Sexual Communication Mediates Cognitive–Behavioral Couple Therapy Outcomes: A Randomized Clinical Trial for Provoked Vestibulodynia

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Provoked vestibulodynia (PVD) is a chronic vulvovaginal pain condition affecting 8%–10% of women and is associated with negative sexual sequalae. Our randomized clinical trial comparing cognitive–behavioral couple therapy (CBCT) to a medical intervention (lidocaine) found that both treatments improved affected women's pain and both affected women's and partners' sexual outcomes, with CBCT demonstrating more benefits (Bergeron et al., 2021). The goal of this study was to examine two putative mediators of CBCT's treatment effects: collaborative and negative sexual communication patterns (SCPs). Women with PVD and their partners were randomly assigned to 12 weeks of CBCT ($N = 53$) or lidocaine ($N = 55$). Outcome measures (sexual satisfaction, function, and distress) were collected at pre-treatment, post-treatment, and 6-month follow-up, and in-treatment measures of the mediators were taken at Weeks 1, 4, 8, and 12 of treatment. Results showed that affected women's reports of improving collaborative communication mediated the effect of CBCT, but not lidocaine, on post-treatment sexual satisfaction (women with PVD and partners), sexual function (women with PVD), and sexual distress (women with PVD). For partners, collaborative communication improved equally in both treatments. Given that there were no differences in negative SCPs between the CBCT and lidocaine conditions, it was not possible to examine negative communication as a potential mediator. From the perspective of women with PVD, CBCT helped couples communicate about their sexual problems in more collaborative ways, which was in turn beneficial for improving the sexual well-being of both members of the couple.

Keywords: sexual communication, sexual dysfunction, couples, genito-pelvic pain, couple therapy

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Sexual problems are one of the leading reasons for seeking couple therapy (Doss et al., 2004). Yet, empirically, consideration of the relational aspects in treating sexual dysfunction has been neglected. One notable exception is genito-pelvic pain/penetration disorder (GPPPD); research over the last decade has demonstrated the relevance of studying and treating this condition from a dyadic perspective (for a review, see Rosen & Bergeron, 2019). Nevertheless, researchers have not evaluated how key interpersonal factors, such as communication, change through treatment to influence the outcomes of couples coping with GPPPD. The present study addressed this gap by examining changes in couples' sexual communication patterns (SCPs) over the course of cognitive–behavioral couple therapy (CBCT) versus topical lidocaine for a common cause of GPPPD—provoked vestibulodynia—and whether changes in communication mediate treatment gains in sexual satisfaction, function, and distress.

Genito-Pelvic Pain/Penetration Disorder: Sequelae and Treatment

GPPPD is characterized by persistent fears of, or pain upon, penetration, causing significant distress (American Psychiatric Association, 2013). The most common subtype of GPPPD, provoked vestibulodynia (PVD), affects 8%–10% of women of all ages, and is characterized by recurrent pain that is elicited when pressure is applied to the vaginal entrance, often during partnered sexual activities (Bergeron et al., 2020). Given that one of pain's most devastating impacts is its interference with valued life activities—in the case of PVD, the sexual relationship—expert guidelines underscore the centrality of outcomes beyond pain (Pukall et al., 2017). Controlled studies show that women with PVD and their partners report greater sexual distress, and lower sexual function and sexual satisfaction (Rosen & Bergeron, 2019).

PVD is caused and maintained by biological, psychological, and social factors (Bergeron et al., 2020). Biopsychosocial interventions, such as cognitive–behavioral therapy (CBT), are advantageous as they target this multifactorial etiology. Several randomized clinical trials (RCTs) support the efficacy of group or individual CBT for reducing affected women's pain and improving their sexual well-being against other medical, physical, and psychological treatments or waitlist controls (e.g., Bergeron et al., 2016; Brotto et al., 2019). However, the mechanisms underlying CBT's efficacy are poorly understood. A study comparing group CBT to group mindfulness for PVD found that changes in cognitive variables mediated outcomes in both treatment conditions (Brotto et al., 2020). No studies have examined interpersonal variables that may serve as mechanisms of change in treatments for PVD.

Sexual Communication and Provoked Vestibulodynia

The *Interpersonal Emotion Regulation Model* of sexual dysfunction theorizes that interpersonal factors influence couples' emotion regulation, which, in turn, affects women's pain and couples' well-being (Rosen & Bergeron, 2019). Given the sexual context implicated in the distress concerning PVD, sexual communication is likely to be especially relevant to how skillfully couples co-regulate their emotions around the pain and associated sexual difficulties.

Sexual communication refers to couples' communication about the sexual aspects of their relationship (Babin, 2013). Women with PVD and their partners have reported more inhibited sexual communication than unaffected couples, and poorer sexual communication is associated with greater pain intensity and sexual distress for women with PVD, and lower sexual satisfaction and function for affected couples (Pazmany et al., 2014; Rancourt et al., 2016). Further, greater perceptions of collaborative SCPs (i.e., partners' cooperating, such as problem-solving and mutually expressing feelings) were associated with higher sexual and relationship satisfaction, and lower sexual distress for both partners (Rancourt et al., 2017). In contrast, in the same study, more negative SCPs (i.e., expressing negative affect and/or withdrawing) were associated with lower relationship satisfaction and higher sexual distress. These findings indicate that *how* couples communicate about sexual problems may be important to their adjustment to PVD and supports sexual communication as a key target for couple-based interventions.

Sexual Communication: A Putative Mediator in Couple Therapy for PVD

Research highlighting the role of interpersonal factors, including sexual communication, led us to develop a manualized couple-based CBT (CBCT) for PVD. CBCT for PVD integrates a systemic context throughout the treatment (e.g., reconceptualizing PVD as a dyadic issue, addressing problematic communication dynamics, considering the role of interpersonal factors). A full description and results of the RCT comparing the 12-week CBCT to nightly application of topical lidocaine, which is recommended as a first-line medical treatment for PVD in treatment algorithms (Mandal et al., 2010), have been published (Bergeron et al., 2021). In sum, both treatments showed improvements in affected women's pain intensity and both partners' sexual function; however, CBCT led to greater improvements in affected women's pain unpleasantness, pain anxiety and catastrophizing, and sexual distress, as well as both partners' global sexuality. Couples in a pilot study of the CBCT rated the communication interventions as the most helpful (Corsini-Munt et al., 2014), suggesting that sexual communication might be central to the benefits of CBCT over topical lidocaine, in which communication is not addressed.

