</td>
<td>53.6</td>
</tr>
</tbody>
</table>

N(female) = 236; N(male) = 56.
BIS = Body Image Scale; BPI = Brief Pain Inventory; CSQ = Changes in Sexual Functioning Questionnaire; FSS = Fatigue Severity Scale; HADS = Hospital Anxiety and Depression Scale; PCS = Pain Catastrophizing Scale; PSEQ = Pain Self-efficacy Questionnaire; PSS = Perceived Stress Scale; RAS = Relationship Assessment Scale; RSE = Rosenberg Self-esteem Scale.
*See the Measures section for details of cutoff scores.
**Males and females differ at Bonferroni corrected P < 0.005; d = 0.70 (sexual functioning sex comparison) and d = 0.45 (body image sex comparison).
†N = 186.
‡N = 99.
correlates of sexual functioning did not differ appreciably between the male and female respondents in this study.

**Exploratory Hierarchical Multiple Regression**

Two outcome variables were of interest: sexual functioning and relationship satisfaction. To determine the variables that account for maximal variance in sexual functioning and relationship satisfaction among men and women experiencing chronic pain, exploratory hierarchical multiple regression analyses were conducted separately for each sex.

**Females**

Eleven variables correlated significantly with sexual functioning (see Table 3). Of the 11, age and relationship satisfaction were treated as covariates and entered on the first block. For the remaining nine variables, principal component analysis (PCA) was used to determine whether conceptually meaningful groupings of variables could be identified, which subsequently would be entered as blocks in the hierarchical multiple regression analysis. Diagnostics (e.g., Kaiser-Meyer-Olkin = 0.85 and Bartlett’s test of sphericity, \( P < 0.001 \)) suggested the data were suitable for PCA. Two components were identified. The pattern matrix revealed that the first component (eigenvalue = 4.36, 48.41% variance accounted for) consisted of self-esteem, depression, anxiety, body dissatisfaction, and perceived stress. The second component (eigenvalue = 1.10, 12.20% variance accounted for) was comprised of pain severity, pain intensity, and fatigue. Inspection of the constructs loading on each of the two components suggested that component 1 represented negative cognitive beliefs (i.e., loadings for self-esteem and self-efficacy were negative) and component 2 represented pain debilitation. Pain self-efficacy did not load uniquely on either component and, thus, was treated as a separate "predictor variable."

Age and relationship satisfaction were entered as covariates on the first block. The measures corresponding to each principal component then were entered as second and third blocks (i.e., self-esteem, depression, anxiety, body dissatisfaction, and perceived stress were entered on block 2; and pain severity, pain interference, and fatigue were entered on block 3). Pain self-efficacy then was entered as a stand-alone "predictor variable" on block 4.

When sexual functioning was the outcome measure, block 1, which contained the covariates, was statistically significant \( (F (2, 183) = 21.67, P < 0.001) \), adjusted \( R^2 = 18.3\% \). Inspection of the standardized beta coefficients revealed that both age \( (\beta = -0.28, t = -4.19, P < 0.01, \text{sr}^2 = 0.08) \) and relationship satisfaction \( (\beta = 0.29, t = 4.28, P < 0.01, \text{sr}^2 = 0.08) \) emerged as significant correlates. Thus, older participants and those less satisfied with their current relationship reported poorer sexual functioning. The addition of block 2

Table 3  Correlation matrix of key variables: Data for female sample above the midline and male sample below

