Chronic prostatitis/chronic pelvic pain syndrome-related pain symptoms and their impact on sexual functioning

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Abstract

Introduction: The present study sought to examine a new model to evaluate the mechanistic pathways between pain and sexual dysfunction in men with chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS), incorporating cognitive and emotional factors.
Methods: Men with a self-reported diagnosis of CP/CPPS (n=94, 24–69 years, M_{age}=44.22, standard deviation 11.25) were recruited through social media, support groups, and urology clinics and completed an online questionnaire of demographic, pain, cognitive, psychological, and sexual variables. Descriptive statistics, correlation analysis, and serial mediation analyses assessed variable associations.
Results: Almost half of participants reported mild to severe erectile dysfunction (47.4%). Sexual dysfunction was associated with greater pain symptom severity and pain catastrophizing, as well as depressive symptoms ($p<0.01$ for all). While pain did not independently predict levels of sexual dysfunction, the addition of pain catastrophizing and depressive symptoms into the pathway explained the association between increased pain symptoms and decreased sexual functioning ($p<0.01$).
Conclusions: Beyond generally poor sexual functioning in the current sample, it appears as if cognitive and emotional factors play a role in the association between pain symptoms and sexual functioning in these men with CP/CPPS. The findings of how pain catastrophizing and depression impact the association of pain severity and decreased sexual functioning is important for improving patient care.

Introduction

Chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS) is associated with penile, testicular, ejaculatory, and/or perineal pain symptoms,[1] and can impact patients' sexual activities and satisfaction. Indeed, 62% of patients with CP/CPPS report sexual dysfunction (i.e., ejaculatory difficulties, erectile dysfunction).[2] Individuals with CP/CPPS with associated sexual dysfunction report a significantly worse quality of life (QoL) than those without.[3] Additionally, individuals with CP/CPPS and erectile dysfunction (ED) report increased depressive symptoms and pain catastrophizing,[4] implicating cognitive and emotional factors in the relationship between CP/CPPS symptoms and sexual functioning. To our knowledge, no study to date has tested a model including these parameters.

Cognitive emotional models of sexual dysfunction have been validated in populations with a clinical diagnosis of a sexual dysfunction, and those who experience subclinical sexual difficulties. Such models suggest that when individuals experience interference in their typical sexual functioning, they will display a heightened focus on the negative consequences of not performing typically, resulting in negative emotionality.[5] The physiological pathway from pain in the penis and pelvis, and impaired erectile functioning is apparent and involves avoidance behaviors, but the psychological pathways underpinning this relationship remain uncertain. It is known that patients with CP/CPPS demonstrate elevations in depression,[6] as well as pain catastrophizing,[7] factors that have been found to predict sexual dysfunction within cognitive-emotional investigations of sexual dysfunction of individuals without CP/CPPS.[8] It is not known whether the same cognitive-emotional pathways and mechanisms operative in those without a genitourinary and pelvic pain condition can be applied to urological patients complaining of these symptoms.

The objectives of this study were to assess a cognitive-emotional CP/CPPS model for the prediction of sexual dysfunction using theoretically and clinically relevant variables. It was hypothesized that CP/CPPS pain would have a direct positive relationship with sexual dysfunction and that this relationship would be mediated by pain catastrophizing and depressive symptoms.

Method

Participants

Participants with a self-identified diagnosis of CP/CPPS were recruited (see *Procedure* below). All participants had to be above the age of 18 years and able to read and understand English. Participants completed an anonymous, online survey through the Qualtrics platform (Qualtrics, Provo, UT, U.S.).

Measures

Participants were asked to indicate their age, gender identity, country of residence, race/ethnicity, level of education, relationship, and employment status, and whether they have previously received a diagnosis of CP/CPPS.

The National Institutes of Health Chronic Prostatitis Symptom Index (NIH-CPSI)[9] was used to assess CP/CPPS symptom severity. The commonly used, 13-item measure includes three subscales: pain symptoms, urinary symptoms, and QoL. The scoring of the items varies, with ranges from 0–1 to 0–10. The scores were summed together to obtain a total NIH-CPSI score from 0–43, as well as a score for the eight-item pain subscale, which ranges from 0–21.

