

# Maintaining Affection Despite Pain: Daily Associations Between Physical Affection and Sexual and Relationship Well-Being in Women with Genito-Pelvic Pain

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**Abstract** Provoked vestibulodynia (PVD) is a recurrent, genito-pelvic pain condition that affects 8–12 % of women and has negative implications for sexual and relationship functioning. Many women with PVD report avoiding physical affection because they are concerned that affectionate behavior will lead to painful sexual activity. In community samples, physical affection is associated with improved sexual and relational well-being; however, no research has assessed the influence of physical affection on well-being in women with PVD. The current study examined day-to-day, within-person associations between affectionate behavior (hugging/kissing, cuddling) and sexual satisfaction, relationship satisfaction, sexual functioning, and pain intensity in women with PVD. Seventy women diagnosed with PVD completed an 8-week daily survey. Data were analyzed using multilevel modeling. All outcomes were assessed on days involving sexual activity ( $n = 401$  days). Physical affection was assessed on days with and without sexual activity. Hugging/kissing was positively associated with sexual satisfaction, relationship satisfaction, and sexual functioning within any given day and when predicting the next day. Hugging/kissing was unrelated to pain intensity. Cuddling was not associated with any outcomes. Results persisted for affection that occurred on days with and without sexual activity. Findings suggest physical affection is beneficial for the sexual and relationship well-being of women with PVD. These results may inform

interventions that encourage women coping with PVD to engage in more daily physical affection with their partners.

**Keywords** Affection · Provoked vestibulodynia · Genito-pelvic pain · Sexual satisfaction · Relationship satisfaction · Sexual functioning

## Introduction

Provoked vestibulodynia (PVD) is the most common cause of genito-pelvic pain in premenopausal women and affects 8 to 12 % of women in the general population (Harlow et al., 2014; Harlow, Wise, & Stewart, 2001). PVD is characterized by discomfort or burning sensations experienced when pressure is applied to the vulvar vestibule (Meana, Binik, Khalife, & Cohen, 1997). This pressure may be the result of sexual (e.g., intercourse) or non-sexual (e.g., gynecological exam, tampon insertion) contact (Moyal-Barraco & Lynch, 2004). The etiology of PVD is multifaceted and includes biological, psychological, and interpersonal factors (Bergeron, Rosen, & Morin, 2011). PVD is associated with a range of negative outcomes including poorer mental health and lower overall quality of life, as well as adverse impacts to women's sexual and relational well-being (Arnold, Bachmann, Kelly, Rosen, & Rhoads, 2006; Gates & Galask, 2001; Nylanderlundqvist & Bergdahl, 2003; Ponte, Klemperer, Sahay, & Chren, 2009; Soklaridis, Cartmill, & Cassidy, 2011; Sutherland, 2012; Svedhem, Eckert, & Wijma, 2013). Recent work emphasizes the key role of relational factors such as intimacy and partner responses to the pain, in determining the sexual and relational well-being of women with this condition (Bois et al., 2016; Rosen et al., 2014a). The goal of the current study was to examine the daily associations between a novel interpersonal factor—physical affection with a romantic partner (i.e., hugging/kissing and cuddling)—and sexual, relational, and pain outcomes in women with PVD.

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The experience of PVD negatively affects women's sexual and relationship well-being (Ponte et al., 2009). Compared to women without this pain, women with PVD report lower sexual desire, arousal, and lubrication (Payne et al., 2007), and these lower levels of sexual desire and arousal typically meet the clinical cutoffs for sexual dysfunction (Masheb, Lozano-Blanco, Kohorn, Minkin, & Kerns, 2004). Additionally, the majority (64 to 85 %) of women with genito-pelvic pain such as PVD report that the pain interferes with their sexual relationships (Blair, Pukall, Smith, & Cappell, 2015; Ponte et al., 2009), with controlled studies showing that they report lower sexual satisfaction (i.e., one's view of an overall sexual relationship as positive versus negative) (Gates & Galask, 2001; Smith & Pukall, 2011; White, Ven, & Jantos, 1998).

The association between PVD and relationship satisfaction is more complex. A recent systematic review concluded that relationship adjustment in women with PVD is comparable to that of women without pain and does not differ from scale norms (Smith & Pukall, 2011). However, women frequently report that the condition has a negative effect on their romantic relationship (Blair et al., 2015). For example, in a sample of 208 women with chronic, unexplained vulvar pain, 61 % reported that it affected how close they can be with those they love and 55 % reported concern that the pain will affect their ability to have a happy relationship (Ponte et al., 2009). In qualitative studies, women also report feelings of inadequacy as a romantic partner and fears of losing or disappointing their partner because of the pain (Ayling & Ussher, 2008; Elmerstig, Wijma, & Berterö, 2008). Given that PVD is detrimental to women's sexual and relationship well-being, it is essential to identify variables that may improve these central aspects of their lives, such as the degree of physical affection with a romantic partner.

