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### Abstract

Intimacy is vital to romantic relationships, yet is often thwarted by relational challenges, such as sexual difficulties. With prevalence estimates ranging from 10% to 28%, genito-pelvic pain/penetration disorder (GPPPD) is an important sexual problem resulting in negative consequences for affected women and their partners, including significant sexual dysfunction and dissatisfaction. Findings from cross-sectional studies indicate that higher levels of intimacy are associated with better sexuality outcomes in couples coping with GPPPD. However, single-occasion measurements may not capture the daily variations in intimacy that could have important implications for couples' sexual wellbeing. The present study focused on a key intimacy-building component—perceived partner responsiveness (PPR)—and its daily associations with women's pain and both partners' sexual function and satisfaction. Using daily diaries over an eight-week period, 160 women ( $M$  age = 26.23,  $SD$  = 6.26) with GPPPD and their partners ( $M$  age = 27.73,  $SD$  = 7.35) reported on PPR, sexual function and satisfaction, as well as women's pain, on days when sexual activity occurred ( $M$  = 8.87,  $SD$  = 5.87). Drawing on the Actor-Partner Interdependence Model, a multivariate multilevel modeling approach was adopted. Controlling for trait-level PPR, when women and partners reported greater PPR, women reported greater sexual function and satisfaction and partners reported greater sexual function. When partners reported greater PPR, they reported greater sexual satisfaction. No association was found between PPR and women's pain. PPR may facilitate better sexual function and satisfaction and could be an important target in sex and couple therapy for GPPPD.

**Keywords:** sexual function, intimacy, perceived partner responsiveness, genito-pelvic pain/penetration disorder

Intimacy is widely considered to be a core element of the quality and longevity of romantic relationships (Reis, 2017). Yet for many couples, it is thwarted by significant relational challenges, such as sexual difficulties. Genito-pelvic pain/penetration disorder (GPPPD) is a distressing women's sexual problem, with prevalence estimates ranging from 10% to 28% in general population samples (Pukall et al., 2016). GPPPD results in negative consequences for both women and their partners, including significant sexual dysfunction and dissatisfaction, psychological distress, and impaired quality of life (Aerts et al., 2016; Arnold et al., 2006). Within a biopsychosocial framework acknowledging the interdependent contributions of medical and psychological factors, the past decade of research has underscored the important role of interpersonal processes in GPPPD and associated sexual difficulties (Rosen & Bergeron, 2019).

Repeated experiences of genito-pelvic pain can take a toll on the couples' sexuality and drive a wedge in their affectionate bond. Indeed, a recent systematic review and meta-ethnography of qualitative studies reported that affected women and partners report reduced feelings of intimacy (Shallcross et al., 2019). According to the empirically validated Interpersonal Process Model of Intimacy (IPMI) (Reis & Shaver, 1988), intimacy develops through a dynamic and reciprocal process. It has two main components: disclosure, which involves the verbal and non-verbal communication of personal facts, thoughts and emotions, and empathic response, or perceived partner responsiveness, defined as verbal and non-verbal responses from a partner, which is interpreted as understanding, validating and caring. Couples with GPPPD who can maintain adequate levels of intimacy may be better able to cope with the negative consequences of the pain, such as reduced sexual function and satisfaction.

Findings from cross-sectional and observational studies (Bois et al., 2016; Bois et al., 2013; Rosen et al., 2016) indicate that higher levels of intimacy are associated with better

sexuality outcomes in women with GPPPD and their partners. However, single-occasion measurements may not capture the daily variations in intimacy that could have important implications for couples' sexual wellbeing. Given the day-to-day fluctuations in both sexual interactions and genito-pelvic pain (Rosen et al., 2014; Taylor et al., 2013), daily diary designs may be particularly relevant to examine associations between intimacy, sexuality and pain in their naturally occurring context. The present study focused on a key intimacy-building component—perceived partner responsiveness (Reis & Clark, 2013)—and its daily associations with women's pain and both partners' sexual function and satisfaction.

