

**Genito-Pelvic Pain Through a Dyadic Lens: Moving Toward an *Interpersonal Emotion*
Regulation Model of Women's Sexual Dysfunction**

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Abstract

Researchers and clinicians alike widely acknowledge the inherently interpersonal nature of women's sexual dysfunctions given that both partners impact and are impacted by these difficulties. Yet theoretical models for understanding the role of interpersonal factors in women's sexual dysfunctions are severely lacking, and have the potential to guide future research and inform more effective interventions. The most widely studied sexual dysfunction in women that has espoused a dyadic approach by including both members of affected couples is genito-pelvic pain/penetration disorder (GPPPD). In this paper we use the example of GPPPD to introduce a novel *Interpersonal Emotion Regulation Model* of women's sexual dysfunction. We first review current knowledge regarding distal and proximal interpersonal factors in GPPPD. Then we describe our theoretical model and consider relevant pain and sex-related research on emotion regulation processes—emotional awareness, expression, and experience—in the context of GPPPD, including sexual function, satisfaction, and distress. Next, we review how existing theories from the fields of chronic pain and sex and relationships research have informed our model, and how our model builds further on them. Finally, we discuss the implications of our model and its applications, including to other sexual dysfunctions in women.

Keywords: women's sexual dysfunction; emotion regulation; genito-pelvic pain/penetration disorder; interpersonal factors

Sexual dysfunctions in women pose a great personal, relational, and financial cost to those affected, as well as to society at large (Bergeron, Corsini-Munt, Aerts, Rancourt, & Rosen, 2015; Brotto et al., 2016; Foley, Foley, & Johnson, 2010; Xie et al., 2012). The repercussions frequently extend to women's partners, who both impact and are impacted by the woman's sexual difficulties (Brotto et al., 2016; N. O. Rosen, Rancourt, Corsini-Munt, & Bergeron, 2014). Although the interpersonal context of women's sexual dysfunctions has been widely acknowledged (Brotto et al., 2016; Dewitte, 2014), is well-integrated into clinical practice (Bergeron, Rosen, & Pukall, 2014; Brotto & Luria, 2014; McCarthy & Wald, 2015), and there has been growing interest in conducting dyadic research studies, theoretical models for understanding the role of interpersonal factors in women's sexual dysfunction are lacking.

The most widely studied sexual dysfunction in women with which researchers have incorporated an interpersonal approach is genito-pelvic pain/penetration disorder (GPPPD). GPPPD researchers may have led the way in this respect, given that sexuality and chronic pain have long been conceptualized as biopsychosocial phenomena. Moreover, pain researchers have made both theoretical and empirical advances to studying the social context of pain (e.g., Edmond & Keefe, 2015; Hadjistavropoulos et al., 2011; Mogil, 2015 for reviews). Thus, GPPPD researchers have adapted and tested interpersonal theories and constructs studied in chronic pain, to the unique sexual situation of pain during intercourse. Still, other sexual dysfunctions in women are also inherently interpersonal and it is likely that much of what has been learned about the role of interpersonal factors in GPPPD might be relevant to these disorders as well. Indeed, a recent study showed that partners of women diagnosed with sexual interest/arousal disorder reported lower sexual function and satisfaction and higher sexual distress compared to controls (N. O. Rosen, Dubé, Corsini-Munt, & Muise, revision requested). It is also possible that this

knowledge can be applied to sexual dysfunctions in men. Comprehensive in-depth studies of the role of relational variables in men's sexuality are extremely limited, making it difficult to draw any gender-specific conclusions. Still, evidence and theory to date suggest that interpersonal factors may be more relevant to women's sexuality relative to men's (Baumeister, 2000; Dewitte, 2014, 2015; Meana, 2010), hence our focus on sexual dysfunction in women. In this paper, we introduce a novel interpersonal model of women's sexual dysfunction using GPPPD as the primary example, and which emphasizes the role of emotion regulation as a key mechanism. We also encourage the reader to consider applications of this model to other sexual dysfunctions in women given the promising—albeit limited—available evidence supporting the central role of interpersonal factors in these difficulties (Brotto, Petkau, Labrie, & Basson, 2011; Oberg & Sjogren Fugl-Meyer, 2005; Witting et al., 2008).

Genito-pelvic pain/penetration disorder affects 14% to 34% of younger women, and 6.5% to 45% of older women (van Lankveld et al., 2010). There are wide-reaching consequences of a pain that prevents women and couples from engaging in, and enjoying, most sexual activities due to the pain, fear of pain, or associated problems such as reduced sexual interest. Controlled studies have shown that women with GPPPD experience more anxiety and depressive symptoms, as well as more difficulties in other aspects of their sexual functioning including lower desire and arousal, orgasm, and satisfaction (Brauer, ter Kuile, Laan, & Trimbos, 2008; Iglesias-Rios, Harlow, & Reed, 2015; Khandker et al., 2011; Smith & Pukall, 2011). Although there is mixed evidence on whether affected women masturbate less than women without GPPPD (Reed, Advincula, Fonde, Gorenflo, & Haefner, 2003; Sutton, Pukall, & Chamberlain, 2009), the pain is typically lower during self-stimulation compared to partnered penetrative activities (van Lankveld, Weijnenborg, & ter Kuile, 1996), presumably because painful parts of the genitals are

more easily avoided. Still, affected women typically score in the clinical range of sexual dysfunction for desire and arousal, underscoring the high co-morbidities across these difficulties (Aerts, Bergeron, Pukall, & Khalifé, 2016). Male partners of affected women also report lower sexual satisfaction and greater erectile difficulties relative to partners of women without GPPPD (Pazmany, Bergeron, Verhaeghe, Van Oudenhove, & Enzlin, 2014; N. O. Rosen, Santos-Iglesias, & Byers, 2017; Smith & Pukall, 2014). Little is known about the experiences of female partners of women with GPPPD. Although overall levels of relationship satisfaction are comparable to couples without this pain, affected women and their partners report reduced feelings of intimacy and closeness (Shallcross, Dickson, Nunns, Mackenzie, & Kiemle, 2018; Smith & Pukall, 2011, 2014). A recent systematic review and meta-ethnography of qualitative studies reinforced these results by highlighting women's negative experiences of social narratives (e.g., the prioritization of penetrative sex, importance of meeting men's sexual needs) and their feelings of shame, guilt, isolation, low self-esteem, and psychological distress resulting from the pain and its implications for their relationships (Shallcross et al., 2018).

Like the many and varied consequences associated with GPPPD, its etiology is also multifactorial and involves an interplay between biomedical, psychological, and interpersonal factors (see Bergeron et al., 2015; Wesselmann, Bonham, & Foster, 2014 for reviews). Interpersonal factors are only one piece of this complex puzzle. We recognize that there are other important factors including genetics, hormonal variations, peripheral pain mechanisms, pelvic floor muscle dysfunction, and intra-individual cognitions, affect, and behaviors (Bergeron, Rosen, & Morin, 2011). Although biological factors are likely to moderate and interact with interpersonal processes, our emphasis is on psychosocial and psychophysical pathways, as these are traditionally neglected in comparison to biomedical factors in the study of GPPPD. Thus, our

theoretical model serves two important functions. First, it provides a conceptual framework for organizing the complex interpersonal responses that occur between two people affected by a sexual dysfunction, and in particular GPPPD, including a core underlying psychological mechanism—emotion regulation. We propose emotion regulation as a central pathway determining couples' adjustment given the high negative affect (e.g., shame, guilt, anxiety) and threat value of the pain that is experienced in relation to this sexual problem (Sadownik, Smith, Hui, & Brotto, 2017; Shallcross et al., 2018). Second, it guides the formulation of testable hypotheses for future research that can subsequently inform psychological interventions. As such, it has heuristic value and may be modified on the basis of new empirical work that supports or counters components of the model that have not yet been tested (Bancroft, Graham, Janssen, & Sanders, 2009). This latter function is especially relevant for applications of the model to other sexual dysfunctions.

The *Interpersonal Emotion Regulation Model* of women's sexual dysfunction (see Figure) applied to GPPPD makes two key assumptions:

1. Interpersonal factors acting at both the distal and proximal levels reciprocally influence couples' emotion regulation surrounding the pain and their sexual relationship.
2. Difficulties regulating negative emotions—in regard to emotional awareness, expression, and experience—in turn, affect women's pain experience and couples' psychological, relational, and sexual functioning.

In the following sections, we first review empirical knowledge regarding distal and proximal interpersonal factors in GPPPD. It should be noted that this research typically included couples in mixed-sex relationships. Then we introduce our theoretical model and consider relevant pain and sex-related research on emotion regulation processes—emotional awareness,

expression, and experience—and in the specific context of GPPPD, including sexual function, satisfaction, and distress. Next, we review how existing theories from the fields of chronic pain and sex and relationship research have informed our current model, and how our model builds on them. Finally, we discuss the implications of our model and its applications, including to other sexual dysfunctions in women.

