

A Pilot Study of Eight-Session Mindfulness-Based Cognitive Therapy Adapted for Women's Sexual Interest/Arousal Disorder

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While few treatment options exist for low sexual desire and arousal, the most common sexual dysfunction in women, a growing body of research supports the efficacy of mindfulness-based approaches. The mechanisms underlying improvements, and whether they are due to mindfulness practice or other treatment components, are unclear. As a result, we designed and pilot-tested an eight-session group mindfulness-based cognitive therapy for sexuality (MBCT-S) program that includes more extensive practice of mindfulness skills and closely aligns with the evidence-based MBCT program for depression and anxiety. A total of 26 women (mean age 43.9, range 25 to 63) with a diagnosis of sexual interest/arousal disorder participated in eight weekly group sessions, before and after which they completed validated questionnaires. The majority of women attended all sessions and completed the recommended at-home mindfulness exercises. Compared to baseline, women reported significant improvements in sexual desire, overall sexual function, and sex-related distress, regardless of treatment expectations, relationship duration, or low desire duration. Depressed mood and mindfulness also significantly improved and mediated increases in sexual function. These pilot data suggest that eight-session MBCT-S is feasible and significantly improves sexual function, and provide the basis for a larger randomized-controlled trial (RCT) with a longer follow-up period.

Low sexual desire is the most common sexual complaint in women across the life cycle, with large, representative studies finding that between 30% and 41% of women have experienced low sexual desire lasting several months over the past year, and between 7% and 10% of women reporting these problems plus significant associated distress (Mitchell et al., 2013; Shifren, Monz, Russo, Segreti, & Johannes, 2008). Given that subjective sexual arousal is highly associated with and often experienced as indistinguishable from desire (for a review, see Brotto, 2010), difficulties in both domains have been combined in the Fifth Edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013)*. Female sexual interest/arousal disorder (SIAD) is defined as a reduced/low level of (1) desire for sex, (2) sexual thoughts/fantasies, (3) initiation and receptivity of sexual

activity, (4) sexual pleasure, (5) desire triggered by sexual stimuli, and/or (6) genital or nongenital sensations. The endorsement of three or more symptoms and clinically significant distress are required for a woman to meet diagnostic criteria for SIAD. The community prevalence of SIAD, with its additional criteria of a duration of six months or more and symptoms experienced on all or almost all (>75%) occasions, is 0.6% (Mitchell et al., 2015).

Few treatment options have been developed to address SIAD. Flibanserin was recently the first medical treatment to be approved by the Food and Drug Administration in the United States, but concerns over interactions with alcohol, prescriber restrictions, and modest efficacy data limit its application to women with SIAD (e.g., Basson, Driscoll, & Correia, 2015; Jaspers et al., 2016), and initial demand for the drug in its first months of availability has been low (Edney & Colby, 2015).

Psychological treatment studies have focused on cognitive-behavioral therapy (CBT), with one study finding that 74% of women no longer met diagnostic criteria for hypoactive sexual desire disorder (one of the two *DSM-IV-TR*

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diagnoses now replaced by SIAD in *DSM-5*) following treatment (Trudel et al., 2001), and another finding a 26% reduction in the proportion of women with significant desire concerns (McCabe, 2001). A sizable percentage of women therefore appear to not meaningfully benefit from CBT, highlighting the need to develop other psychological treatment approaches.

Sexual difficulties are associated with increased cognitive distraction during sexual activity (Nobre & Pinto-Gouveia, 2006b), which may be caused by depressed mood or anxiety, and should optimally also be targeted by treatment. This distraction may contribute to women's difficulty noticing sexual sensations in their bodies and impair the experience of responsive desire that often emerges from sexual arousal (Basson, 2001) because they are not attending to their emerging sexual arousal and/or are judging their own responses negatively. Mindfulness, the meditative practice of observing one's present-moment thoughts, emotions, and bodily sensations in a nonjudgmental manner (Bishop, Lau, Shapiro, & Devins, 2004), is therefore an intuitive treatment for sexual difficulties. Through mindfulness training, women with low desire may become more aware of the physical changes they experience during or in anticipation of sexual activity (e.g., genital vasocongestion, tingling), which may boost and maintain their subjective sexual arousal and desire, thus integrating their physiological and psychological experience. Mindfulness training may also target the myriad negative judgments (Neff & Dahm, 2015) women with sexual difficulties have about themselves (Nobre & Pinto-Gouveia, 2006a) as they consider their distressing situation characterized by absent, highly infrequent, and/or unsatisfying sexual activity.

Over the past decade, and together with various collaborating experts in the fields of sexual medicine, group therapy, and mindfulness-based interventions, we have incorporated mindfulness training into sex therapy groups of three to four sessions for a variety of sexual difficulties. We have found improvements in sexual functioning for survivors of gynecologic cancer (Brotto, Heiman, et al., 2008; Brotto, Erskine, et al., 2012), women with low sexual arousal (Brotto, Basson, & Luria, 2008), women with a history of childhood sexual abuse (Brotto, Seal, & Rellini, 2012), and improvements in sex-related distress in women with provoked vestibulodynia (the most common cause of pain with vaginal penetration; Brotto, Basson, Smith, Driscoll, & Sadownik, 2015). Most recently, we found that a four-session mindfulness-based cognitive-behavioral sex therapy (MBCST) program for women with low sexual desire, but not a wait-list control condition, significantly improved sexual desire, arousal, lubrication, satisfaction, and overall sexual functioning (Brotto & Basson, 2014); sex-related distress decreased more in the MBCST group than the control group, but this difference was not significant. Feedback from group participants indicated that they had just begun to establish a regular mindfulness practice at the conclusion of the four-session program, and scores on all

sexuality measures remained in the clinical range, supporting the need for a longer treatment.