### **Perceived Partner Responsiveness, Pain, and Sexuality**

Perceived partner responsiveness (PPR)—feeling validated, understood and cared for by one's romantic partner—is central to creating intimacy within a couple and is viewed as an important organizational framework for understanding relationship dynamics and wellbeing (Reis & Gable, 2015). PPR arises from an interactive process in which each partner is understanding, validating, supportive, and sensitive to the other's goals, needs, dispositions, and values (Reis et al., 2004). When couples are faced with challenges to their relationship, PPR may promote better coping and support provision by facilitating experiences of closeness and open communication (Manne et al., 2018). PPR may further contribute to maintaining sexual function and satisfaction in couples coping with GPPPD by allowing both partners to share their fears, values and needs around this area of romantic relationships fraught with vulnerability—and to co-regulate cognitive-affective processes more adaptively (Rosen & Bergeron, 2019).

Feeling valued by one's partner may also fuel feelings of sexual desire, one of the core aspects of overall sexual function (Birnbaum et al., 2016). Higher levels of PPR were shown to be associated with greater sexual desire and a higher probability of engaging in sexual activity in

cross-sectional, observational, and daily diary studies among community samples (Birnbaum et al., 2016; Rubin & Campbell, 2012; Stulhofer et al., 2014). In a daily diary study of newlywed couples, greater PPR was associated with better sexual satisfaction (Gadassi et al., 2016). Feelings of validation have also been associated with greater sexual satisfaction in elderly individuals in qualitative studies (Kleinplatz et al., 2013). However, very few studies have examined the associations between PPR and sexuality in clinically distressed populations, and even fewer using a dyadic approach (Manne et al., 2018). In fact, the role of PPR in sexual difficulties has received only scarce empirical attention, despite its potential as a clinical target.

Intimacy is also associated with couples' better adaptation to chronic pain and illness (Cano & Williams, 2010; Manne & Badr, 2010). Expressions of pain-related distress may be conceptualized as emotional disclosure, which the partner may validate or invalidate. It is thought that validation—a form of partner responsiveness—could reduce the threat value of pain (Edmond & Keefe, 2015), and facilitate chronic pain couples' processing of aversive pain stimuli (Leong et al., 2011). Leong, Cano, Wurm, Lumley, & Corley (2015) examined the role of validation in experimentally-induced pain in 126 student couples. When partners engaged in greater perspective-taking, this was associated with perceptions of higher validation in experimental participants relative to controls, and their reports of lower pain intensity. However, the majority of studies in this area did not measure participants' perception of validation, or PPR, nor did they involve the patient's partner or use a dyadic design, hence being limited in terms of their ecological validity (Linton et al., 2012).

### **Perceived Partner Responsiveness and GPPPD**

In the context of GPPPD, couples who want to maintain an active and mutually satisfying sex life are challenged to develop a more varied and flexible repertoire of sexual activity to

accommodate the pain. According to the Interpersonal Emotion Regulation Model of women's sexual dysfunction (Rosen & Bergeron, 2019), both distal and proximal interpersonal processes could act interdependently to determine couples' adjustment to GPPPD. Given the high negative affect (e.g., shame, guilt, anxiety) and threat value of the pain experienced by both partners in relation to GPPPD (Sadownik et al., 2017), PPR may facilitate adjustment by providing a secure context within which to share more openly about their sexuality and downregulate the pain-related negative emotions, resulting in greater sexual function and satisfaction for both partners and less pain for the woman.

Gordon, Panahian-Jand, McComb, Melegari, and Sharp (2003) showed that, among a mixed sample of 428 women with GPPPD, 65% reported that having an understanding partner was the most helpful factor in coping with their pain. In a cross-sectional study conducted among 90 couples coping with GPPPD, women's greater self-reported relationship intimacy, including PPR, was associated with their greater sexual function (Bois et al., 2013). In an observational study involving 50 women with GPPPD and their partners, observed and reported partner responsiveness were associated with better sexual satisfaction and lower sexual distress for each member of the couple (Bois et al., 2016). In another study with the same sample, greater observed partner responsiveness in women was associated with their higher quality of life, whereas women and spouses' greater self-reported PPR were associated with both partners' higher relationship satisfaction (Rosen et al., 2016). These studies highlight that for both members of the couple, feeling understood, accepted and cared for by a partner may promote better overall sexual function and satisfaction (Bois et al., 2016; Rosen et al., 2016). However, their designs did not capture the complexity of the sexual experiences that occur between two individuals as they unfold at an event-level in their natural environment. Dyadic daily diary

methods could shed light on short-term associations between PPR and women's pain as well as both partners' sexual function and satisfaction in couples' everyday life, minimizing bias inherent to retrospective reports and providing higher ecological validity than laboratory studies.