Physical affection is defined as "touch intended to arouse feelings of love in the giver and/or the recipient" (Gulledge, Gulledge, & Stahmann, 2003) and is a key component of intimate interpersonal relationships (Smith et al., 2012). According to the affection exchange theory (Floyd, 2002a; Horan & Booth-Butterfield, 2010), physical affection helps create and maintain close interpersonal bonds and facilitates feelings of fondness, support, and love within a romantic relationship. In community samples, affectionate behaviors such as kissing, hugging, caressing, and cuddling have been linked to greater sexual and relationship satisfaction (Dainton, Stafford, & Canary, 1994; Fisher et al., 2015; Gulledge et al., 2003; Muise, Giang, & Impett, 2014). Furthermore, a recent review of touch therapies (e.g., physiotherapy, massage) supports its effectiveness in relieving acute and chronic pain (So, Jiang, & Qin, 2008). There is also evidence from community samples that touch from romantic partners can alleviate stress (Ditzen et al., 2007; Grewen, Anderson, Girdler, & Light, 2004), which is known to be elevated in samples of women with PVD (Basson, 2012; Ehrström, Kornfeld, Rylander, & Bohm-Starke, 2009). Thus, engaging in physical affection with a romantic partner may help to buffer against the negative cognitions (e.g., catastrophizing), emotions (e.g., shame, fear of losing a partner,

stress), and behaviors (e.g., avoidance) that are often reported by women with PVD (Gates & Galask, 2001; Nylanderlundqvist & Bergdahl, 2003; Payne, Binik, Amsel, & Khalifé, 2005; Payne et al., 2007) and that are associated with greater pain intensity, lower relationship and sexual satisfaction, and poorer sexual function in this population (Blair et al., 2015; Brotto, Yong, Smith, & Sadownik, 2015; Smith & Pukall, 2011).

To our knowledge, no research to date has examined the association between physical affection and pain, and sexual and relationship well-being in women with PVD. On the one hand, in qualitative research, some women with genito-pelvic pain report that maintaining close affectionate contact (e.g., hugging and kissing) with their partner has allowed them to maintain intimacy in their relationship despite having difficulty engaging in sexual activity (Blair et al., 2015; Brotto et al., 2015; Smith & Pukall, 2011; Svedhem et al., 2013). On the other hand, many women with genito-pelvic pain, including PVD, report avoiding or limiting sexual activity in an effort to minimize pain (Cherner & Reissing, 2013; Mitchell, King, Nazareth, & Wellings, 2011). This avoidance appears to extend to affectionate, non-sexual behavior. In qualitative studies, women with genito-pelvic pain consistently report avoiding physical affection (i.e., kissing, hugging, cuddling) due to concerns that it may lead to sexual activity (Hinchliff, Gott, & Wylie, 2012; Marriott & Thompson, 2008; Sutherland, 2012; Svedhem et al., 2013). In a recent study of women receiving treatment for their PVD, more than a third (38 %) reported that they avoided all forms of physical intimacy with their romantic partner (Brotto et al., 2015). This avoidance may be partially driven by a desire to prevent a painful encounter, but may also be driven by concern about "leading a partner on" and not wanting to explicitly reject a partner's sexual initiation.

In summary, lower levels of physical affection with their partner may be associated with negative repercussions for women with PVD's sexual and relational outcomes. Physical affection outside of a sexual context may be particularly important for the well-being of affected women as it may allow couples to maintain intimacy without experiencing the negative outcomes (e.g., pain, anxiety, frustration) that they associate with sexual encounters. Indeed, clinical treatment models for sexual dysfunctions suggest that physical affection, particularly that which removes the pressure of intercourse (e.g., kissing, hugging), is beneficial for enhancing intimacy and consequently, sexual and relationship satisfaction (L'Abate, 2007; McCarthy & Farr, 2012; Weiner & Avery-Clark, 2014). Thus, women who continue to engage in physical affection on days with *and* without sexual activity to a greater degree may report better sexual and relationship well-being.

