

Sexual Cues Mediate the Daily Associations Between Interpersonal Goals, Pain, and Well-being in Couples Coping With Vulvodynia

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Abstract

Background Vulvodynia is an idiopathic vulvovaginal pain condition that has significant sexual and relational consequences. Most women with vulvodynia continue to have intercourse, possibly because of a desire to approach positive outcomes (e.g., intimacy) and avoid negative outcomes (e.g., partner disappointment).

Purpose This study examined daily associations between approach and avoidance sexual goals and women's pain during intercourse and couples' sexual and relational well-being, as well as the mediating role of sexual cues.

Methods Over 8 weeks, on sexual activity days ($M = 8.77$), women with vulvodynia ($N = 101$) and their partners reported their sexual goals, attention to sexual cues, sexual function, and relationship satisfaction, and women reported pain during intercourse.

Results On days when women and partners held higher approach goals, they attended more to positive sexual cues, and in turn, felt more relationally satisfied, whereas on days when they held higher avoidance sexual goals, partners were more focused on negative sexual cues, and in turn, partners reported lower relationship satisfaction. On days when women reported higher approach goals, they reported less pain, and both they and their partners attended more to positive sexual cues, and in turn, both had higher sexual function, whereas on days when women reported higher avoidance goals, both they and their partners attended more to negative sexual cues, and in turn, women reported greater pain, and both partners reported poorer sexual function.

Conclusions Interventions should target cognitive-affective processes during sexual activity as one pathway by which sexual goals impact pain and adjustment.

Keywords Vulvodynia • Chronic pain couples • Goals • Relationship satisfaction • Daily diary • Sexual function

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Vulvodynia is a chronic idiopathic vulvovaginal pain condition. Its most common subtype, provoked vestibulodynia (PVD), affects 8% of women and is characterized by pain on contact to the vulvar vestibule, primarily during sexual activity (1). In line with other chronic pain conditions (2), the complex etiology of vulvodynia includes biological, psychological, and interpersonal factors (3). Partners often trigger the pain during intercourse, and they affect and are affected by this condition (4), underscoring the importance of considering their role in couples' adjustment. Given the intimate context in which this pain occurs, it is not surprising that the core interference

of the pain—i.e., the “disability” associated with this condition—is to couples’ sexual functioning and more broadly their romantic relationship. Indeed, affected women typically score in the clinical range of sexual dysfunction for low desire and arousal (5). Controlled studies have also found that the male partners of women with vulvodynia experience more erectile difficulties and lower sexual satisfaction (e.g., (6)). Although the overall relationship satisfaction is not adversely impacted by this condition (4), women and their partners have consistently reported a negative toll to their relationship (e.g., (6, 7)). Common feelings of isolation, anxiety, lack of intimacy, guilt and inadequacy as a romantic partner, and difficulties with communication likely contribute to these broader sexual and relationship consequences among couples coping with vulvodynia (6, 7).

Most women with vulvodynia continue to have intercourse (8), and their motivations for doing so are often interpersonally determined (9). Specifically, women with vulvodynia have reported persisting with painful intercourse both because of a desire to approach positive relationship outcomes (e.g., intimacy) and to avoid negative ones (e.g., partner disappointment), and these goals can function simultaneously (9, 10). Although there is a growing evidence that interpersonal factors affect couple adjustment in living with chronic illness (11), including vulvodynia (4), little is known about the mechanisms by which such factors influence pain and functioning. This study investigated the mediating role of self-reported attention to sexual cues in the daily associations between interpersonal sexual goals and the pain, sexual, and relational functioning of couples coping with vulvodynia.

Motivational theories suggest that chronic pain is influenced by a variety of goals that go beyond pain reduction (12). Self-reported goals, such as achievement, mood management, and pain-avoidance, have been linked to pain and disability in chronic pain populations (e.g., (12–16)). For example, Karsdorp and Vlaeyen (15) found that the strong reasons for persisting in a painful task and strong pain-avoidance goals were each associated with increased pain severity and disability in patients with chronic musculoskeletal pain. They postulated that strong goals for completing a task led to greater task persistence, whereas strong pain-avoidance goals led to greater avoidance of pain-inducing activities. In turn, excessive task persistence and avoidance eventually lead to greater pain and disability (17, 18).

Whereas biopsychosocial models highlight the important role of interpersonal variables in the maintenance of chronic pain and associated difficulties (2)—including in vulvodynia (4)—researchers have largely focused on intraindividual, pain-related goals, to the exclusion of other important life goals. Examining interpersonal goals may clarify under what conditions

persistence might ameliorate or worsen pain and impairment. Interpersonal goals are especially relevant to vulvodynia given that couples’ distress is highly influenced by their relational interactions and dyadic coping (4).