### **The Current Study**

The current study extends prior research in several ways. First, we examined PPR in a clinically distressed population, whereas past research has focused mostly on community samples (Reis, 2012), apart from one notable cross-sectional study (Manne et al., 2018). Studying PPR in distressed couples may inform intervention development. Second, we focused on a context where responsiveness is particularly salient and significantly challenged – GPPPD, given that sexuality is a key way in which couples build and nurture intimacy, on the one hand (Birnbaum & Reis, 2019), and that pain during sexual activity can make both partners feel rejected and inadequate, on the other hand (Sadownik et al., 2017). Specifically, we examined PPR on days where couples experienced a barrier to their intimacy (i.e., pain/sex days), whereas previous work has linked daily PPR to broader daily outcomes (e.g., relationship satisfaction) (Gadassi et al., 2016). Third, we adopted a dyadic design and corresponding data analytic strategy, involving both members of the couple and examining actor and partner effects. Lastly, we used a daily diary approach over a period of two months, which allowed us to study PPR in the natural context in which it unfolds.

Using an eight-week dyadic daily experience methodology in a sample of women diagnosed with provoked vestibulodynia (PVD), the most common type of GPPPD, and their partners, the present study aimed to investigate the within-person associations between perceived partner responsiveness, women's pain, and both partners' sexual function and sexual satisfaction. The Actor-Partner Interdependence Model (APIM; (Kenny et al., 2006)) was used to control for

the non-independence of the dyadic data and to assess the associations between women's PPR and their own pain, sexual function and satisfaction (i.e., actor effects) and between women's PPR and their partner's sexual function and satisfaction (i.e., partner effects), in addition to corresponding effects for partners of women with GPPPD. We hypothesized that on days when women reported greater PPR, they would report lower pain during intercourse, and they and their partners would report greater sexual function and satisfaction. The corresponding associations for partners' PPR with women's pain and both partners' sexual function and satisfaction were also expected.

## **Method**

### **Participants**

Women with PVD and their partners were recruited at two North American research sites from February 2014 to April 2017, through print and online advertisements (75.0 %), participation in previous studies conducted by the authors (12.5 %), referrals from physicians (7.5 %) and by a friend or unknown source (5.0 %). Site one recruited 114 couples and site two recruited 46 couples. A flow chart of participants' recruitment is shown in Figure 1. The inclusion criteria for women with PVD were the following: (1) pain during vaginal intercourse which is subjectively distressing and occurs on 80% of intercourse attempts in the past six months; (2) pain located in the vulvo-vaginal area (i.e., at the entrance of the vagina); (3) pain limited to activities involving pressure to the vestibule (e.g., vaginal intercourse); (4) being involved in a romantic relationship for at least six months and (5) in-person contact a minimum of four times per week with their romantic partner for at least three months, with at least one sexual activity (including intercourse, manual or oral stimulation) per month in the previous three months. Exclusion criteria were: (1) unprovoked vulvar pain; (2) presence of one of the

following: active infection previously diagnosed by a physician or self-reported infection, pregnancy, menopausal or post-menopausal status, and age less than 18 or greater than 45 years and (3) currently receiving treatment for GPPPD. All women were examined and diagnosed with PVD by a physician. The diagnostic gynecological examination included a standardized and validated protocol using a dry cotton swab to palpate three locations of the vestibule (i.e. 3-6-9 o'clock) and women rated their pain intensity for each location on a scale of 0 (no pain) to 10 (worst pain ever) and had to provide an average rating of 4 or higher (Bergeron et al., 2001).