Interpersonal factors in GPPPD

Distal interpersonal factors in GPPPD

Distal interpersonal factors refer to relational experiences, contexts, or styles that predate GPPPD and are hypothesized to influence proximal factors and couples' emotion regulation strategies, which in turn impact their sexuality outcomes and women's pain (see Figure). Distal factors may shape how couples interact together to manage challenges, specifically, the experience of GPPPD. Distal variables such as child maltreatment and insecure attachment styles can be conceptualized as risk factors for poorer emotion regulation and outcomes, whereas variables such as intimacy can be viewed as facilitating more adaptive dyadic co-regulation.

Social context. Women with GPPPD are apprehensive to speak about their pain with others, and feelings of isolation and invalidation are common (Nguyen, Ecklund, MacLehose, Veasley, & Harlow, 2012; Nguyen, MacLehose, et al., 2012). Qualitative research highlights their negative attitudes toward their bodies and genitalia. Some women report feeling broken, inadequate and useless in the sexual aspects of their relationships, with accompanying feelings of shame and guilt (Ayling & Ussher, 2008; Maille, Bergeron, & Lambert, 2015; Sutherland, 2012). The social context within which this pain occurs may play a role in its manifestations and associated distress. Population-based studies indicate that in comparison to non-Hispanic White women, Hispanic women have significantly higher rates of GPPPD, and are more likely to report

pain with first intercourse, or primary GPPPD (Nguyen, Reese, & Harlow, 2015). Cultural influences such as the *marianismo* ideal, with its emphasis on submissiveness and self-sacrifice, may hinder Latina women's search for sexual pleasure and render them more vulnerable to the experience of pain. Anecdotal evidence suggests that women with GPPPD receive little validation for their symptoms in health care settings, with many being told their pain is "all in their heads" due to the absence of visible pathology. A qualitative study showed that they in fact report a number of barriers to help-seeking (Donaldson & Meana, 2011). Indeed, only about half of women with GPPPD seek medical care, and those who do often report feeling stigmatized by physicians (Nguyen, Turner, Rydell, Maclehose, & Harlow, 2013). Such stigma may be worse for specific subgroups of women, such as those from sexual and ethnic minorities. A growing body of research shows significant gender and ethnic inequities in pain treatment, with women and African Americans being undertreated for their chronic and acute pain (e.g., Hoffman & Tarzian, 2001; Singhal, Tien, & Hsia, 2016). Lastly, women with GPPPD tend to internalize an external and evaluative perspective toward their body, viewing it as an object that must meet unrealistic beauty and sexual performance ideals, as per self-objectification theory (Dewitte, De Schryver, Heider, & De Houwer, 2017; Hirshman, Impett, & Schooler, 2006; Maille et al., 2015; Tolman, 1991). Adolescents and young adult women in particular may be more influenced by such social contextual factors, given adolescence is a developmentally sensitive period, characterized by family, peer, and health behavior transitions (Viner et al., 2012).

Child maltreatment. Child maltreatment, reported by 35% to 40% of individuals in population-based studies (Cyr et al., 2013; MacDonald et al., 2016), refers to any act of commission or omission that results in harm, potential for harm, or threat of harm to a child, such as physical, emotional, or sexual abuse, as well as physical or emotional neglect (Briere & Scott,

2014; Gilbert et al., 2009). It is a form of interpersonal trauma that is well known to be detrimental to individuals' physical and mental health, including their romantic relationships and sexuality (e.g., Bigras, Godbout, Hébert, & Sabourin, 2017). In two population-based studies, women with genito-pelvic pain were more likely to have reported sexual abuse and severe physical abuse, as well as living in fear of abuse, than non-affected women (Harlow & Stewart, 2005; Khandker, Brady, Stewart, & Harlow, 2014). A large-scale study of sexually active female adolescents reporting pain during sex showed similar findings concerning a history of sexual abuse (Landry & Bergeron, 2011). In addition to increasing one's risk for developing genito-pelvic pain, child maltreatment may also affect women's sexual function and mood. In a study of women with dyspareunia, victims of child sexual abuse reported significantly lower levels of sexual function and psychological adjustment than women reporting no sexual abuse (Leclerc, Bergeron, Binik, & Khalifé, 2010). However, only one cross-sectional study to date—and the first dyadic study—examined broader forms of child maltreatment (i.e., all types of abuse and neglect) in couples coping with genito-pelvic pain. Results indicated that women's greater occurrence of child maltreatment was associated with their lower sexual function and higher anxiety, whereas partners' greater occurrence of maltreatment was associated with their lower sexual function, lower relationship satisfaction, and higher anxiety, as well as women's lower relationship satisfaction and higher anxiety. Both women and partners' greater occurrence of maltreatment were associated with higher affective pain ratings for women (Corsini-Munt, Bergeron, Rosen, Beaulieu, & Steben, 2017). Child maltreatment may complicate couples' adjustment to the sexual, psychological, and relationship repercussions of genito-pelvic pain by leading to impaired emotion regulation; indeed, two studies have documented this association (Bigras et al., 2017; Briere, Hodges, & Godbout, 2010). Two potential pathways linking child

maltreatment to poorer emotion regulation are the experience of intimacy in close relationships and adult romantic attachment, both of which are associated with couples' sexual outcomes and women's pain (e.g., Bois et al., 2016; Granot, Zisman-Ilani, Ram, Goldstick, & Yovell, 2010; Leclerc et al., 2015).

Intimacy. Empathic responses and self-disclosure—two components of intimacy—may play a protective role in couples coping with genito-pelvic pain. In an observational study involving 50 couples coping with GPPPD, both partners' observed and reported greater empathic responses were associated with their better sexual satisfaction and lower sexual distress (Bois et al., 2016). Furthermore, both partners' greater perceived self-disclosure was associated with their greater sexual satisfaction (Bois et al., 2016). In another study with the same sample, greater observed empathic response and perceived self-disclosure in women were associated with their higher quality of life, whereas women and partners' greater empathic responses were associated with both partners' higher relationship satisfaction (N. O. Rosen, Bois, Mayrand, Vannier, & Bergeron, 2016). These findings are in line with those of a study showing that the presence of an emotional relationship with a partner during sexual activities is associated with lower sexual distress in women (Bancroft, Loftus, & Long, 2003). Further, findings suggest that for both members of the couple, feeling understood, accepted, and cared for by a partner may promote better overall sexual and relationship adjustment, particularly in the face of challenges to couples' sexuality, such as genito-pelvic pain (Bois et al., 2016; N. O. Rosen et al., 2016).

Attachment. Child maltreatment has also been shown to disturb attachment security (Frias, Brassard, & Shaver, 2014; Godbout, Dutton, Lussier, & Sabourin, 2009)—a prerequisite for the occurrence of reciprocal understanding and acceptance in a relationship. Attachment develops throughout childhood based on the stability and security of the infant-caregiver

relationship, and influences later adult relationships. Two dimensions characterize attachment insecurity: attachment-related anxiety (negative representation of self, fear of abandonment, and high proximity needs) and avoidance (negative representation of other, discomfort with emotional intimacy, and high self-reliance (Bartholomew & Horowitz, 1991; Griffin & Bartholomew, 1994). In the context of GPPPD, women and partners high on attachment anxiety may exaggerate the threat value of pain (Ein-Dor, Mikulincer, & Shaver, 2011; Mikulincer, Birnbaum, Woddis, & Nachmias, 2000), such that they find it difficult to manage pain-related negative thoughts and feelings (Mikulincer, Dolev, & Shaver, 2004). In contrast, those high on attachment avoidance may minimize the threatening aspect of GPPPD, and employ cognitive and behavioral distancing strategies, such as denying or suppressing negative emotions and distress (e.g., Berant, Mikulincer, & Florian, 2001; Birnbaum, Orr, Mikulincer, & Florian, 1997).

Only two cross-sectional studies have examined the role of romantic attachment in women with genito-pelvic pain. Granot et al. (2010) showed that women with genito-pelvic pain had higher levels of attachment avoidance than controls, which was associated with greater pain intensity. In a dyadic cross-sectional study, Leclerc et al. (2015) reported that attachment-related anxiety and avoidance in women with genito-pelvic pain were not associated with pain intensity, although women's higher attachment anxiety and avoidance were associated with their own lower sexual function and satisfaction, whereas partners' higher attachment anxiety and avoidance were associated with their own lower sexual function. Avoidant women may be reluctant to share their distress and ask for their partner's support when they experience pain—and avoidant partners, more inclined to suppress their pain-related emotions and hence reluctant to offer support—which could further exacerbate both partners' sexual difficulties. Conversely, anxiously attached women may experience greater fears that their partner will leave because of

their pain, leading to more hypervigilance to pain, pain catastrophizing, and attributions of personal responsibility, all of which may contribute to worsen pain, sexual function, and sexual satisfaction (Brassard, Dupuy, Bergeron, & Shaver, 2015; Impett & Peplau, 2002; Kratz, Davis, & Zautra, 2012). Indeed, cognitive-affective factors have been shown to play a significant role in the experience of GPPPD and associated sexual difficulties.