Over 85% of women with vulvodynia continue to have penetrative sex (8). Excessive persistence with painful intercourse may contribute to nociceptor sensitization and abnormal nerve proliferation, further exacerbating the pain (19). However, there might also be benefits (e.g., relational intimacy, pain acceptance; (20, 21)) associated with engaging in painful sexual activities, which could lead to reduced pain and disability. Indeed, in a daily experience study of couples affected by vulvodynia, on days where women were more motivated to meet their partner’s sexual needs, they reported greater sexual and relationship well-being, but on days where they prioritized their partners’ needs to the exclusion of their own needs, their sexual and relationship satisfaction suffered (22). This prior study focused on the specific goal of being responsive to a partner’s sexual needs and did not examine links between sexual goals and women’s pain nor the mechanisms by which goals related to couples’ well-being. Examining broader interpersonal goals for engaging in painful intercourse may provide important insight into the consequences of this persistence.

Originating from the theories of social motivation (23), sexual goals are conceptualized as reasons for engaging in painful sex that include wanting to pursue desirable (approach goals; e.g., feeling close to one’s partner) and avert negative (avoidance goals; e.g., losing one’s partner) outcomes (9). Two cross-sectional studies of couples with vulvodynia found that approach sexual goals were related to greater sexual and relationship satisfaction and avoidance sexual goals to lower sexual function and sexual and relationship satisfaction (10, 24). Furthermore, higher avoidance sexual goals in combination with higher avoidance goals in their relationship more generally, predicted greater pain during the intercourse (25). Such cross-sectional studies are limited by their inability to capture factors that may vary across time and sexual interactions, such as relationship conflict, mood, and stress. Indeed, there is evidence that sexual goals vary from day-to-day in community couples (26), as does women’s pain experience and the sexual and relationship functioning of couples coping with vulvodynia (20, 21). Thus, each painful sexual experience may be affected by unique physical, psychological, and relational factors that are better captured by daily measures. Furthermore, no prior studies to our knowledge have investigated the mechanism by which sexual goals impact women’s pain and couples’ adjustment to vulvodynia.

According to approach-avoidance theory (23), sexual goals may be associated with women’s pain and couple’s sexual and relationship functioning through differential

experiences of the sexual event and specifically the processing of positive and negative cues during a sexual interaction. Thus, in line with the dual-control model of sexual response (27), holding stronger approach sexual goals may have an excitatory effect such that individuals are more mindful of positive sensations, thoughts, and emotions during sex, whereas holding stronger avoidance sexual goals may have an inhibitory effect as the individual's focus is on more negative sexual cues. Because approach and avoidance goals are relatively independent, their mediating mechanisms can also be distinct (23). In community samples, those with stronger approach goals are biased toward positive cues in their memories or experience of events, and those with stronger avoidance goals are biased toward negative cues (28, 29), with these biases being associated with more or less relationship satisfaction, respectively (29). Furthermore, inducing a non-pain-related approach goal (e.g., a monetary reward) reduced attention to pain and the experience of pain itself in nonclinical samples (30, 31). Thus, couples affected by vulvodynia who hold stronger approach sexual goals may be more likely to attend to positive cues during sex, such as their feelings of pleasure and partner's enjoyment, whereas those who hold stronger avoidance sexual goals may attend more to negative cues, such as their distracting thoughts or signs of partner distress (32). In turn, attending to sexual cues may promote more or less focus on the pleasurable aspects of the experience or create a more positive or negative (e.g., intimacy vs. anxiety) environment for the sexual interaction, thereby affecting women's pain and the sexual and relational functioning of women and their partners. Because a person's sexual goals affect their partner's experience, independent of their partner's goals (26), this shift in attentional focus may have consequences for both the partners. Few studies have examined the mechanisms by which motivation is linked to chronic pain and associated difficulties, and none to our knowledge using a dyadic, daily diary approach. Examining the mediating role of sexual cues is important because it suggests a pathway by which sexual goals are linked to the key presenting concerns of couples coping with vulvodynia and could therefore be important targets for intervention.

In the current study, we investigated the daily associations between interpersonal sexual goals and women's pain during intercourse and both partners' sexual function and relationship satisfaction, extending prior work by examining the mediating role of sexual cues in these associations. We hypothesized that on days when participants pursued sex for higher approach goals (compared to their average level), they and their partners would report greater attention to positive sexual cues, and in turn, higher sexual function and relationship satisfaction, and women would report lower pain. In contrast,

on days when participants pursued sex for higher avoidance goals, they and their partners would report more attention to negative sexual cues and then lower sexual function and relationship satisfaction, and women would report more pain.

Method

Participants

Women and their partners ($N = 153$) were recruited in two Canadian cities between May 2014 and October 2016 through print and online advertisements (105; 69%), participation in our prior research studies (29; 19%), direct referrals from physicians (16; 10%), and word of mouth (3; 2%). For women, the inclusion criteria were: (a) pain during intercourse which was subjectively distressing, occurred on 80% of intercourse attempts, and had lasted for at least 6 months, (b) pain limited to pressure to the vestibule, (c) pain during the diagnostic gynecological examination rated at a minimum of four on a self-reported scale ranging from 0 (*not pain at all*) to 10 (*worst pain imaginable*), described below in the *Procedure*, (d) a minimum of four in-person contacts with their romantic partner per week for at least 3 months, (e) a minimum level of sexual activity (defined to include intercourse, manual, or oral stimulation but did not require vaginal penetration) of once per month in the previous 3 months, and (f) fluent in English or French. Exclusion criteria were the presence of one of the following: active infection previously diagnosed by a physician or self-reported infection, pregnancy, age less than 18 or greater than 45 years, and menopausal. The only inclusion criterion for partners was age of 18 or older and fluent in English or French.