Although CBCT has multiple intervention targets across cognitive, affective, and behavioral domains (Baucom & Epstein, 1990), a primary emphasis is to facilitate change by addressing patterns of communication, such as reducing unhelpful ways of interacting (e.g., avoidance and withdrawal, criticism), and facilitating more constructive approaches (e.g., empathic responding, shared problem-solving; Davis et al., 2012). Facilitating this change is multifactorial, and involves interventions that address problems in multiple domains (e.g., targeting partners' unhelpful cognitions may shift their emotional reactions, thereby facilitating healthier communication; Epstein et al., 2019). A longstanding history of empirical investigation underscores CBCT as an efficacious treatment for couple distress, and, in more recent years, evidence also points to its benefits in addressing mental and chronic health problems that directly impact only one member of the couple (Fischer et al., 2016).

In CBCT for PVD, interventions aimed to alter communication dynamics specific to the domain of sexuality. In the broader literature, early studies examining how communication patterns change through couple therapy and whether these changes account for improvements following treatment, demonstrated inconsistent findings, likely due to underpowered samples (e.g., Emmelkamp et al., 1988; Hahlweg et al., 1984). More recently, RCTs comparing two behavioral couple therapies for relationship distress found that couples experience pre-/post-treatment reductions in negative communication patterns and increases in positive communication patterns in both therapies (Christensen et al., 2004; Doss et al., 2005; Sevier et al., 2008). Moreover, increases in positive communication and decreases in negative communication patterns are associated with concurrent improvements in relationship satisfaction at posttreatment and longer term (Baucom et al., 2011; Doss et al., 2005; Sevier et al., 2008). Examining communication-related changes using multiple time points over the course of therapy, while establishing temporal precedence between the putative mediator and the treatment outcome and comparing these changes to a non-therapy condition via an RCT, would strengthen causal conclusions. To our knowledge, only one study to date has established temporal precedence between changes in communication and changes in

relationship outcomes over the course of couple therapy. In a sample of 161 couples receiving treatment-as-usual couple therapy in outpatient Veteran Administration Medical Centers, Doss et al. (2015) found that self-reported improvements in communication in each session predicted subsequent improvements in relationship satisfaction in the next session.

The Present Study

The present study used data collected in the previously published RCT (Bergeron et al., 2021). Couples randomized to the lidocaine treatment received no intervention for their sexual communication, and thus represented a comparison group. All participants reported on their SCPs at 4-week intervals over the course of the 12-week treatments. The first objective was to compare the within-group (i.e., lidocaine or CBCT) trajectories of women with PVD's and partners' collaborative and negative SCP across the treatment period. We expected that treatment condition would moderate the trajectories of SCP over time such that women with PVD and partners in the CBCT condition would show significantly greater increases in collaborative and significantly greater decreases in negative SCP compared to those in the lidocaine group, who would exhibit non-significant changes in both types of SCP over the course of treatment. The second objective was to examine whether changes in SCPs mediated the effects of treatment condition on women with PVD's and partners' sexual well-being (i.e., sexual distress, sexual satisfaction, and sexual function) at post-treatment and 6-month follow-up. We predicted that, for both affected women and partners, improvements in collaborative and negative SCPs would mediate the effects of CBCT on sexual outcomes, whereas changes in SCPs would not mediate the effects of lidocaine on sexual outcomes.

Method

Participants

Participants were 108 women diagnosed with PVD and their partners (3 women and 105 men). This study is a secondary analysis (not preregistered) of a preregistered RCT for which a power analysis determined that 108 couples were sufficient to detect small effects for the main analysis (Bergeron et al., 2021). Women with PVD and their partners were recruited between May, 2014 and March, 2018. Inclusion criteria were: (a) age 18 years and older; (b) in a committed relationship for at least 6 months; (c) penetration or attempted vaginal penetration with one another at least once per month for the past 3 months; (d) cohabiting and/or at least four in-person contacts per week in the last 6 months; (e) the affected woman was experiencing pain, provoked by pressure to the vulvar vestibule, for a minimum of 6 months, and on at least 80% of vaginal penetration attempts; (f) the affected woman received a diagnosis of PVD from a collaborating physician. The physician conducted a standardized cotton swab test, whereby affected women self-report pain intensity using a 0–10 numerical rating scale upon random palpation of the vulvar vestibule at 3, 6, and 9 o'clock (Bergeron et al., 2001). Exclusion criteria were: (a) affected women over 45 years of age and/or having started menopause due to vulvar changes in the peri-menopausal period; (b) affected women who had an active vaginal infection or dermatological condition, as identified by the physician; (c) pregnancy or planning a pregnancy; (d) actively receiving treatments for PVD; (e) presently in couple therapy;

(f) major untreated, self-reported medical or psychiatric disorder (e.g., major depressive disorder) that might interfere with their ability to maximally benefit from the treatment; (g) clinically significant levels of relational distress (as indicated by the cut-off score on the Couple Satisfaction Index; Funk & Rogge, 2007); and/or (h) self-reported intimate partner violence. The latter two criteria were due to their negative impacts on relational safety, which require explicit intervention prior to sex therapy. Figure 1 shows a flowchart of participation.

Procedure

The research ethics boards at the IWK Health Centre and the Université de Montréal approved the study. A research assistant conducted an initial eligibility screening via telephone, and a research assistant or PhD-level graduate student in clinical psychology further assessed couples' eligibility during a laboratory-based appointment where couples provided their informed consent to participate and completed a brief structured interview to gather sociodemographic information. Women with PVD and partners independently completed a series of baseline self-report measures for the larger RCT, some of which were used to evaluate their eligibility for the study. Eligible couples were then randomized to either lidocaine or CBCT according to the independent stratified randomization method provided by Dacima Software. All research personnel and investigators remained masked to treatment condition for the duration of the study, with the exception of the research coordinator in charge of randomization, the research assistants in charge of the lidocaine condition, and the CBCT therapists. Following treatment, couples completed a post-treatment structured interview and completed self-report measures; this procedure was repeated 6 months after the post-treatment assessment. Couples were compensated $30 per assessment. During treatment, participants independently completed measures (sent via e-mail) of SCPs, within 2 days of the start of treatment (Week 1, T_0) and at Week 4 (T_1), Week 8 (T_2), and Week 12 (T_3); participants received a reminder email if the survey had not been completed within 24 hr.