The extent to which individuals engage in catastrophic thinking about their pain was measured using the four-item version of the Pain Catastrophizing Scale (PCS-4).[10] From the full-length, 13-item PCS, one item assessing magnification ("I become afraid the pain will get worse"), one item assessing helplessness ("It's terrible and I think it's never going to get any better"), and two items assessing rumination ("I anxiously want the pain to go away," "I keep thinking about how badly I want the pain to stop") were retained. Each of these dimensions have been identified as being central to pain catastrophizing appraisal and mechanisms.

The Patient Health Questionnaire-9 (PHQ-9)[11] assessed depressive symptomology. The nine-item measure is commonly used to screen for symptoms of major depressive disorder based on the DSM-V criteria, asking individuals to indicate how often they have been bothered by problems such as "little interest or pleasure in doing things," on a 0 (not at all) to 3 (nearly every day) Likert scale. Responses to the nine items were summed to obtain a total PHQ-9 score, with higher scores indicating worse depressive symptom severity. The measure was originally a subscale within the full, 16-item measure used for the same purpose.[11]

Sexual functioning was assessed using the International Index of Erectile Function (IIEF).[12] The questionnaire contains 15 items (e.g., "How do you rate your confidence that you could get an erection?"), to which participants must respond on a five-point Likert scale from 1 (almost never or never) to 5 (almost always or always). The items assess sexual functioning in men across several domains: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction.[12]

Procedure

This research was approved by Queen's University Health Sciences Research Ethics Board. The anonymous survey was administered via the Qualtrics platform. The study followed university mandated COVID-19 clinical research guidelines employing a multiformat sampling strategy. Participants were recruited via four avenues: 1) social media advertising; 2) the Pelvic Pain Clinic U.K.'s newsletter; 3) referral from a urologist; and 4) snowball sampling. The social media advertising was conducted through Twitter, Facebook, Instagram, and Reddit. The participating urologists distributed physical advertisements with a QR code linking to the survey directly in clinics, and urology and pelvic pain specialists may have made personal referrals to the study's link through snowball sampling. Once they had opened the survey and provided their consent to participate, participants were asked to verify that they had been diagnosed with CP/CPPS, answer several questions relating to demographics, then taken through the battery of study measures. At any point, if a participant wished to stop, they could terminate their participation in this anonymous study. No compensation was offered to participants.

Data preparation

The data was downloaded directly from the Qualtrics software. Before preparing the data, the dataset was reviewed for irregularities, such as missing or impossible values. For each given measure, only participants who completed 80% of the items would have their total scores calculated to be included in data analysis.[13] Any missing data of a given measure was imputed and replaced with the means of all completed items on that measure. Upon completion, all total and subscale scores were calculated.

Data analyses

The demographics of the current sample, as well as mean scores on standardized measures were assessed. One-way analysis of variances (ANOVA), using Bonferroni correction, assessed mean differences in pain symptoms, pain catastrophizing, depressive symptoms, and sexual functioning across demographic variables. If mean differences were found, independent t-tests were performed to assess mean differences between groups.

Pearson's r correlations were used to examine the relationship between sexual functioning and all independent variables to be used in a serial mediation analysis (i.e., age, pain symptoms, pain catastrophizing, depressive symptomology, sexual functioning). Based on the output of these

correlations, variables that were not significantly associated with sexual functioning (i.e., outcome variable) were not included in the subsequent analyses.

To test the primary study hypothesis, a serial mediation assessed the relationship between pain symptoms and sexual functioning. This primary model was analyzed using model 6 from Hayes' PROCESS Macro for SPSS,[14] with two mediators, 10 000 bootstrap samples, and 95% confidence intervals (CI). NIH-CPSI pain subscale was input as the predictor variable, pain catastrophizing as the first mediator, depressive symptoms as the second mediator, and sexual functioning as the outcome variable.