### **Procedure**

The current study used data collected from a larger study; four papers have been published using a smaller subset of the current sample, the first three focusing on couples' interpersonal sexual motivations (Muise et al., 2018; Muise et al., 2017; Rosen et al., 2018), contingent self-worth (Glowacka et al., 2019) and the other on daily anxiety and depressive symptoms (Pâquet et al., 2018). A brief telephone structured interview was conducted with women to assess eligibility and to confirm whether their partners were willing to participate. Women meeting the initial selection criteria were scheduled for a standardized gynecological examination to confirm PVD diagnosis. Eligible couples were asked to attend an orientation session with a trained graduate-level research assistant where they each provided informed consent and underwent a structured interview to assess demographics information and other self-report measures unrelated to the present study. Couples received instructions to complete online daily diaries for eight consecutive weeks through links to a secure survey server site that were emailed to them individually each day at 5 pm and expired at 2 am to prevent multiple responses on the same day. They were informed to complete diaries at the same time each evening (based on the previous 24 hours) and to not share their responses with their partners. Several methods

were implemented to promote diary completion. First, a research assistant called participants twice a week as a reminder to complete their dairies. Second, an automated reminder email was sent if they did not complete that day's diary by 9 pm. Third, participants received a flyer to post in their home as a reminder. Daily diary measures included variables not relevant for this study and a question about whether or not the participant had engaged in sexual activity, including vaginal intercourse, in the last 24 hours. On days when participants reported sexual activity, they completed measures of perceived partner responsiveness, sexual function and sexual satisfaction and, on days when participants reported sexual intercourse, women completed measures of pain intensity during intercourse. Women received \$20 for the gynecological examination, both partners received \$10 each for attending the orientation session and up to \$116 each for completing the daily diary study (pro-rated based on diary completion). Upon study completion, references to local health care professionals were provided to the couples. This study was approved by the research ethic boards of the University of Montreal, the University of Montreal Hospital, the IWK Health Centre, and Dalhousie University.

### **Measures**

**Perceived partner responsiveness.** Both partners completed a 4-item questionnaire based on the Perceived Partner Responsiveness model (Reis et al., 2004) assessing how much they felt understood (How much did you feel your partner understood you?), accepted (How much did you feel your partner accepted you as you are?), cared for (How much did you feel cared for by your partner?) and validated (How validated did you feel by your partner?) each day (women  $\alpha = .93$ ,  $R_c = .90$ ; partners  $\alpha = .94$ ,  $R_c = .89$ ). Participants were asked to rate each item on a scale ranging from 1 (not at all) to 7 (a lot). Possible total scores for both partners ranged between 4 to 28, with higher scores suggesting greater perceived partner responsiveness. This

measure was widely used in other daily diaries studies (Laurenceau et al., 2005) and is well-validated for protocols that require brevity (Gable et al., 2012).

**Pain.** Women's pain was assessed using a Numerical Rating Scale (NRS), which consists of a single item. Women were instructed to estimate the average intensity of pain experienced during intercourse since last completing a diary using a scale ranging from 0 (no pain) to 10 (worst pain ever). This scale correlates significantly with other pain measures (Desrochers et al., 2009) and has been used in other daily diary studies with PVD (Pâquet et al., 2018).

**Sexual function.** Women's daily sexual function was assessed using the Monash Women's Health Program Female Sexual Satisfaction Questionnaire (MFSSQ; (Davison et al., 2008)). Partners' daily sexual function was assessed using an adapted version of this scale (Rosen et al., 2014). The MFSSQ is an 11-item measure specifically designed to assess the nature and quality of a sexual experience that occurred in the prior 24 hours. The measure included items assessing sexual interest and receptivity, ease of arousal, vaginal lubrication (or erectile function), orgasm, degree of pleasure and satisfaction (women  $\alpha = .80$ ,  $R_c = .74$ ; partners  $\alpha = .80$ ,  $R_c = .51$ ). Possible total scores for both partners ranged between 5 to 54, with higher scores indicating better sexual function. The MFSSQ has demonstrated strong psychometric properties in past research (Davison et al., 2008).

**Sexual satisfaction.** Both partners' daily sexual satisfaction was measured using the Global Measure of Sexual Satisfaction Scale (GMSEX). The GMSEX consists of 5 bipolar items (i.e., good vs. bad, pleasant vs. unpleasant, positive vs. negative, satisfying vs. unsatisfying, and valuable vs. worthless) to which participants rate each item using a 7-point scale (women  $\alpha = .94$ ,  $R_c = .93$ ; partners  $\alpha = .95$ ,  $R_c = .93$ ). Possible total scores for both partners ranged between 5 to 35, with higher scores indicating greater sexual satisfaction. This measure has shown good

psychometric proprieties in previous research (Lawrance & Byers, 1995).