Treatment Conditions

Cognitive–Behavioral Couple Therapy

Couples attended 12 weekly 75-min sessions of CBCT. Therapists followed a detailed treatment manual, which can be obtained by contacting the first or last author. A treatment outline can also be found on the Open Science Framework (OSF; Rancourt et al., 2021). The goals of CBCT were to target couples': (a) cognitions, behaviors, and emotions regarding PVD, (b) framing of the pain as a shared problem, (c) communication about PVD and sex, (d) pain management skills and coping with the impact of PVD on the sexual relationship, and e) sexual adjustment (i.e., sexual satisfaction, distress, and function). The CBCT used a range of cognitive and behavioral interventions to facilitate these goals (e.g., psychoeducation, addressing unhelpful cognitions, breathing and relaxation, problem-solving). Given the dyadic nature of CBCT, an overarching focus of the in-session and at home practice was communication—the putative mediator under investigation in this study. Additionally, specific interventions directly targeted communication skills. For example, in the third session, couples were taught effective

Figure 1
Participant Flow
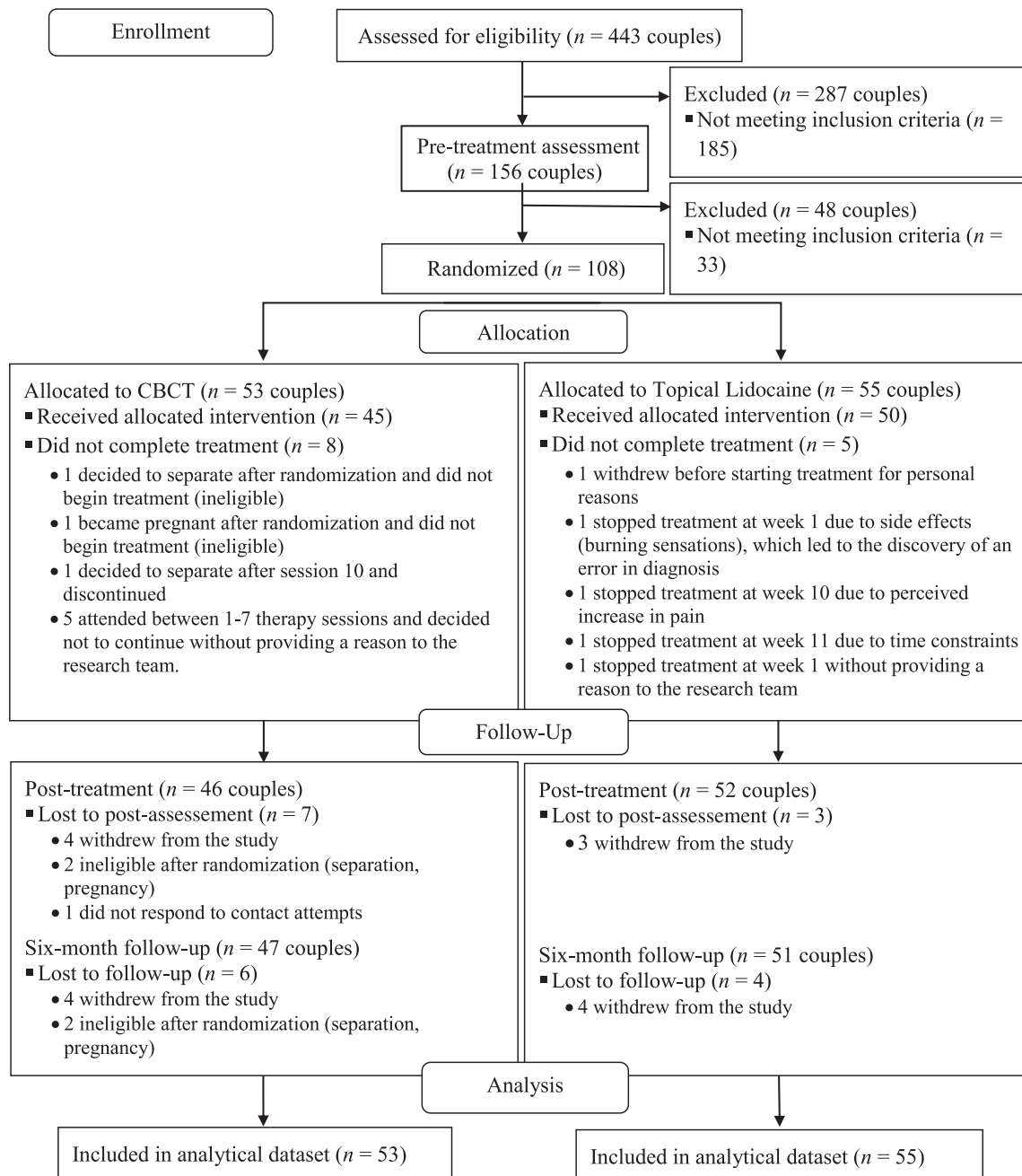
communication skills—namely, self-disclosure (e.g., "I" statements) and active listening. They were encouraged to practice these skills at home, as well as part of an in-session exercise to facilitate expressing sexual and relationship needs to one another. The CBCT manual directed therapists to draw out couples' practice of these communication skills using in-session enactments for the duration of the therapy. In the seventh session, therapists elicited a discussion about continued difficulties around sexual communication and worked to address barriers.

The CBCT therapists were PhD-level students in clinical psychology ($N = 8$) or junior clinicians (PsyD or PhD, $N = 2$; MA in clinical sexology, $N = 1$) who attended weekly supervision with a registered clinical psychologist with expertise in sex and couple therapy and the CBCT intervention for PVD. Therapists received extensive training in delivering the CBCT treatment manual. Two independent clinical associates coded a random sample of 25% of all therapy sessions, obtaining an inter-rater reliability of .70 (mean weighted kappa), and finding that therapists adhered to the treatment

manual 93.8% of the time. Couples in CBCT attended 10.6 out of 12 ($SD = 3.53$; 88.7%) sessions, inclusive of those who did and did not complete treatment. Women with PVD completed 67.7% of homework exercises, whereas partners completed 58.6% of homework exercises.

Topical Lidocaine

Women with PVD attended a laboratory appointment with a trained research assistant who explained the lidocaine application based on the standardized protocol described in Zolnoun et al. (2003). They were instructed to apply a marble-sized amount of a 5% lidocaine ointment to the vulvar vestibule every night for 12 weeks, and to place cotton square coated with the lidocaine ointment on the affected area overnight, kept in place by wearing underwear to bed to ensure approximately 8 hr of contact. A research assistant conducted weekly phone calls to monitor adverse events and adherence; these calls did not involve supportive listening or counseling. Participants kept a daily log to track adherence; women with PVD reported applying the lidocaine 79.4% of the nights during the treatment period.

