### **ORIGINAL PAPER**



# Statistical Mediators of the Association Between Mindfulness and Sexual Experiences in Men with Impaired Sexual Function

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### Abstract

Mindfulness-based therapy has shown promise as a treatment for female sexual dysfunction and has the potential to be an efficacious treatment for male sexual dysfunction. However, there has been little empirical evidence regarding the mechanisms through which mindfulness may improve sexual experiences, especially for men. Recent theoretical reviews have suggested potential mediators that may explain the beneficial effects of mindfulness on symptoms of male sexual dysfunction, including reduced avoidance of sex, reduced distraction during sex, and/or reduced activation of negative sexual schemas. We attempted an initial statistical test of these factors as potential mediators of the association between trait mindfulness and multiple sexual outcomes (sexual function, sexual satisfaction, and sexual distress) using a cross-sectional correlational design. A total of 163 men with self-reported current impairments in one or more aspects of sexual function. Sexual avoidance statistically mediated the link between mindfulness and sexual satisfaction, but not other aspects of sexual function. Sexual avoidance statistically mediated the link between mindfulness and premature ejaculation, both distraction and activation of negative schemas statistically mediated the link between mindfulness. These results generally supported previous theoretical work and have implications for future treatment outcome research.

Keywords Mindfulness · Sexual dysfunction · Mediation · Sexual well-being

# Introduction

Male sexual dysfunction (MSD) has been defined as impairment in sexual function (low sexual desire, delayed or premature orgasm, and/or erectile dysfunction), with related subjective distress (APA, 2013). MSD is very common, with an estimated 20–30% percent of men reporting at least one current sexual difficulty (Lewis et al., 2004). Given that MSD has been associated with depression (Atlantas & Sullivan, 2012), low self-esteem (Althof et al., 2006), and decreased general wellbeing (McCabe & Althof, 2014), there is a significant need for effective treatment options. Mental health professionals have developed multiple psychotherapies which appear helpful in many, but not all, cases (Almås & Landmark, 2010; Frühauf, Gerger, Schmidt, Munder, & Barth, 2013). To continue to

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improve these treatments, it is important to understand what maintains MSD and how treatments can effectively target these maintaining factors.

Two well-supported theoretical models have summarized factors thought to cause and maintain MSD. Barlow's (1986) model posited that MSD is maintained by an interaction between multiple cognitive-emotional processes during and following sex. According to this model, men with MSD enter sexual situations with negative affect (e.g., anxiety) and expectations of negative outcomes. This mindset is thought to cause a shift in attention to possible signs of negative outcomes (e.g., partner dissatisfaction with sexual performance). This attentional shift is then thought to activate the sympathetic nervous system, which intensifies negative affect and contributes to distraction from erotic cues (e.g., one's physical pleasure), reducing arousal. Impaired arousal reinforces negative emotions, leading to anxious apprehension regarding future sexual experiences and/or avoidance of sexual activity (Barlow, 1986; Wiegel, Scepkowski, & Barlow, 2007).

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Nobre's (2010) model of MSD outlined similar cognitive-emotional processes. This model proposed that men with MSD have stable, negative sexual schemas: broad collections of subconscious beliefs and associations regarding sex which are activated in relevant situations (Beck, 1963). For men with MSD, these schemas are thought to include negative, global judgments of the self in relation to sexual activity (e.g., "I'm helpless" or "I'm weak" Nobre, 2010). When men with MSD experience impaired sexual function, these schemas are activated, influencing the content of automatic thoughts during sex (e.g., "This is not going anywhere" or "I must achieve an erection"; Nobre & Pinto-Gouveia, 2003). These thoughts cause distraction and negative emotional responses, which disrupt sexual function further (Nobre, 2010; Nobre & Pinto-Gouveia, 2000). These two models exhibit significant overlap and suggest important maintaining factors of MSD that can be targeted by psychotherapeutic interventions: activation of negative sexual schemas, cognitive distraction during sex, and behavioral avoidance of sex.

At least some empirical evidence of the importance of each of these factors in maintaining MSD has been found. In terms of schemas, individuals with MSD tended to score significantly higher on measures of negative sexual schemas (Nobre & Pinto-Gouveia, 2009a, 2009b; Quinta Gomes & Nobre, 2012). A lack of positive sexual schemas has also been linked to a range of negative sexual outcomes (Andersen, Cyranowski, & Espindle, 1999; Cyranowski, Aarestad, & Andersen, 1999). Additionally, there has been experimental evidence that manipulating schemas can improve sexual function, at least in women (Kuffel & Heiman, 2006; Middleton, Kuffel, & Heiman, 2008).