### **Data Analyses**

As the data used in this study have a hierarchical nested structure (i.e. daily diaries nested within partners and partners nested within couples), the data were analyzed in Mplus 7 (Muthén & Muthén, 1998-2012) using two-level (participant, day) multilevel path analysis with random intercepts. The model was based on the Actor–Partner Interdependence Model (APIM) to account for the possible interdependence between the partners' responses (Kenny et al., 2006). In APIM, data from both partners are modeled concurrently, allowing each partner's independent variable to be associated with their own outcomes (i.e. actor effect) as well as with the outcomes of the other member of the couple (i.e. partner effect). We tested the associations between both women's and partners' daily perceived partner responsiveness (independent variables), women's pain during intercourse, and both partners' sexual function and sexual satisfaction (dependent variables). All independent and dependent variables from both partners were included in the same model to account for associations between pain and sexuality outcomes (Kenny et al., 2006). To test for within-person associations (Level-1), we group-mean centered our predictors (i.e., women's and partners' PPR), which removed all between-person variances. The predictors were also included at Level-2 as grand-mean centered variables to account for the relative degree to which trait level between-person variance predicts daily levels of the outcomes. The model was fully saturated. Figure 2 presents a visual depiction of the multilevel model. The coefficients reported are unstandardized betas ( $b$ ) and are interpreted as an indication of the effect size. As outcomes were only assessed on days where couples reported sexual activity, the analyses only included sexual activity days, except the analyses with women's pain, which only included vaginal intercourse days. Maximum likelihood estimation with robust standard errors (MLR) was

used in model and parameter estimation to account for the non-normality of the independent variables (Kline, 2012; Muthén & Muthén, 1998-2012). Study measures, syntax and outputs are on OSF link: <https://osf.io/cjk4t/>.

## Results

### Descriptive statistics and preliminary analyses

Participants were 160 women with PVD and their partners ( $n = 158$  men; 2 women). Sociodemographic characteristics of the sample are presented in Table 1, and the mean ( $M$ ), standard deviation ( $SD$ ) and correlations among daily measures (aggregated within-person across all diaries) are presented in Table 2. Correlations between participants' age, relationship length, household income and women's pain duration and outcome variables were less than .30 and thus, were not included as covariates (Hinkle et al., 2003). Given that we recruited couples from two sites, we also tested for site differences on our study variables. We conducted independent t-tests comparing couples recruited from each city on our study variables and sociodemographic characteristics. No significant difference was found between recruitment site and sociodemographic characteristics. Results showed that women recruited in city one ( $M = 3.94$ ,  $SD = 2.50$ ) reported higher pain intensity compared to those from city two ( $M = 3.51$ ,  $SD = 2.48$ );  $t(614.30) = 2.48$ ,  $p < 0.05$ . Partners recruited in city two ( $M = 23.52$ ,  $SD = 3.80$ ) reported greater empathic responses compared to partners from city one ( $M = 22.81$ ,  $SD = 4.19$ ;  $t(912) = 2.21$ ,  $p < 0.05$ ). We conducted another set of analyses with recruitment site as a covariate, and pattern and significance of the results remained the same. The most parsimonious models are presented. Intraclass correlation coefficients (ICC) for the dependent and independent variables ranged between 0.36 to 0.60 (see Table 2), indicating that significant proportions of variance in daily scores were accounted for by within-person differences. Women completed on average 47

diaries out of a possible 56 for a completion rate of 83.41% and, partners completed on average 45 diaries out of a possible 56 for a completion rate of 80.30 %. Couples reported means of 8.87 ( $SD = 5.87$ ; range = 1-32) sexual activity days (e.g. caressing, foreplay, masturbation and/or vaginal intercourse) and among those days, 6.03 ( $SD = 4.85$ ; range =1-23) sexual intercourse days over the course of the study.

### **Pain**

No associations were found between women's PPR ( $b = .04$ ,  $SE = .06$ ,  $p = .56$ ) or partners' PPR ( $b = -.03$ ,  $SE = .05$ ,  $p = .63$ ) as a trait (between-person) predicting women's daily pain intensity. No significant associations were found between women's PPR and their own lower pain intensity. Partner effects were not significant, indicating that partners' PPR was also not associated with women's pain (see Table 3 and Figure 2). We also tested the association between women's pain during sexual intercourse and next day's PPR while controlling for PPR on the day of sexual activity. No significant associations were found, indicating that women's pain on one day was also not associated with women and partners' PPR on the next day.