Longer, eight-session mindfulness-based interventions have been developed for a wide range of psychological concerns since Jon Kabat-Zinn's initial mindfulness-based stress reduction (MBSR) program for chronic pain (Kabat-Zinn, 1982). Mindfulness-based cognitive therapy (MBCT), which incorporates education on the cognitive model, has been shown to reduce rates of depressive relapse (Teasdale et al., 2000), depressive symptoms (Sipe & Eisendrath, 2012), and anxiety (Evans et al., 2008). MBCT cultivates decentering, the ability to observe thoughts and feelings as only mental events rather than as reality or truths about the self (Bieling et al., 2012). MBCT is an appropriate program to adapt to target SIAD, as there is a high degree of comorbidity between low desire and depressed mood (McCabe & Goldhammer, 2012; Shifren et al., 2008); even when excluding individuals with major depressive disorder, women with low desire have more depressed and anxious thoughts, more emotional instability, and lower self-image than women without sexual complaints (Hartmann, Heiser, Ruffer-Hesse, & Kloth, 2002).

In this pilot study, we adapted the MBCT protocol for depression to sexual desire and arousal difficulties (MBCT-S), incorporating sex therapy exercises performed in a mindful way (e.g., self-touch). By aligning closely with the established MBCT protocol, this program provided women with more opportunities for mindfulness practice, both within and between sessions. The intention of the MBCT-S program, as with MBCT for depression, was to support participants' establishment of an ongoing personal mindfulness practice. It was theorized that the mindfulness skills women would acquire would benefit their sexual motivation and response both directly, by allowing them to nonjudgmentally focus on sexual sensations in their bodies before and during sexual encounters, and indirectly, by improving mood and decreasing stress and anxiety.

We were interested in the feasibility and preliminary efficacy of the expanded MBCT-S program. In addition, we explored potential underlying mechanisms of the treatment by testing key moderators, or factors that affect the magnitude of the observed effects on sexual response, as well as mediators, or mechanisms that produce the observed effects (Turner, Holtzman, & Mancl, 2007). We hypothesized the following:

1. Women participating in group MBCT-S would experience significant improvements in the primary endpoints of sexual desire, overall sexual function, and sex-related distress, as well as the secondary endpoints of mindfulness, self-compassion, and interoceptive awareness (the ability to attend to and consciously register internal physiological states; Craig, 2002); and depressed mood, rumination, and anxiety sensitivity.

2. Improvements in the primary endpoints would be moderated by general levels of depressed mood and treatment expectations. The sexual difficulties of women with greater depressive symptoms at baseline may be more linked to mood than other factors not as directly targeted by mindfulness training (e.g., relationship dissatisfaction) and, as such, these women may have more room for improvement with an MBCT approach. Women with greater expectations of treatment may be more likely to participate in group discussions and complete the recommended home exercises. Additional exploratory moderators were tested, including mindfulness, self-compassion, interoceptive awareness, age, relationship duration, and low desire duration.
3. Improvements in the primary endpoints would be mediated by improvements in mindfulness and depressed mood. Mindfulness training may first alleviate depressed mood, increasing motivation generally, with this change then increasing sexual desire. Additional exploratory mediators were tested, including self-compassion and interoceptive awareness.

Method

Participants

Women reporting sexual desire and/or arousal concerns were potentially eligible to participate. They were recruited from a combination of referrals to the BC Centre for Sexual Medicine, a tertiary care sexual medicine clinic, as well as from community advertisements. SIAD was diagnosed using a semistructured interview, which inquired about the symptoms, onset, course, and severity of the problem, as well as any medical or psychiatric comorbidities. Inclusion criteria consisted of meeting diagnostic criteria for SIAD, being between the ages of 19 and 65, fluent in English, and able to attend all eight weekly sessions as well as pre- and posttreatment assessments. Women who were experiencing orgasmic difficulties in addition to SIAD were included.

Exclusion criteria included the presence of another medical or psychiatric condition that was significantly impacting daily functioning, a recent change of medications (medication dose was required to be stable for three months), and genital pain with vaginal penetration due to provoked vestibulodynia (PVD; in which case women were referred to another treatment study tailored to this problem). Women endorsing five or more borderline personality disorder traits were excluded due to an increased potential to dissociate during extended mindfulness practices in affected individuals (Sachse, Keville, & Feigenbaum, 2011). The study was approved by the University of British Columbia and the Women's Health Research Institute ethics boards.

Of the 53 women who expressed an interest in participating, 39 were eligible and enrolled in the study. (Of the other 14 women, four had probable PVD, one had only orgasmic

difficulties, two had five or more borderline personality disorder traits, two were currently experiencing significant depression/anxiety, and five were not available for daytime groups. All were provided with other treatment resources in the city.) Ten of these women decided not to participate when offered a group due to scheduling conflicts. Thus, 29 women completed the pregroup assessment and began a MBCT-S group. Three women dropped out of the study prior to the midway point of their treatment group due to feeling it was not applicable to their difficulty ($n = 2$) or scheduling conflicts ($n = 1$), resulting in a total sample size of 26 women (14 self-referred from community advertisements and media coverage, nine referred from sexual medicine clinicians, and three referred from community clinicians). The average age of participants was 43.9 years ($SD = 12.1$, range = 25 to 63); 42% were 50 years of age or older. They largely reported European ancestry (19/26 = 73.1%), with three (11.5%) reporting Latin American, two (7.8%) East Asian, one (3.8%) South Asian, and one (3.8%) mixed European/East Asian ancestry. The majority of participants endorsed a heterosexual sexual orientation (21/26 = 80.8%), with three (11.5%) endorsing a bisexual and two (7.7%) a lesbian orientation. Almost all were currently in a romantic relationship (25/26 = 96%), of an average duration of 11.9 years ($SD = 11.03$, range = 0.25 to 37).