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>BIS</th>
<th>BPI-I</th>
<th>BPI-S</th>
<th>CSQ</th>
<th>FSS</th>
<th>HADS-A</th>
<th>HADS-D</th>
<th>PCS</th>
<th>PSEQ</th>
<th>PSS</th>
<th>RAS*</th>
<th>RSE*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>0.11</td>
<td>0.20</td>
<td>0.22</td>
<td>-0.31</td>
<td>-0.01</td>
<td>-0.07</td>
<td>0.18</td>
<td>-0.09</td>
<td>-0.23</td>
<td>-0.12</td>
<td>-0.17*</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td><strong>BIS</strong></td>
<td>-0.14</td>
<td>0.47</td>
<td>0.30</td>
<td>-0.35</td>
<td>0.36</td>
<td>0.49</td>
<td>0.63</td>
<td>0.25</td>
<td>-0.26</td>
<td>0.49</td>
<td>-0.20</td>
<td>-0.56</td>
<td></td>
</tr>
<tr>
<td><strong>BPI-I</strong></td>
<td>0.19</td>
<td>0.43</td>
<td>0.58</td>
<td>-0.35</td>
<td>0.47</td>
<td>0.31</td>
<td>0.49</td>
<td>0.25</td>
<td>-0.35</td>
<td>0.49</td>
<td>-0.26</td>
<td>-0.42</td>
<td></td>
</tr>
<tr>
<td><strong>BPI-S</strong></td>
<td>0.28*</td>
<td>0.23</td>
<td>0.61</td>
<td>-0.22</td>
<td>0.27</td>
<td>0.26</td>
<td>0.29</td>
<td>0.15*</td>
<td>-0.21</td>
<td>0.33</td>
<td>-0.12</td>
<td>-0.23</td>
<td></td>
</tr>
<tr>
<td><strong>CSQ</strong></td>
<td>-0.42</td>
<td>-0.30*</td>
<td>-0.47</td>
<td>-0.40</td>
<td>-0.17*</td>
<td>-0.15*</td>
<td>-0.45</td>
<td>-0.05</td>
<td>0.20</td>
<td>-0.21</td>
<td>0.34</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td><strong>FSS</strong></td>
<td>-0.06</td>
<td>0.55</td>
<td>0.28</td>
<td>0.37</td>
<td>0.14</td>
<td>0.41</td>
<td>0.55</td>
<td>0.33</td>
<td>-0.42</td>
<td>0.60</td>
<td>-0.27</td>
<td>-0.63</td>
<td></td>
</tr>
<tr>
<td><strong>HADS-A</strong></td>
<td>-0.11</td>
<td>0.58</td>
<td>0.56</td>
<td>0.40</td>
<td>-0.37</td>
<td>0.41</td>
<td>0.55</td>
<td>-0.11</td>
<td>0.14</td>
<td>-0.50</td>
<td>0.38</td>
<td>-0.18*</td>
<td>-0.29</td>
</tr>
<tr>
<td><strong>HADS-D</strong></td>
<td>-0.41</td>
<td>-0.41</td>
<td>-0.26</td>
<td>0.16</td>
<td>0.14</td>
<td>-0.28</td>
<td>-0.46</td>
<td>-0.54</td>
<td>-0.33</td>
<td>0.22</td>
<td>0.63</td>
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</tr>
<tr>
<td><strong>PSEQ</strong></td>
<td>-0.04</td>
<td>0.44</td>
<td>0.47</td>
<td>0.29*</td>
<td>-0.26</td>
<td>0.66</td>
<td>0.69</td>
<td>0.17</td>
<td>-0.25</td>
<td>-0.33</td>
<td>-0.63</td>
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<td></td>
</tr>
<tr>
<td><strong>PSS</strong></td>
<td>-0.41</td>
<td>-0.38</td>
<td>-0.31*</td>
<td>-0.22</td>
<td>-0.16</td>
<td>-0.54</td>
<td>-0.63</td>
<td>-0.14</td>
<td>0.21</td>
<td>-0.59</td>
<td>0.56</td>
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<td></td>
</tr>
</tbody>
</table>

Correlations with an asterisk are statistically significant at \( P < .05 \); Correlations in bold are statistically significant at \( P < 0.01 \).

**BIS** = Body Image Scale; **BPI-I** = Brief Pain Inventory–Interference; **BPI-S** = Brief Pain Inventory–Severity; **CSQ** = Changes in Sexual Functioning Questionnaire; **FSS** = Fatigue Severity Scale; **HADS-A** = Hospital Anxiety and Depression Scale–Anxiety; **HADS-D** = Hospital Anxiety and Depression Scale–Depression; **PCS** = Pain Catastrophizing Scale; **PSEQ** = Pain Self-efficacy Questionnaire; **PSS** = Perceived Stress Scale; **RAS** = Relationship Assessment Scale; **RSE** = Rosenberg Self-esteem Scale.

*For females, 186 of 213 respondents reported being in a relationship; thus, for correlations pertaining to the RAS, \( N = 186 \), whereas for all other correlations \( N = 213 \). For males, 39 of 56 respondents reported being a relationship; thus, for correlations pertaining to the RAS, \( N = 39 \), whereas for all other correlations \( N = 56 \).
resulted in a significant \( F \) change \( (F(5, 178) = 4.59, P < 0.001, \text{adjusted } R^2 = 28.4\%) \). Both age and relationship satisfaction retained their statistical significance (\( \hat{\beta} = -0.23 \) and \( 0.22, \) respectively). Of the new variables contained in block 2, only depression emerged as a statistically significant correlate \( (\hat{\beta} = -0.29, t = -2.86, P < 0.01, \text{sr}^2 = 0.03) \). The addition of blocks 3 and 4 did not result in significant \( F \) change values, suggesting that none of their variables accounted for incremental variance in sexual functioning. Thus, of the variables entered, only age, relationship satisfaction, and depression were statistically significant correlates, accounting, in total, for 11% unique variance in women’s sexual functioning.