Measures

Sexual Communication Patterns

SCPs were assessed using the Sexual Communication Patterns Questionnaire (S-CPQ; Rancourt & Rosen, 2019). This measure assesses individuals' perceptions that they and their partner use various patterns of communication when sexual problems arise, on a scale of 1 (*very unlikely*) to 9 (*very likely*). The S-CPQ has two subscales: (a) "Collaborative SCP" contains eight items that reflect a mutual engagement in collaborative approaches to sexual problem discussions (e.g., *both members express feelings to each other*); (b) "Negative SCP" contains 14 items that reflect the expression of negative affect or withdrawal on the part of one or both members of the couple (e.g., *both members blame, accuse, or criticize each other*). Summed scores range from 8 to 72 for the collaborative, and 14–126 for the negative subscales, with higher scores indicating a greater perception of using these patterns. The factor structure of the S-CPQ was established in an online sample of 263 individuals, and demonstrated strong internal consistency and convergent and discriminant validity (Rancourt & Rosen, 2019). In the present study, alpha coefficients across all time-points ranged from .77 to .83 for women with PVD's collaborative subscale and .70 to .85 for partners. For the negative subscale, alphas ranged from .83 to .91 for women with PVD and .85 to .91 for partners.

Sexual Satisfaction

Sexual satisfaction for women with PVD and partners was measured using the 5-item Global Measure of Sexual Satisfaction (GMSEX; Lawrance & Byers, 1995). Individuals report their satisfaction with their sexual relationship on a 7-point bipolar scale (e.g., good–bad, satisfying–unsatisfying). Total summed scores range from 7 to 35, with higher scores indicating greater sexual satisfaction. In the present study, alpha coefficients across time-points ranged from .91 to .94 for women with PVD and from .88 to .91 for partners.

Sexual Function

Women's sexual function was measured using the 19-item Female Sexual Function Index (FSFI; Rosen et al., 2000), which assesses six domains of sexual function: desire, arousal, orgasm, lubrication, satisfaction, and pain. The FSFI has demonstrated good internal consistency and construct validity (Rosen et al., 2000). Total scores range from 2 to 36, with higher scores indicating better sexual function. Male partners' sexual function was assessed with the International Index of Erectile Function (IIEF; Rosen et al., 1997). This 15-item measure assesses five domains of sexual function: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction. Total scores range from 5 to 75, with higher scores indicating better sexual function. Alpha coefficients across time points ranged from .89 to .93 for women (FSFI) and .76 to .81 for male partners (IIEF).

Sexual Distress

Distress associated with their sexual functioning was measured using the Female Sexual Distress Scale - Revised (FSDS-R; DeRogatis et al., 2008), which has been validated in men (Santos-Iglesias et al., 2018). The FSDS-R consists of 13 items measured on a 5-point scale from 0 (*never*) to 4 (*always*). Total summed scores range from 0 to 48, with higher scores indicating greater sexual distress. Alpha coefficients across time points ranged from .91 to .97 for women with PVD, and from .91 to .94 for partners.

Data Analyses

All study materials, data, and syntax can be found on the OSF page (Rancourt et al., 2021). Descriptive statistics were computed using the Statistical Package for the Social Sciences (SPSS 26.0). The main analyses were estimated in M*plus* 8.2 (Muthén&Muthén, 1998–2017) using the maximum likelihood estimator. Model fit was evaluated by considering several fit indices: non-statistically significant chi-square value; a comparative fit index (CFI) of .95 or higher; a root mean square error of approximation (RMSEA) and a standardized root-mean-square residual (SRMR) below .08. Missing data were accounted for using the full information maximum likelihood method (FIML; Muthén&Muthén, 1998–2017). There were pre-treatment differences between the two sites: Women with PVD from Site A, compared with those from Site B, reported higher collaborative SCP at Week 1 and lower sexual distress at pretreatment, and partners reported higher sexual function at pretreatment. Thus, treatment site was effect coded as 0.5 = Site A and −0.5 = Site B and added as a covariate in the main analyses.

To examine changes in SCP between Week 1 and Week 12 of treatment, and the difference in trajectories between treatment conditions, we conducted dyadic latent growth curve models (LGCM) within a structural equation model (SEM; Peugh et al., 2013). In dyadic models with distinguishable dyads (i.e., women with PVD and their partners) two latent growth factors are estimated simultaneously, allowing covariances between women with PVD and their partners. As a preliminary testing step, two unconditional dyadic LGCMs were estimated to examine fixed and random estimates of intercepts and linear slopes for affected women's and partner's collaborative and negative SCP. The intercept represents the starting point at Week 1 and the slope represents the linear

trajectory from Week 1 to Week 12. To examine if the trajectories differed significantly between treatments two conditional models were estimated in which treatment condition was added as a fixed-effect predictor of affected women's and their partner's intercept (initial levels) and slope (trajectories). Treatment condition was effect coded with CBCT = 0.5 and topical lidocaine = −0.5. If the effect of treatment condition was significant we used simple slopes to report the changes in each treatment condition. An example of a conditional model is presented in Figure S1 of the online Supplementary Material. Only SCP showing statistically significant treatment effects were examined as mediating variables in the following mediation model. Couples were included in the dyadic LGCM if at least one partner provided data at any of the in-treatment time points. Overall, 93.5% (n = 101) of couples completed Week 1, 92.6% (n = 100) completed Week 4, 91.7% (n = 99) completed Week 8, and 87.0% (n = 94) completed Week 12. Thus, 104 couples were included in the dyadic LGCM, as in four couples both partners did not complete the in-treatment questionnaires.

Dyadic mediation models were computed using the actor-partner interdependence model (APIM; Ledermann et al., 2011) in which affected women's and their partner's individual intercept and slope parameters from the unconditional dyadic LGCM were used as mediator variables (saved intercepts and slopes for each individual via FSCORES in Mplus; von Soest & Hagtvet, 2011). In the mediation models, we examined the effects of treatment condition (X) on women with PVD's and their partner's sexual outcomes (Y) at post-treatment and 6-month follow-up through affected women's and partner's intercepts and slopes of SCP (M). The effects on post-treatment and 6-month follow-up sexual outcomes were examined while controlling for the same variable at pre-treatment. An example

of the mediation model is presented in Figure 2. To determine the statistical significance of indirect effects 95% confidence intervals (CI) around the estimates were computed with the bias-corrected bootstrap. The mediation analyses were conducted using the intention-to-treat principle whereby all randomized couples were included in the analyses (n = 108 couples). Post-treatment and follow-up assessment completion rates were 90.7% (n = 98), with no significant differences by treatment condition.