All participants reported levels of sexual desire and sex-related distress in the clinical range at pretreatment, and almost all (24/26 = 92%) were in the clinical range for overall sexual function (using the measures described in the section that follows). At pretreatment, a minority (9/26 = 35%) reported depressed mood in the "mild depression" range or higher. On average, participants had been experiencing low sexual desire for 11.2 years ($SD = 10.6$, range = 1 to 38), with the majority of participants (21/26 = 81%) reporting acquired sexual desire difficulties. Almost half of the sample (11/24 = 46%) reported experiencing nonconsensual sexual contact as a child and/or as an adult.

Measures

Primary Endpoints. Sexual desire was measured with the 14-item Sexual Interest/Desire Inventory (SIDI; Clayton et al., 2006), which includes questions on both sexual initiation and receptivity. Total scores range from 0 to 51, with higher scores indicating greater sexual desire. The SIDI has excellent internal consistency (Cronbach's $\alpha = 0.90$). The SIDI has been found to have excellent discriminant validity, correctly identifying 94.7% of women with hypoactive sexual desire disorder (HSDD; now replaced by the SIAD diagnosis) using a cutoff score of 33 (Clayton et al., 2010). In this sample, Cronbach's alpha at pretreatment was 0.80.

Sex-related distress was measured with the 13-item Female Sexual Distress Scale-Revised (FSDS-R; Derogatis, Clayton, Lewis-D'Agostino, Wunderlich, & Fu, 2008). Total scores range from 0 to 48, with higher scores indicating greater distress. The FSDS-R has been found to have excellent discriminant validity, correctly identifying

92.7% of women with HSDD using a cutoff score of 11 (Derogatis et al., 2008). In this sample, Cronbach's alpha at pretreatment was 0.80.

Overall sexual function was measured with the 19-item Female Sexual Function Index (FSFI; Rosen et al., 2000), modified according to Meyer-Bahlburg and Dolezal's (2007) recommendations. The modified version was reordered to assess overall sexual satisfaction and the sexual desire domain first, with only those women reporting any solo or partnered sexual activity over the past four weeks continuing to answer questions on the other domains of sexual arousal, lubrication, orgasm, sexual satisfaction, and pain with vaginal penetration. Total scores range from 2 to 36, with higher scores indicating better sexual function. Data for missing items were interpolated to calculate domain scores, and data for missing domains (e.g., for pain in women who did not attempt vaginal penetration) were interpolated from the remaining domain scores to calculate a total score (Meyer-Bahlburg & Dolezal, 2007). The FSFI has been found to have good discriminant validity, correctly identifying 70.7% of women with sexual dysfunction using a cutoff score of 26.55 (Wiegel, Meston, & Rosen, 2005). In this sample, Cronbach's alpha at pretreatment was 0.92.

Secondary Endpoints. Mindfulness was measured with the 39-item Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Each item was rated on a 5-point Likert scale ranging from 1 = *Never or very rarely true* to 5 = *Very often or always true*. It measures five facets of mindfulness: observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience. Only total scores, which range from 39 to 195, were analyzed for this study, with higher scores indicating greater mindfulness. The FFMQ has been found to have adequate to good internal consistency, with alphas ranging from 0.72 to 0.92 (Baer et al., 2008). In this sample, Cronbach's alpha at pretreatment was 0.73.

Self-compassion was measured with the 26-item Self-Compassion Scale (SCS; Neff, 2003). It measures six domains of self-compassion: overidentification, mindfulness, isolation, common humanity, self-judgment, and self-kindness. Only total scores, which range from 26 to 130, were analyzed for this study, with higher scores indicating greater self-compassion. In this sample, Cronbach's alpha at pretreatment was 0.96.

Interoceptive awareness was measured with the 32-item Multidimensional Assessment of Interoceptive Awareness (MAIA; Mehling et al., 2012). Questions were answered on a 6-point Likert scale ranging from 0 = *Never* to 5 = *Always*. It measures eight dimensions of interoceptive awareness: noticing, not distracting, not worrying, attention regulation, emotional awareness, self-regulation, body listening, and trusting. The MAIA has been found to have high internal consistency (.66 to .82), and high unstandardized alphas (> .70; Mehling et al., 2012). Although the scoring

guide for the MAIA does not include calculating a total score, a principal components analysis (PCA) supported the calculation of a total score¹ (ranging from 0 to 160) to test this variable as a potential mediator and moderator. In this sample, Cronbach's alphas for the eight domains ranged from .68 to .95, and was 0.95 for the total score.

Depressed mood was measured with the 21-item second version of the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996). Each item was rated on a 4-point scale from 0 to 3. Total scores range from 0 to 63, with higher scores indicating greater depressive symptoms, and a score ≥ 15 denoting probable depression. In a sample of college students, the internal consistency of the BDI-II was excellent at 0.90, and concurrent validity was good at ($r = .76$) (Storch, Roberti, & Roth, 2004). In this sample, Cronbach's alpha at pretreatment was 0.76.

Rumination was measured with the 22-item Ruminative Responses Scale (RRS; Treynor, Gonzalez, & Nolen-Hoeksema, 2003), which inquires about participants' responses when they "feel down, sad, or depressed" (e.g., "Think about how alone you feel"). It measures two components of rumination: reflective pondering and brooding. Total scores range from 22 to 88, with higher scores indicating greater rumination. In this sample, Cronbach's alpha at pretreatment was 0.88.