Ten variables correlated significantly with relationship satisfaction (see Table 3). Of the 10, age and sexual functioning were treated as covariates and entered on the first block. For the remaining eight variables, PCA was again used to identify potentially meaningful groups. Diagnostics (e.g., Kaiser-Meyer-Olkin = 0.85 and Bartlett’s test of sphericity, \( P < 0.001 \)) suggested the data were suitable for PCA. A two-component solution was obtained. The pattern matrix indicated that the first component (eigenvalue = 4.10, 51.25% variance accounted for) consisted of pain intensity, self-esteem (negative loading), depression, anxiety, body dissatisfaction, and perceived stress. Based on these loadings, component 1 appeared to reflect negative cognitive beliefs related, in part, to pain intensity. Component 2 was comprised of pain catastrophizing and pain self-efficacy. Inspection of these loadings suggested that this component reflects adaptive psychological responses to pain (i.e., the loading for catastrophizing was negative).

Age and sexual functioning were entered as covariates on the first block. The measures corresponding to each principal component then were entered as second and third blocks (i.e., pain intensity, self-esteem, depression, anxiety, body dissatisfaction, and perceived stress were entered on block 2, and pain catastrophizing and pain self-efficacy were entered on block 3).

When relationship satisfaction was the outcome measure, block 1, which contained the covariates, was statistically significant \( (F(2, 183) = 12.25, P < 0.001, \text{adjusted } R^2 = 10.8\%) \). Inspection of the standardized beta coefficients revealed that only sexual functioning was statistically significant \( (\hat{\beta} = 0.32, t = 4.28, P < 0.01, \text{sr}^2 = 0.09) \). Thus, female participants reporting greater sexual functioning were more satisfied with their current relationship. The addition of block 2 resulted in a significant \( F \) change \( (F(5, 49) = 3.88, P < 0.01, \text{adjusted } R^2 = 15.9\%) \). The standardized beta coefficient for age was \( -0.42 \) \( (t = -3.37, P < 0.01, \text{sr}^2 = 0.17) \), which suggests that as participants’ age increases, their perceived sexual functioning decreases. The addition of block 2 resulted in a significant \( F \) change \( (F(5, 49) = 3.88, P < 0.01, \text{adjusted } R^2 = 33.6\%); \) however, the only variable to meet the conventional cutoff for statistical significance remained age \( (\hat{\beta} = -0.42, t = -3.45, \text{sr}^2 = 0.14) \).

Three variables correlated with men’s relationship satisfaction (body satisfaction, depression, and self-esteem). Given the small number of “predictor variables,” there was no need to conduct a PCA. Also, as age did not correlate with relationship satisfaction, it was not treated as a covariate and entered in the first block. With relationship satisfaction serving as the criterion measure, the overall model was statistically significant \( (F(3, 35) = 6.13, P < 0.01, \text{adjusted } R^2 = 28.6\%) \). Only one correlate (self-esteem) emerged as significant \( (\hat{\beta} = 0.42, t = 2.35, P < 0.03, \text{sr}^2 = 0.10); \) thus, men reporting greater self-esteem also indicated being more satisfied with their current relationship.

**Discussion**

There is considerable evidence indicating high rates of sexual difficulties in people who have chronic pain [4,8,22,64], and a review study suggested that relationship satisfaction may decrease following onset of chronic pain [65]. While our results appear to be consistent with these findings (i.e., sexual function difficulties were experienced by substantial proportions of the women and men in our study, 48% and 43%, respectively), it is important to gauge whether persons with

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**Chronic Pain and Sexual Functioning/Relationship Satisfaction**