Pain catastrophizing and attributions. Studies focusing on two overarching distal cognitive-affective factors—pain catastrophizing and pain attributions—suggest intra-individual and interpersonal associations with both partners' outcomes. One study showed that male partners' lower pain catastrophizing—i.e., the tendency to hold exaggerated negative thoughts and feelings about the pain—was associated with women's lower genito-pelvic pain (Lemieux, Bergeron, Steben, & Lambert, 2013). In another study, partners' higher negative pain attributions (e.g., *We will be stuck with this pain problem forever and it is affecting our whole life*), were associated with their own greater psychological distress, and poorer relationship and sexual satisfaction in the presence of women's greater pain intensity (Jodoin et al., 2008). In a large study involving 354 women with GPPPD and their partners, results of path analysis indicated that partner catastrophizing and negative attributions were associated with more negative partner responses (e.g., hostility), which were in turn associated with women's higher pain. Further, partner pain catastrophizing was associated with greater solicitous partner responses, which in turn were associated with women's higher pain and depressive symptoms (Davis et al., 2015). Such findings highlight the role of partners' cognitive-affective responses in women's experience of pain and psychological distress. A factor that underlies these cognitive-affective responses to pain, whether in the woman or her partner, is emotion regulation.

Ambivalence over emotional expression. Ambivalence over emotional expression (AEE), defined as the extent to which one is comfortable with the way one expresses emotions (King & Emmons, 1990), is the only emotion regulation variable examined to date in couples coping with genito-pelvic. Being high in AEE indicates that the way one handles (or does not handle) emotions is personally problematic and carries with it negative personal consequences. Being low in AEE involves managing emotions in a less internally conflicted way and, overall, suggests better emotion regulation. In a cross-sectional study of over 250 couples with genito-pelvic pain, those in which both members reported being low in AEE had significantly better sexual function and satisfaction, less depressive symptoms, and better relationship satisfaction than couples in which both were high in AEE or in which one member was high and the other was low (Awada, Bergeron, Steben, Hainault, & McDuff, 2014). As proposed by Dewitte (2014), how couples co-regulate their affective, cognitive, and motivational responses may impact their adjustment to GPPPD. Research to date suggests that one mechanism via which such co-regulation occurs—dyadic sexual communication—does indeed play a role in both members' sexuality and relationship outcomes, as well as women's pain.

Sexual communication. Couples affected by genito-pelvic pain report lower quality of sexual communication than pain-free couples (Pazmany et al., 2014; Smith & Pukall, 2014). In turn, couples' reports of lower sexual communication are associated with worse sexual and relationship outcomes (Pazmany, Bergeron, Verhaeghe, Van Oudenhove, & Enzlin, 2015; Rancourt, Rosen, Bergeron, & Nealis, 2016). In a study involving 107 couples with GPPPD, women and partners' reports of greater sexual communication were associated with their own greater sexual satisfaction and sexual function, and lower depressive symptoms. Interestingly, partners' reports of greater sexual communication were associated with women's lower pain and

greater sexual satisfaction (Rancourt et al., 2016). Specifically, collaborative sexual communication patterns (e.g., mutual problem-solving) may promote better sexual and relationship outcomes in couples with genito-pelvic pain (Rancourt, Flynn, Bergeron, & Rosen, 2017). Such communication patterns could be indicative of more adaptive co-regulation of responses to the pain, characterized by greater emotional awareness, empathic responding, and, ultimately, higher tolerance of negative affect. Overall, findings concerning distal factors suggest that couples who are better able to co-regulate their affective, cognitive, and motivational responses together may experience less pain-related negative impacts on their sexuality, relationship, and mood.

Proximal interpersonal factors in GPPPD

Interpersonal factors acting at the proximal level—that is, before, during, and immediately following painful sexual activities—also play a role in the modulation and maintenance of GPPPD. Using daily experience methodology, exploration of cognitive, affective, and behavioral responses to the pain closer in time to the painful experience (i.e., sexual activities) has provided insight into how women and their partners influence one another in their more immediate experiences of the pain and its consequences. A recent study demonstrated that while (male) partners accurately tracked variability in women’s pain during intercourse over a period of two months, they generally underestimated their (female) partner’s pain, and those whose relationship satisfaction varied more day-to-day demonstrated poorer tracking accuracy for the woman’s pain (N. O. Rosen, Sadikaj, & Bergeron, 2015). Such findings underscore how each person brings unique thoughts, emotions, and behaviors to a shared sexual interaction that may fluctuate according to other experiences that day (e.g., mood, couple conflict, intimacy), with

direct or indirect (i.e., via emotion regulation) consequences for their co-management of women's pain and couples' sexual, relational, and psychological adjustment.

Partner responses to pain. The most studied proximal interpersonal factor to date in GPPPD has been partner responses to women's pain during intercourse. Partner responses can be solicitous (e.g., expressions of attention and sympathy), negative (e.g., expressions of hostility or frustration), and facilitative (e.g., affection and encouragement of adaptive coping). In cross-sectional and daily diary studies of couples coping with GPPPD, greater facilitative partner responses were associated with women's lower intercourse pain (N. O. Rosen, Bergeron, Glowacka, Delisle, & Baxter, 2012) and better sexual functioning (N.O. Rosen et al., 2014b), as well as greater relationship and sexual satisfaction for both members of the couple (N. O. Rosen et al., 2012; N. O. Rosen, Muise, Bergeron, Delisle, & Baxter, 2015). In line with the model proposed here, Rosen and colleagues suggested that facilitative responses might promote couples' more adaptive emotion regulation and subsequent coping in the face of pain. In contrast, greater negative and solicitous partner responses were associated with women's greater pain (Desrosiers et al., 2008; N. O. Rosen et al., 2012; N. O. Rosen, Bergeron, Lambert, & Steben, 2013; N. O. Rosen, Bergeron, Leclerc, Lambert, & Steben, 2010), depressive symptoms (N. O. Rosen et al., 2014a), lower sexual functioning (N.O. Rosen et al., 2014b), and lower relationship and sexual satisfaction (N. O. Rosen, Muise, et al., 2015). The authors posited that solicitous and negative partner responses disrupt couples' adaptive regulation of their pain-related emotions by reinforcing avoidance of pain and sex and increasing the threat value of the pain—factors that are known to impact pain intensity and associated consequences (Bergeron et al., 2015).

Affection. Although women with GPPPD have reported avoiding physical affection with their partners because it provokes negative emotions, primarily a fear that it could lead to painful

intercourse (Gates & Galask, 2001; Nylanderlundqvist & Bergdahl, 2003), greater affection (e.g., hugging and kissing) *outside* of a sexual context has been linked to higher sexual satisfaction and sexual functioning on days of sexual activity, as well as greater daily relationship satisfaction (Vannier, Bergeron, Mackinnon, & Rosen, 2016). Thus, maintaining affectionate contact with a partner might act as a protective buffer—perhaps by enhancing feelings of intimacy and dyadic unity—that helps couples better cope with their emotions when faced with perceived stressors (e.g., sexual initiations or painful intercourse itself), such that they can more effectively navigate these situations in mutually satisfying ways.

Mood. The daily affective states of both partners also appear to have implications for women's pain and couples' sexual well-being. Specifically, on days of sexual activity, when women with GPPPD reported higher anxiety and depressive symptoms, they reported greater pain and lower sexual functioning, and when partners reported higher anxiety and depression, both women and partners reported greater sexual distress (Pâquet et al., 2018). Psychological distress is linked to cognitive biases (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Gotlib, Krasnoperova, Yue, & Joorman, 2004), which in painful intercourse, may include discounting or ignoring the potential benefits of sexual activity, or greater attention to negative interpersonal cues during sex (e.g., partner distress or lack of sexual interest), among others. In fact, studies have documented attentional biases toward painful stimuli (Payne, Binik, Amsel, & Khalifé, 2005, but see also Melles, Dewitte, ter Kuile, Peters, & de Jong, 2016) and enhanced pain cognitions (e.g., catastrophizing and hypervigilance; Borg, Peters, Weijmar Schultz, & de Jong, 2012) and cognitive avoidance of sexual stimuli (Lykins, Meana, & Minimi, 2010) among women with GPPPD compared to those without. Such cognitive biases interfere with the ability to use more adaptive emotion regulation strategies, such as

cognitive reappraisal (e.g., reframing the anticipation of pain to focus on pain management and reduce anxiety). However, greater use of reappraisal has been found to mitigate the negative emotions provoked by interpersonal conflict and other stressful situations, and to buffer against negative consequences to the relationship over time (Finkel, Slotter, Luchies, Walton, & Gross, 2013; Ray, Wilhelm, & Gross, 2008). Thus, the daily negative mood states of couples coping with GPPPD may have consequences for women's pain, and the degree of sexual impairment and distress they experience because it interferes with their adaptive emotional processing. It is also possible that more daily symptoms of anxiety and depression are a marker of poor emotional regulation itself.