In terms of distraction, correlational studies have found that greater frequency of non-erotic thoughts during sex (which are thought to distract from erotic cues) was associated with worse sexual satisfaction and sexual function in men and women (Nelson & Purdon, 2009; Purdon & Holdaway, 2006; Purdon & Watson, 2011). Early experimental research also found distraction impaired sexual function (Farkas, Sine, & Evans, 1979; Geer & Fuhr, 1976). However, one study found that distraction reduced erection for men without sexual problems, but not for men with sexual problems (Abrahamson, Barlow, Sakheim, Beck, & Athanasiou, 1985). They suggested that men with sexual problems were already distracted from erotic cues because their attention was already focused on evaluating their response (i.e., performance monitoring) or other non-sexual topics (Beck, Barlow, & Sakheim, 1983). Recent research has also found that individuals who reported more distraction during sex exhibited lower sexual satisfaction and less consistent rates of orgasm (Dove & Wiederman, 2000; Newcombe & Weaver, 2016).

Distraction and resulting impaired arousal are thought to result in avoidance of sexual activity. Avoidance of feared situations is well established as a maintaining factor across psychological disorders (Foa & Kozak, 1986) because it prevents the disconfirmation of overly negative thoughts and unrealistic perceptions of threat and may maintain negatively biased perceptions regarding one's sexual response (Foa et al. 2006; Wiegel et al., 2007). According to Sbrocco and Barlow (1996), 90 percent of men in their sample who sought treatment for MSD reported ending a sexual experience after losing their erection. Qualitative research has similarly shown that men with erectile dysfunction may reduce initiation of sexual activity with partners (e.g., Bokhour, Clark, Inui, Silliman, & Talcott, 2001). In quantitative research, avoidance of sexual activity has predicted worse sexual pain and sexual functioning in women with provoked vestibulodynia (Desrochers, Bergeron, Khalifé, Dupuis, & Jodoin, 2010). The reduction in avoidance may also serve as a mechanism of action for psychological treatments of sexual problems (ter Kuile et al., 2007). In sum, both theoretical models and empirical evidence have suggested that negative schema activation, distraction, and avoidance can maintain sexual dysfunction.

One treatment that may target these processes is mindfulness-based therapy (MBT). Mindfulness has been defined as moment-to-moment awareness of present experience that is non-reactive and nonjudgmental (Kabat-Zinn, 2015). Mindfulness can be assessed as either a trait (i.e., typical levels of mindfulness across time) or a state (i.e., mindfulness at a given time). MBTs tend to differ from widely used cognitive-behavioral therapies by emphasizing acceptance of one's present experience, as opposed to trying to challenge or change it. MBTs have been shown to be efficacious for many psychological disorders (e.g., Kuyken et al., 2016; Roemer, Orsillo, & Salters-Pedneault, 2008).

Numerous studies have supported the effectiveness of MBTs for sexual dysfunction in women (Brotto & Basson, 2014; Stephenson & Kerth, 2017). Although the evidence is less extensive, preliminary findings have suggested that MBTs may also be helpful for MSD. For example, case studies have reported that MBT can be effective for treating erectile dysfunction (e.g., Sommers, 2013). Additionally, a recent test of a psychoeducational and mindfulness program for male and female colorectal cancer survivors with sexual problems found significant improvements in sexual satisfaction despite a small sample size of 15 men (Brotto et al., 2017a, 2017b). Bossio, Basson, Driscoll, Correia, and Brotto (2018) have also published the first study of which we are aware that tested MBT specifically designed for male sexual dysfunction. In this test of feasibility, ten men with erectile difficulties completed a group treatment and reported positive experiences, including improvement in both erectile function and sexual satisfaction. Given such promising findings, it is highly likely that this is the first of numerous studies to test the effects of MBT in men.