## The Current Study

The current study used a daily diary method to examine within-person associations between physical affection and pain, as well as sexual and relationship well-being on days of sexual activity

in women with PVD. Daily diary methodology offers several notable advantages. First, affection varies day-to-day (Burlison, Trevathan, & Todd, 2007), as does the sexual and relationship satisfaction, sexual functioning, and pain intensity of women with PVD (e.g., Rosen, Bergeron, Sadikaj, & Delisle, 2015a; Rosen et al., 2014a, b). Use of daily diaries allowed us to capture this variability in order to better predict these outcomes in the context of women's day-to-day lives. Second, past research assessing physical affection between romantic partners has typically relied on retrospective and global self-reports (Dainton et al., 1994; Fisher et al., 2015; Gulledge et al., 2003; Heiman et al., 2011). Daily reports help to minimize recall bias (McAuliffe, DiFranco, & Reed, 2007), because they allow for the assessment of behavior as close in time as possible to when the behavior occurs. This is particularly beneficial when reporting on frequent behaviors (e.g., hugging and kissing). Finally, daily measures allowed us to examine temporal associations between physical affection and women's pain and sexual and relationship outcomes. Given that sexual activity and affection often co-occur (Galinsky, 2012; Smith et al., 2012), it can be difficult to disentangle their relationship. Physical affection may have a stronger effect on sexual satisfaction when it occurs during foreplay to sexual activity than when it occurs outside of the sexual context. Alternatively, physical affection that takes place outside of a sexual situation may help to minimize the feeling of anxiety and avoidance reported by many women with PVD (Hinchliff et al., 2012; Marriott & Thompson, 2008; Sutherland, 2012; Svedhem et al., 2013) and, in turn, lead to improved sexual and relationship outcomes when sexual activity does occur. Use of daily diaries allowed us to examine the role of physical affection on days with sexual activity (e.g., affection on the same day) and without sexual activity (e.g., affection on the previous day) in the sexual and relationship well-being of women with PVD on the days that they engaged in sexual activity.

Based on affection exchange theory (Floyd, 2002a, b; Horan & Booth-Butterfield, 2010) and our review of the literature, we hypothesized that on days when sexual activity occurred (1) same-day physical affection would be positively associated with increased same-day sexual satisfaction, relationship satisfaction, sexual functioning, and decreased pain intensity; and (2) previous-day physical affection would be positively associated with next-day sexual satisfaction, relationship satisfaction, sexual functioning, and decreased pain intensity.

## Method

### Participants

Participants were recruited through print and online advertisements (71 %), at clinical appointments with physicians affiliated with the study (20 %), and through word of mouth (9 %). There were no sociodemographic differences based on recruitment location. Women were screened for eligibility using a structured

interview over the telephone and then scheduled for a gynecological examination (if they were not referred directly from a physician who had conducted an examination). Inclusion criteria were as follows: (1) pain that occurs on 75 % of intercourse attempts over the last 6 months, has lasted at least six months, and causes subjective distress, (2) pain resulting from pressure to the vestibule, (3) pain during a diagnostic gynecological exam which included a "cotton swab test"—the standard gynecological procedure to diagnose PVD (Bergeron, Binik, Khalifé, Pagidas, & Glazer, 2001), (4) age between 18 and 45 years, and (5) cohabitating with a male romantic partner for a period of six months or longer. Exclusion criteria were as follows: (1) active infection, (2) vaginismus (defined in the DSM-IV-TR as involuntary tightness of the pelvic floor muscles during attempted penetration) (American Psychiatric Association, 2000), and (3) pregnancy. A more detailed description of recruitment and inclusion/exclusion criteria can be found in a previous paper using a subset of the current sample (Rosen et al., 2014b). A total of 123 women were interested in the study. Forty-five (37 %) did not meet eligibility criteria: 19 were single, 8 did not receive a diagnosis of PVD from the study physician, 9 had partners who did not wish to participate in the broader study from which the present data were obtained, and 9 were ineligible for other reasons (e.g., pregnancy, non-English speaker). Seventy-eight (63 %) women met eligibility criteria and provided informed consent, although eight women did not report engaging in sexual activity during the period of data collection. The final sample consisted of 70 women.

## Measures

### *Relationship Satisfaction*

Relationship satisfaction was assessed using the Kansas Marital Satisfaction Scale (KMSS) (Schumm et al., 1986). The KMSS included three items that were modified to accommodate participants who were cohabitating, but not necessarily married, and the daily diary format of the study. The items were as follows: "How satisfied are you with your relationship with your partner today?," "How satisfied are you with your partner today?," and "How satisfied are you with your overall marriage/common-law relationship today?" Participants responded to each item on a 7-point scale ranging from 1 (*very unsatisfied*) to 7 (*very satisfied*). Responses were summed to create a daily total score. Total scores could range from 3 to 21, with higher scores indicating higher satisfaction. The KMSS has demonstrated strong psychometrics in previous research (Schumm et al., 1986). The scale demonstrated strong reliability in the current study ( $\alpha_{\text{between}} = .98$ ,  $\alpha_{\text{within}} = .91$ ).