Anxiety sensitivity was measured with the 18-item Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007). It measures three domains of anxiety sensitivity: physical concerns, cognitive concerns, and social concerns. Only total scores, which range from 0 to 72, were analysed for this study, with higher scores indicating higher levels of anxiety sensitivity. In this sample, Cronbach's alpha at pretreatment was 0.80.

Treatment expectations were measured with a two-item investigator-derived questionnaire completed following the first session of the MBCT-S group. These two items were "To what extent do you think the treatment is logical in terms of alleviating your sexual desire concerns?" and "To what extent do you expect improvement in your sexual desire as a result of treatment?" Items were rated on an 11-point scale from 0 = *Not at all* to 10 = *Completely logical/complete improvement*. Total scores ranged from 0 to 20, with higher scores indicating greater treatment expectations. Cronbach's alpha was 0.79.

Participants' homework compliance was rated by group facilitators at the end of the eight MBCT-S sessions on a scale from 0 = *Did not complete homework* to 2 = *Notable efforts at completing homework* (as used in Brotto & Basson, 2014).

¹ A principal components analysis of the pretreatment MAIA responses extracted eight components with eigenvalues > 1, but all but seven out of 32 items loaded most significantly onto the first factor (eigenvalue = 15.15), which explained 47.4% of the variance.

Procedure

Women were either referred to this study by a health care provider (e.g., doctor specializing in sexual medicine, sex therapist, physiotherapist) or self-referred in response to community advertisements, mailings, and social media postings looking for women who experience distressing low sexual desire or interest. After interested women contacted the study coordinator by telephone and had the study and procedures described to them in detail, their preliminary eligibility was assessed through a telephone screening. Potentially eligible women then met in person with one of the study investigators to confirm eligibility and be assessed for a SIAD diagnosis, at which time they had an opportunity to ask questions about the study procedures. After providing written informed consent, participants were scheduled into a treatment group, which typically started within one to three months of enrollment.

One to two weeks before their first group session, participants completed a pretreatment physiological assessment, which took place in the sexual psychophysiological laboratory of the last author; these data will be reported separately in another manuscript. (This assessment included a heart-beat perception task [an objective measure of interoceptive awareness; Schandry, 1981] and a sexual arousal assessment, during which participants watched an erotic film clip and reported on their levels of subjective sexual arousal while their genital sexual arousal was measured with a vaginal photoplethysmograph [Sintchak & Geer, 1975].) Following their physiological assessment session, participants were e-mailed a link to a confidential online questionnaire battery consisting of demographic questions and self-report questionnaires. The same physiological assessment and questionnaires were administered two to four weeks after treatment.

Mindfulness-Based Cognitive Therapy Adapted for Women with Low Sexual Desire (MBCT-S)

This study’s treatment protocol was based largely on the MBCT program for prevention of depressive relapse (Segal, Williams, & Teasdale, 2013); it integrated aspects of sex therapy from our previous efficacious interventions for low sexual desire (Brotto & Basson, 2014) and provoked vestibulodynia (Brotto et al., 2015). Some of the background psychoeducational information on mindfulness and how it might address women’s sexual difficulties was adapted from the treatment manual developed for women with provoked vestibulodynia (Basson et al., 2015). The MBCT-S involved eight weekly 2.25-hour group sessions, with three to six women participating in each group. Sessions were co-facilitated by two sex therapists (clinical psychologists or clinical psychology graduate students) with training in MBCT and ongoing personal mindfulness practices, often with a third trainee observing. A detailed facilitator manual (Brotto, Paterson, Basson, Driscoll, & Grabovac, 2015) was developed and outlined the contents for facilitators to follow as

well as the suggested at-home activities. A corresponding participant manual was provided to each participant and contained the educational information as well as instruction on the mindfulness practice and sex therapy exercises to be completed at home. During Session 1, facilitators introduced women to the themes of the group and to mindfulness experientially with a guided eating meditation (see Table 1). Each subsequent session included at least one extended mindfulness practice of 20 to 30 minutes duration focused on various foci (e.g., body sensations at rest or during stretching, breath, sounds, thoughts), guided by a facilitator and followed by an inquiry in which the facilitator asked about the participants’ experiences during the practice. Participants were provided with 25- to 40-minute audio recordings of formal meditations following each session and encouraged to practice these at home daily; these were each recorded by either the last author, Jon Kabat-Zinn (from his mindfulness-based stress reduction program; Kabat-Zinn, 2005), or Zindel Segal (from the MBCT for prevention of depressive relapse program; Segal et al., 2013).

Sex Therapy Components. Sexuality worksheets and exercises were introduced in session, completed at home, and