This probable growth provides an excellent opportunity to simultaneously test the efficacy of a new treatment and its mechanisms of action. In an influential review, Kazdin (2007) offered several reasons why studying mechanisms of action for psychological treatments is important. For example, identifying "active ingredients" of treatment allows for more targeted and efficient interventions, improving ease of dissemination and delivery. Investigating potential mechanisms of action for MBTs in men could provide similar benefits; however, highquality treatment outcome studies of psychological therapies for sexual dysfunction are relatively rare (Pyke & Clayton, 2015), due in part to difficulty obtaining funding (e.g., Brotto, 2007). In order to maximize our ability to effectively identify mechanisms of treatment response in these studies, scientists should assess for mediators that (1) are based on organized theories of sexual dysfunction, and (2) have received empirical support in the form of preliminary correlational research.

Recent reviews have suggested potential theory-based mechanisms of action for mindfulness-based treatment of sexual dysfunction. Arora and Brotto (2017) focused on female sexual dysfunction (FSD) and suggested that improved anxiety and depressed mood, along with interoceptive awareness (the conscious processing of, and attending to, internal physiological experiences) may serve as important mechanisms. Stephenson (2017) considered both FSD and MSD, utilizing Barlow's model of sexual dysfunction and existing research on MBTs for other disorders. A range of potential mechanisms were identified, including reduced distraction during sex, reduced avoidance of sex, and changing the content of negative sexual schemas (and/or reducing their activation). Indeed, evidence from areas other than sexual dysfunction has suggested that mindfulness may impact levels of distraction (Chambers, Lo, & Allen, 2008; Jain et al., 2007), schema content (Silberstein, Tirch, Leahy, & McGinn, 2012; Thimm, 2017), and maladaptive avoidance of unpleasant experiences (Davis, Manley, Goldberg, Smith, & Jorenby, 2014; Roemer et al., 2008). While limited research has explicitly assessed these mechanisms in the context of sex, there have been some preliminary correlational studies, primarily using female samples.

For example, Newcombe and Weaver (2016) found that distraction during sex statistically mediated the association between trait mindfulness and sexual satisfaction in a sample of women. Paterson, Handy, and Brotto (2017) expanded on this research, testing potential mediators in the context of a treatment study assessing MBT for female sexual arousal/interest disorder. They found that improved sexual function over the course of treatment was mediated by decreased depressed mood, increased self-compassion, and increased interoceptive awareness. Interoceptive awareness has been conceptualized as antithetical to distraction during sex (in that distraction directly reduces interoceptive awareness). Similarly, self-compassion has been thought of as antithetical to negative self-schemas (which include negative self-judgment). As such, these studies provided some support for reduced distraction and shifting schemas as possible mechanisms for the effect of mindfulness on sexual outcomes in women.

Pepping, Cronin, Lyons, and Caldwell (2018) conducted the only study of which we are aware that examined possible mediators of the link between mindfulness and sexual outcomes across both genders. They focused on sexual satisfaction, as well as hyperactivation/deactivation of the "sexual system" as relevant sexual outcomes. Using a cross-sectional correlational design, they found that emotional regulation statistically mediated the association between trait mindfulness and these outcomes. The authors noted that deactivation of the sexual system can include decreased sexual arousal, and that emotional regulation should be associated with reduced distraction during sex. As such, this study provided indirect support for the importance of distraction as a mediator of the link between mindfulness and sexual outcomes in men.

The goal of the present study was to expand upon this existing research by explicitly testing whether distraction during sex, negative cognitive schema activation, and avoidance of sex statistically mediated the association between mindfulness and sexual outcomes in men. While experimental manipulation of these factors in the context of a randomized clinical trial would be ideal, the scarcity of opportunities for such research (Brotto, 2007; Brotto et al., 2017a, 2017b) makes it essential to first establish potential mediators in preliminary correlational research. We attempted to expand on past studies in a number of ways.

First, we tested multiple potential mediators derived from empirically supported models of MSD simultaneously (i.e., assessing indirect effects of each while controlling for indirect effects of the others). Second, we used a sample of men reporting impaired sexual function, increasing the relevance of our results to clinical populations. Third, we assessed multiple sexual outcomes including sexual function, as well as potentially distinct components of subjective sexual well-being. Research on well-being broadly defined has suggested that positive mental health and happiness are distinct from the absence of mental illness and distress (e.g., Keyes, 2005, 2007). Sexuality research has similarly suggested that sexual satisfaction and distress may be independent constructs rather than opposite ends of a single continuum (Stephenson & Meston, 2010). As such, we included measures of all three factors.