Of the 153 interested couples, 49 (32%) were ineligible: 12 (8%) did not receive a diagnosis of PVD by the gynecologist, 25 (16%) women or partners withdrew before starting the daily surveys, 9 (6%) couples ended their relationship during the eligibility process, and 3 (2%) were ineligible for other reasons (e.g., pain location criteria). Of the 104 eligible couples, three couples were not included in the analyses because they did not report engaging in sex during the study. The final sample size consisted of 101 women diagnosed with PVD and their partners ($n = 99$ men, two women). See [Table 1](#) for participant demographics.

Procedure

The current study used data collected from a larger study of which one paper has been published using a subset of the current sample and focusing on a particular facet of couples' interpersonal motivation (22). Specifically, the

Table 1 Sample Characteristics ($N = 101$ Couples)

| Characteristic | Women | | Partners | |
|----------------------------------|------------------------------|----------------|------------------------------|----------------|
| | <i>M</i> (range) or <i>n</i> | <i>SD</i> or % | <i>M</i> (range) or <i>n</i> | <i>SD</i> or % |
| Age (years) | 25.59 (18–45) | 5.66 | 26.97 (18–50) | 6.97 |
| Cultural background | | | | |
| French Canadian | 52 | 52% | 42 | 43.8% |
| English Canadian | 32 | 32% | 33 | 34.4% |
| American | 1 | 1% | 1 | 1% |
| European | 5 | 5% | 9 | 9.4% |
| Other | 10 | 10% | 11 | 11.4% |
| Annual income (household; CAD\$) | | | | |
| \$0–19,999 | 31 | 31% | – | – |
| \$20,000–39,999 | 13 | 13% | – | – |
| \$40,000–59,999 | 18 | 18% | – | – |
| \$60,000–79,999 | 18 | 18% | – | – |
| \$80,000–99,999 | 10 | 10% | – | – |
| ≥ \$100,000 | 15 | 10% | – | – |
| Relationship status | | | | |
| Married | 19 | 19% | – | – |
| Cohabiting | 48 | 48% | – | – |
| Dating | 33 | 33% | – | – |
| Relationship duration (months) | 49.84 (6–204) | 41.66 | – | – |
| Women's pain intensity | 6.67 (1.7–10) | 1.60 | | |
| Women's pain duration (months) | 62.10 (6–264) | 55.55 | | |
| Sexual activity days | 8.77 (1–31) | 5.70 | | |
| Study Variables (daily) | | | | |
| Approach sexual goals | 3.85 (1–7) | 1.53 | 3.78 (1–7) | 1.45 |
| Avoidance sexual goals | 2.25 (1–7) | 1.64 | 1.91 (1–7) | 1.27 |
| Positive sexual cues | 5.06 (1–7) | 1.55 | 5.76 (1–7) | 1.18 |
| Negative sexual cues | 2.47 (1–7) | 1.34 | 1.65 (1–7) | .93 |
| Relationship satisfaction | 5.70 (1–7) | 1.05 | 5.80 (1–7) | 1.02 |
| Sexual Function | 29.61 (4–54) | 11.55 | 40.53 (11–54) | 7.69 |
| Women's pain intensity | 1.96 (0–5) | 1.12 | | |
| Women's pain unpleasantness | 4.39 (0–10) | 2.74 | | |

prior study examined how being more or less responsive to a partners' sexual needs related to couples' sexual and relationship well-being. Detailed information regarding the study procedures can be found in this prior publication. In brief, women were diagnosed with PVD during a standardized gynecological examination which included the well-validated "cotton swab test" (33). Eligible couples then attended a laboratory session where they each provided informed consent and completed online questionnaires not relevant to the current study. Participants were given instructions for completing daily surveys for 8 consecutive weeks through links to a secure survey server site that was emailed individually to each participant. They were asked to begin the diaries that day

and to complete them each evening (beginning at 5:00 PM and expiring at 2:00 AM) reflecting on sexual activity that occurred since last completing a diary and independently from their partner. On days where partnered sexual activities were reported since last completing a diary, participants completed measures of approach and avoidance sexual goals, attention to positive and negative cues during sexual activity, sexual function, and relationship satisfaction, and women completed measures of pain intensity and unpleasantness. We employed several methods to promote diary participation, described previously (22). The total rate of diary completion was 87.04% (9,748 diaries of a possible 11,200). Participants reported a mean of 8.77 sexual activity days ($SD = 5.77$;

range = 1–31), and 73% of these days included vaginal intercourse/penetration ($M = 5.96$, $SD = 4.53$, range: 1–21). At the end of the study, participants received resources about vulvodynia. Women received \$20 for the gynecological examination, both partners received \$10 each for attending the laboratory session and up to \$96 each for completing the diaries (payment was prorated based on the number of diaries completed). The research ethics boards at our institutions approved this study.