Table 1. *Therapeutic Contents of MBCT-S*

Session	In-Session Meditation	Sexuality Education and Exercises	Home Practice (Time/Day)
1	Raisin exercise	Prevalence of sexual difficulties; Importance of Sexuality questionnaire and letter; Snowball exercise	Mindful eating (10 minutes)
2	Body scan	Mindfulness for sexual difficulties; Contributing and protective factors worksheet; Anatomy and physiology of sexual response; Mirror exercise	Body scan (40 minutes)
3	Stretch and breath	Sexual beliefs worksheet; Body image worksheet; Focusing exercise	Stretch and breath (40 minutes)
4	Breath, body, sounds, and thoughts	Cognitive model worksheet; Thought biases worksheet; Focusing exercise	Sitting meditation (40 minutes)
5	Mindfulness of breath	Circular sexual response cycle worksheet; Self-observation exercise; Focusing exercise	Sitting meditation (40 minutes)
6	Working with difficulty	Self-exploration with touch exercise	Working with difficulty (25 minutes)
7	Working with sensations in the body	Sexual arousal enhancement with sexual aids; Sexual sensations awareness exercise; Pleasurable touch exercise; Long-term intentions worksheet	Meditation of their choosing
8	Body scan	Partner sensate focus exercise; Other treatments for sexual difficulties	N/A

reviewed during the following session (see Table 1). Psychoeducational discussions covered the high prevalence of sexual difficulties (Session 1); the rationale for using mindfulness for sexual difficulties and the anatomy and physiology of sexual response (Session 2); the impact of common sexual beliefs and body image on sexuality (Session 3); the cognitive model and common thought biases (Session 4); the circular sexual response cycle (Basson, 2001) and the varied motivations women describe for engaging in sexual activity (Meston & Buss, 2007; Session 5); the enhancement of sexual arousal with sexual aids (fantasy, erotica, and vibrators; Session 6); and other (psychological and experimental medical) treatments for sexual difficulties (Session 8). On worksheets, women were invited to reflect upon the importance they ascribed to sexuality, the evolution of their sexual difficulty, and related distress over time (using the analogy of a snowball; Session 1); the factors that contributed toward and protected them from experiencing sexual difficulties (Session 2); their own sexual beliefs and body image (Session 3); their thoughts, feelings, physical sensations, and behaviors in an actual or anticipated sexual situation, and their own biased thoughts (Session 4); and their sexual response cycle (Session 5). During graded mindful body self-awareness exercises, women identified their genital structures using a handheld mirror (Session 2); focused on their bodily sensations during a shower, and afterward observed their bodies nonjudgmentally in a mirror (Sessions 3, 4, and 5); observed their genitals nonjudgmentally (Session 5); explored their bodies with touch, including their breasts and genitals (Session 6); tuned in to sexual sensations in the body after using a sexual aid to elicit sexual arousal, and touched their genitals to induce feelings of pleasure (Session 7). At the end of the group, women were invited to reflect upon their long-term intentions to maintain their mindfulness practice and engagement with their sexuality, and an optional exercise on mindful touch with a partner was introduced (sensate focus).

Data Analyses

Not all participants completed every measure, given that some measures were added over the course of the pilot study (sample sizes are denoted with each endpoint). Data analyses were performed using SPSS Version 22 (IBM Statistics, Inc.) and were organized according to the study hypotheses.

Hypothesis 1. Paired *t* tests were used to compare pre- and posttreatment levels of the primary and secondary endpoints. Given the absence of a no-treatment control group, effect sizes (Cohen's *d*) were calculated accounting for dependence between means in within-subjects designs (Morris & DeShon, 2002). Although age has been found to be related to sexual desire (e.g., Shifren et al., 2008), it was not significantly correlated with pretreatment sexual desire ($r = -.04$, $p = .87$) or overall sexual function ($r = .35$, $p = .082$) and was therefore not included as a covariate in analyses of these variables. Age was significantly negatively

correlated with pretreatment sex-related distress ($r = -.45$, $p = .02$) and was therefore included as a covariate in a follow-up repeated-measures analysis of covariance (ANCOVA) of this variable.

Hypotheses 2 and 3. All hypothesized moderators were tested using linear regression analyses. The secondary endpoints were tested as both mediators and moderators by including both the variable's change score and the pre- and posttreatment sum score in each individual regression analysis (following the procedure for within-subjects designs outlined in Judd, Kenny, & McClelland, 2001). Standardized betas were reported for all analyses.

RESULTS

Hypothesis 1: MBCT-S Affects Primary and Secondary Endpoints

Participants reported significant improvements in all primary endpoints compared to baseline: Self-reported sexual desire increased by 60% ($d = 0.94$), overall sexual function increased by 26% ($d = 0.86$), and sex-related distress decreased by 20% ($d = -0.68$; see Figure 1). Two of the four participants who reported not having engaged in sexual activity in the past month at pretreatment reported having done so at posttreatment. A follow-up ANCOVA of sex-related distress with age entered as a covariate revealed a significant interaction ($F_{1, 23} = 5.27$, $p = .031$), indicating that younger participants experienced a greater decrease in distress (see moderation analysis, reported in the following section). All domains of sexual function improved significantly, and each was associated with medium to large effect sizes, except for pain with vaginal penetration, which did not significantly change compared to pretreatment (see Table 2).

Following treatment, participants reported significant improvements in mindfulness and four dimensions of interoceptive awareness (not distracting, attention regulation, self-regulation, and body listening), as well as depressed mood, rumination, and anxiety sensitivity, compared to pretreatment. Neither self-

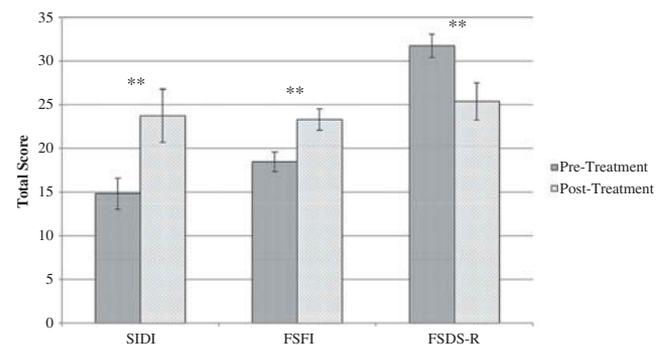


Figure 1. Sexual desire (SIDI), overall sexual function (FSFI), and sex-related distress (FSDS-R) before and after treatment; ** $p < .01$; analyses based on $n = 18$ (SIDI), $n = 21$ (FSFI), and $n = 25$ (FSDS-R).