Six variables correlated with sexual functioning (age, body satisfaction, anxiety, depression, and pain severity/interference). Age was treated as a covariate and entered on the first block. To identify potentially meaningful groupings of variables, PCA was used. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.77, and Bartlett’s test of sphericity was statistically significant \( (P < 0.001) \). Both of these diagnostics suggest that the data were suitable for PCA. As a single component was identified (eigenvalue = 2.95, 59.01% variance accounted for), body satisfaction, anxiety, depression, and the indicators of pain severity and pain interference were entered as “predictor variables” on block 2. When sexual functioning served as the outcome measure, block 1, which contained the covariate, was statistically significant \( (F(1, 54) = 11.38, P < 0.01, \text{adjusted } R^2 = 15.9\%) \). The standardized beta coefficient for age was –0.42 \( (t = -3.37, P < 0.01, \text{sr}^2 = 0.17) \), which suggests that as participants’ age increases, their perceived sexual functioning decreases. The addition of block 2 resulted in a significant \( F \) change \( (F(5, 49) = 3.88, P < 0.01, \text{adjusted } R^2 = 33.6%); \) however, the only variable to meet the conventional cutoff for statistical significance remained age \( (\hat{\beta} = -0.42, t = -3.45, \text{sr}^2 = 0.14) \).
chronic pain differ, in terms of sexual functioning and relationship satisfaction, from those without chronic pain. We were unable to locate any published research that validated the CSFQ-14 or RAS with a general population and thus must make comparisons with studies that relied on convenience samples (albeit ones that did not specifically target persons experiencing chronic pain). The point of interest is whether participants in the current study evidenced lower levels of sexual functioning and relationship satisfaction in comparison with these other groups. In a small study targeting Spanish Caucasian postmenopausal women (N = 117), Llaneza and colleagues [66] found that 64.1% of participants obtained scores on the CSFQ-14 denotative of sexual dysfunction (i.e., identified by the authors as <41). Further, the Spanish women’s mean score on the CSFQ-14 was significantly lower than the mean score obtained by the female participants in our study (d = −0.51; medium ES). In a validation assessment of the CSFQ-14, participants were 6,268 individuals evaluated for depression at primary care clinics located throughout the United States [41]. The proportion of female participants who had a score suggesting possible sexual dysfunction was 62.1%, a percentage that exceeds the one we observed for females in the current study. The mean score obtained by the women in the validation research also was significantly lower than the mean score obtained by our female participants (d = −0.67; medium ES). Similarly, in comparison with the male participants in our research, a larger proportion of men in the validation study obtained a score lower than 41 (65.6%). Their mean CSFQ-14 score also was significantly lower (d = −0.91; large ES).

In terms of the Relationship Assessment Scale (RAS), Hendrick, Dicke, and Hendrick [56] report means and standard deviations for 12 samples (six male, six female), including both clinical and nonclinical couples. Two statistically significant differences were noted between the RAS scores obtained by the female participants in the current study and two of the female samples featured by Hendrick et al. Specifically, the women in our study obtained 1) a lower mean score in comparison with 149 college females in dating relationships (d = 0.45; medium ES) and 2) a higher mean score in comparison with 40 women seeking couples counseling (d = −0.64; medium ES). For males, we identified only one significant difference in RAS scores. The male participants in our study reported a significantly higher mean score in comparison with a sample of men undergoing couples counseling (d = −0.51; medium ES).

Collectively, these comparisons suggest that the chronic pain participants in our study did not evidence greater levels of sexual dysfunction or relationship dissatisfaction when contrasted with samples recruited for purposes other than chronic pain (e.g., couples selected to validate the RAS, postmenopausal women, and persons evaluated for depression). One should not discount, however, that sizeable proportions of men and women in our study obtained scores that were in the clinical range on the CSFQ-14 and RAS, suggesting that sexual functioning and relationship satisfaction among those experiencing chronic pain warrant scrutiny.

The results of the present study provide some support for a cognitive behavioral model of chronic pain in that affective and cognitive variables appeared to be significantly correlated with sexual functioning. However, further analysis revealed only age, relationship satisfaction, and depression to be significant correlates of sexual functioning in women, while for men the sole correlate was age.

The regression findings for female participants are congruent with previous research suggesting that the variance in sexual functioning accounted for by pain severity and interference is minimal when other psychosocial factors such as depression are taken into account [23,24]. The current study’s finding that pain variables did not emerge as statistically significant correlates of sexual functioning underscores Randolph and Reddy’s [24] observation that efficacious treatments necessitate disentangling the extent to which compromised sexual function is attributable to depression vs pain and 2) explicating the reciprocal relationships among sexual dysfunction, depression, and pain.