Sexual motivation. Another interpersonal proximal factor that has received recent attention is sexual motivation. Women with GPPPD report that meeting a partner's sexual needs is a primary reason for continuing to engage in painful sexual activities (Ayling & Ussher, 2008; Brauer, Lakeman, van Lunsen, & Laan, 2014; Elmerstig, Wijma, & Bertero, 2008; Marriott & Thompson, 2008). Three aspects of sexual motivation have been studied in a daily context to shed light on the potential benefits and costs of these motivations for GPPPD: sexual goals (i.e., the reasons for engaging in sexual activity), sexual communal strength (i.e., the extent to which people are motivated to meet their partner's sexual needs), and unmitigated sexual communion (i.e., being motivated to meet a partner's sexual needs to the exclusion of one's own needs). With regard to sexual goals, on days when women with GPPPD reported engaging in sexual activity in order to pursue positive relationship outcomes such as intimacy (i.e., approach goals), they reported less pain (N. O. Rosen et al., 2018). They also attended to more positive thoughts and feelings during sex and, in turn, reported greater sexual functioning and relationship satisfaction. In addition, when women engaged in sex for more approach-oriented reasons, their partners

reported focusing on more positive cues during sex and, in turn, had higher sexual functioning and relationship satisfaction. Holding stronger approach goals may create a more positive interpersonal context that promotes emotional expression and validation. In contrast, on days when women reported having sex to avoid negative relationship outcomes such as partner disappointment or conflict (i.e., 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. Avoidance goals are linked to greater negative pain-related emotions (e.g., fear of pain; Claes, Crombez, Meulders, & Vlaeyen, 2016), and may sensitize the couple to focus on the negative interference to their (sexual) lives, as well as promote the use of less adaptive emotion regulation strategies (e.g., avoidance).

In another daily experience study of GPPPD, the pattern of results generally showed that on days where people reported being more motivated to meet a partner's sexual needs (i.e., higher sexual communal strength), both partners reported greater sexual functioning, sexual satisfaction and relationship satisfaction, and less anxiety and pain during intercourse for women (Muise, Bergeron, Impett, Delisle, & Rosen, 2018; Muise, Bergeron, Impett, & Rosen, 2017). However, when women with GPPPD were overly focused on a partner's sexual needs and ignored their own needs (i.e., higher unmitigated sexual communion), there were negative repercussions for couples' sexual, relationship, and psychological well-being, as well as women's pain. The daily associations between women's unmitigated sexual communion and greater pain, depression, and anxiety were mediated by heightened sexual distress, underscoring the key role of negative emotions about the sexual relationship in these associations. These findings are consistent with a study of women with fibromyalgia, wherein those higher in unmitigated communion reported more negative emotions in response to a relationship stressor

(e.g., an argument), compared to those lower in unmitigated communion (Nagurney, 2008). In summary, avoidance sexual goals and unmitigated sexual communion might be risk factors for poor emotion regulation before, during, or after sex, whereas approach goals and sexual communal strength may promote more adaptive emotional processing within the couple, with subsequent implications for their adjustment and women's pain that day.

Potential proximal factors. Communication and catastrophizing have been examined in single-occasion studies to date and warrant further investigation as proximal variables. Couple communication before, during, or after sex, may be particularly relevant, including the overall quality (Rancourt et al., 2016) and degree of disclosure and empathic response (i.e., sexual intimacy; Bois et al., 2016; N. O. Rosen et al., 2016). Pain catastrophizing is thought to serve the interpersonal function of eliciting attention and support from significant others (Sullivan et al., 2001). Although relatively stable over time, pain catastrophizing varies within-person such that on days when a person with chronic pain reports greater catastrophizing than they typically do, they also have worse pain, disability, and mood (Turner, Mancini, & Aaron, 2004), and there are subsequent changes in partner emotions and behaviors (i.e., both supportive and hostile responses; Burns et al., 2015). This latter finding suggests that pain catastrophizing affects couples' interpersonal environment and emotional processes and behaviors. In GPPPD, higher levels of catastrophizing were linked with greater pain, and predicted worse treatment outcomes in a randomized trial of cognitive-behavioral therapy (Desrochers, Bergeron, Khalifé, Dupuis, & Jodoin, 2009; Desrochers, Bergeron, Khalifé, Dupuis, & Jodoin, 2010, but see also Davis et al., 2015). Although we have considered catastrophizing as an interpersonal factor that affects emotion regulation, it has also been conceptualized as a cognitive-affective coping strategy in and of itself. Indeed, one study of women with GPPPD found that greater catastrophizing

mediated the links between higher solicitous partner responses and greater pain during intercourse (N. O. Rosen et al., 2013). Studies that tease apart the temporal order of interpersonal factors (such as catastrophizing) and couples' emotion regulation are needed.

Overall, the pattern of findings related to proximal factors suggests that couples' cognitive-affective, behavioral, and motivational responses are associated with women's daily pain and both partners' daily sexual, relational, and psychological adjustment, and that emotion regulation provides an empirically and clinically meaningful way of understanding these pathways.

Interpersonal Emotion Regulation Model applied to GPPPD

The *Interpersonal Emotion Regulation Model* of women's sexual dysfunction as applied to GPPPD and depicted in the Figure, suggests that interpersonal factors acting at the distal level (i.e., relating to overarching, trait, or predisposing aspects of the couple relationship) and the proximal level (i.e., relating to what occurs before, during, and immediately following painful sexual activities) influence couples' emotion regulation surrounding the pain, and their sexual and romantic relationships. Although there is insufficient longitudinal evidence to establish the temporal order of distal to proximal factors, developmentally and theoretically, distal factors are likely to precede and influence the more proximal ones (as illustrated by the bolder arrow between these two variables in the figure). However, some of the distal factors are also likely to exert a powerful influence in the present moment (e.g., childhood maltreatment), and proximal factors—such as partner responses—might activate predisposing relational patterns and styles (e.g., attachment insecurities; as illustrated by a lighter arrow in the figure from proximal to distal). In this way, there is also reciprocity in these dynamics.

Difficulties regulating negative emotions make women and their partners more sensitive and reactive (e.g., heightened catastrophizing, higher threat value of pain) to negative stimuli (e.g., couple conflict over sex, the pain itself), and promote the use of less adaptive emotion regulation strategies (e.g., suppression, avoidance) rather than more adaptive strategies (e.g., reappraisal, acceptance). In turn, emotion regulation affects women's pain experience and the couples' sexual, relational, and psychological adjustment. In other words, according to this model, a key mechanism by which interpersonal factors affect genito-pelvic pain and its associated consequences is through the individuals' regulation, as well as the couples' co-regulation, of their emotions.

There is overlap in the concepts of emotion regulation and coping as both involve regulatory processes. In coping, the regulation occurs specifically in response to a stressor and includes efforts to modify the amount or intensity of emotions as well as physiological reactions, thoughts, or behaviors, making it both a broader and narrower construct. In contrast, emotion regulation occurs in response to emotions (only), irrespective of the presence and nature of a specific stressor (Compas et al., 2017). Moreover, although inter-related, emotion regulation processes are also distinct from emotional states, which include both transitory and longer-duration moods, as well as affective disorders (e.g., mood or anxiety disorders; Lumley, 2010; Lumley et al., 2011). By contrast, emotion regulation refers to the way in which emotions are generated, experienced, and used. Such processes include emotional awareness (attention, differentiation, and labeling of emotions), expression (suppression vs. expression of emotions), and experience (accessing and reflecting on one's emotions and their consequences; Lumley et al., 2011).

In comparison to chronic pain, there has been less research on the associations between emotion regulation and sexual well-being (sexual function, satisfaction, and distress), although existing evidence is promising. Discussions around sex tend to provoke greater feelings of vulnerability and anxiety than other relationship topics (Rehman, Lizdek, Fallis, Sutherland, & Goodnight, 2017). Indeed, individuals struggling with sexual dysfunction, including GPPPD, report more difficulties with sexual communication compared to unaffected individuals (Pazmany et al., 2014). Such findings suggest that emotion regulation may be especially salient in the context of sexual problems such as GPPPD, since understanding one's emotions plays an essential role in communication. In the following sections, we review relevant pain and sex-related research on the three emotion regulation processes, and in the specific context of GPPPD, including sexual function, satisfaction, and distress.

Emotional awareness

Several studies have found that alexithymia, which refers to difficulties in identifying and communicating one's emotions, is positively correlated with pain severity and several chronic pain conditions (Ak, Sayar, & Yontem, 2004; Glaros & Lumley, 2005; Lumley et al., 2005). It is thought that alexithymia may be related to increased somatosensory amplification (i.e., hypervigilance) and physiological hyperarousal, leading to prolonged muscle tension (Lumley et al., 2011); both hypervigilance to pain and muscle dysfunction are linked to greater pain severity, including in GPPPD (Benoît-Piau et al., 2018).

Prior studies have also found that individuals with sexual dysfunctions, including GPPPD, score higher on measures of alexithymia compared to those without sexual problems (Ciocca et al., 2013; Madioni & Mammana, 2001; Wise, Osborne, Strand, Fagan, & Schmidt Jr, 2002). Sexual desire and satisfaction are frequently associated with feelings of emotional

connection with a partner, especially for women (Peplau, 2003), and symptoms of alexithymia are likely to interfere with establishing and maintaining this bond.

