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Pilot Study of a Brief Cognitive Behavioral Versus Mindfulness-Based Intervention for Women With Sexual Distress and a History of Childhood Sexual Abuse

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Although sexual difficulties related to a history of childhood sexual abuse (CSA) are common, there are no efficacious treatments to address sexual distress. Recent evidence for the benefits of mindfulness, which emphasizes present-moment non-judgmental awareness, in the treatment of women's sexual concerns provided the impetus for this pilot study. Twenty partnered women with sexual difficulties and significant sexual distress, and a history of CSA were randomized to two sessions of either a cognitive behavioral (CBT, n = *8) or mindfulness-based (MBT,* n = *12) group treatment (age:* M = *35.8 years, range: 22–54 years). Hierarchical Linear Modeling to assess changes in concordance between laboratory-based subjective and genital sexual arousal revealed a significant effect of MBT on concordance such that women in the MBT group experienced a significantly greater subjective sexual arousal response to the same level of genital arousal compared to the CBT group and to pre-treatment. Both groups also experienced a significant decrease in sexual distress. These data support the further study of mindfulness-based approaches in the treatment of sexual difficulties characterized by a disconnection between genital and subjective sexual response.*

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Female sexual dysfunction is believed to be among the most prevalent of the psychological disorders (Spector & Carey, 1990). Results from a national probability sample suggest that approximately 43% of women experience sexual difficulties (Laumann, Paik, & Rosen, 1999), characterized by problems with sexual arousal, desire, orgasm, satisfaction, pleasure, or the experience of pain. Several lines of evidence point toward a link between sexual dysfunction and biological (e.g., Rosen, Lane, & Menza, 1999) and psychosocial etiologic factors (see Althof et al., 2006; Brotto, Bitzer, Laan, Leiblim, & Luria, 2010). Among the known factors, a history of childhood sexual abuse (CSA) has been identified as a significant correlate of impaired sexual functioning as an adult. Data from the National Health and Social Life Survey ($N = 1{,}749$ women) indicate that a history of sexual abuse before puberty was associated with a significantly increased odds ratio (1.73) of having female sexual arousal disorder (Laumann et al., 1999). The recent Boston Area Community Health Survey ($N = 3{,}205$ women) found that, among partnered women, a history of physical, sexual, or emotional abuse approximately doubled the odds of having a female sexual dysfunction (Lutfey, Link, Litman, Rosen, & McKinlay, 2008). Among women seeking treatment for a sexual dysfunction, a study from Chicago showed that 20% of the 359 married women assessed reported a history of CSA, although some have criticized this figure as representing an underestimate given the barriers women have expressed in disclosing their histories of abuse (Leonard & Follette, 2002).

The relation between CSA and impaired sexual functioning as an adult is likely multifaceted. Because dissociation during the unwanted sexual events may reflect a mechanism by which the child learned to cope with the abuse while it was unfolding (Boysan, Goldsmith, Çavuş, Kayri, & Keskin, 2009; Herman, 1992), disconnection between psychological and physiological aspects of the sexual response may be a normal consequence in woman's sexual experiences as an adult (Kinzl, Traweger, & Biebl, 1995; Rellini, 2008). In other words, despite the presence of (sometimes strong) physical sexual sensations, her mental awareness may have deliberately gone to a nonsexual fantasy world, leading to repeated experiences of physical arousal paired with dissociation. Clinical and empirical data also confirm that women with a history of sexual abuse have difficulty experiencing and/or interpreting sexual feelings as an adult (Rellini, 2008). For example, women with a history of father–daughter incest reported a lack of sexual feelings, even in the presence of orgasm (Herman & Hirschman, 1977). Other research has found that despite physiological evidence of a stress response during exposure to sexual stimuli (i.e., increase in cortisol levels), women with a history of CSA did not report an increase in their negative affect (Rellini, Hamilton, Delville, & Meston, 2009), further supporting the idea of a disconnect between body and mind in these women. The authors speculated that symptoms of posttraumatic stress disorder may have mediated the relation between CSA history and reduced sexual response as an adult. Posttraumatic stress disorder is

the most commonly reported mental health problem among individuals exposed to CSA (Kendall-Tackett, Williams, & Finkelhor, 2001). In particular, researchers have estimated that between 37% and 53% of sexually abused children eventually develop posttraumatic stress disorder (Kendall-Tackett, Williams, & Finkelhor, 1993; McLeer, Deblinger, Atkins, Foa, & Ralphe, 1988; McLeer et al., 1998).

Although dissociation may have evolved as an adaptive strategy to allow the child to cope with the abhorrent acts subjected upon her, disconnection between genital and psychological arousal during consensual sexual activity as an adult has a direct negative effect upon sexual response and satisfaction. One theory of sexual dysfunction posits that distraction from relevant sexual cues may directly impede sexual responding among those vulnerable to sexual symptoms (Barlow, 1986). The sexual experiences of women with a history of CSA may be understood within Barlow's (1986) model in that genital arousal is experienced in the context of distraction away from positive sexual experiences and toward negative or neutral mental events.

In contrast with the literature on the etiology of sexual dysfunction in women, relatively little research has focused on nonpharmacological treatments for these complaints. According to a recent review by ter Kuile, Both, and van Lankveld (2010), directed masturbation for primary anorgasmia is the only empirically validated and efficacious psychological treatment. Other treatment techniques, often provided concurrently (e.g., Brotto, Basson, & Luria, 2008; van Lankveld et al., 2006), are desired by women (Heiman, 2002) and appear promising, including education, exposure and systematic desensitization, sensate focus, partner communication, cognitive restructuring, and relaxation strategies (for reviews see Heiman & Meston, 1997 and ter Kuile et al., 2010). In terms of psychological treatments for women with sexual dysfunction related to a history of CSA, the literature is characterized largely by case studies, not empirical examinations. Hall (2008) described treatment of sexual problems in adult women with a CSA history from the New View (Tiefer, Hall, & Tavris, 2002) perspective, which recognizes and addresses the larger sociocultural, political, and economic context in which the abuse took place. Maltz (2002) also proposed a number of techniques to facilitate sexual healing in women with a history of sexual abuse, although no empirical data are available. It is not surprising that pharmacological options for sexual dysfunction in women with a CSA history are not effective (Berman, Berman, Bruck, Pawar, & Goldstein, 2001) and may be inappropriate.