Table 2. Sexual function (FSFI) subscales, mindfulness (FFMQ), interoceptive awareness (MAIA), depressed mood (BDI-II), rumination (RRS), self-compassion (SCS), rumination (RRS), and anxiety sensitivity (ASI-3) before and after treatment

Measure	Pretreatment		Posttreatment		% Change	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>					
FSFI sexual desire	2.14	0.92	2.88	1.19	34.83	-3.97	25	0.001	0.82
FSFI overall satisfaction question	1.88	0.95	3.00	1.22	60.00	-3.96	24	0.001	0.82
FSFI arousal	2.19	0.91	3.41	1.19	56.21	-4.28	21	< 0.001	1.10
FSFI lubrication	3.54	1.62	4.41	1.42	24.60	-3.26	21	0.004	0.72
FSFI orgasm	3.10	1.64	3.93	1.75	26.68	-2.78	21	0.012	0.61
FSFI satisfaction	2.66	1.21	3.75	1.32	40.98	-3.39	20	0.003	0.76
FSFI pain	5.01	1.70	5.15	1.08	2.82	-0.40	17	0.692	0.11
FFMQ	126.13	19.08	137.42	19.72	8.95	-2.98	23	0.007	0.61
MAIA not distracting	2.08	0.96	3.73	0.76	79.00	-7.00	23	< 0.001	1.44
MAIA not worrying	2.68	1.10	2.50	0.80	-6.74	0.60	23	0.556	-0.12
MAIA noticing	3.22	1.02	3.28	1.16	2.05	-0.22	23	0.83	0.04
MAIA attention regulation	2.46	0.87	3.24	0.63	31.64	-4.48	23	< 0.001	0.94
MAIA emotional awareness	3.35	1.07	3.69	0.83	10.20	-1.54	23	0.137	0.32
MAIA self-regulation	2.59	0.91	3.34	0.66	28.92	-3.82	23	0.001	0.80
MAIA body listening	2.00	1.28	2.64	0.98	31.89	-3.09	22	0.005	0.67
MAIA trusting	3.19	1.16	3.45	0.84	8.18	-1.31	22	0.203	0.29
SCS	89.83	20.85	93.00	16.78	3.53	-0.70	17	0.492	0.17
BDI-II	10.92	7.60	6.54	6.63	-40.08	2.47	23	0.021	-0.51
RRS	45.17	10.52	39.25	9.84	-13.10	2.80	23	0.01	-0.57
ASI-3	8.82	1.47	6.24	1.61	-29.33	1.70	16	0.11	-1.70

compassion nor the other four dimensions of interoceptive awareness (not worrying, noticing, emotional awareness, and trusting) changed significantly from baseline (see Table 2).

Hypothesis 2: There Are Moderators of Improvements in Primary Endpoints

Summed (pre- + posttreatment) depressed mood and treatment expectations, as well as mindfulness, self-compassion, total interoceptive awareness, age, relationship duration, and low desire duration (in years) were tested as potential moderators. The change in sexual desire was significantly moderated only by total interoceptive awareness ($\beta = 0.81, t_{2,15} = 3.21, p = .006; p > .05$ for other variables). The change in sex-related distress was significantly moderated by depressed mood ($\beta = 0.42, t_{2,21} = 2.11, p = .047$), total interoceptive awareness ($\beta = 0.46, t_{2,21} = 2.08, p = .05$), and age ($\beta = -0.43, t_{2,23} = -2.30, p = .031; p > .05$ for other variables; all variables scaled to be positively correlated). There were no significant moderators of the change in overall sexual function (all $ps > .05$).

Hypothesis 3: There Are Mediators of Improvements in Primary Endpoints

Mindfulness and depressed mood, as well as self-compassion and total interoceptive awareness, were tested as potential mediators. The change in sexual desire was significantly mediated only by the change in total interoceptive awareness ($\beta = 0.60, t_{2,15} = 2.37, p = .031; p > .05$ for other variables). The change in overall sexual function was significantly mediated by the change in mindfulness ($\beta = 0.54, t_{2,17} = 2.73, p = .014$),

depressed mood ($\beta = 0.59, t_{2,17} = 2.97, p = .009$), and self-compassion ($\beta = 0.69, t_{2,12} = 3.24, p = .007; p > .05$ for other variables). There were no significant mediators of the change in sex-related distress (all $ps > .05$).

DISCUSSION

This study tested the feasibility and preliminary efficacy of an eight-session mindfulness-based cognitive therapy program for women’s low sexual desire, adapted from that developed for the prevention of depressive relapse (Segal et al., 2013). The primary treatment components were mindfulness meditations practiced in session and at home, and mindful body awareness exercises, which were eventually adapted to sexual encounters. The group ended with a discussion of how to transition from practicing mindful touching individually to doing so with a current or future partner. MBCT-S was hypothesized to improve sexual desire, overall sexual function, sex-related distress, as well as mindfulness- and mood-related constructs, compared to baseline. This study also explored a number of potential mediators and moderators theorized to account for the efficacy of mindfulness for sexual difficulties, as a means of generating hypotheses for future investigations.

Participants entered the study with clinically significant levels of low sexual desire, overall sexual function, and sex-related distress, as measured by self-report measures and confirmed during a pretreatment clinical interview, where a diagnosis of SIAD was also determined. Younger participants reported greater sex-related distress at pretreatment than older women. Depressed mood was below clinical

levels on average, but in the “mild depression” or higher range for one-third of participants.