Results

Descriptive Statistics

Sociodemographic characteristics are published (Bergeron et al., 2021), found in Supplemental Table S1, and did not differ between treatment conditions. The mean scores and standard deviations of women with PVD's and partners' collaborative and negative SCP, as well as sexual outcomes within treatment condition and at each time point, are presented in Table 1. Bivariate correlations between collaborative and negative SCPs and sexual outcomes among women with PVD and partners are presented in Supplemental Table S2.

Change Trajectories in Women With PVD's and Partners' SCPs

Collaborative SCPs

The unconditional dyadic LGCM of collaborative SCP including fixed and random estimates of intercepts and slopes showed a satisfactory fit to the data, $\chi^2(18) = 19.12$, $p = .385$; RMSEA = .02, 90%CI [.00, .09]; CFI = 1.00; SRMR = .07. Women with PVD

Figure 2

Mediational Model of the Associations Between Treatment Condition and Women With PVD's and Their Partner's Sexual Satisfaction at Post-Treatment Via Collaborative Sexual Communication Patterns
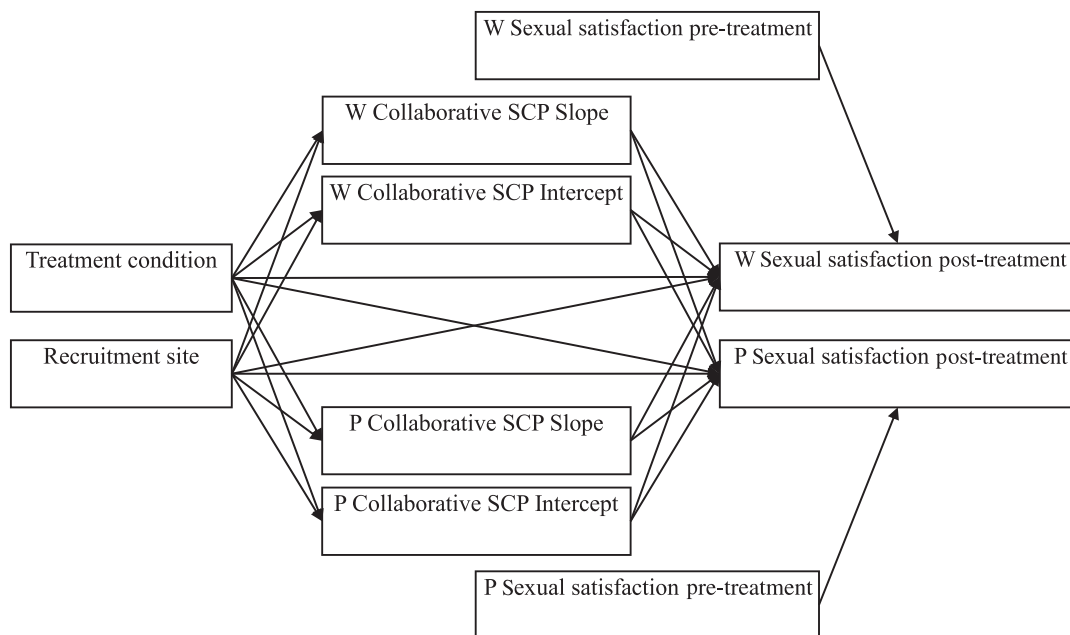
Note. Treatment condition was coded −0.5 = lidocaine and 0.5 = cognitive–behavioral couple therapy. PVD = provoked vestibulodynia; W = women with PVD. P = partners; SCP = sexual communication pattern.

Table 1

Means and Standard Deviations for Sexual Communication Patterns and Sexual Outcomes by Treatment Condition

Construct and time-point	Total		CBCT		Topical lidocaine	
	Women with PVD	Partners	Women with PVD	Partners	Women with PVD	Partners
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
Collaborative SCP Wk 1	45.29 (10.65)	45.30 (9.99)	43.17 (9.83)	46.33 (10.28)	47.17 (11.09)	44.38 (9.73)
Collaborative SCP Wk 4	47.67 (11.99)	47.19 (12.69)	49.60 (10.41)	49.02 (8.60)	45.96 (13.10)	45.54 (15.39)
Collaborative SCP Wk 8	50.18 (12.15)	46.94 (11.81)	51.62 (11.64)	48.83 (7.91)	48.94 (12.55)	45.46 (14.06)
Collaborative SCP Wk 12	50.39 (12.09)	47.64 (11.61)	52.86 (11.06)	49.83 (8.97)	48.22 (12.65)	45.74 (13.30)
Negative SCP Wk 1	32.48 (14.97)	32.71 (15.17)	33.40 (13.92)	31.74 (12.63)	31.66 (15.93)	33.58 (17.18)
Negative SCP Wk 4	28.37 (13.87)	34.07 (19.27)	28.00 (12.59)	31.57 (13.42)	28.70 (15.03)	36.33 (23.25)
Negative SCP Wk 8	29.12 (16.10)	32.01 (16.81)	29.04 (15.41)	32.39 (16.15)	29.18 (16.82)	31.71 (17.45)
Negative SCP Wk 12	28.09 (14.72)	30.47 (15.25)	28.57 (14.14)	29.25 (15.28)	27.66 (15.34)	31.52 (15.31)
Sexual satisfaction pre-treatment	21.99 (6.75)	25.21 (6.45)	22.36 (6.97)	25.15 (6.22)	21.64 (6.57)	25.26 (6.72)
Sexual satisfaction post-treatment	26.47 (6.96)	26.66 (6.45)	27.70 (6.60)	26.82 (5.83)	25.37 (7.16)	26.53 (6.99)
Sexual satisfaction 6-month follow-up	25.14 (6.85)	26.09 (6.68)	25.28 (6.41)	25.19 (6.01)	25.02 (7.29)	26.88 (7.19)
Sexual function pre-treatment	19.56 (5.12)	58.38 (7.70)	19.74 (5.35)	57.29 (8.08)	19.41 (4.96)	59.43 (7.24)
Sexual function post-treatment	22.65 (5.77)	61.41 (6.72)	23.14 (5.55)	60.54 (6.21)	22.23 (5.97)	62.13 (7.10)
Sexual function 6-month follow-up	23.20 (5.87)	60.32 (7.73)	23.34 (5.91)	59.08 (7.69)	23.10 (5.91)	61.30 (7.71)
Sexual distress pre-treatment	34.09 (9.76)	16.85 (9.83)	34.64 (9.40)	16.25 (8.33)	33.56 (10.15)	17.44 (11.13)
Sexual distress post-treatment	25.18 (14.14)	15.08 (10.91)	21.63 (12.90)	14.41 (9.02)	28.37 (14.56)	15.65 (12.35)
Sexual distress 6-month follow-up	24.02 (14.58)	15.19 (10.61)	23.69 (14.47)	16.25 (9.93)	24.32 (14.82)	14.29 (11.18)