Recently, a mindfulness-based cognitive behavioral therapy (CBT) approach has been applied to the treatment of women's sexual difficulties (for reviews, see Brotto & Heiman, 2007; Brotto & Woo, 2009). *Mindfulness*, an ancient Eastern practice with roots in Buddhist meditation, has been defined as present-moment, nonjudgmental awareness (Hanh, 1976). In the past three decades, mindfulness has made its way into Western medicine originally as a method for reducing suffering in chronic pain patients (Kabat-Zinn, 1990; Praissman, 2008). Mindfulness has been referred to as the third

wave in the evolution of behavior-based therapies. It differs from other techniques in that it encourages acknowledgement and acceptance of what is in any given moment, rather than contradicting or attempting to change what is (e.g., as occurs with cognitive restructuring). When used in the psychiatric setting, mindfulness guides patients to become aware of their thoughts in a nonjudgmental way and to observe them simply as thoughts and not necessarily reflections of reality. *Metacognition*, or the ability to "watch oneself think" is a fundamental component of mindfulness that is directly linked to reduced distress and suffering (Teasdale et al., 2002). Mindfulness-based CBT has evolved as a distinct form of psychological therapy that integrates mindfulness practice and theory with CBT (e.g., identification and challenging of biased thoughts), and it has been found effective for numerous psychiatric ailments, including: depression (Segal, Williams, & Teasdale, 2002), anxiety (Gratz, Tull, & Wagner, 2005), childhood behavior problems (Dumas, 2005), substance abuse (Marlatt et al., 2004), marital discord (Carson, Carson, Gil, & Baucom, 2007), and eating disorders (Terence, 2004).

In two uncontrolled studies incorporating mindfulness in the treatment of female sexual problems, mindfulness was found to significantly improve self-reported desire, arousal, and mood, and significantly decrease sexual distress following three monthly sessions and 5–7 hr per week of homework practice (Brotto, Basson, et al., 2008; Brotto, Heiman, et al., 2008). This mindfulness-based treatment also significantly improved self-reported perception of genital and nongenital arousal when tested in response to laboratory-based erotic stimuli. The authors speculated that these effects may have been secondary to women's increased ability to redirect their attention to the present moment, and in particular, to their genital and nongenital sensations during sex (Brotto, Heiman, et al., 2008) instead of focusing on the myriad (internal and external) distractions that typically impede their sexual arousal response. Given that mindfulness encourages more effective reactions to what is occurring in any moment, it is also possible that any improvements with mindfulness are a direct result of reduced distress and negative affect. It is interesting that a post hoc analysis in the study by Brotto, Basson, and Luria (2008), which separated women reporting a history of sexual abuse versus those with no history of abuse, found that women with a history of abuse experienced the most benefit from the mindfulness-based approach.

The goal of the present study was to develop and pilot test a brief mindfulness-based intervention for women with sexual distress and a history of CSA. Considering that the sexual interactions of women with a CSA history may be characterized by a fundamental disconnection between the sexual response of the body and the mind, we hypothesized that mindfulness—which embodies present-moment nonjudgmental awareness and therefore reduces emotional suffering—may enhance the connection between genital and subjective sexual sensations and may improve sexual distress.

The aim was to compare the effects of a brief CBT intervention versus a brief mindfulness intervention on the primary endpoints of (a) concordance between genital and subjective sexual arousal among women with sexual difficulties related to a history of CSA and (b) sexual distress. The genital/subjective arousal relation was our primary endpoint because of the hypothesized mechanism of action of mindfulness; namely, that mindfulness would allow women to tune in to their existing genital arousal nonjudgmentally, and this might translate to enhanced subjective sexual arousal. In particular, we expected that women in the mindfulness-based therapy (MBT), but not the CBT condition, would show greater subjective sexual arousal after the intervention directly resulting from enhanced awareness of genital sexual arousal. A secondary endpoint was the effects of CBT and MBT on subjective and genital sexual arousal, separately, to an erotic stimulus in the laboratory. We did not hypothesize changes in genital sexual arousal per se in either treatment arm. Thus, such an increase in subjective sexual arousal accompanied by the same level of genital sexual arousal, the genital/subjective ratio was expected to be lower at posttreatment in the mindfulness condition only.

METHOD

Participants

Women seeking treatment for sexual concerns at a university medical center or those who responded to posted advertisements were recruited from March to August 2009. Inclusion criteria were as follows: at least 18 years of age, fluent in English, having engaged in some form of partnered sexual activity over the past 4 weeks (e.g., kissing, petting, and/or intercourse), self-reported anxiety causing significant distress during sexual activity, and a self-reported history of childhood sexual abuse (which women self-defined as being any nonconsensual experience under the age of 16 years that involved sexual coercion or touch). Participants were excluded if they had a partner with a sexual dysfunction (as determined by the woman's self-report during an interview).

Respondents were 58 women; of these, 38 did not participate for the following reasons: were not comfortable with the use of a photoplethysmograph ($n = 5$), were not comfortable with watching erotic videos ($n = 1$), did not speak English ($n = 1$), were limited by time or distance ($n = 3$), was not satisfied with the compensation ($n = 1$), had no anxiety or distress during sexual activity ($n = 5$), were not currently in a relationship ($n = 12$), did not show up for session ($n = 8$), or withdrew from study before participation without providing a reason ($n = 2$). The final sample consisted of 20 women (8 randomized to the CBT group, 12 randomized to the MBT group). Participants ranged in age from 22 to 54 years ($M = 35.8$

years, $SD = 8.8$ years), and 95% of the sample had at least some college education. Of the women, 70% were currently in a relationship, 25% were single, and 1 (5%) did not indicate her relationship status; however, 100% of the sample indicated that they were currently sexually active. There were no significant group differences in age or relationship duration. The sample was primarily Euro-Canadian (85.0%), and a small subgroup self-identified as African-Canadian (5%) or biracial (10%).

Among those participants who elected to provide more detailed information on the type and severity of their sexual abuse ($n = 11$), all reported that the CSA occurred before the age of 16 years (youngest was 5 years old), and the frequency of the abuse took place between two times and every other day for 5 years. Perpetrators were described as being a brother, father, Sunday school teacher, crosswalk guard, stepbrother, cousin, or acquaintance. Nearly all participants described unwanted fondling, 50% reported giving oral sex to the perpetrator, and 20% reported vaginal penetration. All women indicated that their current sexual distress was significantly associated with their history of sexual abuse.

Measures

Female Sexual Distress Scale

The Female Sexual Distress Scale (FSDS; Derogatis, Rosen, Leiblum, Burnett, & Heiman, 2002) is a 12-item self-report questionnaire assessing sexually related personal distress. It was used to provide descriptive information at baseline and to address one of our primary endpoints focused on distress. Scores on the FSDS can range from 0 to 48, with higher scores representing higher levels of sexual distress. The FSDS has been shown to have good discriminant validity for differentiating between sexually dysfunctional and sexually functional women (Derogatis et al., 2002). There is also satisfactory consistency, test–retest reliability, and moderate correlations with measures of nonsexual distress.