Following their first group session, participants endorsed moderately high treatment expectations ($M = 14.42/20$, $SD = 2.43$, range = 10 to 18), and the majority of women attended all sessions and reported practicing the mindfulness meditations and mindful body awareness exercises between sessions. Average facilitator ratings of homework compliance were therefore high ($M = 1.85/2$, $SD = 0.37$, range = 1 to 2). The fact that the eight women (31%) who missed one group session all attended an individual makeup session suggests that the program was feasible and that participants were eager to receive all components of the intervention.

Following treatment, women reported statistically significant improvements in the primary endpoints of sexual desire, overall sexual function, and sex-related distress; all were associated with medium to large effect sizes. The largest effect size was for subjective sexual arousal, and this increase may have been bolstered by greater positive affect, which has been found to predict women’s sexual arousal in response to erotica (Vilarinho et al., 2014). Women may have experienced more positive affect in sexual situations because of their mindfulness training (MBCT has been found to increase general positive affect in individuals in partial remission from depression [Garland, Geschwind, Peeters, & Wichers, 2015]) and/or greater comfort with their bodies and sexuality after completing the mindful sex therapy exercises during the group.

These results replicate and extend those found using a four-session mindfulness-based cognitive-behavioral sex therapy group (Brotto & Basson, 2014). Effect sizes for the three primary endpoints were high in both the current study and the four-session intervention: 0.94 and 0.97 for sexual desire, 0.86 and 1.04 for overall sexual function, and -0.68 and -0.56 for sex-related distress, respectively. In the previous briefer intervention, sexual desire and overall sexual function did not change during a wait-list control period (Brotto & Basson, 2014), suggesting that the improvements in these domains observed in the current study were not simply due to the passage of time or to increased hopefulness with treatment. While the similar effect sizes for the current study and for our previous, briefer intervention call into question whether the extra sessions were worth the time and energy investment, we suspect that the additional mindfulness practice and sexuality exercises provided women with a stronger foundation to maintain changes over time after the group ended. We are testing the hypothesis that longer treatment results in a higher rate of long-term mindfulness practice, and with sustained improvements when tested six and 12 months after treatment, with ongoing follow-up assessments.

Despite the significant improvements in the primary endpoints, all remained in the clinical range on average, which may be typical of women experiencing long-standing low sexual desire (participants reported an average duration of at least a decade of symptoms). Scores were no longer in the clinical range for only 28% (5/18) of participants for sexual

desire, 22% (5/23) for overall sexual function, and 4% (1/25) for sex-related distress. Although it is difficult to compare these results to those of CBT for HSDD because of the use of different diagnostic criteria for participants and measures administered, the current findings appear to be similar to those of McCabe (2001), who found a 26% reduction in the proportion of women with significant desire concerns following treatment, but more modest than those of Trudel and colleagues (2001), who found that 74% of women no longer met diagnostic criteria for HSDD. The fact that the majority of our participants remained in the clinical range on these primary endpoints suggests that the MBCT-S program may be a starting point in treatment but may need to be supplemented with additional treatments. Mindfulness was a new skill for almost all participants, and they were encouraged to continue practicing the mindfulness and sexuality exercises after the eight sessions ended. It is possible that as women continue to practice, their sexual functioning will improve further; we are testing this hypothesis with our additional follow-up assessments, which will allow us to determine the proportion of women who fall into the nonclinical range at six and 12 months after group completion.

As hypothesized, there were also significant improvements in several mindfulness-related secondary endpoints. Mindfulness and the interoceptive awareness dimensions of not distracting, attention regulation, self-regulation, and body listening also increased significantly with treatment; all changes were associated with medium to large effect sizes. Interestingly, however, neither of the other domains of interoceptive awareness nor self-compassion changed significantly. The interoceptive awareness dimensions of emotional awareness and trusting were associated with small effect sizes and improvements may have reached significance with a larger sample size; in contrast, the dimensions of not worrying and noticing did not appear to change with treatment. A study investigating changes in interoceptive awareness following three months of contemplative training similarly found no significant changes in the dimensions of not worrying and noticing (as well as not distracting; Bornemann, Herbert, Mehling, & Singer, 2015), perhaps suggesting that these abilities are less modifiable with (short-term) mindfulness practice. Three studies of MBCT have assessed self-compassion and found increases ranging from 7% to 12% (Kuyken et al., 2010; Lee & Bang, 2010; Rimes & Wingrove, 2011), compared to only 4% in the current study. It is possible that more targeted interventions or a longer period of practice are necessary for women with long-standing sexual difficulties and related self-judgments to experience a significant change in this area.

As hypothesized, there were also significant improvements in several mood-related secondary endpoints. Depressed mood and rumination both decreased significantly, with moderate associated effect sizes. A meta-analysis of the efficacy of mindfulness-based interventions found a similar effect size for depressed mood in participants with disorders other than anxiety or depression (0.53; Hofmann,

Sawyer, Witt, & Oh, 2010) to that found in the current study (0.51). Although anxiety sensitivity decreased, this did not reach statistical significance; this was likely due to the small sample size for this measure, as the change was associated with a large effect size.

Moderation analyses revealed that, as hypothesized, women with higher general levels of depressed mood experienced greater changes in sex-related distress but not in sexual desire or overall sexual function. There is a strong association between depression and sex-related distress (Bancroft, Loftus, & Long, 2003), and MBCT-S may have targeted this distress mostly in our more depressed participants. This finding provides support for the decision to model treatment after MBCT for depression and suggests that MBCT-S may be an especially warranted treatment approach for women with both low desire and low mood.