### *Physical Affection*

Two items assessed physical affection: "I hugged/kissed my partner" and "I cuddled with my partner." Participants reported

how many times (in an open-ended response format) they engaged in each behavior during the previous 24 h.

### *Sexual Satisfaction*

Sexual satisfaction was assessed using the Global Measure of Sexual Satisfaction (GMSEX) (Lawrance & Byers, 1995). The GMSEX included five bipolar items (i.e., good vs. bad, pleasant vs. unpleasant, positive vs. negative, satisfying vs. unsatisfying, valuable vs. worthless). Participants responded to each item on a 7-point scale. Responses were summed to create a daily total score. Total scores could range from 5 to 35, with higher scores indicating higher sexual satisfaction. The GMSEX has demonstrated strong psychometric properties in previous research (Lawrance & Byers, 1995) and had strong reliability in the current study ( $\alpha_{\text{between}} = .78$ ,  $\alpha_{\text{within}} = .72$ ).

### *Sexual Functioning*

Sexual functioning was assessed using the Monash Women's Health Program Female Sexual Satisfaction Questionnaire (MFSSQ) (Davison, Bell, La China, Holden, & Davis, 2008). The MFSSQ is an 11-item measure designed to assess the characteristics and quality of a sexual experience that occurred in the prior 24 h. The scale included 11 items. Two items assessed initiation of sexual activity and orgasm (yes/no), five items assessed sexual receptivity, ease of arousal, vaginal lubrication, degree of pleasure, and satisfaction (Likert scale ranging from 1 to 9), and one item assessed ease of orgasm (Likert scale ranging from 0 to 9 where participants select 0 if orgasm did not occur). Two descriptive yes/no items assessed partner involvement and intercourse, but are not included when calculating a total score. Due to an experimenter error, the ease of arousal item was dropped from the scale. Possible total score ranged between 4 and 45, with higher scores indicating better functioning. The MFSSQ has demonstrated good psychometrics in past research (Davison et al., 2008) and had good reliability in the current study ( $\alpha_{\text{between}} = .79$ ,  $\alpha_{\text{within}} = .77$ ).

### *Pain Intensity*

Women rated the intensity of pain experienced during sexual activity within the previous 24 h on a 11-point numerical rating scale ranging from 0 (*no pain*) to 10 (*worst pain ever*). This measure has been used previously in women with PVD to detect treatment effects (Bergeron et al., 2001) and has demonstrated convergent validity with other measures of pain intensity (Desrochers, Bergeron, Khalifé, Dupuis, & Jodoin, 2009).

### **Procedure**

The data included in the present study were collected as part of a larger research project examining couples in which a woman

was diagnosed with PVD. Data from this larger project have been published previously and examined the associations between partner responses to women's pain and partner estimates of women's pain, and relevant outcomes (Rosen, Bergeron, Glowacka, Delisle, & Baxter, 2012; Rosen et al., 2014a, b, 2015a; Rosen, Muise, Bergeron, Delisle, & Baxter, 2015b; Rosen, Sadiqaj, & Bergeron, 2015c). A detailed description of study procedures can be found in these previously published papers, but will be reviewed briefly here.

Women attended an orientation session with their partner. Participants provided informed consent and completed an online survey that assessed sociodemographics, pain history, and several other variables not relevant to the current study. Participants were then instructed as to how to complete the daily diaries. A link to the online survey was sent to participants via e-mail. Each day, for an 8-week period, participants clicked on the survey link and completed the study measures. Participants were asked to start and complete the diary at the same time each day and to base their responses on their experiences during the previous 24 h. The importance of completing the survey independently from their partner was stressed. On days when participants reported engaging in sexual activity (i.e., "I engaged in vaginal intercourse" or "I engaged in sexual activities other than vaginal intercourse with my partner"), participants also completed the measures of sexual satisfaction, sexual functioning, and pain intensity. On each day, participants completed the items assessing physical affection and the measure of relationship satisfaction, regardless of whether or not they engaged in sexual activity. The overall rate of diary completion was 87.37 % (3425 diaries of a possible 3920), with a mean number of 8.61 (SD = 6.14; range = 1–29; median = 5) sexual activity days over the course of the study. Details regarding the strategies used to increase and assess participant compliance can be found in our previous papers (e.g., Rosen et al., 2014b). Participants were compensated \$20 for completing the orientations and \$12 for completing each week of the daily diaries (\$116 total). University and health centers' institutional review boards approved all of the study procedures.