Female Sexual Function Index

The Female Sexual Function Index (FSFI) is a 19-item self-report measure of female sexual function that provides scores on six domains of sexual function as well as a total score (Rosen et al., 2000). It was administered to provide descriptive information about the groups at baseline. The domains include the following: desire (two items), arousal (four items), lubrication (four times), orgasm (three items), satisfaction (three items), and pain (three items). The FSFI has been shown to reliably discriminate (a) women with female sexual arousal disorder from sexually healthy controls on each of the six domains of sexual function and on the full scale score (Rosen et al.,

2000) and (b) between sexually functional women and women with female orgasmic disorder and/or hypoactive sexual desire disorder (Meston, 2003) and women with female sexual arousal disorder (Rosen et al., 2000). The FSFI was found to be internally consistent (Cronbach's alpha ranged between .82 and .98) and test–retest reliabilities using a 4-week interval ranged between 0.79 and 0.86 (Rosen et al., 2000). None of the participants scored 0 (*no sexual activities in the past 4 weeks*) on any of the items; thus, all items were summed after reverse-coding when appropriate.

Assessment of Child Sexual Abuse History

We first assessed history of CSA as an inclusion criterion in the telephone screen. Women were asked, "Have you experienced any form of unwanted sexual activity as a child?" Only women responding positively continued on with the screen. This was then reassessed in person at the time of obtaining consent. During that assessment, women were asked about the age when the abuse occurred, its frequency, what types of sexual activities occurred, the relationship (if any) with the perpetrator, and the perpetrator's age.

Assessment of Sexual Arousal With Erotic Stimuli

We measured genital arousal with a vaginal photoplethysmograph (Sintchak & Geer, 1975) consisting of an acrylic vaginal probe, which was tampon-shaped and inserted vaginally in private by the participant. The probe (Behavioral Technology Inc., Salt Lake City, UT) measured vaginal pulse amplitude (VPA), which was monitored throughout exposure to each of two film segments (neutral and erotic). VPA was recorded on a personal computer (HP Pentium M laptop), which collected, converted (data from analog to digital, using a Model MP150WSW data acquisition unit [BIOPAC Systems, Inc., Santa Barbara, CA]), using the software program AcqKnowledge III, Version 3.8.1 (BIOPAC Systems, Inc.). The signal was band-pass filtered (0.5–30 Hz) at a sampling rate of 200 samples/second. A trained research assistant performed artifact smoothing of the signal following visual inspection of the data. The probe was disinfected in a solution of Cidex OPA (ortho-phthalaldehyde 0.55%), a high-level disinfectant, for 13 min, promptly after each session.

We measured subjective sexual arousal continuously during presentation of the films with an arousometer that was constructed by a local engineer modeled after the one described by Rellini, McCall, Randall, and Meston (2005). This device consisted of a computer optic mouse mounted on a plastic track with 10 intervals, and it was affixed to the arm rest of the recliner so that the participant could easily move the mouse while reclining and watching the erotic film. Women were instructed to move the mouse up and down the track over the course of the film to indicate their level of

subjective sexual arousal ranging from 7 (*highest level of sexual arousal*) to –2 (*sexually turned off*). This measure has been shown to be significantly and positively correlated with measures of subjective sexual arousal assessed with retrospective self-reported scales, and with physiological measures of sexual arousal (Rellini et al., 2005).

Procedure

Posted advertisements read as follows:

> Do you experience sexual difficulties? Are you currently in a relationship? Have you experienced unwanted/nonconsensual sexual events when you were a child? If you answered yes to these questions, you may be eligible to participate in an experimental treatment program aimed at sexual distress.

Women who responded to the advertisements were told that the purpose of the study was to develop and investigate the effects of a two-session psychoeducational group on women's sexual distress. Women responding to the advertisements were assessed for eligibility through a phone interview conducted by a trained doctoral-level clinical psychology graduate student. Participants were informed that they would be randomly assigned to take part in one of two arms, with first arm being focused on thoughts/feelings and second arm focused on staying in the present moment. Women who met inclusion criteria participated in two individual assessments (pre- and posttreatment; 1 hr each) and two treatment sessions delivered in group format (Session 1: 120 min, Session 2: 60 min) at the university-based medical center. The pretreatment assessment was scheduled no more than 2 weeks before the first group session, and the posttreatment assessment was scheduled 3–4 weeks after the second session. During the pretreatment assessment, women signed the consent form, returned their questionnaires that they completed at home, and participated in an assessment of sexual arousal in the laboratory. The posttreatment session was identical except for the omission of the consent form.

Assessment of Sexual Arousal

Participants received detailed instructions on how to insert the probe and were then left in private. An intercom system between the participant and experimenter rooms allowed for communication with participants at all times. First, participants inserted the probe and completed a brief self-report assessment of sexual arousal (data not presented). Then, they were encouraged to relax on a reclining chair during a 10-min habituation period. Subsequently, the investigator started the film sequence, which consisted of 1-min display

of the word *relax*, 3 min of a neutral travelogue on Hawaii, and 8 min of an excerpt from a sexually explicit film made by a female director and designed for women (Candida Royalle). We used two film sequences; one for the pretreatment assessment and the other for the posttreatment assessment. The film sequences were matched in length and erotic content and were counterbalanced across sessions.

Intervention

Women were randomly assigned to one of two arms: CBT or MBT. Each arm consisted of two sessions that were spaced 2 weeks apart. At the beginning of their first session, women in both arms were given a set of participant handouts to take home that included homework exercises, educational information, and resources for further reading. The contents for the CBT and MBT arms were modified from an existing psychoeducational treatment manual previously developed for women with hypoactive sexual desire disorder (Brotto, Basson et al., 2008).[1]

Topics covered in Session 1 of both arms included the following: (a) the importance of sexuality in participants' lives; (b) information on prevalence rates of sexual difficulties; (c) discussion of predisposing, precipitating, perpetuating, and protective factors of participants' sexuality; and (d) education on the female sexual response cycle (Basson, 2002). Topics specific to the CBT group included the following: (a) discussion and illustration of the cognitive behavioral model, with nonsexual and sexual examples highlighting the interplay among emotions, thoughts, and behaviors; (b) discussion of types of biased/irrational thinking styles that take place in sexual situations; (c) instruction on cognitive challenging of maladaptive thoughts and beliefs in nonsexual and sexual situations using a thought record with in-session practice; and (d) in-session practice of diaphragmatic breathing and progressive muscle relaxation. Topics specific to the MBT arm included the following: (a) introduction to mindfulness and a discussion on the benefits of mindfulness in nonsexual and sexual situations; (b) introduction to an in-session practice of mindfulness "how" and "what" skills (Linehan, 1993); (c) in-session practice of mindful breathing; and (d) an in-session body scan. All psychoeducational material was covered in Session 1 of both groups, and participants were assigned daily homework exercises to practice between Sessions 1 and 2. Homework included an evaluation of the factors contributing to participants' sexual experiences, completion of their own sexual response cycle, and at-home practice of skills in nonsexual and sexual situations (e.g., identifying and challenging biased thoughts for the CBT group;

[1] The developed facilitator's manual for the CBT and MBT interventions are available upon request to the first author.

mindfully observing bodily sensations for the mindfulness group). Session 2 included a review of the material from Session 1, homework review, and troubleshooting. Participants were also encouraged to ask questions about the material and about their homework. At the end of Session 2, participants in both arms were instructed to continue with daily practice of their skills in nonsexual and sexual situations. Group sessions were cofacilitated by two clinical psychology graduate students who had received training in CBT and mindfulness techniques and who were both supervised by the Brotto.