Contrary to our hypothesis, treatment expectations did not appear to impact the observed changes. This is surprising considering the established influence of expectations on sexual response: Providing false-positive feedback to women about their sexual response has been found to significantly heighten their sexual responding (McCall & Meston, 2007; Palace, 1995), and there is a strong placebo response in pharmacotherapy studies for women's sexual desire. Women's low desire has been found to improve by 40% or more in placebo arms (Bradford & Meston, 2009), with at least one-third of participants showing clinically significant improvements (Bradford & Meston, 2011). On the other hand, treatment expectations were not found to influence improvements in psychosocial adjustment in female cancer patients who completed a mindfulness-based stress reduction program (Henderson et al., 2012). Our results suggest that participants became equally engaged in their MBCT-S group and home practice regardless of their initial expectations, and that this treatment may be effective even for women who have initial doubts about the mindfulness approach.

Exploratory analyses found that women with higher general levels of interoceptive awareness experienced greater changes in sexual desire and sex-related distress. Higher baseline interoceptive awareness may prime women to (re)connect with sexual sensations in their bodies, with women with lower interoceptive awareness requiring more practice to achieve the same effect.

In terms of demographic variables, women who were of a younger age experienced greater changes in sex-related distress. Because younger women started out with higher levels of distress compared to their older counterparts, this difference may have emerged because they had more room for improvement. Changes in the primary endpoints were not moderated by relationship or low sexual duration, suggesting that women benefited equally regardless of differences in these variables. This finding provides support for the generalizability of this treatment to diverse populations of women with sexual complaints.

Mediation analyses revealed that, as hypothesized, improvements in mindfulness and depressed mood significantly mediated improvements in overall sexual function, but this was not the case for sexual desire or sex-related distress. It is possible that women who became more mindful and less depressed began to experience greater sexual arousal during sexual encounters, but that levels of sexual desire and distress were not directly targeted by these changes. Exploratory analyses additionally found that improvements in interoceptive awareness and self-compassion significantly mediated improvements in sexual desire and overall sexual function, respectively. As theorized, an increased ability to tune in to physical sensations (including sexual sensations), and to do so nonjudgmentally, therefore appears to predict women's (re)connection with their sexuality. A meta-analysis of MBSR and MBCT mediation studies similarly found moderate evidence for mindfulness and preliminary evidence for self-compassion as mechanisms underlying changes in psychological functioning and well-being (Gu, Strauss, Bond, & Cavanagh, 2015). To our knowledge, the current study is the first to test interoceptive awareness as a potential mediator, and results suggest that it should be included in future investigations.

Strengths and Limitations

This study is the first to test an eight-session MBCT program adapted from a program aimed at preventing depressive relapse to women's low sexual desire/arousal. The study included an expanded set of measures, providing preliminary evidence for moderators and mediators of the observed improvements in the primary outcome measures, to be replicated in follow-up studies. Unlike our previous mindfulness-based programs that included a variety of treatment elements (e.g., sex therapy, cognitive-behavioral therapy, couples therapy exercises), the current program was largely based on mindfulness practice, with almost half of each session devoted to an extended guided practice and inquiry.

As in all treatment outcome research, the women participating in this study may not have been representative of the population of women with sexual desire complaints at large. This pilot study had a small sample size, and because we added measures over time some were likely not adequately powered for statistical analyses to reach significance; we therefore focused our interpretations on reported effect sizes. Furthermore, some of our measures were correlated with one another at baseline and we did not employ any correction factor to account for this. We did not reassess women for a SIAD diagnosis following treatment, instead relying on self-report data focused on symptoms but not diagnoses. The homework compliance measure was based on facilitators' impressions, and future studies should have participants quantify their amount of formal, at-home mindfulness practice. We did not include a control group, and it is therefore possible that any type of group treatment would have led to the observed improvements. In the absence of a control group,

we can only interpret findings with respect to pretreatment scores. We did not assess the mediators and primary endpoints midway through the group, and it therefore remains speculative that the former changed before the latter. We are currently conducting a randomized-controlled trial (RCT) of MBCT-S versus group sex therapy that does not include mindfulness training, in an attempt to isolate the effects of mindfulness training on sexual desire, while controlling for many of the nonspecific therapeutic effects of group therapy. This study will include an assessment of hypothesized mediators and primary endpoints midway through the eight-session MBCT-S to establish their temporal precedence (Labelle, Campbell, Faris, & Carlson, 2015).

Clinical Implications

The MBCT-S program developed for this study was feasible and well accepted by participants, and could be adopted by clinicians experienced in facilitating other mindfulness-based interventions. While the group setting normalizes sexual difficulties and provides the opportunity for women to learn from one another's experiences with the meditations and sexuality exercises, this program could also be administered in an individual psychotherapy context.

Conclusions

The results of this study suggest that an eight-session mindfulness-based program significantly improves sexual desire, sexual function, and sex-related distress, partly due to underlying changes in mindfulness, interoceptive awareness, self-compassion, and depressed mood. These pilot data need to be replicated in a larger randomized-controlled trial with a longer follow-up period.

Acknowledgments and Funding

The authors would like to thank our coauthors of the MBCT-S treatment manual, Drs. Rosemary Basson, Miriam Driscoll, and Andrea Grabovac, as well as group co-facilitators, Drs. Nicole Pugh and Kelly Smith. Dr. Paterson's work on this study was funded by postdoctoral fellowships from the Canadian Institutes for Health Research and the Michael Smith Foundation for Health Research. The authors report no conflicts of interest.

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