Results

Descriptive statistics

Demographic characteristics of the sample are represented in Table 1. Of those who opened the survey, 42.9% completed enough of the questionnaires to be included in the final analysis, resulting in a final sample of 97. All participants identified as male and the average age of participants was 44.22 years (standard deviation [SD] 11.25, range 24–69). Most of the sample self-identified as White (79.4%), married (83.5%), and having at least graduated from college/university (61.8%). Most of the participants reported living in the U.K., the U.S., and Canada; 19.6% (n=19) of participants indicated they were not from any of these countries. Other than these countries, participants indicated that they were living in Singapore, Italy, Mexico, Philippines, Lithuania, Switzerland, Turkey, Guyana, Sweden, Spain, Iran, Germany, Egypt, Romania, South Africa, Iceland, and Hong Kong. Just over half of the sample were recruited via Facebook (55.6%, n=53), 2% (n=2) from other social media platforms (i.e., Instagram, Reddit, Twitter), 24.7% (n=24), from a CP/CPPS support group, 2% (n=2) from a friend's referral, and 13.4% (n=13) received a referral from their urologist

There was one statistically significant difference between demographics and IIEF scores; race/ethnicity was the only demographic characteristic that displayed a significant relationship with sexual functioning (p=0.008). To further analyze this relationship, two categories for racial identity had to be created due to some racial identities having two cases or less. Participants who indicated that they identified as White were retained in this category (n=77), and those who selected a racial identity other than White, were categorized as Black, Indigenous, and People of Colour (BIPOC) (n=15). After this recategorization, the groups showed significantly different means in IIEF scores (p=0.014), with White participants demonstrating worse sexual functioning (M=51.10), compared to BIPOC participants (M=38.07). There were no additional significant differences across education, relationship, and employment status, or where the participants had heard about the study from.

The four-item PCS-4, nine-item PHQ-9, and 15-item IIEF demonstrated high internal consistency (α=0.82, 0.91, and 0.93, respectively). The 13-item NIH-CPSI also demonstrated sufficient internal consistency (α=0.78). The mean total score of the NIH-CPSI (25.90, SD 6.85) indicated moderate to severe CP/CPPS severity, with 22.7% reporting severe,

Table 1. Demographic information of participants

Baseline characteristics	n	Full sample (%)
Race/Ethnicity		
Black	2	2.1
Asian	8	8.2
Hispanic/Latinx	3	3.1
Indigenous	1	1.1
White	77	79.4
Other	1	1.1
Country of residence		
Canada	17	17.5
United States	29	29.9
United Kingdom	31	32
Australia	1	1.1
Other	19	19.6
Education status		
Some high school or GED	12	12.4
Some college/university	19	19.6
Graduate from college/university	30	30.9
Some postgraduate	5	5.2
Graduated from postgraduate	30	30.9
Employment status		
Employed	83	85.6
Unemployed	4	4.1
Retired	8	8.2
Student	2	2.1
Relationship status		
Single	11	11.3
Married	81	83.5
Divorced	3	3.1

GED: general educational development.

Table 2. Correlation matrix for predictor variables and sexual functioning

Relevant variable	Age	Pain	Depressive symptoms	Pain catastrophizing	Sex function
Age	–				
Pain	-0.12	–			
Depressive symptoms	-0.14	0.48*	–		
Pain catastrophizing	-0.20	0.43*	0.60*	–	
Sex function	-0.07	-0.33*	-0.50*	-0.29*	–

Pain: National Institutes of Health-Chronic Prostatitis Symptom Index pain symptoms.
*p<0.01 (two-tailed).

61.9% moderate, and 4.1% mild symptoms. The mean score on the pain subscale was 12.31 (SD 3.58). The mean PHQ-9 score (11.16, SD 7.07) indicates minimal to moderately severe depressive symptoms overall; 16.5% of the sample reported minimal depressive symptom severity, 32% reported mild symptom severity, 18.6% reported moderate symptom severity, 19.6% reported moderate-to-severe symptom severity, and 13.4% reported severe depressive symptom severity. The mean score of the PCS-4 was 10.10 (SD 3.92). The global score of the IIEF was 49.13 (SD 18.66). To analyze the severity of ED, the erectile function domain of the IIEF was used, and 47.4% of participants met criteria; 16.5% had mild ED, 12.4% had mild-to-moderate ED, 10.3% had moderate ED, and 8.2% had severe ED.