Note. CBCT = cognitive–behavioral couple therapy; PVD = provoked vestibulodynia; SCP = sexual communication pattern; Wk = week.

were at 45.81 ($SE = 1.04$, $p < .001$) at Week 1 with a significant increase of 0.47 per week over subsequent weeks ($SE = 0.10$, $p < .001$). Partners were at 45.66 ($SE = 0.99$, $p < .001$) at Week 1 with a significant increase of 0.20 per week over subsequent weeks ($SE = 0.10$, $p = .048$). Random estimates of the intercepts and the slopes were all significant, indicating variability in the initial levels and the trajectories between individuals.

To examine if treatment condition was associated with trajectories of collaborative SCP, treatment condition was included as a predictor of affected women's and partners' intercepts and slopes. This model showed a satisfactory fit to the data, $\chi^2(26) = 32.21$, $p = .186$; RMSEA = .05, 90%CI [.00, .10]; CFI = 0.99; SRMR = .07. Results, presented in Table 2, showed that treatment condition was unrelated to affected women's intercept, but was related to their slope. Simple slopes indicated that for women with PVD, collaborative SCP significantly increased over the course of CBCT, whereas they were relatively stable over the course of lidocaine treatment. Treatment condition was not significantly related to partners' intercept and

slope. Thus, for partners, collaborative SCP significantly increased over the course of both CBCT and lidocaine treatments.

Negative SCPs

The unconditional dyadic LGCM of negative SCP including fixed and random estimates of intercepts and slopes showed a satisfactory fit to the data, $\chi^2(18) = 28.04$, $p = .061$; RMSEA = .07, 90%CI [.00, .12]; CFI = 0.97; SRMR = .06. Women with PVD were at 31.07 ($SE = 1.32$, $p < .001$) at Week 1 with a significant decline of -0.30 per week over subsequent weeks ($SE = 0.13$, $p = .019$). Partners were at 33.64 ($SE = 1.56$, $p < .001$) at Week 1 with no significant change over subsequent weeks (estimate = -0.22, $SE = 0.14$, $p = .119$). Random estimates of the intercepts were significant for both women with PVD and partners, indicating variability in the initial levels between individuals, but random estimates of affected women's and partners' slopes were non-significant, indicating that patterns of change during treatment were similar between individuals. The associations between

Table 2

Conditional Dyadic Latent Growth Curve Models of Collaborative and Negative Sexual Communication Patterns

Model	Collaborative SCPs				Negative SCPs			
	Women with PVD		Partners		Women with PVD		Partners	
	Estimate (*SE*)	*p*value	Estimate (*SE*)	*p*value	Estimate (*SE*)	*p*value	Estimate (*SE*)	*p*value
Mean intercept	45.92 (1.02)	<.001	46.02 (0.96)	<.001	30.90 (1.33)	<.001	33.36 (1.57)	<.001
Variance in intercepts	81.33 (14.94)	<.001	57.79 (14.07)	<.001	101.72 (25.23)	<.001	168.26 (36.38)	<.001
Mean slope (Wk 1–Wk 12)	0.51 (0.10)	<.001	0.21 (0.10)	.040	−0.32 (0.13)	.014	−0.19 (0.14)	.164
Variance in slopes	0.44 (0.18)	.015	0.40 (0.20)	.048	0.56 (0.33)	.091	0.22 (0.45)	.627
Tx on intercept	−2.03 (2.06)	.325	2.38 (1.92)	.217	0.22 (2.60)	.933	−3.26 (3.08)	.291
Tx on slope	0.66 (0.19)	.001	0.18 (0.20)	.381	−0.03 (0.26)	.905	0.12 (0.28)	.657
Simple slopes								
Mean slope—Lidocaine	0.19 (0.13)	.144	—	—	—	—	—	—
Mean slope—CBCT	0.84 (0.14)	<.001	—	—	—	—	—	—

Note. $N = 104$ couples. SCPs = sexual communication patterns; PVD = provoked vestibulodynia; Wk = week; CBCT = cognitive–behavioral couple therapy; Tx = treatment condition which was coded -0.5 = lidocaine and 0.5 = cognitive–behavioral couple therapy. Treatment site was included as a covariate.

Table 3

Indirect Effects of Treatment Condition on Sexual Outcomes at Post-Treatment Via Collaborative Sexual Communication Patterns

Outcomes	Direct effects Estimate [95%CI]	Indirect effects via women with PVD's slope Estimate [95%CI]	Indirect effects via partners' slope Estimate [95%CI]
Model 1. Fit indices: $\chi^2(9) = 3.56$, $p = .938$; RMSEA = .00, 90% CI = [.00, .03]; CFI = 1.00; SRMR = .03			
Women with PVD's sexual satisfaction	0.74 [−1.72, 3.03]	**1.27 [0.41, 2.76]**[a]	−0.25 [−0.94, 0.06]
Partners' sexual satisfaction	−1.18 [−3.11, 0.59]	**0.65 [0.04, 1.75]**[a]	−0.08 [−0.83, 0.37]
Model 2. Fit indices: $\chi^2(9) = 12.58$, $p = .183$; RMSEA = .06, 90% CI = [.00, .13]; CFI = 0.99; SRMR = .05			
Women with PVD's sexual function	−0.35 [−2.39, 1.74]	**1.11 [0.32, 2.46]**[a]	−0.22 [−0.89, 0.10]
Partners' sexual function	−0.49 [−2.49, 1.48]	0.35 [−0.16, 1.10]	−0.25 [−0.99, 0.08]
Model 3. Fit indices: $\chi^2(9) = 13.58$, $p = .138$; RMSEA = .07, 90% CI = [.00, .14]; CFI = 0.98; SRMR = .04			
Women with PVD's sexual distress	**−5.48 [−10.09, −0.83]**	**−1.72 [−4.65, −0.17]**[a]	0.16 [−0.83, 1.60]
Partners' sexual distress	−0.03 [−2.67, 2.82]	−0.60 [−2.07, 0.22]	0.42 [−0.19, 1.85]

Note. $N = 108$ couples. CI = confidence interval; PVD = provoked vestibulodynia; RMSEA = root mean square error of approximation; CFI = comparative fit index; SRMR = standardized root-mean-square residual.
[a] Evidence of a significant effect (in bold) as 95% bias corrected bootstrap confidence interval did not include zero. Treatment site was included as a covariate.

treatment condition and these trajectories were examined despite nonsignificant slope variances, as the slopes may still vary as a function of the covariate.