Our specific hypotheses were:

- 1. Trait mindfulness would be associated with better sexual function, higher sexual satisfaction, and lower sexual distress in men reporting impaired sexual function
- Trait mindfulness would be associated with less distraction during sex, less activation of negative sexual schemas in response to sexual problems, and less avoidance of sexual activity
- Distraction, negative schema activation, and sexual avoidance would be associated with worse sexual function, satisfaction, and distress.

4. Distraction, negative schema activation, and sexual avoidance would significantly statistically mediate the association between trait mindfulness and sexual function, satisfaction, and distress.

# Method

### **Participants and Procedure**

Participants were recruited throughout the U.S. via online postings through Amazon's Mturk and Craigslist. Postings specified the following inclusion criteria: age 18 or older, male, sexually active in the past month, currently in a monogamous heterosexual relationship, and experiencing impairment in sexual desire, erection, or orgasm/ejaculation in the past month. Interested individuals contacted the laboratory via email or phone and were phone screened by undergraduate research assistants who answered any questions and ensured that individuals had not previously participated in the study. Research assistants were supervised by the first author (KS) and were familiar with DSM diagnostic criteria of sexual dysfunction. However, "impairments" in function were self-defined by participants. Participants who qualified received a link to a secure online survey hosted by SurveyMonkey.com and those who completed the survey were compensated \$10. All study procedures were reviewed and approved by the Institutional Review Board at Willamette University.

The final sample consisted of 163 men with an average age of 36.5 years (range, 19–67, SD = 11.0). Average length of relationship was 83.1 months (range, 1–538, SD = 100). Participants reported either a relationship status of married/in a domestic partnership (42.8%), or a non-marital monogamous relationship. Participants reported education levels of a high school degree or equivalent (10.3%), some college (27.9%), an associate's degree (7.3%), a bachelor's degree (39.4%), or a graduate degree (13.3%). The sample was largely Caucasian (70.3%), in addition to African-American (11.5%), Asian-American (9.1%), and Hispanic (5.5%).

### Measures

### Mindfulness

The Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) consists of 39 self-report Likert items which measure five domains of trait mindfulness: non-reactivity, observing, acting with awareness, describing, and nonjudgment. Item scores ranged from zero to five, with a higher score indicating a higher level of mindfulness. For the purposes of this study, the total score across all subscales was used to represent participants' level of trait mindfulness. Across facets, the FFMQ has shown adequate internal reliability (Cronbach's alpha=0.72–0.92; Baer et al., 2008), convergent validity (significant relationship with meditation experience), and predictive validity (significant negative relationship between most facets and psychological symptoms, and significant positive relationship with psychological well-being; Baer et al., 2008). In the current sample, Cronbach's alpha was 0.93.

### **Sexual Satisfaction and Function**

The International Index of Erectile Function (IIEF; Rosen et al., 1997) consists of 15 self-report Likert items which measure five domains of sexual function and well-being: erectile function, orgasmic function, intercourse satisfaction, sexual desire, and overall satisfaction. Item response options range from zero to five, with higher scores indicating better sexual function or well-being. The overall satisfaction subscale was used to represent participants' satisfaction with their sex life (e.g., "how satisfied have you been with your overall sex life?"). The erectile function, sexual desire, and orgasmic function subscales were used to represent sexual function. The IIEF has demonstrated a high degree of internal consistency (Cronbach's alpha = 0.73) and test-retest reliability (r=0.82 over 1 month), discriminant validity (significantly distinguishing between clinical and nonclinical populations), and convergent validity (positively correlating with clinical interview scores; Rosen et al., 1997). In the current sample, Cronbach's alpha was 0.87 for the sexual satisfaction subscale. The sexual desire subscale (Cronbach's alpha = 0.92), erectile function subscale (Cronbach's alpha = 0.94), and orgasmic function subscale (Cronbach's alpha=0.92) also exhibited adequate internal consistency. Of the 163 participants, 76 (44.1%) scored within the clinical range on the erectile function subscale, suggesting likelihood of significant erectile problems (Cappelleri, Rosen, Smith, Mishra, & Osterloh, 1999).

An additional aspect of male sexual function is premature ejaculation, which was measured using the Premature Ejaculation Diagnostic Tool (PEDT; Symonds et al., 2007). The PEDT consists of five self-report Likert items, of which three explicitly measure symptoms of premature ejaculation (e.g., brief latency period before beginning sexual activity and reaching orgasm) and two measure distress regarding these symptoms. Responses range from zero to four with higher scores indicating more severe symptoms of premature ejaculation/distress. The PEDT has exhibited test-retest reliability (r=0.73 for one month), good internal reliability (Cronbach's alpha=0.71), and discriminant validity between a clinical group with premature ejaculation versus a control group (Symonds et al., 2007). In our sample, we utilized the three items measuring sexual function (excluding those measuring distress, which conceptually overlapped with another construct of interest). Cronbach's alpha for the three items utilized was 0.92.