Emotional expression

Greater difficulties in regulating one's negative emotions have been associated with greater pain during intercourse in community samples of women (Rellini, Vujanovic, Gilbert, & Zvolensky, 2012; Tutino, Ouimet, & Shaughnessy, 2017). Poor emotion regulation enhances distress and interferes with adaptive coping efforts (Gross, 2002). Thus, women with GPPPD who struggle with emotional expression may experience more distress surrounding the interference of the pain to their relationship and engage in less optimal behaviors to manage that distress (e.g., avoidance of sex), leading to greater pain and lower sexual function and satisfaction.

Ambivalence over emotional expression (AEE) has been associated with greater pain and maladjustment in chronic pain patients (Carson et al., 2007; Porter, Keefe, Lipkus, & Hurwitz, 2005). Examining AEE across the couple (as a single variable) is a better predictor of relationship quality than each individual's level of ambivalence, suggesting that it is best conceptualized as a dyadic variable (Ben-Ari & Lavee, 2011). Indeed, in studies of couples with chronic pain, when both partners were high in AEE, patients reported greater pain, disability, and distress, compared to when couples were lower in their ambivalence (Porter et al., 2005; Tucker, Winkelman, Katz, & Bermas, 1999). As noted earlier, in couples coping with GPPPD, those in which both partners were low in AEE had the highest scores on sexual satisfaction, sexual function and relationship satisfaction, and the lowest scores on depression, compared to when both partners were high in AEE, although no differences in pain were found between couples (Awada et al., 2014).

A second area of research relating to emotional expression is the suppression of emotions, that is, the inhibition or concealing of one's emotions. Although not yet studied in GPPPD, a series of daily diary and experimental studies have found that inhibiting the expression of anger led to lower pain tolerance, higher pain ratings, and increased pain behaviors in chronic pain patients (Burns, Quartana, et al., 2008; van Middendorp et al., 2010). Both women with GPPPD and their male partners report extensive negative emotions surrounding the condition, including anger, frustration, guilt, and shame (Donaldson & Meana, 2011; Pâquet et al., 2016; Sadownik et al., 2017; Sheppard, Hallam-Jones, & Wylie, 2008). In qualitative studies, they have also reported attempts to hide these feelings in order to protect or appear supportive of their partner, or for fear that the other person will not understand (Connor, Robinson, & Wieling, 2008; Sadownik et al., 2017). In one study of chronic pain patients, anger suppression appeared to create symptom-specific changes (i.e., increased muscle activity at the site of the pain) that exacerbated the pain (Burns, Holly, et al., 2008). Moreover, inhibiting an emotional response may provoke a more stressful sexual encounter because it disrupts the sharing of important signals of interest or preferences with one's partner (e.g., the need to adapt a sexual activity to be less painful; Butler et al., 2003). Such findings suggest that inhibiting one's emotional experience might in fact exacerbate the negative consequences one is trying to avoid.

Avoidance can be conceptualized as an emotion regulation strategy for suppressing feelings of distress in addition to the pain itself. As in other chronic pain conditions (Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, 2012), avoidance is a key maintaining and exacerbating factor of the pain and consequences associated with GPPPD (Ekdahl, Flink, Engman, & Linton, 2018; Thomtén & Karlsson, 2014). Affected women and their partners often cooperate—whether intentionally or not—in avoidance of painful sexual activities, as well as

discussions about the pain problem (Ayling & Ussher, 2008; Pazmany et al., 2014; Smith & Pukall, 2014; White & Jantos, 1998). Consequently, partners may be less aware of each other's feelings and needs, and provide less helpful emotional or instrumental support as a result.

Given the vast literature on the health benefits of social support and romantic relationships (DiMatteo, 2004; Robles, Slatcher, Trombello, & McGinn, 2014), another pathway by which emotional suppression and avoidance may lead to greater pain and distress is via a compromised support system. People who suppress their emotions to a greater extent tend to have lower social support, are seen as less likeable by others, and report lower closeness and satisfaction in their relationships compared to those who suppress less (Gross & John, 2003; Impett et al., 2012). Moreover, among couples where one member has chronic pain, those who refrained from communicating about the pain and related concerns were more likely to experience difficulties adjusting to the condition (Porter, Keefe, Wellington, & Williams, 2008). Specifically, people who reported holding back from discussing pain-related concerns with their partners also reported greater pain and psychological disability. And when their spouses held back from disclosing concerns, they reported higher caregiver strain and more negative affect (Porter et al., 2008). However, there is also evidence to suggest that partner support may begin to erode with repeated exposure to their partner's pain related-distress (Cano, Leong, Williams, May, & Lutz, 2012), which would presumably be compounded by poor emotional regulation on the part of the person with pain.

Conversely, emotional reappraisal—the strategy of positively re-framing emotionally-provoking events—has been linked to seeking social support, greater feelings of emotional closeness, and more problem-focused coping (John & Gross, 2004), suggesting that it may promote better adjustment in GPPPD. Examples of cognitive reappraisal for a woman with

GPPPD may include focusing on the potential benefits of engaging in sexual activity that involves less or no pain (such as intimacy and partner happiness), and considering a partner's sexual advances as expressions of love and desire rather than (solely) the initiation of pain. Indeed, in a recent daily diary study, on days where women with GPPPD reported engaging in sexual activity in order to pursue positive relationship outcomes, they reported less pain. They *and their partners* also attended to more positive thoughts and feelings during sex and, in turn, reported greater sexual function and relationship satisfaction (N. O. Rosen et al., 2018). However, the distress associated with poor emotion regulation may interfere with the cognitive flexibility required for using the more adaptive strategy of reappraisal. Emotional suppression and reappraisal have not yet been examined in GPPPD.

Importantly, an individual's emotional expression also has implications for their romantic partner (Ben-Naim, Hirschberger, Ein-Dor, & Mikulincer, 2013; Butler et al., 2003; Klein, Renshaw, & Curby, 2016), underscoring our central argument for why it is essential to consider emotional processes in GPPPD and women's sexual dysfunction within an interpersonal context. In a 13-year longitudinal study of married couples, more successful regulation of negative emotions predicted greater marital satisfaction for both partners over time (Bloch et al., 2014). In addition, difficulties with emotion regulation in both romantic partners and greater suppression of negative emotions during a relationship discussion have been linked to greater perceptions of hostile communication from one's partner (Klein et al., 2016). In fact, emotional suppression has been likened to "second-hand smoke" in that suppression adversely affects the psychophysiology of both the suppressor and the partner via heightened cardiovascular arousal and negative mood (Ben-Naim et al., 2013). Such findings suggest that couples who have difficulty regulating their emotions and who try to suppress emotions when discussing an emotionally-evocative topic—

such as painful intercourse—may be more prone to fall into detrimental patterns of communication (e.g., demand-withdrawal) that are common in distressed couples (Gottman & Levenson, 1986). In couples coping with GPPPD, negative communication patterns that are characterized by hostility and withdrawal have been linked to lower relationship satisfaction and greater sexual distress (Rancourt et al., 2017).

Emotional experience

The final emotion regulation process of emotional experience refers to actively accessing and reflecting on one's emotions in order to reduce pain and enhance well-being. Deliberate attempts to *disinhibit* emotions around stressful events have been found to be beneficial for individuals with chronic pain (Broderick, Stone, Smyth, & Kaell, 2004; Kelley, Lumley, & Leisen, 1997). Psychological interventions such as mindfulness-based psychotherapy and Acceptance and Commitment Therapy (ACT) explicitly target emotional experiencing. Mindfulness interventions focus on enhancing non-judgemental awareness of emotions, thoughts, and sensations. Mindfulness is associated with improving skills in identifying and communicating emotions, as well as self-efficacy for coping under stress (Carson, Carson, Gil, & Baucom, 2004; Wachs & Cordove, 2007). It has also been linked to greater use of positive reappraisal in individuals with chronic pain (Garland, Gaylord, & Fredrickson, 2011). A recent meta-analysis suggested that mindfulness interventions significantly improved chronic pain, depression, and quality of life, but that the quality of evidence was low and more rigorous randomized controlled trials (RCTs) are needed (Hilton et al., 2017). Similarly, a meta-analysis of the efficacy of mindfulness-based therapy for sexual dysfunction found that all aspects of sexual function tended to improve following intervention, with larger effects for subjective aspects of sexual response (e.g., desire and arousal) and smaller effects for more “physiological”

outcomes including pain (Stephenson & Kerth, 2017). A lack of RCTs and long-term follow-up, as well as the use of heterogeneous samples and the combining of therapy methods (i.e., mindfulness delivered together with cognitive-behavioral interventions) limit current knowledge regarding the specific efficacy of mindfulness for sexual dysfunctions.