Three to four weeks after Session 2, participants took part in the post-group assessment, which was identical to the first except that the other neutral-erotic film sequence was presented. Women were then thoroughly debriefed and compensated $40 each. They were also provided with a list of resources to seek further services. All procedures were approved by the university's and the hospital's research ethics board.

Data Analysis

As described by Rellini et al. (2005), the most appropriate way to investigate the relation between genital and subjective sexual arousal within a person uses multilevel methodologies. These methodologies have been widely used in studies that examine the relation between two variables as these variables change over time (Bryk & Raudenbush, 1992). Multilevel methodology is considered to be a more appropriate tool to analyze data when examining rich information similar to that provided by psychophysiology research because it allows one to use continuous data rather than reducing hundreds of observations to one point. It also allows one to examine changes within an individual (from pre- to posttreatment) rather than computing averages across individuals. Because in this study we were specifically interested in the extent to which the intervention would lead to increased concordance between genital and subjective sexual arousal within a woman (and not between women), a multilevel linear modeling approach was deemed to be most appropriate.

To address this research question, we completed a three-level model in which subjective sexual arousal (SA) was the outcome variable predicted by VPA (Level 1). We used data from the pre- and posttreatment assessment sessions (Visit 0 = pretreatment, Visit 1 = posttreatment) to determine whether participants' genital/subjective ratio decreased, as expected, with intervention (Level 2). This model also compared the CBT and MBT arms (Group 0 = CBT, Group 1 = MBT) to test the hypothesis that sexual concordance would become stronger after MBT compared with CBT (Group, Level 3).

We used Hierarchical Linear Modeling 6 (SSI, Inc.) software to compute all multilevel analyses. For a comprehensive summary of the models tested and a detailed explanation of the meaning of each coefficient, see the Appendix. Although the tables report all coefficients, in agreement with the

guidelines for reporting hierarchical linear modeling results, only the coefficients of interest will be discussed here. The relation between VPA and SA is represented by a regression line, characterized by an intercept and a slope. Four main coefficients representing the VPA/SA ratio are the focus of our attention: (a) the VPA/SA ratio at pretreatment for the CBT group ($\gamma 20$), (b) the ratio at pretreatment in the MBT arm ($\gamma 21$), (c) the ratio at posttreatment for the CBT group ($\gamma 30$), and (d) the ratio at posttreatment for the MBT arm ($\gamma 31$). Hierarchical linear modeling uses a reference group, which, in this model, was the CBT group. Therefore, all results are first provided for the CBT group and subsequently on the difference between the MBT and the CBT groups.

Analyses of change in VPA and in SA (separately) are often computed with a repeated measures analysis of variance; however, for consistency, we elected to present the multilevel results for the data so that VPA, SA, and the relation between VPA and SA would have the same format. Multilevel coefficients can be interpreted as regression coefficients for VPA increase during the erotic condition comparing pretreatment to posttreatment VPA and comparing treatment change across groups. We conducted these analyses to confirm that the change in ratio was the product of greater SA and lower VPA after MBT.

These hierarchical linear modeling models concurrently assess for the effects of Condition and Condition × Visit, although, for clarity, we first presented the effects observed at pretreatment (visit = 0) and then the results for changes in outcomes after treatment (visit = 1).

RESULTS

Participants' Sexuality-Related and Mood Characteristics at Pretreatment

Pretreatment values for FSFI subscales and the FSDS appear in Table 1. There were no significant baseline group differences on any of these variables except the Female Sexual Function Index's orgasm domain, $t(15) = -2.35$, $p < .05$, with women in the MBT arm reporting significantly higher scores than women in the CBT arm.

Effects of Erotic Stimuli on Genital and Subjective Sexual Arousal at Pretreatment

To assess potential differences in the two groups before treatment, we first examined the sexual responses to laboratory-induced erotic stimuli. We computed a three-level model to compare changes in overall increase in sexual arousal (VPA or SA) during the erotic film (Level 1) from pre- to posttreatment (Level 2) and to see whether these changes differed by condition (CBT

TABLE 1. Participants' Responses on the Female Sexual Function Index and the Female Sexual Distress Scale at Pretreatment for Women in the Cognitive Behavioral Therapy and Mindfulness-Based Therapy Groups

	Cognitive behavioral ($n = 8$)		Mindfulness-based therapy ($n = 12$)			
Measure	*M*	*SD*	*M*	*SD*	*t*	*df*
FSFI desire	3.53	1.91	2.70	1.29	1.16	18
FSFI arousal	3.94	1.41	3.98	1.33	–0.06	15
FSFI lubrication	4.43	1.44	4.80	0.95	–0.64	15
FSFI orgasm	3.10	1.38	4.49	1.05	–2.35*	15
FSFI satisfaction	4.15	1.61	3.20	1.37	1.27	14
FSFI pain	4.05	2.23	3.90	2.92	0.12	14
FSFI total score	23.19	6.96	23.57	5.91	–0.12	14
FSDS score	27.50	7.45	30.33	7.85	–0.81	18

Note. Higher FSFI scores denote better sexual functioning. Higher FSDS scores indicate more sexually related distress. FSFI = Female Sexual Function Index; FSDS = Female Sexual Distress Scale.
*$p < .05$.

vs. MBT; Level 3). In this section, we present only the coefficients pertaining to pretreatment: $\gamma 20$ and $\gamma 21$. A complete list of the relevant coefficients is presented in Table 2 and will be discussed later.

At pretreatment, women in the CBT group showed a significant increase in SA ($t = 6.52$, $p < .001$); during the erotic film they showed an increase in 3.00 SA units (range: 2–7) every 30 s, for the duration of the erotic stimulus (Table 2). The MBT group showed a significantly lower SA in response to the erotic film as compared with the CBT group ($t = –2.89$, $p < .05$); their average increase in SA for each 30 s of erotic video was 0.79 SA units (Figure 1, Panel A). This suggests a possible randomization bias; however, because of our method of within-subjects analysis, this difference did not affect the results.