### **Data Analysis Strategy**

Two types of days were included in analyses: days when sexual activity occurred and days preceding a sexual activity day. If sexual activity took place on consecutive days, only the first day was included in analyses. This was necessary to ensure that affection on the previous day was outside of a sexual context. A total of 802 days were included in the final analyses (i.e., 401 days with sexual activity and 401 days without sexual activity preceding a day with sexual activity).

A two-level model was analyzed with multilevel modeling using Mplus 7.0 (Muthén & Muthén, 2012). Daily observations (Level 1; within-subjects) were nested within participants (Level 2; between-subjects). For all models, we specified random intercepts and fixed

slopes and used robust (MLR) estimation of standard errors. The sexual satisfaction and relationship satisfaction variables were negatively skewed. Though MLR estimation does minimize the effect of non-normal data, we re-ran all analyses using a negative binomial distribution (Atkins, Baldwin, Zheng, Gallop, & Neighbors, 2013) and found the same pattern of significant results. As such, we chose to present the simpler models that did not use the negative binomial distribution. These results are available from the first author upon request.

We calculated intraclass correlations (ICCs) to confirm that it was appropriate to use multilevel modeling. ICCs above .05 indicate that a sufficient amount of variance is explained at the between-subjects level and as such, that multilevel modeling is appropriate (Preacher, Zyphur, & Zhang, 2010). ICCs for all variables met this criterion (see Table 1). Internal consistency was calculated using a multilevel version of Cronbach's alpha (Geldhof, Preacher, & Zyphur, 2014; Preacher et al., 2010). Before hypothesis testing, multilevel bivariate correlations were examined. Between-subjects correlations can be interpreted as the trait-like association between physical affection and outcomes when averaging across all days with sexual activity. Within-subjects correlations ask the question: When physical affection changes across sexual encounters, do outcomes systematically change with it? Two sets of analyses were conducted: (1) same-day physical affection predicting outcomes, and (2) previous-day physical affection predicting outcomes. In all analyses, the days on which outcomes were assessed were days when sexual activity had occurred. This was to ensure that participants had completed measures of sexual satisfaction, sexual functioning, and pain intensity.

## Results

### Descriptive Statistics and Bivariate Correlations

Descriptive statistics are reported in Table 1. On days when sexual activity occurred, women hugged/kissed their partner 8.66 times and cuddled their partner 2.22 times, on average. On days preceding sexual activity days, on average women hugged/kissed 5.83 times and cuddled 1.69 times.

Bivariate correlations are reported in Table 2. Between-subjects correlations indicated that women who reported higher levels of hugging/kissing also reported higher relationship satisfaction, sexual satisfaction, and sexual functioning. In addition, cuddling was positively associated with sexual functioning. Relationship satisfaction, sexual satisfaction, and sexual functioning were all positively correlated. Pain intensity was not associated with any of the physical affection, satisfaction, or functioning measures.

Within-subjects correlations indicated that when hugging/kissing and cuddling changed across sexual encounters, relationship satisfaction and sexual functioning changed with it in a similar direction. Relationship satisfaction, sexual satisfaction, and sexual

functioning were all positively correlated. Again, pain intensity was not associated with same-day or previous-day physical affection. However, on days when women reported higher pain intensity, they also reported lower relationship and sexual satisfaction. As pain was not related to physical affection, we did not examine any further models with pain as an outcome.

### Predicting Relational and Sexual Outcomes from Same-Day Affection

To examine the association between same-day affection (i.e., affection that occurred on the same day as sexual activity) and relational and sexual outcomes, three models were tested (Table 3; models one to three). When hugging/kissing increased across sexual encounters, relationship satisfaction, sexual satisfaction, and sexual functioning similarly increased. Cuddling was not associated with any of the outcome variables after controlling for hugging/kissing. Overall, models one through three accounted for 7 to 15 % of the variance in the outcome variables.

### Predicting Relational and Sexual Outcomes from Previous-Day Affection

To examine the association between previous-day affection (i.e., affection that occurred on the day before sexual activity) and relational and sexual outcomes, we tested an additional three models (Table 3; models four to six). Hugging/kissing on days before sexual activity was positively associated with relationship satisfaction, sexual satisfaction, and sexual functioning on the day sexual activity occurred. Again, cuddling was not associated with any of the outcome variables after controlling for hugging/kissing. Overall, models four through six accounted for 6 to 10 % of the variance in the outcome variables.