Correlations among variables

As shown in Table 2, Pearson's r correlations were used to analyze the extent to which the current study's variables were correlated. NIH-CPSI pain symptom, pain catastrophizing, depressive symptoms, and sexual functioning scores were all correlated. The largest correlation emerged between PCS-4 and PHQ-9 scores. IIEF and PHQ-9 scores were also correlated, indicating that sexual functioning is more highly correlated with depressive symptoms than the other predictor variables. Sexual dysfunction was negatively correlated with pain symptom, pain catastrophizing, and depressive symptom scores, indicating that greater scores on all these variables are related to worse sexual functioning.

Serial mediation

The serial mediation analysis determined the relationship between CP/CPPS pain symptoms and sexual dysfunction through the indirect effects of pain catastrophizing and depressive symptomatology. As expected, the total effect of NIH-CPSI pain symptomatology on sexual functioning was significant (b=-1.72, SE 0.50, 95% CI -2.721, -0.717), suggesting that the combined weights of pain symptoms, pain catastrophizing, and depressive symptoms were significantly associated with sexual functioning in patients with CP/CPPS. The direct effect from CP/CPPS pain symptomatology to sexual functioning was much smaller and did not reach statistical significance (pain symptoms → sexual functioning), b=-0.64, SE 0.54, 95% CI -1.716, 0.440). The individual unstandardized path coefficients for the predictor variables and sexual functioning are illustrated in Figure 1.

While pain symptoms in isolation were not related to sexual functioning scores, when the mediating influences of pain catastrophizing and depressive symptoms were accounted for (pain symptoms → pain catastrophizing → depressive symptoms → sexual functioning), pain symptoms were associated with sexual functioning (b=-0.48, SE 0.20, 95% CI -0.939, -0.163). Increased pain symptom scores led to increased pain catastrophizing levels, leading to increased depressive symptoms, and ultimately resulting in decreased sexual functioning scores. Depression on its own also mediated the relationship between pain symptom and sexual dysfunction scores (pain symptoms → depressive symptoms → sexual functioning) (b=-0.66, SE 0.25, 95% CI -1.20, -0.25). Pain catastrophizing was not found to mediate the relationship independent of depressive symptoms scores (b=0.06, SE 0.26, 95% CI -0.515, 0.550).

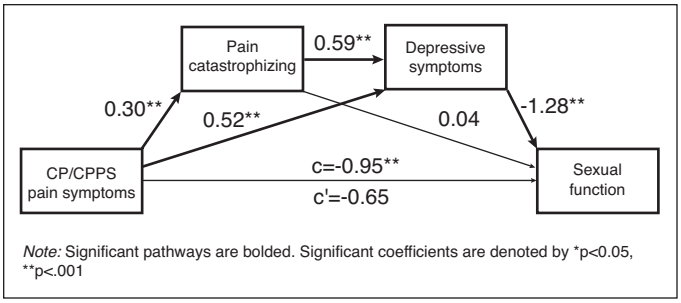
Discussion

The relationship between pain and sexual functioning in the current sample is best explained through pain catastrophizing and depressive symptoms. The serial mediation analysis revealed that pain symptoms in isolation do not effectively predict sexual functioning scores, yet did when influences of pain catastrophizing and depressive symptoms were entered into the model as mediators. Depressive symptoms were also found to be an effective mediator without the influences of pain catastrophizing, but pain catastrophizing did not emerge as a unique mediator. These results provide evidence that pain is not the primary driver of sexual dysfunction in CP/CPPS but supports a much more complex role of cognitive-emotional processing in impaired sexual functioning.