Women in the CBT group showed an increase in VPA in response to the erotic film ($t = 2.56$, $p < .05$) and for women in the MBT arm there was a similar significant increase in VPA that did not differ from the CBT group ($t = 0.99$, $p = .35$). On average, women in the CBT and MBT groups showed a VPA increase of 0.02 millivolts every 30 s during erotic stimulation (Table 2 and Figure 1, Panel B) suggesting that the film was effective at eliciting genital arousal.

Effects of CBT and MBT on the Relation Between Genital and Continuous Subjective Sexual Arousal; VPA/SA

Coefficient $\gamma 20$ in Table 3 represents the ratio VPA/SA during pretreatment for the CBT group. This coefficient was statistically significant ($t = 2.45$, $p < .05$), indicating that SA increased along with VPA at pretreatment for the CBT

TABLE 2. Hierarchical Linear Modeling Coefficients Illustrating Effects of Treatment on Subjective and Genital Sexual Arousal for Cognitive Behavioral Therapy and Mindfulness-Based Therapy Groups

	Coefficient	*SE*	*t*	*df*	*p*
Subjective sexual arousal					
Pretreatment					
CBT					
$\gamma 00$ Intercept	0.111	0.101	1.10	516	.27
$\gamma 20$ Change during erotic film	3.004	0.461	6.52	15	.00
MBT					
$\gamma 01$ Intercept	0.335	0.247	1.36	516	.18
$\gamma 21$ Change during erotic film	–2.214	0.767	–2.89	15	.01
Posttreatment					
CBT					
$\gamma 10$ Intercept	0.014	0.024	0.62	516	.54
$\gamma 30$ Change during erotic film	0.338	0.325	1.04	15	.32
MBT					
$\gamma 11$ Intercept	−0.328	0.223	–1.47	516	.14
$\gamma 31$ Change during erotic film	0.887	0.448	1.98	15	.06
Genital sexual arousal					
Pretreatment					
CBT					
$\gamma 00$ Intercept	0.052	0.009	5.51	516	<.001
$\gamma 20$ Change during erotic film	0.001	0.0004	2.56	15	.031
MBT					
$\gamma 01$ Intercept	–0.002	0.002	–0.1	516	.925
$\gamma 21$Change during erotic film	0.001	0.0009	0.99	15	.350
Posttreatment					
CBT					
$\gamma 10$ Intercept	0.003	0.025	0.49	516	.629
$\gamma 30$ Change during erotic film	0.001	0.009	0.13	15	.901
MBT					
$\gamma 11$ Intercept	0.002	0.015	0.99	516	.550
$\gamma 31$ Change during erotic film	–0.014	0.019	–0.74	15	.463

TABLE 3. Concordance Between Genital and Subjective Sexual Arousal

	Coefficient	*SE*	*t*	*df*	*p*
$\gamma 00$	0.028	0.005	6.01	17	.000
$\gamma 01$	–0.023	0.011	–2.06	17	.055
$\gamma 10$	0.001	0.009	0.13	30	.901
$\gamma 11$	–0.014	0.019	–0.74	30	.463
$\gamma 20$	0.009	0.004	2.45	17	.025
$\gamma 21$	–0.001	0.005	–0.26	17	.802
$\gamma 30$	0.003	0.003	1.20	30	.242
$\gamma 31$	–0.013	0.004	–3.04	30	.005
	SD	Variance	χ^2	*p*	
R0	0.024	.0006	496.68	.000	
R1	0.004	<.0000	87.65	.000	
E	0.014	.0002			
Random	0.007	<.0000	15.44	>.500	
Subjective sexual arousal	0.008	<.0000	92.47	.000	

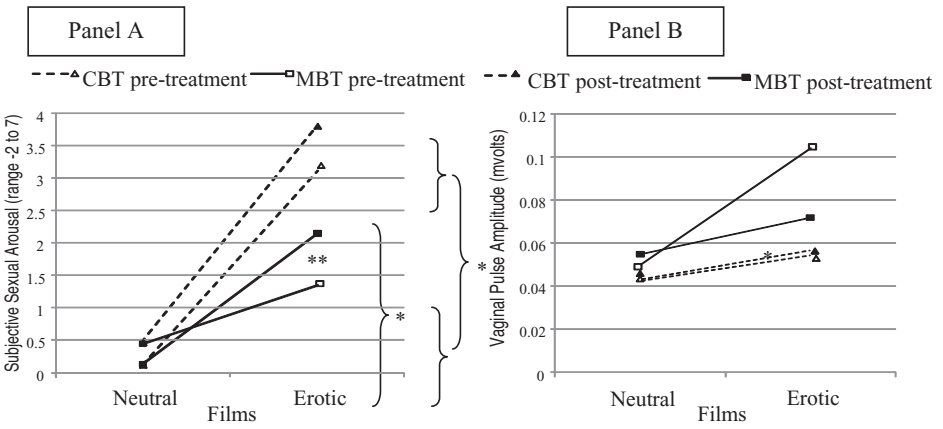

FIGURE 1. Increase in subjective (Panel A) and genital (Panel B) sexual arousal from the neutral to the erotic film for the mindfulness-based therapy (MBT) and cognitive behavioral therapy (CBT) groups. The empty markers indicate measures during pretreatment, and the filled markers represent posttreatment data. The reference group is CBT at pretreatment. No significance in pretreatment slopes indicates that the slopes were not statistically different from those in the CBT pretreatment. No significant difference in posttreatment slopes indicates that the changes from pre- to posttreatment were not significantly different from the changes from pre- to posttreatment for the CBT group. Thus, we can interpret the following results as all groups showed a significant increase in subjective sexual arousal (SA) and vaginal pulse amplitude (VPA). For SA at pretreatment, the MBT group reported greater SA than did the CBT group. Also, the increase in SA from pre- to posttreatment was greater for the MBT group than it was for the CBT group. For the VPA, all groups showed a statistically significant increase in VPA, and no significant differences were observed between groups.

group. Overall, for each increase in 1 SA unit (range: 2–7), women in the CBT group showed an average increase of 0.009 millivolts in VPA. Coefficient $\gamma 21$ was not statistically significant ($t = -0.26$, $p = .80$), indicating that the MBT group did not significantly differ from the CBT group at pretreatment; that is, women in both groups showed that increases in VPA were associated with increases in SA at pretreatment. For the MBT group, an increase in 1 SA unit corresponded to an increase of 0.008 millivolts of VPA ($\gamma 20 + \gamma 21$; Figure 2).