## Discussion

This study investigated the association between physical affection (hugging/kissing, cuddling) and sexual satisfaction, relationship satisfaction, sexual functioning, and pain intensity using a daily diary methodology in a sample of women with PVD. We found partial support for our hypotheses. As predicted, when hugging and kissing increased across sexual encounters, sexual satisfaction, relationship satisfaction, and sexual functioning tended to increase with it. These associations were found for hugging and kissing that occurred on the same day as sexual activity, and during the day prior to sexual activity. However, contrary to hypotheses, daily cuddling was unrelated to women's sexual and relationship outcomes, and neither type of physical affection was associated with pain intensity. This study provides insight into the role of physical affection—on days of sexual activity and on days preceding sexual activity—in the sexual and relationship well-being of women living with genito-

**Table 1** Descriptive statistics for all participant characteristics and study variables ( $n = 70$ )

	Descriptive statistics			
	<i>M</i> (range) or <i>n</i>	SD	%	ICCs
Participant characteristics				
Age (years)	28.21(18–44)	6.06	–	–
Average pain intensity	5.61 (0–10)	2.68	–	–
Pain duration (months)	72.34 (6–228)	54.26	–	–
Education level (years)	16.17 (11–24)	2.74	–	–
Relationship length (years)	5.99 (0–19)	4.80	–	–
Marital status				
Married	29	–	41	–
Household annual income				
\$0–\$19,000	6	–	9	–
\$20,000–\$39,000	13	–	119	–
\$40,000–\$59,000	10	–	14	–
\$60,000–\$79,000	18	–	26	–
\$80,000 and over	23	–	33	–
Independent variables (daily)				
Same-day affection				
Hugging/kissing	8.66 (0–46)	8.66	–	.80
Cuddling	2.22 (0–19)	1.85	–	.79
Previous-day affection				
Hugging/kissing	5.83 (0–37)	6.12	–	.58
Cuddling	1.69 (0–15)	1.81	–	.75
Dependent variables (daily)				
Relationship satisfaction	18.78 (3–21)	3.11	–	.53
Sexual satisfaction	25.76 (6–35)	6.76	–	.74
Sexual functioning	33.62 (6–54)	11.64	–	.53
Pain intensity	4.33 (1–10)	2.51	–	.47

*ICC* intraclass correlation

**Table 2** Bivariate (between and within) correlations

Variable	1	2	3	4	5	6	7	8
1. Hugging/kissing <sub>t</sub>	–	.32***	–	.26*	.26***	.33**	.44**	.22
2. Cuddling <sub>t</sub>	.36***	–	.35	–	.18	.13	.22*	.11
3. Hugging/kissing <sub>t-1</sub>	.35***	.16*	–	.28	.33***	.39***	.43**	.24
4. Cuddling <sub>t-1</sub>	.16*	.30**	.57***	–	.18*	.10	.17	.10
5. Relationship satisfaction	.14**	.15**	.06	.07	–	.59***	.42*	.01
6. Sexual satisfaction	.08	.07	–.02	.01	.26**	–	.82***	.09
7. Sexual functioning	.21***	.15***	.04	.04	.20**	.58***	–	.07
8. Pain intensity	–.02	–.11	.12	.07	–.11*	–.24***	–.11	–

Between-subjects bivariate correlations are presented above the diagonal. Within-subjects bivariate correlations are presented below the diagonal

↓ Indicates same-day affection,  $t_{-1}$  indicates previous-day affection

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

pelvic pain, and more broadly, to the literature on touch and sexuality.

More frequent daily hugging and kissing with a romantic partner was associated with increased relationship satisfaction, regardless of whether this affection occurred on the day of sexual activity or the day prior to sexual activity. This finding adds to the large body of data linking physical affection to positive outcomes such as feelings of liking and loving, relationship happiness and satisfaction, and improved conflict resolution in community samples (Dainton et al., 1994; Debrot, Schoebi, Perez, & Horn, 2013; Fisher et al., 2015; Gullede et al., 2003; Muise et al., 2014), and extends these findings to a clinical population of women suffering from sexual dysfunction. This finding also provides support for affection exchange theory (Floyd, 2002a, 2002b; Horan & Booth-Butterfield, 2010), which posits that physical affection facilitates the development and maintenance of close interpersonal bonds. Women with PVD have reported that physical affection with their partner produces negative emotions and avoidance, primarily driven by a fear that this affection will lead to painful sexual activity (Gates & Galask, 2001; Nylanderlundqvist & Bergdahl, 2003; Payne et al., 2005, 2007). However, our data suggest that maintaining affectionate contact with a partner may offer benefits for women with PVD and their romantic relationships.