Measures

As part of a background survey, participants reported their own age and women also reported their relationship status, relationship duration, pain duration, and household income. All other described measures were completed on sexual activity days (41 items), with the exception of the measures of pain during intercourse, which were completed only on days that couples reported engaging in vaginal intercourse/penetration. Means and standard deviations for all measures are presented in Table 1.

Approach and avoidance sexual goals

Sexual goals were assessed with a 13-item measure adapted from Cooper et al. (34) by Impett et al. (28) and used previously in diary studies (26). Participants rated the importance of eight interpersonally oriented approach goals (e.g., “to feel closer to my partner”) and five avoidance goals (e.g., “to prevent my partner from becoming upset”) in their decision to have sex on seven-point scales (1 = *not at all important* to 7 = *extremely important*). Higher scores indicate higher approach and avoidance goals and are represented as mean scores. Cronbach’s alphas for approach goals were 0.86 for women and 0.87 for partners, and 0.89 for women and 0.88 for partners for avoidance goals.

Positive and negative sexual cues

Positive and negative cues during sexual activity were measured with 12 items (six positive, “During sexual activity, I felt passionately attracted to my partner”; six negative, “During sexual activity, bothersome thoughts disturbed my concentration”) used in prior diary experience research to assess feelings and cognitions during sexual activity (35). Participants rated how true they believe each statement to be on a seven-point scale (1 = *not at all true*, 7 = *very true*). Mean scores of positive and negative sexual cues were calculated such that higher scores indicated more attention to positive and negative sexual cues, respectively. Cronbach’s alphas for positive cues were 0.89 for women and 0.91 for partners, and 0.73 for women and 0.78 for partners for negative cues.

Relationship satisfaction

Relationship satisfaction was assessed with the well-validated Kansas Marital Satisfaction Scale (36) adapted previously for nonmarital relationships and to be completed daily (37). The three items were rated on a seven-point scale from 1 (*extremely dissatisfied*) to 7 (*extremely satisfied*) and are represented as means. Higher scores indicate higher satisfaction. Internal consistency was excellent for women and the partners ($\alpha = 0.96$ for both).

Sexual function

Sexual function was assessed with the Monash Female Sexual Satisfaction Questionnaire (MFSSQ; (38)). The 11-item MFSSQ assesses a recent sexual experience (within 24 hr) with reference to sexual receptivity, ease of arousal, vaginal lubrication, degree of pleasure, and satisfaction. The MFSSQ was previously adapted to assess male partners’ sexual function (39). The potential range in scores for both women and men was 5 to 54, with higher scores indicating better sexual function. In the current study, good internal consistency for both women and partners was observed ($\alpha = 0.86$ for both).

Pain experience (intensity and unpleasantness)

Women’s pain intensity during intercourse was assessed with the Present Pain Intensity scale (PPI) of the McGill Pain Questionnaire (MPQ; (40)). Women rated the intensity of their pain during intercourse in the last 24 hr using the six-point PPI scale, which ranged from 0 (*no pain*) to 5 (*excruciating*). The PPI correlates significantly with the Pain Rating Index of the MPQ across a number of chronic pain conditions (40). Women reported the unpleasantness of their intercourse pain by using a horizontal numerical rating scale ranging from 0 (*not unpleasant*) to 10 (*most unpleasant ever*). Given the high correlation between the two pain measures ($r = 0.86$, $p < .001$), a composite variable was created using the standardized score of each pain measure.

Data Analyses

Data were analyzed with the multilevel modeling in SPSS version 20.0, guided by the Actor Partner Interdependence Model (41). We examined the associations between women’s and partners’ daily approach and avoidance sexual goals and their own and partner’s sexual function and relationship satisfaction and the women’s experience of pain. We also tested whether the effects were mediated by women’s and partners’ self-reported focus on positive and negative cues during sex. We ran the models separately for each outcome (pain, sexual function, and relationship satisfaction) and in all cases tested a two-level cross model with random intercepts

where persons are nested within dyads, and person and days are crossed to account for the fact that both partners completed the daily surveys on the same days (41). All models included both partners' approach and avoidance sexual goals entered simultaneously as predictors. To avoid confounding within- and between-person effects, all daily-level predictors were person-mean centered such that coefficients reflect associations between deviations from a person's mean score on daily sexual goals and each outcome measure (42). As such, these analyses account for between-person differences in sexual goals and assess whether day-to-day changes from a person's own mean in sexual goals are associated with changes in each outcome. The analytical approach offers one way of estimating the missing data, in lieu of actually having these data (43).

The coefficients reported are unstandardized betas (*b*) and are interpreted as the change in the outcome for every one-unit increase in the predictor; these act as an indication of the effect size. In tests of mediation, we followed the guidelines for a 1-1-1 mediation outlined by Zhang et al. (2009) and used the Monte Carlo Method of Assessing Mediation (44) with 20,000 resamples and 95% confidence intervals (CIs) to test the significance of the indirect effects. Consistent with the theory (23) and as described earlier, prior research has shown that stronger approach goals are linked to greater attention to positive cues whereas stronger avoidance goals are associated with more attention to negative cues (28, 29). We therefore only examined positive cues as a mediator of the approach goals effects and negative cues as a mediator of the avoidance goals effects.