In ACT, pain, disability, and distress are reduced by targeting psychological flexibility, which refers to increasing openness (acceptance), awareness, and engagement with one's emotions, thoughts, and behaviors (McCracken & Morley, 2014). Across RCTs, effectiveness studies, and longitudinal follow-ups, ACT appears to be efficacious for reducing chronic pain and associated difficulties (McCracken & Vowles, 2014). ACT has not yet been studied as a treatment for sexual dysfunction or GPPPD specifically. Further, studies that examine the role of emotional experiencing as a mechanism for change in both mindfulness and ACT interventions for chronic pain are needed. Mindfulness and ACT interventions have been found to improve couple communication, increase feelings of acceptance toward one's partner, and reduce negative emotional arousal during relationship conflicts (Barnes, Brown, Krusemark, Campbell, & Rogge, 2007; Baucom et al., 2015; Carson et al., 2004). Such findings suggest that the modulation of heightened emotions may be one relevant mechanism of change for interventions targeting sexual dysfunction, such as GPPPD (Stephenson, 2017).

In qualitative reports, young women with GPPPD described that the stress of the pain and impact on their relationships made emotion regulation difficult (Donaldson & Meana, 2011), highlighting why interventions that target emotional experience are relevant. There is some evidence to support the role of mindfulness and acceptance in GPPPD. A brief, mindfulness-based group intervention for genito-pelvic pain (compared to wait-list control) demonstrated significant pre to post-treatment improvements in pain self-efficacy, pain vigilance,

catastrophizing, sexual distress, and depression (Brotto, Basson, Smith, Driscoll, & Sadownik, 2015). Women in this study did not show improvements in self-reported pain during intercourse, possibly due to the small sample size and the limited penetrative activities reported during the study. A cross-sectional dyadic study found that greater pain acceptance in affected women was associated with lower pain during intercourse, anxiety and depression, and greater sexual function for women, as well as greater sexual satisfaction for both women with GPPPD and their partners. In addition, when partners of women with GPPPD reported greater pain acceptance, they reported fewer depressive symptoms (Boerner & Rosen, 2015). Similarly, when women and partners reported higher levels of self-compassion—kindness and understanding toward the self when faced with pain or perceived failure—they also reported lower anxiety and depression, and partners' higher self-compassion was linked to both partners' lower sexual distress (Santerre-Baillargeon et al., 2018). Greater pain acceptance, self-compassion, and mindfulness during sexual activity may interrupt rumination and avoidance, and direct attention toward the potential benefits of sexual activity (e.g., intimacy, pleasurable sensations), thus soothing emotional distress and facilitating efforts to adapt the sexual relationship to account for the pain, ultimately resulting in less pain and sexual impairment.

Summary and next steps for the model

Our model posits that interpersonal factors acting at both the proximal and distal level influence the couples' emotional regulation processes surrounding the pain and related impairments and distress, which in turn affects women's genito-pelvic pain and its consequences for both members of the couple. Evidence from studies examining interpersonal factors in GPPPD, as well as emotion regulation processes in the fields of pain and sexual dysfunction are consistent with this notion, and we bring them together for the first time in a unifying model.

Several aspects of the model require further empirical investigation. Specifically, in GPPPD, direct links between the interpersonal factors and couples' emotion regulation processes need to be established, as well as the associations between additional facets of emotion regulation (e.g., suppression and reappraisal), women's pain, and couples' psychological and sexual adjustment. Importantly, researchers should examine the mediational pathway, which situates emotion regulation as the mechanism through which interpersonal factors influence women's pain and sexual dysfunction, and couples' well-being, in longitudinal studies where temporal order can be determined. Daily diary studies are best able to capture within-person variations in the interpersonal dynamics, emotional processes, and their consequences closer in time to when they occur. Further, behavioural observation studies can elicit emotional processes in the moment and allow for an examination of the dynamic and reciprocal influences of interpersonal factors and emotional responses between members of the couple. Observational studies also afford the opportunity to integrate physiological measures of emotional arousal and regulation through monitoring of the autonomic nervous system (e.g., heart rate, skin conductance). In so doing, one can adopt a truly biopsychosocial approach to the study of emotional regulation in couples affected by GPPPD and other types of sexual dysfunction in women.

Insights from other theoretical models

The *Interpersonal Emotion Regulation Model* of women's sexual dysfunction draws on ideas proposed in prior theoretical models of pain and sexual dysfunction, and builds on these contributions by assembling them into a more integrated framework. Our model fills an important gap in these literatures. In particular, although there is an extensive literature on the role of emotions in chronic pain (Lumley et al., 2011 for review), consideration of emotion processes in social contexts is much more recent (Cano & Williams, 2010; Hadjistavropoulos et

al., 2011). Similarly, the interpersonal context of sexual dysfunctions has been widely acknowledged (Brotto et al., 2016; Dewitte, 2014), with growing interest in conducting dyadic studies, but studies of emotion regulation processes—both individually and as a couple—have been few and far between. In the following section, we review relevant interpersonal models of chronic pain and sexual dysfunction, and describe how they were influential to our thinking and where our model builds further upon their contributions.

Pain Theories

Operant Model. Fordyce (1976) originally proposed an operant learning model as an explanation for the role of the partner/close others in the maintenance of pain. He suggested that pain behaviors such as facial expressions and verbal complaints are influenced by environmental contingencies that serve to reinforce and perpetuate, or punish and extinguish, expressions of pain-related distress. The partner, as the primary witness of these behaviors, may become a powerful reinforcing agent and contribute to increased pain and associated distress, disuse, and disability. This model has received considerable empirical support from studies using dyadic observational, daily diary, and self-report methods in chronic pain (Cano & Williams, 2010) and genito-pelvic pain samples (for reviews, see Bergeron et al., 2015; N. O. Rosen et al., 2014). Strengths of this model include its emphasis on how context-dependent contingencies may shape the experience of GPPPD and associated sexual and relationship outcomes. According to this model, the mechanism via which the partner plays a role in genito-pelvic pain is reinforcement, and, as such, the model is focused mostly on explicit behavior to the exclusion of other potentially important cognitive, affective, and motivational factors, stemming both from the woman with pain and her partner. Many of these factors are not visible to the partner and hence, not amenable to selective reinforcement. This model also omits the role of distal variables in the

display of woman and partner responses to pain. Other studies have underscored how certain pain behaviors and coping strategies may increase in the presence of a neutral observer, where past reinforcing experiences could not have taken place (Sullivan, Adams, & Sullivan, 2004). Based on some of these criticisms, Sullivan et al. (2001) proposed an alternative to the operant model—the communal coping model (CCM).

Communal Coping Model. The CCM purports that exaggerated displays of pain behavior in the presence of the partner, or pain catastrophizing, may serve as a means to elicit empathic responses or to maximize proximity and support (Sullivan et al., 2001). Support for this model has been mixed. Some studies corroborated the model by showing that solicitous responses mediate the relation between higher catastrophizing and greater pain in both GPPPD couples (Davis et al., 2015) and individuals with chronic pain (Gauthier et al., 2012), and, using a dyadic daily diary design, that within-patient increases in catastrophizing are associated with greater partner reports of patient pain behavior (Burns et al., 2015). Another study indicated that among women with GPPPD reporting high partner support, catastrophizing was not significantly related to pain (Benoît-Piau et al., 2018). Support also moderated the relation between catastrophizing and partner responses in a large chronic pain sample (Buenaver, Edwards, & Haythornthwaite, 2007), suggesting that supportive relationships may buffer the negative effects of pain catastrophizing. Other empirical research did not corroborate the CCM, whereby catastrophizing was found to have a direct association with pain and was not correlated with partner solicitousness (Romano et al., 2016).

However, most work in this area has been cross-sectional and has not espoused a dyadic approach, focusing solely on the individual with chronic pain, thus limiting the conclusions that can be drawn from this literature. Nevertheless, strengths of the CCM lie in its inclusion of

cognitive and motivational dimensions of couple interactions, such as relational proximity goals (Sullivan et al., 2001). Accordingly, relational goals may supersede pain reduction goals. The mechanisms via which couple interactions play a role in genito-pelvic pain involve the communication of distress by the woman and communal coping, or co-regulation, with the partner. A shared exaggeration of the threat value of pain sensations, accompanied by an increased attentional focus on pain by both members of the couple, may contribute to worsen both pain and sexuality experiences. However, a woman's expression of distress as well as the threat value assigned to the pain problem may also be influenced by factors unrelated to the immediate interaction, or even the broader relationship with a partner, such as child maltreatment or attachment style. Further, although emphasizing the communication of pain-related distress, the CCM does not take into account the affective components of pain couples' interactions.

Validation Model. Cano and Williams (2010) proposed that 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 empathic response—may reduce the threat value of pain (Edmond & Keefe, 2015) and promote effective emotion regulation in chronic pain couples by facilitating their processing of aversive pain stimuli, as well as enhance intimacy (Leong, Cano, & Johansen, 2011). One dyadic, observational study showed that validation is distinct from solicitous and distracting partner responses, and that, when observed in both partners, is associated with greater relationship satisfaction and perceived partner support in the individual with pain (Cano, Barterian, & Heller, 2008). Leong, Cano, Wurm, Lumley, & Corley (2015) examined the role of validation in experimentally-induced pain in a sample of 126 student couples. Training partners in perspective-taking was associated with perceptions of higher validation in experimental participants relative to controls, and their experience of lower pain

severity. Other studies in this area consisted of experimental manipulations of validation/invalidation and did not measure participants' perception of validation, nor did they involve the pain patient's partner or use a dyadic design, hence being limited in terms of their ecological validity (Linton, Boersma, Vangronsveld, & Fruzzetti, 2012; Vangronsveld & Linton, 2012).