The second set of coefficients (i.e., $\gamma 30$ and $\gamma 31$) illustrated the change in VPA/SA ratio from pre- to posttreatment. Coefficient $\gamma 30$ was not statistically significant ($t = 1.20$, $p = .24$), indicating that, for the CBT group, this ratio did not significantly change from pre- to posttreatment. Coefficient $\gamma 31$ was statistically significant ($t = -3.04$, $p < .01$), suggesting that for the MBT group, the VPA/SA ratio significantly changed from pre- to posttreatment and the change was in the expected direction. Upon computation of the coefficients ($\gamma 20 + \gamma 21 + \gamma 30 + \gamma 31$), we found that, on average, during posttreatment, for a woman in the MBT group an increase in 1 SA unit was associated with an increase in .002 millivolts in VPA. At pretreatment, 1 SA unit change was associated with .008 millivolt increase in VPA; thus,

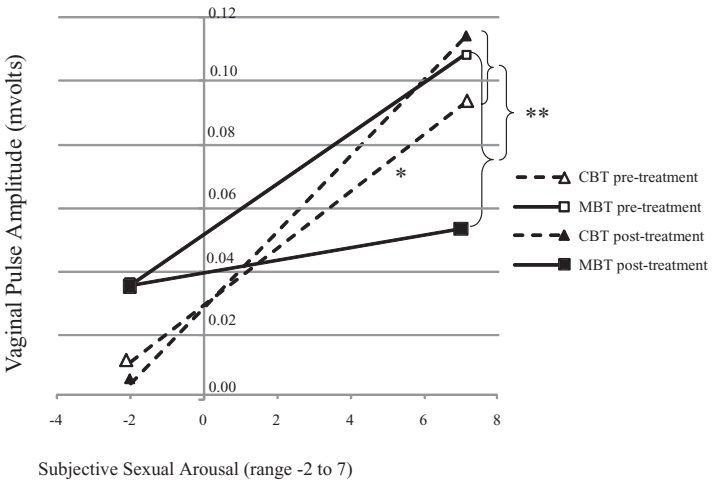

FIGURE 2. Illustration of the multilevel model describing the relation between genital vaginal pulse amplitude (VPA) and subjective sexual arousal (SA). Solid lines represent the mindfulness-based therapy (MBT) group, and the dashed lines represent the cognitive behavioral therapy (CBT) group. A decrease in slopes indicates that the same SA is achieved with less VPA, thus indicating a potential increase in the relation between VPA and SA. The reference group is CBT baseline. For the reference group, the relation between VPA and SA was statistically significant ($p < .05$). Compared with the CBT group, the MBT group showed greater changes from baseline to postgroup in the relation between VPA and SA ($p < .01$). For the MBT group at posttreatment, same levels of SA were reported with less increase in VPA, indicating that less VPA change was needed in order to reach the same level of SA (i.e., greater sexual concordance = reduction in slope).

women in the MBT arm showed that, after treatment, the VPA/SA ratio was smaller, suggesting that either SA increased or VPA decreased after treatment (Table 3).

Effects of CBT and MBT on Subjective Sexual Arousal at Posttreatment

At posttreatment, the CBT group showed a trend towards increased SA (Table 2) that was not statistically significant ($t = 1.04$, $p = .32$). The MBT group showed a trend toward a greater increase in SA ($t = 1.98$, $p = .06$). For the CBT group, SA changed from 3.00 SA units to 3.33 SA units every 30 s, whereas the change in SA went from 0.79 to 2.02 units every 30 s for the MBT group (Figure 1).

Effects of CBT and MBT on Genital Sexual Arousal at Posttreatment

On the basis of the three-level model used to predict VPA, the CBT group showed a significant increase in VPA in response to the erotic film at posttreatment, $p < .05$ (Figure 1, Panel B). However, there was no significant

change in VPA from pre- to posttreatment with CBT ($t = 0.13$, $p = .90$), meaning that the VPA response to the erotic film was not different from pre- to posttreatment in the CBT group. The coefficient testing for condition differences also showed that the same pattern was true for the MBT group ($t = –0.74$, $p = .463$) such that VPA significantly increased in response to the erotic film at posttreatment, but this change at posttreatment was not significantly different from pretreatment.

Effects of CBT and MBT on Sexual Distress

A between- (CBT, MBT) and within- (pretreatment, posttreatment) repeated measures analysis of variance examined the effects of treatment on sexual distress as measured by the FSDS total score. There was a significant main effect of treatment, $F(1, 11) = 5.07$, $p = .046$, but no treatment by group interaction, $F(1, 11) < 1$, indicating that women in both groups experienced a significant decrease in sexual distress (Figure 3). Overall there was a

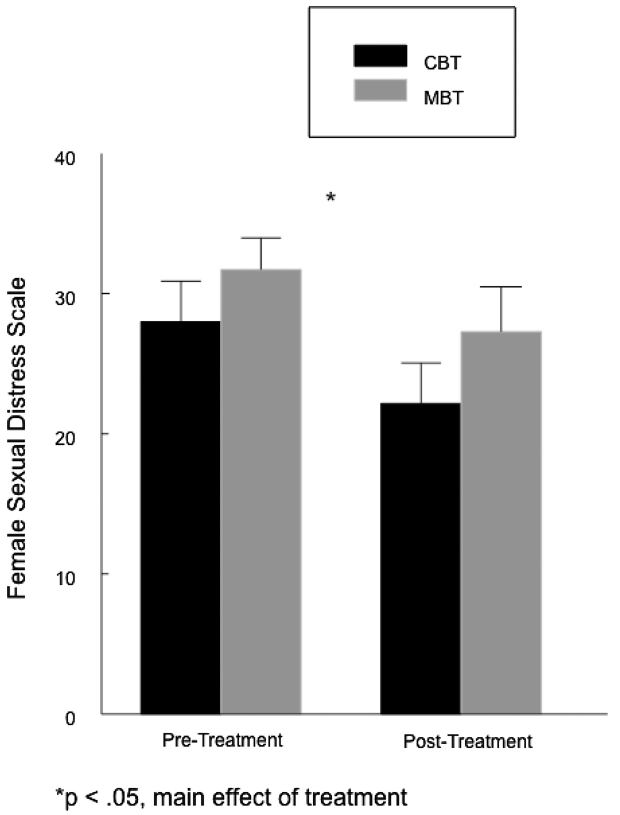

FIGURE 3. Effects of cognitive behavioral therapy (CBT) and mindfulness-based therapy (MBT) on Female Sexual Distress Scale scores. Data represent mean plus standard error of the mean.

6-point drop in FSDS scores from pre- (mean: 30) to posttreatment (mean: 24).

DISCUSSION

Overall, women in the MBT arm showed a significant change in concordance between genital and subjective sexual arousal (a) at posttreatment compared with pretreatment and (b) compared with women in the CBT group. The reduction in the VPA/SA coefficient indicated that, relative to pretreatment, for every unit increase in subjective arousal at posttreatment, this required a corresponding smaller increase in VPA to elicit the same subjective arousal response. In the CBT group, there was no significant difference in concordance between genital and subjective sexual arousal from pre- to posttreatment. The hierarchical linear modeling coefficient for the slope of the relation between VPA and SA is equivalent to a VPA/SA ratio; thus, it is a measure of the amount of change in the dependent variable for every change in one unit of the independent variable. Treatment also resulted in a slightly greater increase in the subjective sexual arousal reported by the MBT group compared with the CBT group; however, the groups did not differ in magnitude of VPA response to erotic films from pre- to posttreatment. Sexual distress significantly declined in both groups at posttreatment, with no between-group differences.