A smaller number of variables correlated significantly with sexual functioning for male participants than for female participants (six vs 10, respectively). This difference is congruent with previous research that has identified a greater number of statistically significant correlates of sexual functioning for women than for men [12]. Basson [33], for example, argues that the traditional linear model of the sexual response cycle and the medical diagnoses of sexual disorders based on such a model originated from a male-centric view of sexual functioning. This may offer an impoverished account of women’s sexual functioning, which involves a greater number of nonphysiologic factors [33]. This is also supported by research that found that the best “predictors” of sexual distress among a cohort of American women were emotional well-being and relationship markers, while physical aspects of sexual arousal were poor “predictors” [67]. Sex differences were also noted in a large-scale study investigating motivations for sexual intercourse, with women being more likely than men to identify emotional motivators [68]. However, additional research with larger numbers of male participants is needed to clarify the differences that were observed in the current study.

When relationship satisfaction was treated as the outcome measure, two covariates, age and sexual functioning, as well as perceived stress, were statistically significant correlates for female respondents. In contrast, the only significant correlate for males was self-esteem. Contrary to our hypotheses, the regression models for sexual functioning and relationship satisfaction evidenced little overlap, an outcome that may be accounted for by our broad definition of sexual functioning (i.e., it was not restricted to sexual intercourse and

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included masturbation. We regarded self-stimulation as an important element because sexuality is not the exclusive domain of persons in relationships. It is the case, however, that while sexual functioning constitutes an integral element of relationship satisfaction for most persons, the former is not the sole determinant of the latter. Indeed, while the sample appeared to score relatively highly in terms of relationship satisfaction, with less than 20% in the clinical range, the proportion in the clinical range for sexual difficulties was between 40% and 50%, underscoring the distinction between the two.

For both of the outcomes examined here, there was considerable unexplained variance. Future work is needed to identify other correlates of sexual functioning and relationship satisfaction. One potential influence on sexual functioning, which is outside the scope of this paper, concerns medication use. Medication is often the first line of treatment for chronic pain. In addition, given the link between depression and chronic pain, many individuals may also be prescribed antidepressants. The side effects of many of these medications can include sexual dysfunction [4]. However, the link is not always straightforward (i.e., some medications may enhance sexual functioning, and others may improve pain/mood enough to partake in sexual activity) [4]. As the participants in this study were not recruited from a pain clinic and we relied solely on self-report, formal prescription information was unavailable.

Another potential concern is the possibility of organic sexual difficulties in our chronic pain population. However, evidence suggests that sexual functioning in sexual pain disorders is also subject to the influence of psychological factors [69].

There are several limitations to the study that warrant mention. First, the number of male participants was relatively small, which had implications for the types of statistical analyses that could be conducted (i.e., structural equation modeling was not viable). Second, the use of the Internet to recruit participants restricts the sample to those who are computer literate, a bias that is (possibly) reflected in the high levels of college education noted among the respondents. Third, there is no way to determine if self-selection is problematic; that is, persons suffering from chronic pain and interested in the topics of sexual functioning and interpersonal relationships may have been more likely to participate. Fourth, the rate of dropout in the study (40% dropout) could be considered an issue. Some of this was due to a technical error, which was resolved when brought to the attention of the researchers and thus may not have affected the results significantly. This interpretation is reinforced by finding no significant differences in terms of the demographic profile of those who dropped out of the study and those who remained. Fifth, the study is cross-sectional in nature, which precludes making causal inferences or identifying specific temporal sequences among our variables. Sixth, the present study did not collect data from a control sample, so it is not possible to directly compare the correlates of sexual functioning in people with vs without chronic pain. However, findings from the current study are compatible with previous research suggesting that depression and anxiety [70], self-esteem [25], and body image [26,27] correlate with sexual functioning among members of the general population. Seventh, and finally, there is ongoing controversy about the factorial structure of the HADS, with some researchers contending that a two-factor model, in which the HADS-A (anxiety) and HADS-D (depression) are permitted to covary, provides the best fit [71,72] and others suggesting that optimal fit occurs when using a model in which the HADS-A and HADS-D are treated as orthogonal factors, with all items loading onto a higher-order “general distress” factor [73]. Still others recommend that, due to its inconclusive factor structure, “researchers should interpret subscale scores with caution” [74] or forego the subscales entirely and regard the HADS as a unitary measure of general distress [73]. On the basis of this concern, we would advise that future research in this area target brief standalone measures designed to assess anxiety and depression (e.g., the PHQ-9 [75] or the GAD-7 [76]).

In conclusion, both men and women with chronic pain were found to experience moderate levels of sexual difficulties and some relationship dissatisfaction. It is recommended that researchers continue investigating the correlates of sexual functioning and relationship satisfaction among those with chronic pain, and also delineate appropriate coping and support strategies that will enable those with chronic pain to experience maximal sexual well-being.

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