To examine if treatment condition was associated with trajectories of negative SCP, treatment condition was included as a predictor of affected women's and partners' intercepts and slopes. This model showed a satisfactory fit to the data, $\chi^2(26) = 32.97$, $p = .163$; RMSEA = .05, 90%CI [.00, .10]; CFI = 0.98; SRMR = .06. Treatment condition was not significantly related to affected women's and partners' intercepts and slopes (see Table 2). Thus, for women with PVD, negative SCP significantly decreased over the course of both CBCT and lidocaine treatments; for partners, they were relatively constant over the course of both treatments.

Mediation Models of Treatment Condition on Sexual Outcomes Via Change in Women With PVD's and Partners' SCPs

As treatment condition was not significantly related to affected women's and partners' negative SCP and the variances of these slopes were non-significant, changes in negative SCP were not examined as a mediator. Direct and indirect effects of treatment condition on sexual outcomes at post-treatment via change in collaborative SCP are reported in Table 3. Treatment condition was related to affected women's higher sexual satisfaction at post-treatment, their higher sexual function at post-treatment, and their lower sexual distress at post-treatment via a steeper increase in their collaborative SCP over CBCT treatment. Thus CBCT, relative to lidocaine, was related to a steeper increase in affected women's collaborative SCP and this increase was in turn related to their higher sexual satisfaction and function, and lower sexual distress, at post-treatment. Treatment condition was also related to partners' higher sexual satisfaction at post-treatment via a steeper increase in affected women's collaborative SCP over CBCT treatment. Thus CBCT, as compared with lidocaine, was related to a steeper increase in affected women's collaborative SCP and this increase was in turn related to partners' higher post-treatment sexual satisfaction. No significant indirect effects emerged via changes in partners' collaborative SCP. Direct and indirect effects of treatment condition on sexual outcomes at 6-month follow-up via change in collaborative SCP are reported in Table 4. Even if treatment condition was directly related to partners' sexual satisfaction and distress at 6-month follow-up, no significant indirect effects emerged to predict treatment outcomes at 6-month follow-up.

Table 4

Indirect Effects of Treatment Condition on Sexual Outcomes at 6-Month Follow-Up Via Collaborative Sexual Communication Patterns

Outcomes	Direct effects Estimate [95%CI]	Indirect effects via women with PVD's slope Estimate [95%CI]	Indirect effects via partners' slope Estimate [95%CI]
Model 1. Fit indices: $\chi^2(9) = 3.03$, $p = .963$; RMSEA = .00, 90% CI = [.00, .00]; CFI = 1.00; SRMR = .03			
Women with PVD's sexual satisfaction	−0.16 [−2.99, 2.61]	0.30 [−0.80, 1.68]	0.04 [−0.62, 0.82]
Partners' sexual satisfaction	**−2.28 [−4.41, −0.05]**[a]	0.26 [−0.35, 1.12]	0.39 [−0.002, 1.30]
Model 2. Fit indices: $\chi^2(9) = 10.60$, $p = .304$; RMSEA = .04, 90% CI = [.00, .12]; CFI = 0.99; SRMR = .04			
Women with PVD's sexual function	−0.50 [−2.75, 1.87]	−0.07 [−1.10, 1.01]	0.32 [−0.06, 1.15]
Partners' sexual function	−1.12 [−4.26, 2.54]	0.02 [−1.07, 0.85]	0.001 [−0.84, 0.56]
Model 3. Fit indices: $\chi^2(9) = 11.39$, $p = .250$; RMSEA = .05, 90% CI = [.00, .13]; CFI = 0.99; SRMR = .04			
Women with PVD's sexual distress	−0.15 [−5.91, 5.14]	−0.68 [−3.29, 1.46]	−0.31 [−2.25, 0.63]
Partners' sexual distress	**3.64 [0.21, 7.41]**[a]	−0.77 [−2.59, 0.23]	−0.61 [−2.29, 0.09]

Note. $N = 108$ couples. CI = confidence interval; PVD = provoked vestibulodynia; RMSEA = root mean square error of approximation; CFI = comparative fit index; SRMR = standardized root-mean-square residual.
[a] Evidence of a significant effect (in bold) as 95% bias corrected bootstrap confidence interval did not include zero. Treatment site was included as a covariate.

Discussion

This study examined two putative mediators of change in CBCT versus a medical treatment (lidocaine) for PVD: collaborative and negative SCPs. A steeper increase in women with PVD's report of collaborative SCP during CBCT, as compared with lidocaine, explained post-treatment gains in sexual well-being for women with PVD and their partners in the CBCT condition. Findings are consistent with theory and prior studies showing that couple therapies improve couples' communication, which benefits their relationships (e.g., Sevier et al., 2015), and extends these findings to the domain of sexuality. In contrast, treatment condition was not related to changes in negative SCPs, as women with PVD's negative SCP significantly decreased and partners' negative SCP remained relatively constant over the course of both treatments.

CBCT for PVD, which directly intervened upon couples' collaborative approaches to sexual communication, did in fact contribute to women with PVD and partners perceiving greater collaborative communication about sex over the course of treatment. With a strictly medical intervention—lidocaine—women with PVD did not perceive changes in collaborative SCP, indicating that for affected women, perceiving gains in collaborative communication was uniquely tied to CBCT. In turn, a steeper increase in women with PVD's perception of collaborative sexual communication over CBCT led to improvements in their own and their partners' self-reported sexual satisfaction, and their own self-reported sexual function and sexual distress at post-treatment. Findings corroborate those of a cross-sectional study, wherein greater collaborative SCP were associated with higher sexual satisfaction and lower sexual distress in couples coping with PVD (Rancourt et al., 2017). As CBCT helped couples improve their ability to communicate with each other about their sexual problems, it may have contributed to cognitive and behavioral shifts allowing them to adapt their sexual activity (e.g., expansion of sexual repertoire beyond penetration), thereby improving sexual satisfaction and function, and reducing sexual distress (MacNeil & Byers, 2009). Improving collaborative communication may have helped couples to feel more intimately connected and to perceive their partner as more responsive to their needs, which are factors known to be linked to greater sexual well-being in couples with PVD (Bois et al., 2016; Muise et al., 2017). These benefits were not retained at the 6-month follow-up, suggesting that longer term gains might be attributed to other factors.