In their critical review of the literature showing the inadequacy of pharmacotherapies in the treatment of women's sexual problems, Chivers and Rosen (2010) postulated that any treatment-related increase in VPA that was not associated with a corresponding increase in subjective sexual arousal would result in a reduced concordance score. Therapies for low sexual arousal have advocated the importance of attuning to one's body and not simply on increasing genital sexual response (i.e., Brotto, Heiman, et al., 2008; Meston, Rellini, & Telch, 2008). Our findings showed that women participating in a brief mindfulness intervention reported a greater subjective sexual arousal to ostensibly the same genital sexual arousal response they experienced before treatment, thus leading to a decrease in the VPA/SA ratio. Given that one goal of our MBT was to allow women to connect the somatic with the psychological experience in a nonjudgmental manner, we interpret these findings as an indication that these women were able to reach greater subjective sexual arousal by attuning more to their bodily sensations and letting go of the negative cognitive chatter. Although genital engorgement (insofar as this is what is measured by VPA) remained unchanged, women were now experiencing their physical sexual responses such that this awareness may have facilitated an increase in subjective sexual arousal.

Our findings are consistent with previous studies showing that mindfulness-based treatments are associated with enhanced sexual functioning (Brotto, Heiman, et al., 2008), and with studies demonstrating that mindfulness is effective for a variety of health ailments (Grossman, Niemann, Schmidt, & Walach, 2004). There may be many potential avenues by which mindfulness led to these changes. For example, because women in the mindfulness group were encouraged to focus their moment-to-moment awareness on a greater range of stimuli during sexual activity, this redirection of attention may have allowed women to let go of attachment to distracting thoughts (e.g., memories of sexual abuse or thoughts of other negative sexual interactions). Mindfulness also encouraged women to allow negative thoughts and feelings to gently come and go from awareness rather than suppress or try to avoid them. The Buddhist Psychological Model indicates that it is the lack of attachment to these sense perceptions, and the practice of acceptance of what is, that opens the pathway to improvement (Grabovac, Lau, & Willett, 2011), and leads to tolerance (Lynch, Chapman, Rosenthal, Kuo, & Linehan, 2006). Concepts of acceptance and neutrality towards negative affect were not addressed in the CBT arm, which is known for its change-oriented approach to irrational thoughts. Second, in letting go of the attachment to distracting negative thoughts, women in the MBT arm may have been able to enhance the quality of their awareness by noticing what was actually occurring in the present moment, including experiences such as pleasurable sexual feelings. This concentration training aspect of mindfulness meditation is reminiscent of the goals of sensate focus (Masters & Johnson, 1970), which encourages an individual to focus their attention onto pleasant sexual sensations.

Women also learned about the concept of *nonjudgment* (Linehan, 1993) in the MBT arm, which encourages one to be in the present moment in a factual (or nonjudgmental) way, and to stop the typical struggle that often occurs in the presence of unwanted thoughts, emotions, physical sensations, or other experiences (e.g., struggling to rid or suppress thoughts). When practicing being nonjudgmental, women recognized each moment for exactly what it was, and refrained from placing their own ideas or interpretations onto the experience. This included adverse stimuli as well as pleasant and wanted stimuli. Women were taught to notice their tendency to label an experience judgmentally (e.g., as *good* or *bad*, *right* or *wrong*), and to practice restating their experiences factually. For example, a participant may have practiced rephrasing the statement, "I am having a *bad* thought" or "That's a *terrible* feeling" to "I notice a thought that increased my heart rate and increased my emotion of anxiety." Lynch and colleagues (Lynch et al., 2006) described the mechanisms of mindfulness as being similar to the notion of interoceptive exposure, in which all experiences (including distressing ones) are allowed for. Although speculative, it may be the case that women became habituated to negative stimuli over the course of their participation as

they practiced allowing rather than suppressing such stimuli, thus lowering the likelihood that the stimuli resulted in distressing responses (Lynch et al., 2006). Acceptance of what is a key mediating factor of mindfulness practice, and it has been linked to improved clinical symptoms in a variety of different populations (e.g., Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

In general, women's increased repertoire of responses may have been the mechanism for change. Because women with a history of CSA may learn to respond to sexual interactions with dissociation during childhood (Finkelhor & Browne, 1985), the dissociation can become maladaptive during wanted sexual experiences in adulthood. The MBT group aimed to provide women with skills allowing them to respond more adaptively to their wanted sexual experiences, including focusing on a greater range of stimuli in the present moment. Although CBT and MBT are associated with a change in clinical symptoms, the target of change differs between the techniques, with CBT being focused on changing thoughts, whereas mindfulness involves changing one's reactions to thoughts (Farmer & Chapman, 2007). Women in the MBT arm learned to tolerate and accept their emotional reactions to sex, and this likely promoted increased awareness of a range of stimuli in any given moment, instead of a focus on adverse stimuli only.

Results from the present study also indicated a significant decrease in sexual distress for women in both groups, which was larger in magnitude that that found in recently reported clinical trials of women with sexual dysfunction. For example, in a recent randomized placebo-controlled trial of flibanserin conducted on premenopausal women with hypoactive sexual desire disorder (Nappi et al., 2009), the placebo group had a drop in Female Sexual Distress Scale scores of 3 points and the flibanserin groups had a drop of 4.8–6.4 points, depending on the dose. It is notable that our trial of a brief psychological intervention resulted in decreases in sexual distress that were at least as marked and even more marked than that obtained by 24 weeks of treatment with a pharmacological agent. These findings have significant clinical implications for providing women with non-pharmacologic options for effectively reducing their sexual distress.

The effect of nonspecific therapeutic factors cannot be understated. Women derived a sense of support in the group milieu which was likely therapeutic and may have contributed to the reduced sexual distress scores. Several participants anecdotally reported feeling relief and comfort with discussing their sexual histories and with having their histories of abuse acknowledged. Women also frequently noted that they were comforted knowing others who had gone through similar experiences (i.e., childhood sexual abuse), and several women expressed hope for their futures as a result of participating. Both groups also went through skills training that promoted relaxation (e.g., diaphragmatic breathing in CBT and body scan in mindfulness). As suggested by Farmer and Chapman (2007), it is possible that these

techniques helped to reinforce adaptive responses and extinguish maladaptive responses. That is, the relaxation techniques practiced in both groups may have reinforced women's presence in the group setting, participation in the sessions, and in-session practice of the other new skills.