### **Sexual Distress**

The Sexual Satisfaction Scale (SSS; Meston & Trapnell, 2005) consists of 30 self-report Likert items which measure five domains of sexual well-being: contentment, communication, compatibility, relational concern, and personal concern. This scale has been validated in women and has been shown to differentiate women with and without sexual dysfunction (Meston & Trapnell, 2005). The scale has also been used with male samples (e.g., Stephenson, Ahrold, & Meston, 2011). Importantly, this scale differentiates between sexual satisfaction and sexual distress (i.e., anxiety or shame about impaired sexual function). The personal concern subscale of the SSS was used to assess subjective distress regarding participants' sexual difficulties. Example items from this subscale include "My sexual difficulties are frustrating to me" and "I'm so distressed about my sexual difficulties that it affects my own well-being." Scores ranged from 6 to 30, with higher scores indicating less distress (greater well-being). The SSS has demonstrated adequate internal reliability in past studies (Cronbach's alpha = .8; Meston & Trapnell, 2005). In the current sample, Cronbach's alpha was 0.84.

### **Negative Schema Activation**

The Cognitive Schema Activation Questionnaire (CSAQ; Nobre & Pinto-Gouveia, 2000, 2009a, 2009b) consists of 28 self-report Likert items which measure thoughts resulting from the activation of negative self-schemas in participants when faced with sexual difficulties. Each item poses a thought which participants might have about themselves as people (e.g., "I'm helpless" and "I'm inadequate") when experiencing sexual difficulties. While there have been other validated self-reported measures of sexual schemas (e.g., Andersen & Cyranowski, 1994; Andersen et al., 1999), they have often been implicit measures (with no direct mention of sex or sexual problems). The explicitly sexual nature of this study, as described in recruitment materials, would likely have run counter to the effective use of such measures in this context.

CSAQ responses ranged from one to five, with a higher score indicating a stronger agreement with the statement (i.e., stronger activation of negative self-schemas). The CSAQ has exhibited good internal reliability (Cronbach's alpha=0.94), test-retest reliability over four weeks (r=0.66). Convergent validity has also been established, including strong correlations with the widely used and strongly validated Schema Questionnaire (Schmidt, Joiner, Young, & Telch, 1995). In the current sample, Cronbach's alpha was 0.95.

### **Cognitive Distraction**

The Cognitive Distraction Scale (CDS; Dove & Wiederman, 2000) consists of 29 self-report Likert items which measure the

level of distraction experienced by participants during sexual situations. Responses range from one to six, with a higher overall score indicating a higher level of distraction. The original version of this scale, which consisted of 20 questions measuring distraction related to one's physical appearance and attractiveness, has been validated using female samples (Cronbach's alpha=0.97; Dove & Wiederman, 2000). An expanded version of the scale (Newcombe & Weaver, 2016) included items evaluating distraction related to performance and everyday distractions (e.g., "Overall, during sexual activity, I am distracted by thoughts about my sexual performance"; "During sexual activity, I am distracted by thoughts of my day(s) ahead"). A factor analysis of the expanded scale yielded two factors for performance and appearance-based distractors, which were strongly related (r = 0.83; Newcombe & Weaver, 2016). Both factors yielded the same internal reliability (Cronbach's alpha = 0.96). We used the expanded scale in the current analyses (Cronbach's alpha = 0.96). Results did not differ depending on whether the original or expanded version of the scale was used.

### **Behavioral Avoidance**

The Golombok Rust Inventory of Sexual Satisfaction (GRISS; Rust & Golombok, 1986) consists of 28 self-report Likert items which measure the severity of sexual dysfunction through twelve subscales: Impotence, premature ejaculation, infrequency, non-communication, vaginismus, anorgasmia, male and female nonsensuality, male and female dissatisfaction. and male and female avoidance. The male avoidance subscale was used to assess the level of behavioral avoidance exhibited by participants (e.g., "Do you try to avoid having sex with your partner?" and "Do you avoid engaging in specific sexual behaviors (e.g., intercourse) because you're worried about your sexual function?"). The overall inventory has exhibited good internal validity (Cronbach's alpha=0.87), discriminant validity between a clinical and control group (point biserial r=0.37), and convergent validity with therapists' ratings of symptom severity (Rust & Golombok, 1986). The avoidance subscale has exhibited adequate internal reliability (Cronbach's alpha = 0.76) and test-retest reliability (r=0.62 from pre-post therapy data; Rust & Golombok, 1986). In our sample, Cronbach's alpha for the avoidance subscale was 0.96. See Table 1 for descriptive statistics of study variables.