### **Sexual function**

Women's PPR as a trait (between-level) was associated with their own higher daily sexual function ( $b = .92$ ,  $SE = .21$ ,  $p < .001$ ) and partners' PPR as a trait was also associated with their own higher daily sexual function ( $b = .54$ ,  $SE = .20$ ,  $p < .01$ ), indicating that women and partners who reported greater PPR in general tended to report higher daily sexual function. Controlling for trait-levels PPR (between-level), on days when women reported greater PPR, relative to their average level across all days, both women and partners experienced better sexual function. Thus, results indicate that on days when a woman reported a one-unit increase above her own average PPR, she would be predicted to report .42 points higher than her own average

on sexual function, and the partner would also be predicted to report .17 points higher than their own average on sexual function. On days when partners reported greater PPR, both women and partners experienced better sexual function. Thus, results indicate that on days when a partner reported a one-unit increase above his/her own average PPR, they would be predicted to report .32 points higher than their own average on sexual function, and the woman with pain would also be predicted to report .38 points higher than her own average on sexual function. Partner effects were significant, indicating that both women and partners' PPR were associated with the sexual function of the other member of the couple (see Table 3 and Figure 2). We also tested the associations between both partners' sexual function and the next day's PPR while controlling for PPR on the day of sexual activity. No significant associations were found, indicating that both partners' sexual function on one day were not associated with women and partners' PPR on the next day.

### **Sexual satisfaction**

Women's PPR as a trait (between-level) was associated with their own higher daily sexual satisfaction ( $b = .68, SE = .10, p < .001$ ) and partners' PPR as a trait was also associated with their own higher daily sexual satisfaction ( $b = .78, SE = .12, p < .001$ ), indicating that women and partners who reported greater PPR in general tended to report higher daily sexual satisfaction. Controlling for trait-levels PPR (between-level), on days when women reported greater PPR, relative to their average level across all days, they experienced higher sexual satisfaction. Thus, results indicate that on days a woman reported one-unit increase than her own average PPR, she would be predicted to report .43 points higher than her own average on sexual satisfaction. Partner effects for women were not significant, indicating that women's PPR was not associated with their partners' sexual satisfaction. On days when partners reported greater

PPR, both women and partners experienced higher sexual satisfaction. Thus, results indicate that on days when a partner reported a one-unit increase above their own average PPR, they would be predicted to report .34 points higher than their own average on sexual satisfaction and the woman with pain would also be predicted to report .17 points higher than her own average on sexual satisfaction (see Table 3 and Figure 2). We also tested the associations between both partners' sexual satisfaction and the next day's PPR, while controlling for PPR on the day of sexual activity. No significant associations were found, indicating that both partners' sexual satisfaction on one day were not associated with women and partners' PPR on the next day.

### **Discussion**

Using a two-month dyadic diary design, the present study examined whether perceived partner responsiveness (PPR) was associated with women's pain and both partners' sexual function and satisfaction among a sample of women with GPPPD and their partners. Controlling for between-person differences, findings indicated that on days of sexual activity when women reported greater PPR relative to their own average across all sexual activity days, both members of the couple experienced better sexual function, and the same was true when partners reported greater PPR. On days when women reported greater PPR, they experienced higher sexual satisfaction, whereas on days when partners reported greater PPR, both women and partners experienced higher sexual satisfaction. No significant associations were found between PPR and women's pain intensity. Taken together, findings suggest that feeling understood, cared for and validated by one's partner may mitigate the negative sexual consequences of relationship challenges such as GPPPD for both afflicted and non-afflicted partners.