There are several limitations to the current study worth noting. First, our study did not include a waitlist or no treatment control group. This did not allow for an understanding of potential placebo effects at play. An examination of the effectiveness of CBT and MBT versus placebo was not our aim; instead, we were interested in pitting these interventions against one another since both have been found useful in recent trials of sexual problems. It should also be mentioned that alternate interpretations for the increased concordance seen in the MBT group are possible. For example, it might be that women in the MBT arm experienced a greater discrepancy in concordance between subjective and genital sexual responses given that subjective sexual arousal increased while the genital response remained the same. Having a cutoff coefficient that indicates how much genital sexual response is normal to expect for each increase in subjective sexual response could help direct the interpretation of such findings. Given the lack of data on this cutoff, we are basing our interpretation of the findings on the theories that guided our selection of mindfulness as a way to increase attunement with physiological states. Another limitation was that a detailed history of sexual abuse and symptoms of posttraumatic stress disorder were not gathered for most women. It is possible that the effect of our interventions may have been dependent on women's baseline trauma symptoms. Our study was also limited by a small sample size, which included women who were recruited through advertisements and who likely do not represent the population of women who would typically seek help for sexual difficulties. Also, although several women who withdrew or chose not to participate provided reasons for doing so, 10 either did not show up for their scheduled sessions or withdrew from participation without explanation. Although our experience is that this is typical for studies of this nature, we cannot comment on the characteristics of our sample versus the larger group of women with CSA history and sexual distress. It is important to note that our CBT and MBT interventions involved only two sessions and therefore are unlike other larger trials using these therapies. Also, while the group format may have been beneficial for several reasons, it did not allow for a focus on each individual's situation or specific difficulties. Last, there are limitations associated with the assessment portion of the study. Assessments were conducted in the contrived setting of the laboratory. It may be that women's responses would differ in their real-life sexual situations, such as when their partners were present. The degree to which the laboratory-based findings translate into women's real-world experiences is unclear. Limitations associated with the use of vaginal photoplethysmography should also be considered. There is debate in the literature about whether physiological measures of

female sexual arousal are an indicator of sexual function status, and research has shown low diagnostic sensitivity (Brotto, Basson, & Gorzalka, 2004; Meston, Rellini, McCall, 2010). The signal is also subject to distortion (e.g., movement, coughing), and movement artifacts in the data must be removed. Data also support the presence of biases in participation. For example, Wolchick, Spencer, and Lisi (1983) reported that volunteers in studies of photoplethysmography reported less sexual anxiety, more frequent masturbation, and more exposure to erotica compared with nonvolunteers.

In this small pilot study of a brief CBT and MBT intervention, the findings point to a significant impact on reducing sexual distress among women with a history of CSA. In addition, a brief mindfulness-based intervention significantly increased concordance between genital and subjective sexual arousal by increasing the amount of subjective sexual arousal to a fixed level of genital arousal in response to an erotic stimulus. These findings support other research pointing to mindfulness as an important therapeutic agent in the treatment of sexual dysfunction (Brotto, Heiman, et al., 2008; Brotto, Krychman, & Jacobson, 2008; Brotto & Woo, 2009), and suggest that future research should examine an expanded mindfulness-based intervention in a larger sample of women with sexual distress related to a CSA history. If replicated, the findings would have significant clinical implications for treatment of this distressing and often difficult to treat aspect of quality of life.

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APPENDIX. Descriptions of Coefficients and Hierarchical Linear Modeling Model Used to Test Variance in Subjective Sexual Arousal Measured With the Arousometer for Participant *i* During Visit *k* in Group *j*

	Coefficients	
	Symbol	Description
Level 1		
$SA_{ikj} = \pi_{0kj} + \pi_{1kj}(VPA) + \varepsilon_{ikj}$		
	π_{0kj}	Initial SA of a visit *kj* in the last second of the nonsexual video
	π_{0ij}	Change in SA predicted by VPA during visit *kj*
	e_{tij}	Error
Level 2		
$\pi_{0kj} = \beta_{00j} + \beta_{01j}(Visit)_{kj} + r_{0ij}$		
	β_{00j}	Mean initial SA during the last second of nonsexual video during pretreatment (visit = 0) for group *j*
	β_{01j}	Mean initial SA during last second of nonsexual video at Visit k (i.e., posttreatment; visit = 1) for group *j*
$\pi_{1kj} = \beta_{10j} + \beta_{11j}(Visit)_{ik} + r_{1ij}$		
	β_{10j}	Change in SA predicted by VPA, pretreatment (visit = 0) for group *j*
	β_{11j}	Change in SA at posttreatment (visit = 1) for group *j*
Level 3		
$\beta_{00j} = \gamma_{00} + \gamma_{01}(Group)_j + u_{00j}$		
	$\gamma 00$	SA during the neutral condition at pretreatment (visit = 0) for a participant in the CBT group (Group 0) – intercept for the line describing CBT group at pretreatment
	$\gamma 01$	SA during the neutral condition at pretreatment (visit = 0) for a participant in the MBT arm (Group 1)
$\beta_{01j} = \gamma_{10} + \gamma_{11}(Group)_j + u_{10j}$		
	$\gamma 10$	SA during the neutral condition at posttreatment (visit = 1) for the CBT arm (Group 0)
	$\gamma 11$	SA during the neutral condition at posttreatment (visit = 1) for the MBT arm (Group 1)
$\beta_{10j} = \gamma_{20} + \gamma_{21}(Group)_j + u_{01j}$		
	$\gamma 20$	SA predicted by VPA at pretreatment (visit = 0) for the CBT group (Group 0) – coefficient represents SA/VPA ratio.
	$\gamma 21$	SA predicted by VPA at pretreatment (visit = 0) for a participant in the MBT arm (Group 1); ratio SA/VPA for the MBT arm at pretreatment as compared with the CBT arm

APPENDIX. Descriptions of Coefficients and Hierarchical Linear Modeling Model Used to Test Variance in Subjective Sexual Arousal Measured With the Arousometer for Participant *i* During Visit *k* in Group *j (Continued)*

	Coefficients	
	Symbol	Description
$\beta_{11j} = \gamma_{30} + \gamma_{31}(Group)_j + u_{11j}$		
	$\gamma 30$	SA predicted by VPA at posttreatment (visit = 1) for a participant in the CBT condition, the reference condition (Group 0); changes in SA/VPA ratio from pre- to posttreatment for the CBT, reference group
	$\gamma 31$	SA predicted by VPA at posttreatment (visit = 1) for a participant in the MBT arm (Group 1), compared with the CBT group; changes in SA/VPA ratio from pre- to posttreatments in the MBT group as compared with the CBT group

SA = subjective sexual arousal. VPA = vaginal pulse amplitude. MBT = mindfulness-based therapy. CBT = cognitive behavioral therapy.