Before conducting the main analyses, we calculated the intraclass correlation coefficient (ICC) for each outcome and mediator to determine the percentage of variance that was accounted for by within-person differences. The ICC is calculated by running a baseline model without predictors and represents the amount of variance that can be attributed to between-person differences; this is subtracted from 1 to calculate the variance attributed to within-person differences. Correlations for the daily variables were calculated using the aggregate across days.

Results

Descriptive Statistics and Preliminary Analyses

The ICC values indicated that within-person differences accounted for 18% of the variance in negative sexual cues, 24% for positive sexual cues, 26% for pain during intercourse, 40% for sexual function, and 29% for relationship satisfaction. Correlations between all study variables are reported in Table 2. Participants' age,

relationship duration, sexual frequency, and women's pain duration were correlated with our key variables at less than 0.30 and were not included as covariates in the analyses. There were no significant differences between recruitment sites on any of the sociodemographic or key variables, so the sites were analyzed together.

Daily Associations Between Sexual Goals and Couples' Sexual Function, Relationship Satisfaction, and Women's Pain

As predicted and reported in Table 3, on days when women reported higher approach sexual goals (compared with their average level), they reported higher relationship satisfaction, but there was no association with their partner's relationship satisfaction. As a measure of the effect size, the unstandardized coefficients represent the change in outcome for every one-unit change in the predictor from the person's own mean score. Thus, e.g., every one-unit increase in women's approach goals (compared with their own mean score on approach goals) was associated with an increase of 0.15 on the measure of relationship satisfaction (measured on a scale of 1 to 7). Similarly, on days when partners reported higher approach goals than usual, they reported higher relationship satisfaction, but partner approach goals were not associated with women's relationship satisfaction. Also in line with expectations, on days when women reported higher avoidance sexual goals than their average, they reported lower relationship satisfaction, but there was no association with their partner's relationship satisfaction.

Next, on days when women reported higher approach sexual goals, they reported better sexual function and so did their partners. On days when partners reported higher approach goals, women with PVD reported better sexual function. Conversely, on days when women with PVD reported higher avoidance sexual goals, both they and their partner reported poorer sexual function. Partners' avoidance goals were not significantly associated with their own or women with PVD's sexual function.

Finally, on days when women reported higher approach sexual goals compared with their average, they reported less pain intensity and unpleasantness, whereas on days when women reported higher avoidance sexual goals, they reported more pain intensity and unpleasantness. There were no associations between partners' sexual goals and women's pain. Given the centrality of pain in the couples' sexual experiences, we ran additional analyses to determine whether the effects for sexual function and relationship satisfaction were retained when controlling for pain. All effects remained significant with one exception: Women's greater approach goals were no longer associated with partners' sexual function, $b = 0.43$ ($SE = 0.37$), $t = 1.17$, $p = .24$.

Table 2 Cross-sectional Correlations Among Key Study Variables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---------------------------------|-----------------|-----------------|---------|-----------------|---------|-------------|-------------|--------------|----------------|-----------------|----------------|--------|---------|
| 1. Age | 0.83 *** | 0.55*** | 0.68*** | -0.20* | 0.59*** | 0.03 | 0.04 | -0.12 | -0.08 | -0.06 | -0.07 | -0.02 | -0.09 |
| 2. Income | 0.49*** | 1.00 *** | 0.42*** | -0.37*** | 0.45*** | 0.02 | 0.06 | -0.21* | -0.04 | -0.17 | -0.08 | 0.17 | 0.09 |
| 3. Relationship duration | -- | -- | -- | -0.25* | 0.52*** | -0.05 | 0.10 | -0.31** | 0.09 | -0.08 | -0.10 | 0.01 | -0.07 |
| 4. Sex frequency | -0.32*** | -0.44*** | -- | 0.82 *** | -0.14 | 0.01 | 0.15 | 0.17 | -0.07 | 0.06 | 0.21* | -0.11 | -0.06 |
| 5. Pain duration | -- | -- | -- | -- | -- | 0.04 | 0.12 | -0.16 | 0.03 | 0.05 | 0.16 | -0.01 | -0.08 |
| 6. Approach goals | -0.14 | -0.08 | -- | 0.07 | -- | 0.09 | 0.65*** | 0.15 | 0.31** | -0.01 | 0.20* | 0.07 | 0.07 |
| 7. Avoidance goals | -0.08 | -0.09 | -- | 0.09 | -- | 0.58*** | 0.12 | -0.12 | 0.40*** | -0.15 | 0.35*** | 0.09 | 0.10 |
| 8. Positive cues | -0.18 | -0.18 | -- | 0.06 | -- | 0.18 | -0.21* | -0.01 | -0.43*** | 0.29** | -0.01 | -0.15 | -0.19 |
| 9. Negative cues | 0.06 | 0.06 | -- | -0.18 | -- | 0.11 | 0.39*** | -0.52*** | -0.17 * | -0.16 | 0.27** | 0.30** | 0.40*** |
| 10. Relationship satisfaction | -0.24* | -0.18 | -- | 0.13 | -- | 0.02 | -0.35*** | 0.69*** | -0.39*** | 0.61 *** | -0.29** | 0.03 | 0.09 |
| 11. Sexual function | -0.04 | -0.12 | -- | 0.10 | -- | 0.01 | -0.20** | 0.77** | -0.63** | 0.23** | 0.22 ** | -0.23* | -0.28** |
| 12. Woman's pain intensity | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.86*** |
| 13. Woman's pain unpleasantness | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

*** $p < .001$, ** $p < .01$, * $p < .05$; correlations are between aggregates of the daily variables; women's correlations are above the diagonal; partner's correlations are below the diagonal; bolded correlations are between women and partner reports.