Strengths of the validation model reside in its affective and relational dimensions, which were missing from previous interpersonal theories of chronic pain, and its emphasis on the importance of emotion regulation. According to this model, effective co-regulation of pain-related distress could reduce the threat value of pain stimuli, with benefits in terms of the couples' adjustment. However, the extent to which this co-regulation translates into clinically relevant reductions in pain and disability remains to be determined. Importantly, more work measuring the pain patient's perception of validation is needed.

The operant learning, communal coping, and validation models paved the way toward conceptualizations that incorporate the social context of pain and disability. Our interpersonal emotion regulation model builds on these existing theories while providing (1) a more comprehensive account of the distal and proximal factors that may play a role in the experience of genito-pelvic pain and associated sexual difficulties, (2) placing a greater emphasis on the relational aspects of the pain experience and its co-regulation by both members of the couple, as well as (3) stressing the significance of partners as dynamic players in the moment to moment unfolding of interactions that also impact their sexual and psychological wellbeing, and are impacted by their own vulnerabilities.

Sex and Relationship Theories

Interpersonal Process Model of Intimacy. The interpersonal process model of intimacy (IPMI) posits that intimacy develops through a dynamic and reciprocal process of affective

communication between partners (Reis & Shaver, 1988). It is composed of two interrelated components: the disclosure of personal thoughts, feelings, and information, and perceptions of empathic response from a partner (i.e., feeling validated, understood and cared for) in response to such disclosures. The IPMI, whereby couples perceive higher levels of disclosure and empathic response as heightened intimacy, is well-validated in cross-sectional and daily diary studies with community samples (Laurenceau, Barrett, & Pietromonaco, 1998; Laurenceau, Barrett, & Rovine, 2005). More positive intimate exchanges in relationship interactions—particularly when they focus on emotions—tend to characterize couples who are more satisfied in their relationships, whereas the absence of intimacy is indicative of less satisfaction and poorer functioning (Fruzzetti, 1996; Laurenceau et al., 2005). The IPMI thus operationalized an important interpersonal factor—intimacy—that has subsequently been found to have implications for couples' relational and sexual well-being. Indeed, greater intimacy as defined by the IPMI has been linked to higher relationship satisfaction and sexual satisfaction, and lower sexual distress in community and clinical samples, including in GPPPD (Bois et al., 2016; Laurenceau et al., 2005; Manne et al., 2004; N. O. Rosen et al., 2016). Such findings are consistent with growing evidence that intimacy may buffer against the distressing consequences of sexual dysfunction (Stephenson & Meston, 2010). Our model, within which intimacy is one of several key interpersonal factors, takes this theory a step further by stipulating the process by which intimacy leads to well-being outcomes, that is, via emotion regulation.

Motivational Theories. Motivational theories including the Dual Control Model and the Approach-Avoidance framework seek to understand *why* people engage in sexual activity. The Dual Control Model proposes that sexual response involves an interaction between excitatory and inhibitory processes, which vary between individuals (Bancroft et al., 2009; Bancroft &

Janssen, 2000). Those with a low propensity for excitation and/or a high propensity for inhibition are more likely to experience sexual dysfunction. According to this model, there are numerous neurophysiological and psychological characteristics of individuals that mediate the associations between sexual interactions and potential outcomes for an individual (i.e., sexual functioning, behaviour, and satisfaction). The relevance of this model has been demonstrated in many aspects of human sexuality, including sexual development, sexual desire, sexual identity, the relationship between mood and sexuality, high risk sexual behaviors, and—as per its original conceptualization—sexual dysfunction (Bancroft et al., 2009 for review). The relationship between sexual excitation and inhibition in women has primarily been examined in nonclinical samples, and has found sexual inhibition to be higher in women reporting sexual problems compared to those without (Sanders, Graham, & Milhausen, 2008). One notable exception is a Dutch study of 445 women, which replicated this finding among women diagnosed by semi-structured interview with a sexual dysfunction compared to women without sexual dysfunction, and also demonstrated that affected women scored lower on sexual excitation (Bloemendaal & Laan, 2015). The pattern of sexual inhibition and sexual excitation being linked to lower and higher sexual functioning in women, respectively (Velten, Scholten, Graham, & Margraf, 2016), has also been replicated in older women and in sexual minority women (Bell & Reissing, 2016; Jozkowski, Sanders, Milhausen, & Graham, 2016). Finally, in a small dyadic study ($N = 35$ couples), a greater discrepancy between partners on scores of sexual excitation and inhibition was linked to more sexual problems in women (Lykins, Janssen, Newhouse, Heiman, & Rafaeli, 2012). This model has not yet been tested in genito-pelvic pain. Nonetheless, it has informed our current theory by highlighting how interpersonal factors may function to inhibit or promote more adaptive emotional processes, with subsequent implications for the couple.

Another influential motivational model for our thinking has been Approach-Avoidance motivational theory (Carver, Sutton, & Scheier, 2000; Gable & Impett, 2012). This theory contrasts approach goals, which in a sexual context refers to having sex in order to pursue a positive outcome such as greater relational intimacy, physical pleasure or partner enjoyment, and avoidance goals, which focus on having sex to avoid a negative outcome such as relationship conflict or partner disappointment (Cooper, Shapiro, & Powers, 1998; Impett, Peplau, & Gable, 2005). This theory can in fact be conceptualized as consistent with the Dual Control Model such that holding stronger approach goals may have an excitatory effect on sexual processes whereas stronger avoidance goals have an inhibitory effect (N. O. Rosen et al., 2018). In romantic relationships, and in GPPPD in particular, interpersonal goals that focus on the partner or the relationship are especially relevant given that these are just as common as goals focused on physical pleasure (Meston & Buss, 2007), and appear to be a central force behind why women persist with painful intercourse (Elmerstig et al., 2008). It is important to note that people can have multiple motivations for engaging in sex and it is possible to hold both approach and avoidance goals simultaneously, despite these goals having different implications for couples' well-being (Impett et al., 2005).

Several cross-sectional, daily diary, experimental, and longitudinal studies have demonstrated that engaging in sex for more approach-oriented interpersonal goals is linked to both partners feeling more satisfied with their sexual and overall relationship, whereas having sex for avoidance goals has the opposite consequences (Impett, Muise, & Rosen, 2015 for review). Sexual goals—particularly when they relate to the partner—may affect the emotional processing of positive (e.g., feelings of pleasure, partner enjoyment) and negative (e.g., distracting thoughts, signs of partner disinterest) cues during a sexual interaction, with

implications for couples' functioning (Gable & Impett, 2012; N. O. Rosen et al., 2018). Indeed this assertion has been supported in a recent daily experience study of couples coping with GPPPD as described earlier (N. O. Rosen et al., 2018). These findings informed our current model which states that several interpersonal factors may follow a similar pathway.

Intimacy and motivational models rooted in sex and relationship theories established the role of *specific* interpersonal factors in promoting or interfering with sexual and relationship functioning. Our interpersonal emotion regulation model builds on these existing theories by providing (1) a much broader conceptualization for the role of several empirically-validated interpersonal factors and (2) delineating a mechanism—emotion regulation—by which interpersonal factors affect women's genito-pelvic pain and couples' adjustment.

Applications and Implications of our Model

We have based the *Interpersonal Emotion Regulation Model* of women's sexual dysfunction on theoretically driven empirical work in a field where current conceptualizations of women's sexual dysfunctions are often limited to unfounded biomedical explanations or, at the very least, where psychosocial factors have been neglected. One potential reason for the neglect is that we have failed to provide solid empirical evidence supporting the role of these factors in women's sexual difficulties. The research underlying the *Interpersonal Emotion Regulation Model* of women's sexual dysfunction stems from influential psychosocial theories, for example, the interpersonal process model of intimacy and motivational theories, all validated in both clinical and nonclinical samples, often across different age groups and dyadic constellations. The integration of such conceptualizations represents a significant leap forward in our understanding of GPPPD and can pave the way toward more complex, empirically supported etiological

conceptualizations of sexual dysfunctions in women, as well as data and theory driven interventions, which are sorely lacking in our field.