#### **PPR is associated with greater sexual function**

On days of sexual activity, women's PPR was associated with their own, but also their

partner's, greater sexual function, i.e., perceiving greater responsiveness in their partner contributed to women with GPPPD's greater sexual desire, arousal, and orgasm, but also to their partners' greater experience of desire, arousal and orgasm. This result is consistent with, and extends findings from a prior cross-sectional study conducted among couples coping with GPPPD and based on the Interpersonal Process Model of Intimacy (Reis & Shaver, 1988), whereby women's self-reported intimacy was associated with their greater sexual function, beyond the effects of partners' self-reported intimacy (Bois et al., 2016; Bois et al., 2013; Rosen et al., 2016). This prior study, however, did not examine partners' sexual function. In addition, the current result is in line with those of a large-scale study conducted among women with GPPPD, indicating that 65% reported that having an understanding partner was the most helpful factor in coping with their condition (Gordon et al., 2003). Among community samples, higher levels of PPR were also shown to be associated with greater sexual desire and a higher probability of engaging in sexual activity in cross-sectional, observational, and daily diary studies (Birnbaum et al., 2016; Rubin & Campbell, 2012; Stulhofer et al., 2014). The finding that women's PPR was associated with both partners' sexual function lends support to theoretical models of women's sexuality suggesting that responsiveness is central to their sexual desire (Basson, 2000). Specifically, Basson's model proposes that for women in committed relationships, emotional closeness and the well-being of the partner during sexual activity both facilitate women's sexual function. The present study provides novel empirical evidence based on a clinical sample reporting on their sexual activity in its natural context, and extends the model by indicating that when women perceive their partner to be responsive, the partner's sexual function benefits as well.

Partners' PPR was associated with their own, but also women with GPPPD's, greater

sexual function, i.e., perceiving greater responsiveness contributed to partners' greater sexual desire, arousal, and orgasm, but also to the women's. Although they typically do not suffer from clinical levels of sexual dysfunction, partners of women with GPPPD nevertheless report some level of sexual impairment. Controlled studies indicate that male partners of affected women report lower sexual satisfaction and greater erectile difficulties relative to partners of women without GPPPD (Pazmany et al., 2014). No studies to date have focused on female partners. This result corroborates those of other studies examining the role of the partner in GPPPD and indicating that how partners respond to women's pain impacts both members of the couple's sexual function (Rosen & Bergeron, 2019). In the context of GPPPD, it may be more difficult for women to be understanding and validating of the partners' needs on days when they themselves experience pain, but the present finding suggests that when partners do feel understood and cared for, both women and partners may benefit with respect to their overall sexual function.

### **PPR is associated with greater sexual satisfaction**

On days of sexual activity, women's greater PPR was associated with their higher sexual satisfaction – but not with partners' sexual satisfaction, and partners' greater PPR was associated with both their own and women with GPPPD's higher sexual satisfaction. These findings are in line with those of an observational study conducted among 50 couples coping with GPPPD and based on the Interpersonal Process Model of Intimacy (Reis & Shaver, 1988), which showed that both partners' observed and perceived partner responsiveness during a laboratory-based discussion about GPPPD were associated with their better sexual satisfaction (Bois et al., 2016). When negotiating their sexuality in the face of a chronic condition as distressing as GPPPD, couples need to develop a varied and flexible repertoire of sexual activity that will satisfy both individuals and that is less focused on vaginal penetration. This process may be facilitated by

couples' higher levels of perceived partner responsiveness, which could create an environment conducive to sharing more private aspects of their sexual selves and experiencing more positive feelings during sexual interactions, leading to higher sexual satisfaction. That women's greater PPR was not associated with partners' sexual satisfaction suggests that other factors, possibly non-relational ones, play a role in partners' sexual satisfaction.

### **Today's sexual function and satisfaction are not associated with tomorrow's PPR**

Controlling for PPR on the day of sexual activity, we did not find any significant associations between both partners' sexual function and satisfaction on that day and the next day's PPR. The fact that all significant associations were found within the same day suggests that extremely proximal processes are at play. Thus, future studies might need to turn to Ecological Momentary Assessment (EMA) designs with multiple assessments per day to clarify the possible directions of causality and examine microprocesses underlying associations between PPR and sexuality outcomes. Although we could not test for next day associations between today's PPR and tomorrow's sexual function and satisfaction given the latter were only measured on days of sexual activity, findings nevertheless indicate that, consistent with theory, these sexuality variables were not driving next day's PPR.