Mediating Role of Positive and Negative Sexual Cues

The associations between approach and avoidance sexual goals and the mediators are reported in Table 4. Below we report the significant mediation effects, but in all models, both partners' approach and avoidance goals as well as their self-reported attention to positive

and negative sexual cues were entered into the model simultaneously. As predicted, on days when women reported higher approach goals, they reported more positive sexual cues and in turn reported greater relationship satisfaction (indirect effect: 95% CI = [0.02, 0.08]). Partners also appeared to benefit from women's greater approach goals: on days when women reported

Table 3 Daily Associations Between Sexual Goals and Relationship Satisfaction, Sexual Function, and Women's Pain

| | Woman's relationship satisfaction | | Partner's relationship satisfaction | | Woman's sexual function | | Partner's sexual function | | Woman's pain | |
|---------------------|-----------------------------------|----------|-------------------------------------|----------|-------------------------|----------|---------------------------|----------|---------------|----------|
| | <i>b</i> (SE) | <i>t</i> | <i>b</i> (SE) | <i>t</i> | <i>b</i> (SE) | <i>t</i> | <i>b</i> (SE) | <i>t</i> | <i>b</i> (SE) | <i>t</i> |
| Woman's approach | 0.15(0.04) | 4.23*** | 0.04(0.03) | 1.27 | 1.19(0.52) | 2.31* | 1.01(0.32) | 3.11** | -0.15(0.05) | -3.06** |
| Partner's approach | 0.04(0.03) | 1.15 | 0.11(0.03) | 3.53*** | 0.23(0.31) | 0.73 | 1.76(0.50) | 3.52 | 0.03(0.05) | 0.51 |
| Woman's avoidance | -0.20(0.04) | -5.41*** | -0.06(0.04) | -1.68 | -3.39(.53) | -6.37*** | -1.67(.34) | -4.97*** | 0.22(0.05) | 4.56*** |
| Partner's avoidance | -0.01(0.05) | -0.09 | -0.05(0.04) | -1.19 | -0.45(0.66) | -0.69 | 0.71(0.41) | 1.72 | 0.04(0.06) | 0.61 |

* $p < .05$, ** $p < .01$, *** $p < .001$; *b* values are unstandardized coefficients. Degrees of freedom ranged from 418.31 to 512.01.

Table 4 Daily Associations Between Sexual Goals and Positive and Negative Cues During Sex

| | Woman's positive cues during sex | | Partner's positive cues during sex | | Woman's negative cues during sex | | Partner's negative cues during sex | |
|---------------------|----------------------------------|----------|------------------------------------|----------|----------------------------------|----------|------------------------------------|----------|
| | <i>b</i> (SE) | <i>t</i> | <i>b</i> (SE) | <i>t</i> | <i>b</i> (SE) | <i>t</i> | <i>b</i> (SE) | <i>t</i> |
| Woman's approach | 0.20(0.07) | 3.11** | 0.14(0.04) | 3.14** | -0.10(0.06) | -1.70 | -0.01(0.03) | -0.38 |
| Partner's approach | 0.34(0.06) | 5.35*** | 0.14(0.04) | 3.26** | -0.02(0.06) | -0.30 | -0.03(0.03) | -1.01 |
| Woman's avoidance | -0.50(0.07) | -7.40*** | -0.21(0.05) | -4.73*** | 0.45(0.06) | 7.12*** | 0.06(0.03) | 1.96* |
| Partner's avoidance | -0.03(0.08) | -0.40 | -0.00(0.06) | -0.07 | 0.07(0.07) | 0.96 | 0.13(0.04) | 2.95** |

* $p < .05$, ** $p < .01$, *** $p < .001$; *b* values are unstandardized coefficients. Degrees of freedom ranged from 514.67 to 590.38.

higher approach goals, their partners reported more positive sexual cues, and in turn, the partners reported greater relationship satisfaction (indirect effect: 95% CI = [0.01, 0.03]). The same pattern emerged for partners' approach goals: on days when partners reported higher approach goals, both they and women with PVD reported attending to more positive sexual cues, and in turn, the partners and women reported higher relationship satisfaction (Women: 95% CI = [0.03, 0.08]; Partner: 95% CI = [0.01, 0.03]). Furthermore, on days when partners reported more avoidance goals, they reported attending to more negative sexual cues and, in turn, reported lower relationship satisfaction (indirect effect: 95% CI = [-0.03, -0.02]). When women reported more avoidance goals, their partners reported attending to more negative sexual cues, and in turn, partners reported lower relationship satisfaction (95% CI = [-0.03, -0.01]).