Previous studies have found that patients with CP/CPPS and ED demonstrate higher levels of depressive symptoms, pain catastrophizing, and symptom severity compared to those without ED,[4] prompting the use of such variables in the present study. The association of poor sexual functioning with cognitive factors and emotional states is consistent with prior research in men with genital pain.[15,16]

Prior CP/CPPS literature has failed to examine the relationship that cognitive-emotional variables have with each other and how these factors predispose patients to experience a decrease in sexual functioning. The mediation analysis results suggest that when individuals experience pain, predominantly in the pelvic region, they begin to catastrophize the extent of their pain and ruminate on this pain's impact on their daily life and typical functioning, such as sexual functioning. Then, negative emotions are experienced because of this attentional focus on negative consequences from failure to function typically, and the individuals' functioning further decreases.[17] The specific aspect of functioning examined in the present study was sexual functioning, such as erectile and orgasmic function. The novel mediation model tested in this study offers a new insight into the directionality of how pain symptoms and cognitive-emotional processes lead to poor sexual functioning in the sample.

The present primary line of treatment for ED in CP/CPPS includes the administration of phosphodiesterase type 5 (PDE-5) inhibitors,[18] which may improve the physiologic-



Note: Significant pathways are bolded. Significant coefficients are denoted by *p<0.05, **p<.001

Figure 1. Serial mediation model with chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS) pain symptoms as the predictor variable and sexual function as the outcome variable.

al components of ED yet neglect the omnipresent mental components. The present study's evidence for the role that psychological factors have in perpetuating poor sexual functioning in patients with CP/CPPS offers evidence for the incorporation of psychotherapy, such as cognitive behavioural therapy (CBT), into current treatment standards. CBT, in conjunction with pharmaceutical agents, has been shown to lead to extended improvements upon sexual parameters in men with ED compared to the use of pharmaceutical agents alone.[18] In a feasibility trial, Nickel et al[19] found that a cognitive behavioral symptom management program for CP/CPPS significantly reduced patients' levels of pain catastrophizing, disability, and pain, but not depressive symptoms. This program challenged patients' illness-focused coping and catastrophic cognitions, potentially explaining the improvements in catastrophizing but not depressive symptomatology, although the two have been found to be highly related.[5] Thus, future multimodal therapies for CP/CPPS should incorporate considerations of depressive symptoms in the condition and include evidence-based methods of reducing depression through CBT identified in healthy individuals.[20]

Limitations

There are study limitations to mention. Due to the largely homogenous racial distribution of participants in the present study, the results may not be generalizable to BIPOC individuals and may only be generalizable to White individuals with CP/CPPS. Additionally, the survey did not include assessment of sexual orientation of participants, negating the opportunity to assess differences across sexual identities. The current survey was administered online due to the difficulties posed to in-person recruitment following health and safety measures aimed at reducing the spread of COVID-19. While the participants' scores on the measures included in this study closely mirror those obtained from patients at tertiary care clinics,[4] they were slightly elevated. This may be best explained by literature on self-report survey modes, which proposes that individuals may be more likely to disclose stigmatized behaviors (which could include the inability to obtain/maintain an erection or feelings of sadness in men particularly) via computerized surveys opposed to in-person survey administration.[21] As usual, replication and extension of the current study is recommended.

Conclusions

The present findings suggested that men with CP/CPPS are at risk of experiencing poor sexual functioning due to pain in the genitals, pain catastrophizing, and depressive symptoms. The implication of cognitive and emotional factors in the etiology and maintenance of poor sexual functioning adds further support to the cognitive-emotional model of sexual dysfunction, begging future research to adapt comprehensive frameworks when studying sexuality. The evidence additionally adds support to the growing movement to integrate psychotherapy into the multifaceted management of CP/CPPS.

Competing interests: Dr. Nickel has been an advisor/consultant for Aliovio, HengRui USA, Inmunotek, Japan TC Pharma, Kanglaite, MicroGenDX, OM Pharma, Red Leaf Medical, Seikagaku Corp, Shionogi, Urogen Pharma, UTIVA, Valensa Int, and Zambon SpA; and is currently involved in clinical trials supported by Inmunotek and MicroGenDX. The remaining authors do not report any competing personal or financial interests related to this work.

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This paper has been peer-reviewed.

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