Partners perceived a significant increase in collaborative SCP irrespective of treatment condition. Given that PVD is associated with more inhibited sexual communication (Pazmany et al., 2014), it is possible that participating in any treatment alleviated some of this inhibition for partners. Partners have historically been neglected in PVD treatments. Even though only the woman with PVD actively applied the lidocaine, partners were still involved through their participation in the assessments and completion of study questionnaires. Being included in either treatment might have helped partners feel more involved in addressing PVD, thereby changing their perceptions of the dynamics around discussing sex.

Women with PVD (but not their partners) perceived decreases in negative SCPs in both treatments. However, given that there were no differences in negative SCPs between the CBCT and lidocaine conditions, it was impossible to examine whether negative SCPs were a potential mediator. Reductions in negative SCPs may have occurred as a result of time rather than intervention. It is also possible that both interventions helped women with PVD to reduce negative approaches to their sexual problem (e.g., criticism or withdrawal), or perceive such reductions in their sexual communication. Engaging in any treatment may help to soothe the high emotional distress experienced by women with PVD, which may facilitate greater emotion regulation and translate to either a reduction in negative SCP or a perception that SCPs are less negative over time (Leong et al., 2011). Brotto et al. (2015) found that women on the waitlist for a mindfulness-based cognitive therapy for PVD experienced significant increases in pain self-efficacy and decreases in sexual distress prior to beginning the treatment. Thus, expectancies for improvement may contribute to actual or perceived changes in couples' communication for women with PVD regardless of the treatment they received (Cormier et al., 2016).

In contrast, partners did not report reductions in negative SCPs in either treatment, which was surprising for the CBCT condition given that sexual communication was targeted in treatment. It is possible that collaborative patterns were targeted more directly in CBCT (e.g., teaching skills like emotional disclosure and active listening), whereas negative patterns were targeted indirectly (e.g., replacing negative approaches with more adaptive skills). Thus, partners may not have perceived change in negative SCP through CBCT. Indeed, collaborative and negative communication patterns are often found to be distinct, but related, constructs that do not necessarily demonstrate consistent patterns of change with one another (e.g., Sevier et al., 2015).

Theoretical and Clinical Implications

Situated within a broader literature supporting the application of CBCT to individual physical and mental health concerns (Fischer et al., 2016), this study extends the application of CBCT to sexuality. The mechanisms of change for psychological treatments for PVD or other sexual dysfunctions are largely unknown, and while communication has been shown to mediate treatment outcomes for couple therapy for relational distress (e.g., Baucom et al., 2011; Doss et al., 2005; Sevier et al., 2008), some studies have been limited by aspects of their research design (e.g., pre-post assessments of mediation; Baucom et al., 2011). In using an RCT with multiple measurements of sexual communication throughout treatment, the present study advances the examination of mechanisms of change in CBCT as compared to a medical treatment.

Findings suggest that clinicians should target collaborative, and potentially negative, SCPs in CBCT for PVD. Intervening upon these communication patterns may require different approaches (e.g., disrupting hostile interaction vs. promoting emotional disclosure), resulting in different outcomes (Benson et al., 2012), as was seen in the present study. Indeed, positive contextual factors (e.g., affection) predict longitudinal relationship outcomes above and beyond negative factors (e.g., hostile communication; Gordon & Chen, 2016).

Finally, clinicians and couples may benefit from routinely monitoring couples' self-reported SCPs during CBCT for PVD. Monitoring session-by-session change is a useful method for ensuring that treatment is resulting in intended outcomes (Lambert & Shimokawa, 2011). Based on the present study, if couples receiving CBCT for PVD are failing to make gains in adopting more collaborative approaches to discussing their sexual problems, this may signal a need for clinicians to modify their approach.

Limitations and Future Research

Couples in this sample were relatively homogenous in terms of race, education, income, and sexual orientation, limiting generalizability to more diverse groups and interpretations around how social role (i.e., partner with or without PVD) versus gender influenced findings. Couples experiencing significant relationship distress, intimate partner violence, or who were not currently attempting vaginal intercourse, were not included. These criteria may have impacted the variability reported in this sample, as more distressed or sexually avoidant couples may engage in higher rates of negative SCP. We asked couples to self-report on their likelihood of using SCPs at repeated time points, which was subject to social desirability effects and other self-report biases. The field would benefit from studying SCP using other methods, such as observational coding of couples' communication patterns within therapy sessions (Sevier et al., 2015), or validating couples' reports of SCPs against therapist reports of these behaviors in session. These approaches could help to quantify the degree to which change occurs objectively versus subjectively, or in-session versus between-sessions. Ultimately, such endeavors may shed light on the external validity of targeting couples' SCP in CBCT for PVD.

Finally, this study examined only one mediator of treatment effects—communication patterns. CBCT uses several interventions to facilitate therapeutic gains; other mediators should be investigated to better understand the mechanisms of change in CBCT for PVD. Moreover, future research should employ methodologies that permit the testing of reciprocal effects between sexual communication and sexual well-being, such as cross-lagged analyses.

Conclusion

Increases in collaborative SCP, as reported by women with PVD, are an important change process in couple therapy. These patterns explained how CBCT is more effective than lidocaine in improving affected women's and partners' sexual satisfaction and affected women's sexual function and sexual distress at post-treatment. The findings showed that CBCT influences affected women's perception of collaborative communication about their sexual problems, and that adopting more collaborative sexual communication during treatment contributes to improved sexual well-being. Additionally, women with PVD reported decreases in negative SCPs and partners reported increases in collaborative SCPs over the course of both treatments, pointing to the benefits of treatment overall (medical or psychological) on couples' patterns of sexual communication. Findings situate collaborative sexual communication as a therapeutic mechanism in CBCT for PVD and should be extended to improve our understanding of therapeutic mechanisms for other sexual dysfunctions.

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