On days when women reported higher approach goals, women and partners reported more positive cues during sex, and in turn, both reported better sexual function (Women: 95% CI = [0.39, 1.71]; Partner: 95% CI = [0.22, 0.80]). Similarly, on days when partners reported higher approach goals, both women and partners reported more positive sexual cues and, in turn, better sexual function (Women: 95% CI = [1.14, 2.42]; Partners: 95% CI = [0.22, 0.80]). Conversely, on days when women reported higher avoidance goals, both women and partners reported more negative sexual cues, and in turn, both reported poorer sexual function (Women: 95% CI = [-1.11, -0.39]; Partners: 95% CI = [0.01, 0.43]). On days when partners reported higher avoidance goals, they reported more negative sexual cues and, in turn, reported poorer sexual function (95% CI = [-0.38, -0.05]).

With regard to pain experience, as expected, on days when women reported more avoidance sexual goals, they reported more negative sexual cues and, in turn, greater

pain (indirect effect: 95% CI = [0.07, 0.17]). Results are presented for the composite variable of pain intensity and unpleasantness given their high correlation, however, the same effects were observed when examining these variables separately. Contrary to our hypothesis, attending to positive sexual cues did not mediate the association between approach sexual goals and women's pain experience.

Again, we reran the analyses for sexual function and relationship satisfaction controlling for women's pain experience. The associations between approach and avoidance sexual goals and our mediating variables of positive and negative cues during sex all remained significant, with one exception: women's greater approach goals were no longer associated with partners reporting more positive cues during sexual activity, $b = 0.00$ ($SE = 0.04$), $t = 0.08$, $p = .94$. As such, when women's pain was taken into account, the association between women's higher approach goals and partners' greater relationship satisfaction as well as couples' sexual function was no longer mediated by partners reporting greater attention to positive sexual cues.

Discussion

Given the growing evidence supporting the important role of motivation in chronic pain (12, 16), and that most of the couples coping with vulvodynia engage in regular intercourse (8), it is critical to understand how and through what process each partner's reasons for engaging in sexual activity relate to women's pain and couples' adjustment. The current study examined how sexual goals were associated with women's pain and couples' adjustment to vulvodynia and provided novel evidence for the processes by which these goals might lead to more or less pain and sexual dysfunction in affected couples—two key treatment targets that have not previously been linked to daily interpersonal goals.

Daily Interpersonal Goals and Couples' Relationship Satisfaction and Sexual Function

On days when women with PVD or their partners engaged in sex for more approach goals—to pursue positive outcomes in their relationship such as intimacy—both they and their partners reported attending more to positive thoughts and feelings during sexual activity, and in turn, they both felt more satisfied with their relationship and reported better sexual function. In contrast, on days when women engaged in sex for more avoidance goals—to avoid negative outcomes such as relationship conflict—both partners reported being more focused on negative thoughts and feelings during sex, and in turn, partners (but not women with PVD) reported lower relationship satisfaction, and both partners reported poorer sexual function. Partners' higher avoidance goals was also linked to their own perceptions of more negative sexual cues and in turn, their own poorer sexual function. Findings are consistent with prior work demonstrating the relational and functional benefits of more autonomous (e.g., enjoyment) rather than controlled (e.g., avoidance of guilt, pressure) motives in chronic pain couples (16), as well as cross-sectional studies of interpersonal goals in couples coping with PVD (10, 25). The results are also in line with a prior PVD study showing that being more responsive to a partner's sexual needs was beneficial for couples' sexual and relationship well-being, so long as one's own needs were not neglected as a result (22).

The dual-control model of sexual response suggests that a variety of biopsychosocial factors can have either an excitatory or inhibitory effect on an individual's sexual function during a given interaction (27). Holding stronger approach goals may minimize behavioral avoidance of sexual activity and negative cognitive-affective pain appraisals (e.g., catastrophizing), thus reducing the functional and relational interference of the pain. Consequently, engaging in a valued activity (i.e., partnered sex) that one perceives to be beneficial for the relationship may exert an excitatory effect by allowing couples to be more attuned to the present moment during sexual activities, as reflected by an increased focus on positive sexual cues such as pleasure. Acceptance of chronic pain, which refers to an openness to experiencing pain sensations and the pursuit of valued activities despite pain (in this case, sexual activities), has been linked to fewer functional and relational consequences in chronic pain (45) and PVD (21).

In contrast, studies with community samples have shown that those with stronger avoidance goals are more focused on negative aspects of interpersonal relationships (29) and have linked greater avoidance sexual goals with more negative emotions and relationship conflict

(28). On days when women with PVD or their partners had sex to avoid negative outcomes, they may have been primed to focus on the negative impact of the pain condition on the couple's (sexual) life, which had an inhibiting effect on the sexual interaction, as reflected by a greater self-perceived attention to negative sexual cues and resulted in more interference to their sexual desire, arousal, and enjoyment. In addition, a more frustrating sexual interaction may lead partners to attribute higher (negative) valence to this aspect of their relationship when evaluating the overall relationship.