The finding that physical affection outside of a sexual context—that is, on the day preceding sexual activity—was positively associated with women’s greater sexual well-being is notable. Sex and couple therapy for sexual dysfunction frequently includes interventions that increase the amount of non-sexual physical affection between partners, such as in sensate focus

exercises (L’Abate, 2007; McCarthy & Farr, 2012; Weiner & Avery-Clark, 2014). Typically, these interventions emphasize the importance of “non-demand pleasuring.” That is, engaging in physical affection without the assumption that this affection will lead to intercourse. The goal of these therapeutic techniques is to allow couples that may have grown distant due to avoidance to regain some of the benefits of physical intimacy (e.g., increased relationship intimacy, closeness, satisfaction) without the pressure to perform sexually. Over time, this increased intimacy is thought to improve sexual well-being (Weiner & Avery-Clark, 2014). Although the data from the present study are correlational, our results are consistent with these clinical models suggesting that daily non-sexual affection is linked with greater sexual satisfaction and sexual function in women with genito-pelvic pain.

One possible mechanism underlying the link between affection and positive sexual and relationship outcomes in women with PVD is the development and maintenance of intimacy. As described above, both affection exchange theory (Floyd, 2002a, 2002b; Weiner & Avery-Clark, 2014) and clinical interventions for sexual dysfunction (L’Abate, 2007; McCarthy & Farr, 2012; Weiner & Avery-Clark, 2014) highlight the importance of physical affection for creating and maintaining a close connection between partners. Physical affection increases psychological intimacy in couples (Emmers & Dindia, 1995; Mackey, Diemer, & O’Brien, 2000). In a 1-week daily diary study, non-sexual touch (i.e., hugging, touching, or caressing) between romantic partners increased intimacy (i.e., feelings of closeness, security, caring, and understanding), which in turn led to improved mood (Debrot et al., 2013). Similarly, previous research has linked psychological intimacy with relationship satisfaction and passion, sexual

**Table 3** Within-person associations between affectionate behaviors and outcome variables

Model	Outcome	Predictors	<i>B</i>	SE	<i>p</i>	<i>R</i> <sup>2</sup>
1	Relationship satisfaction	Hugging/kissing <sub>t</sub>	.07	.02	<.001	.07*
		Cuddling <sub>t</sub>	.22	.14	.124	
2	Sexual satisfaction	Hugging/kissing <sub>t</sub>	.22	.05	<.001	.10*
		Cuddling <sub>t</sub>	.29	.35	.414	
3	Sexual functioning	Hugging/kissing <sub>t</sub>	.42	.12	<.001	.15**
		Cuddling <sub>t</sub>	.82	.55	.134	
4	Relationship satisfaction	Hugging/kissing <sub>t-1</sub>	.10	.04	.003	.06*
		Cuddling <sub>t-1</sub>	.15	.08	.067	
5	Sexual satisfaction	Hugging/kissing <sub>t-1</sub>	.22	.05	<.001	.10*
		Cuddling <sub>t-1</sub>	.29	.35	.414	
6	Sexual functioning	Hugging/kissing <sub>t-1</sub>	.48	.14	.001	.09*
		Cuddling <sub>t-1</sub>	.57	.53	.281	

Outcome variables were assessed only on days when sexual activity occurred

‡Indicates same-day affection, <sub>t-1</sub> indicates previous-day affection

\* *p* < .05, \*\* *p* < .01

satisfaction, and sexual frequency in community couples (Mackey et al., 2000; Rubin & Campbell, 2012). Thus, daily physical affection may increase feelings of psychological intimacy in women experiencing PVD, which in turn may lead to improved sexual and relational outcomes. Recent studies have found greater intimacy to be linked to improved sexual functioning and satisfaction in women with PVD (Bois et al., 2016; Bois, Bergeron, Rosen, McDuff, & Grégoire, 2013). Future research should examine intimacy as a possible mediator of the relationship between physical affection and sexual and relational outcomes in women with PVD.