Implications and applications of the model for GPPPD

The first practical implication of this model and the work underlying it has been an increased recognition of the dyadic dimensions of GPPPD: how they play a role in the manifestations of this disorder, and how they can be targeted in psychological interventions. A logical next step has been the development of a cognitive-behavioral couple intervention based on this model (Corsini-Munt, Bergeron, Rosen, Mayrand, & Delisle, 2014), which is presently being tested in a randomized clinical trial (Corsini-Munt, Bergeron, Rosen, Steben, et al., 2014). From a broader perspective, the role of psychosocial factors in the experience of GPPPD is now more clearly delineated. The model integrates the conceptual shifts of the last two decades (e.g., Binik, Bergeron, & Khalifé, 2007) and steers away from dualistic, psychogenic views of the disorder, where sexual abuse and other sexual development issues were seen as causal factors to be explored in long-term therapy or medical conditions were thought to be the sole contributors and any associated sexual/couple difficulty was ignored. In contrast, the model suggests a complex clinical picture, whereby both distal and proximal factors in each partner may result in emotion regulation difficulties, and ensuing pain and sexual dysfunction—two equally important endpoints rather than symptoms to be pitted against one another (Meana, Binik, Khalifé, & Cohen, 1997). Further, moving beyond the area of sexuality and relationships to anchor research questions in widely recognized chronic pain theories (e.g., communal coping model) has yielded rich knowledge that can be used to understand not only GPPPD, but other sexual dysfunctions in women. Lastly, the model is embedded within a biopsychosocial framework that takes into account the roles of biomedical and sociocultural factors, although it does not purport to explain

their specific contributions. The integration of these other major dimensions of GPPPD to our research designs will require additional scientific inquiry, and more importantly, higher levels of interdisciplinarity in our approaches.

One caveat of the model is that it is based primarily on research among mixed-sex couples. Although GPPPD is not an artefact of having men as partners and/or a penetrative sex focus, but rather is a complex pain and sexual problem affected by multiple, interdependent biopsychosocial factors (e.g., Bergeron et al., 2011), the model nevertheless requires testing among women partnered with women or with both men and women. Given that clinically, and in our studies, we have seen same-sex couples just as distressed by GPPPD as mixed-sex couples, we hypothesize that the model would apply to all couple configurations. This nevertheless remains an empirical question.

Applications to other female sexual dysfunctions

The body of dyadic genito-pelvic pain research indicates that interpersonal factors impact women's sexual function outcomes (Bergeron, Dubé, Merwin, & Rosen, in press). In fact, interpersonal factors are more consistently associated with women's sexual function and dysfunction than with their pain (e.g., N. O. Rosen et al., 2014). The sexual function measures utilized in these studies, such as the Female Sexual Function Index (R. C. Rosen et al., 2000), include sexual desire, arousal and orgasm domains. These findings suggest that interpersonal factors are equally relevant to other sexual dysfunctions in women, such as female sexual interest/arousal disorder (SIAD) and female orgasmic disorder.

This is also consistent with the little published research focusing on the role of interpersonal factors in other sexual dysfunctions in women. One population-based study showed that perceived partner sexual incompatibility was associated with women's sexual dysfunction

(Witting et al., 2008). Another study conducted among a nationally representative sample of sexually active Swedish women showed that the major predictors of most distressing sexual dysfunctions were relationship dissatisfaction and partner sexual dysfunction (Oberg & Sjogren Fugl-Meyer, 2005). Similarly, McCabe and Cobain (1998) indicated that deficits in relationship satisfaction were more likely to occur among women with a sexual dysfunction than those without. Bodenmann, Ledermann, Blattner, & Galluzzo (2006) found that relationship stress was associated with low desire and arousal among women experiencing sexual dysfunction. In terms of specific sexual dysfunctions, relational factors were shown to better account for women's inhibited sexual desire than did hormonal transitions such as menopause (Brotto et al., 2011; Guthrie, Dennerstein, Taffe, Lehert, & Burger, 2004).

Although these findings point toward an involvement of relationship factors in other women's sexual dysfunctions, this area of research remains in its infancy. Indeed, none of the aforementioned studies included the partner or conducted dyadic analyses, hence knowledge about the interpersonal experience of sexual desire, arousal, and orgasm is extremely limited. SIAD, in particular, is where GPPPD was 20 years ago, with still a strong focus on biomedical factors (e.g., testosterone) and consequently, treatments focusing on drugs, which, not surprisingly, show limited efficacy (Jaspers et al., 2016; Levine, Sheridan, & Cooper, 2016). Further, studies published to date were cross-sectional, atheoretical, and involved single-occasion measures focusing on broad dyadic factors such as relationship satisfaction. Notwithstanding these caveats, new research focusing on the role of emotion regulation in women's sexual dysfunctions is emerging. Sarin, Amsel, & Binik (2016) found that women diagnosed with sexual desire and arousal difficulties reported greater deficits in regulating their negative emotions compared to healthy controls. In a dyadic study, women with sexual arousal/interest

disorder (SIAD) and their partners who reported greater difficulties regulating negative emotions reported greater depression and anxiety, and partners reported greater sexual distress (Dubé, Corsini-Munt, Muise, & Rosen, under review). The *Interpersonal Emotion Regulation Model* of women's sexual dysfunction could guide future research by delineating a relevant agenda based on an empirically supported, coherent theoretical framework.

Specifically, the contributions of distal factors such as childhood interpersonal trauma, attachment, and intimacy to other sexual dysfunctions in women (e.g., SIAD) could be examined using rigorous study designs involving dyadic longitudinal approaches over multiple years, combined with daily diary methods to examine the variations of sexual function in a more ecologically valid manner. Questions concerning emotion regulation are also particularly amenable to dyadic daily diary designs, whereby daily variations in the processing of relevant but neglected emotions, such as both partners' shame and guilt, could be tracked in relation to variations in their sexual function, and relative to the moderating effect of distal factors, such as child maltreatment. In order to understand some of the biological underpinnings of distal factors and their role in emotion regulation, studies could incorporate measures of oxytocin and cortisol—to begin identifying pathways through which interpersonal factors affect emotion regulation processes and sexual function. Indeed, although it has been shown that higher levels of attachment anxiety are associated with more production of cortisol (Jaremka et al., 2013), the idea that couples co-regulate each other's moods and physiology remains largely untested, yet is highly relevant to our emotion regulation model and to understanding the role of relationship factors in women's sexual dysfunctions. One notable exception is a small study conducted by Saxbe and Repetti (2010), which indicated that among 30 married couples, spouses' fluctuations in negative mood and cortisol levels were linked over a three-day period and that marital satisfaction buffered spouses from their partners' negative mood. Dyadic studies of this kind

examining emotion regulation processes, their biological underpinnings, and women's sexual dysfunctions, could begin to elucidate potential etiologic pathways via which emotion regulation contributes to women's sexual dysfunctions.

Despite the fact that our model may apply to sexual dysfunctions in men (e.g., Fisher, Eardley, McCabe, & Sand, 2009), evidence and theory to date suggest that it may be more relevant to women's experience of sexuality, which is more embedded in, and influenced by, romantic relationships (Baumeister, 2000; Dewitte, 2014). Emotional intimacy with a partner is thought to facilitate the emergence of women's sexual desire (Diamond, 2004; Levine, 2002) and to reinforce it through sexual satisfaction (Basson, 2002). A recent experimental study indicated that at the implicit level, women wanted more sex after being primed with romantic mood, whereas men showed the least interest in sex in the romantic condition (Dewitte, 2015). Another experimental study found that women's subjective arousal was higher when the partner was in the laboratory than when he/she was absent (van Lankveld et al., 2014). Women's sexual fantasies have higher romantic/relational content than those of men, and intimate relationships are posited to dominate women's sexual choices (Meana, 2010). Although it is still premature to conclude that interpersonal factors play a larger role in women's sexual dysfunctions relative to men's, especially given the scarcity of empirical work in this area, the current state of knowledge weighs in favour of this hypothesis. One noteworthy caveat is that most of the findings on gender differences and relationship factors in sexuality stem from community samples, rather than individuals with sexual dysfunctions. Ultimately, moving forward the empirical validation of the *Interpersonal Emotion Regulation Model* of women's sexual dysfunction could shed light on this question and lead to more sophisticated and nuanced theoretical conceptualizations of women's sexual difficulties, resulting in a better offering of much needed targeted, efficacious interventions.

Conclusions

Romantic partners in monogamous relationships are inherently interdependent in cultivating a mutually satisfying sexual relationship, which becomes more challenging in the face of a sexual dysfunction such as genito-pelvic pain. Historically, sex and relationship researchers and likewise sex and couple therapists have functioned relatively independently, despite the established bidirectional relationships between sexual and relationship satisfaction (McNulty, Wenner, & Fisher, 2015). Recent years have enjoyed a surge in studies merging the fields of sexual and relationship science and, particularly, the use of dyadic research designs (Muise, Maxwell, & Impett, 2018), but empirically-based theoretical models for understanding the contribution of interpersonal factors to sexual dysfunction have fallen behind. In this paper we introduced the *Interpersonal Emotion Regulation Model* of women's sexual dysfunction and applied it to the specific context of genito-pelvic pain with a view toward filling this important gap. We posited that emotion regulation processes are a key explanatory mechanism in the associations between interpersonal factors and sexuality outcomes. Our hope is that this model will provide rich opportunities for formulating testable hypotheses that will enhance knowledge of the ways in which couple dynamics influence the development and maintenance of sexual dysfunction in women, and will ultimately contribute to more effective, couples-based interventions.

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Figure. The *Interpersonal Emotion Regulation Model* as applied to GPPPD.