Daily Interpersonal Goals in Relation to Women's Pain

This study is the first to our knowledge to link daily interpersonal goals to pain. On days when women reported higher approach sexual goals, they reported less pain during sex; however, this association was not mediated by attention to positive cues during sex. Motivational accounts of pain suggest that focusing on non-pain-related goals is accompanied by reduced processing of pain-related information, which might explain the observed association (12, 30). Another potential mechanism could be reduced behavioral avoidance of pain, which has been consistently linked to lower pain across pain populations (46), including PVD (47). An experimental study found that healthy participants showed less avoidance of pain and greater pain persistence when presented with a concurrent reward, compared with the pain task alone (48). Valuable incentives have been found to increase pain tolerance (49). Thus, being more approach-motivated for sex may reduce the behavioral avoidance displayed by women with PVD while concurrently promoting the rewards of sexual activity and, in this way, translate into lower pain.

In contrast, on days when women reported higher avoidance sexual goals, they reported more negative sexual cues and, in turn, women had greater pain. This negative attentional focus—both as the motivating force driving sexual activity as well as during sexual activity—may exacerbate the negative outcomes that women are trying to avoid (e.g., anxiety, relationship conflict or disappointment), resulting in greater pain (32). Avoidance of pain increases task-related anxiety (46), avoidance goals are linked to greater fear of pain (50), and aversive cues enhance both pain-related fear and avoidance (51); anxiety, avoidance, and fear of pain are all correlates of increased pain intensity in women with PVD (52).

Limitations and Contributions

Our sample consisted primarily of Caucasian couples in mixed-sex relationships and may not generalize to all couples affected by PVD. This study was correlational,

and causal conclusions cannot be drawn. However, longitudinal and experimental studies of approach and avoidance goals in community samples (26, 29, 53) and in chronic pain populations (30) support the theoretically based direction of the associations. Still, it is possible that these relationships are bidirectional. For example, couples struggling with more intense pain or who have more significant relationship difficulties, may be more attentive to negative cues present during sexual activity and endorse more avoidance goals for sex as a result. Future longitudinal studies would help to tease apart these temporal associations. Finally, the daily diary methods reduced recall biases and enhanced ecological validity; however, we could only capture self-reported perceptions of attentional focus to sexual cues. Experimental studies would complement this research and might better capture the process of shifting attention to positive or negative cues as a function of sexual goals.

This study has important theoretical and clinical implications. The growing field of the study examining goals and chronic pain has largely neglected interpersonal goals or subsumed them within broader “lifestyle goals” (e.g., (13, 14)). However, interpersonal relationships, and romantic relationships in particular, are vital to well-being, central to decision-making, and can buffer from poor health (e.g., (54)), including chronic pain (e.g., (2)). It follows that partner-related goals could play a significant role in task persistence and the potential benefits or consequences of this persistence for chronic pain and adjustment. Using an approach-avoidance motivational framework, the current findings suggest that the pain experienced by women with PVD as well as both partners’ sexual function and relationship satisfaction fluctuated alongside their own and their partner’s goals for engaging in sexual activity, and that these associations were, in part, accounted for by the degree to which couples were attuned to the positive or negative cues during sexual activity. Future research might investigate additional distal (e.g., attachment style) or proximal (e.g., daily stress, relationship conflict) factors that could trigger sexual goals and the subsequent chain of events. Consistent with the growing evidence for the social context of chronic pain (2), and building on prior work (22), this study provided evidence of the contribution of one person’s daily goals to their partner’s adjustment to pain, and specifically PVD, underscoring the dyadic nature of these associations. However, it should be noted that the associations between women’s approach goals and their partners’ sexual experience (sexual function and positive sexual cues), were no longer significant when we controlled for women’s pain intensity during intercourse.

Findings might enhance the efficacy of psychological interventions for couples coping with vulvodynia, which are empirically supported (55). A randomized controlled

trial has demonstrated the efficacy of a brief goal-pursuit intervention to improve physical capacity in chronic back pain patients (56). Clinicians could use cognitive-behavioral and acceptance-based strategies to assist couples in identifying and focusing on their approach sexual goals and reducing their emphasis on avoidance goals, to promote better function and satisfaction, and reduce women’s pain. Approach and avoidance goals may be considered as independent targets for intervention depending on couples’ needs, though it is possible that targeting both simultaneously could have cumulative benefits.

In conclusion, this study demonstrated that the daily fluctuations in approach and avoidance sexual goals were related to daily changes in women’s pain during intercourse as well as women’s and partners’ relationship satisfaction and sexual function, in part through an enhanced focus on positive and negative cues during sexual activity. Although individuals with chronic pain, including vulvodynia, commonly seek to avoid pain, these findings underscore the role of interpersonal goals in persisting with painful tasks and enhance understanding of when and why continuing with painful intercourse might be beneficial or harmful to affected couples.

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Compliance with Ethical Standards

Authors’ Statement of Conflict of Interest and Adherence to Ethical Standards All authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the Institutional Review Boards at the IWK Health Centre and the Université de Montréal.

Informed Consent All participants provided informed consent as part of this study.

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