### **PPR is not associated with the experience of pain**

Neither partners' PPR was associated with women's pain during sexual activity, contrary to our hypothesis, which was rooted in interpersonal models of chronic pain (Cano & Williams, 2010). Nevertheless, this is consistent with findings from the only other study that examined associations between intimacy and pain in couples coping with GPPPD, using a cross-sectional design, where neither partners' self-reported intimacy (PPR and disclosure) was associated with women's pain during intercourse (Bois et al., 2013). Although a growing body of literature

shows that relationship factors, such as partner solicitous and negative responses to pain and sexual goals, do play a role in the experience of pain (Rosen et al., 2018), other factors such as ambivalence over emotional expression (Awada et al., 2014) have only been associated with sexuality outcomes. This could be explained by the fact that factors associated with pain tend to be proximal, occurring during sexual activity, where the partner is a direct witness of the woman's pain experience, and those not associated are distal, i.e., refer to relational experiences, contexts or styles that predate GPPPD or occur outside of the painful sexual interaction. Indeed, pain and sexuality outcomes in GPPPD are only modestly correlated and reflect distinct phenomena (Aerts et al., 2016).

### **Strengths and Limitations**

This study presents some limitations. First, the correlational design precludes drawing causal inferences. Because of the study's event-level method focusing on sexual activity days, it was not possible to examine associations between previous day responsiveness and next day sexual function and satisfaction. It is possible that the associations between perceived partner responsiveness and sexuality outcomes are bidirectional, such that greater sexual function and satisfaction could lead to greater partner responsiveness. This question should be examined using longitudinal designs, where directionality can be established (see for an exception; (Vaillancourt-Morel et al., 2019)). Second, couples were instructed not to engage in any treatment for PVD during their participation in the study. Although this directive was important to ensure internal validity, it may have biased the sample toward lower levels of sexual impairment given they were able to refrain from treatment for two months. Lastly, the sample consisted mainly of mixed-sex couples. Future research should include a greater proportion of sexual and gender minority couples.

Nevertheless, this study adds to the growing body of research showing day-to-day associations between perceived partner responsiveness and positive relationship and sexuality outcomes (Birnbaum et al., 2016). Among its strengths, this study examined PPR in a clinically distressed sample of couples coping with GPPPD, for whom responsiveness is particularly salient and significantly challenged. The use of a dyadic design and corresponding data analytic strategy, involving both members of the couple and examining actor and partner effects, allowed us to account for both partners' PPR, indicating that perceiving partner responsiveness not only had consequences for one's own sexual function and satisfaction, but for the partner's as well. Further, we used a diary approach over a period of two months, which enabled participants to report on their experience in a more natural context, closer to its time of occurrence, and better capture variations in sexual outcomes than would single-occasion, retrospective evaluations.

Theoretically, the present study expands conceptualizations of perceived partner responsiveness by providing support for the relevance of this framework in clinical populations and showing that PPR may facilitate the experience of greater sexual wellbeing in the face of relationship challenges. Findings also corroborate the Interpersonal Emotion Regulation Model of women's sexual dysfunction (Rosen & Bergeron, 2019), which proposes that both distal and proximal interpersonal factors modulate couples' emotion regulation concerning GPPPD and associated sexual difficulties, and in turn, women's experience of pain and couples' sexual adjustment. The model highlights how interpersonal factors may function to inhibit or promote more adaptive emotional processes, with subsequent implications for the couple. Although this model proposes that intimacy – including PPR – represents a distal factor, the present findings suggest that PPR may also function as a proximal factor that facilitates better emotion regulation for both partners, leading to greater sexual function and satisfaction. In the context of GPPPD,

days of sexual activity are when emotions and the perceived threat of pain may be especially salient, emphasizing the importance of PPR on those days. More studies are needed to further document the associations between PPR and couples' co-regulation of cognitive-affective processes involved in GPPPD.

As for clinical implications, findings suggest that PPR may be a relevant target in sex and couple therapy interventions for women with GPPPD and their partners. They support the involvement of both partners rather than just the affected woman, in order for each to benefit in terms of greater sexual function and satisfaction. A recent pilot study evaluating the effectiveness of a couple intervention for GPPPD yielded significant improvements in women's pain and sexuality outcomes for both women and partners, as well as high treatment satisfaction (Corsini-Munt et al., 2014). Focusing on both partners' responsiveness may facilitate disclosure of GPPPD-related sexual concerns and minimize the negative impact of the pain on the couples' sexuality in the context of their day-to-day lives. Alternatively, limiting painful sexual activities, which tend to trigger negative affect in both partners, could serve to boost their PPR, thereby facilitating the experience of greater sexual desire and arousal.

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