Contrary to hypotheses, daily cuddling was unrelated to women's sexual and relationship well-being. Cuddling is commonly perceived as sexual, often occurs immediately before or after sexual activity, and frequently takes place in bed (van Anders, Edelstein, Wade, & Samples-Steele, 2013). As such, cuddling may be less likely to be seen as an expression of spontaneous affection as compared to hugging or kissing and, as a result, may be less likely to foster feelings of intimacy or offer fewer benefits for overall sexual and relationship well-being. Alternatively, the timing of cuddling may be more important than the frequency of cuddling. Recent data suggest that post-sex cuddling with a romantic partner is a stronger predictor of sexual and relationship satisfaction than cuddling at other times (Muisse et al., 2014). Our measures did not assess the timing of physical affection in relation to sexual activity each day, though this may be an interesting direction for future research. A third possible explanation might be flaws in the measurement tool. Participants may have used different definitions of cuddling when responding to the questionnaire, reducing the reliability of measurement—and thus, reducing statistical power.

Changes in daily physical affection were not associated with fluctuations in women's pain intensity during intercourse. This finding stands in contrast to past research showing that physical affection can offer benefits specific to managing pain (Kutner et al., 2008; So et al., 2008). In the context of PVD, it may be that physical affection is more important for determining psychosocial well-being, while not impacting the pain itself. This conclusion is in line with several studies documenting links between interpersonal variables such as intimacy, attachment, and women's perceptions of dyadic sexual communication, and women with PVD's sexual and relationship well-being, but not their pain (Bois et al., 2013; Leclerc et al., 2014; Rancourt, Rosen, Bergeron, & Nealis, 2016). The extent to which pain interferes with valued aspects of one's life—such as their relationships—is frequently the primary motivation for seeking treatment and may be a key factor in subsequent coping and recovery (Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, 2012). Thus, the importance of identifying predictors of their well-being cannot be underestimated. Still, it may be of interest to consider how physical affection is associated with pain that is not limited to sexual intercourse, such as in generalized vulvodynia.

The daily diary methodology used in this study is a notable strength. Collecting 8-weeks of daily reports allowed us to examine within-person variability in physical affection and sexual and

relationship well-being and minimized the likelihood of recall bias. Further, the study design allowed us to assess physical affection on days with and without sexual activity. This provided novel insight into the importance of physical affection both days with and without sexual activity. There are also limitations to the present study. All of the women were between the ages of 18 and 44 and involved in mixed-sex cohabitating relationships. As a result, the present findings may not generalize to older women, women in same-sex relationships, or women in less committed types of romantic relationships. In addition, to be included in analyses women must have reported at least one occasion of sexual activity during the 8-week period of data collection. Our findings may not generalize to women who are less sexually active. All of our data were obtained via self-report, and as such was subject to the limitations of self-reports including the possibility of social-desirability and recall bias. Additionally, asking participants to report on their daily affection may have encouraged them to engage in more affectionate behavior. A different method, such as random event sampling throughout the day, may have provided a more accurate measure of the frequency of behaviors such as hugging, kissing, and cuddling and could provide more nuanced insight into the temporal order of affection and sexual activity within each day.

The study was correlational, and hence we cannot draw causal conclusions. There may be other possible directions of the relationships between physical affection and relationship and sexual satisfaction and sexual functioning. For example, women who are in better functioning relationships may be more likely to engage in affectionate behavior with their partners. Further longitudinal research is needed to form conclusions about causality. Our measure of physical affection collapsed hugging and kissing into one item. We were thus unable to examine the unique effects of each affectionate behavior. Finally, some of the effects of physical affection can be considered small. However, Abelson (1985) has argued that small effects can be meaningful, particularly when they are cumulative as is the case with daily physical affection. As time passes, patterns of day-to-day affection may have an increasing impact on the sexual and relationship well-being of couples coping with PVD. Future research is needed to test this possibility. Other studies have identified interpersonal predictors of daily sexual and relationship well-being, such as partner responses (Rosen et al., 2014a). Future research should examine how these relevant variables interact with physical affection to produce larger effects.

In conclusion, the current findings suggest that physical affection, such as hugging and kissing, is associated with greater sexual satisfaction, relationship satisfaction, and sexual functioning in the daily lives of women with PVD. Affection also appears to be beneficial when it occurs both within and outside of a sexual context. Many women with PVD report avoiding physical affection (Cherner & Reissing, 2013; Mitchell, King, Nazareth, & Wellings, 2011), which may have wider reaching implications for women's and couple's sexual and relationship well-being. The current results may inform interventions aimed at enhancing the



sexual and relationship adjustment of women with PVD by encouraging them to engage in more daily physical affection with their partners.

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#### Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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