### **Data Analysis**

Four sets of analyses were performed. First, bivariate correlations were used to determine whether mindfulness was significantly associated with sexual outcomes of interest: sexual desire, erectile function, orgasmic function, premature ejaculation, overall sexual satisfaction, and sexual distress. Second, bivariate correlations were used to determine whether mindfulness was significantly associated with proposed statistical mediators: cognitive distraction during sex, behavioral avoidance of sex, and activation of negative sexual schemas during sex. Third, bivariate correlations were used to determine whether proposed statistical mediators were associated with sexual outcomes.

Fourth, indirect effects models included in the PROCESS Macro for SPSS (Hayes, 2013) were used to test whether proposed statistical mediators accounted for the association between mindfulness and sexual outcomes. The PROCESS Macro uses computer-intensive bootstrapping to provide estimates of the entire indirect effect of a predictor variable on an outcome variable for up to ten mediators that are correlated and operate "in parallel" in a single model. We tested distinct models for each sexual outcome that was significantly associated with mindfulness in bivariate tests. Model 4 with 5000 resamples was used to create 95% confidence intervals for bootstrapped estimates.

# Results

# Associations Between Mindfulness and Sexual Outcomes

Mindfulness was significantly correlated with sexual well-being outcomes (satisfaction and distress) and premature ejaculation, but not other sexual function outcomes (desire, erectile function, orgasmic function; see Table 2).

#### **Table 1** Descriptive statistics for study measures (n = 163)

Scale	М	SD
IIEF desire	6.34	2.10
IIEF erectile function	24.78	5.52
IIEF orgasmic function	7.79	2.34
IIEF overall satisfaction	6.22	2.29
IIEF total	55.27	10.45
Premature ejaculation	4.20	3.90
SSS personal distress	16.67	6.18

Absolute ranges: IIEF Desire: 2–10, IIEF erectile dysfunction: 6–30, IIEF orgasmic function: 2–10, IIEF overall satisfaction: 2–10, IIEF Total: 15–75, Premature ejaculation: 0–12, SSS Personal Distress: 6–30

*IIEF* International Index of Erectile Function; *SSS* Sexual Satisfaction Scale

# Associations Between Mindfulness and Proposed Statistical Mediators

Mindfulness was significantly correlated with all proposed statistical mediators (cognitive distraction, behavioral avoidance, and negative sexual schema activation; see Table 2).

# Association Between Proposed Statistical Mediators and Sexual Outcomes

Proposed statistical mediators were generally significantly correlated with outcomes. Exceptions were that neither behavioral avoidance nor negative sexual schema activation was associated with orgasmic function (see Table 3).

### **Indirect Effects Models**

We assessed models including statistical mediators of the association between mindfulness and outcomes to which it had exhibited significant association in bivariate analyses: sexual satisfaction, sexual distress, and premature ejaculation.

### **Sexual Satisfaction**

Coefficients from indirect effects models are included in Table 4. The overall model with sexual satisfaction as an outcome was significant, explaining approximately 22% of the variance in sexual satisfaction. The overall indirect effect was statistically significant (standardized CI .08, .26). The only statistical mediator that exhibited a unique indirect effect (controlling for other mediators in the model) was behavioral avoidance (standardized CI .03, .17). After controlling for the statistical mediators, the association between mindfulness and sexual satisfaction was no longer significant (CI -.01, .02).

## **Sexual Distress**

The overall model with sexual distress as an outcome was significant, explaining approximately 39% of the variance in sexual distress. The overall indirect effect was statistically significant (standardized CI .15, .33). Unique indirect effects were exhibited by cognitive distraction (standardized CI .01, .12), behavioral avoidance (standardized CI .01, .14), and negative

**Table 2** Correlations between mindfulness, sexual function, and well-being (n = 163, mean age = 36.5)

	Sexual desire	Erectile function	Orgasmic function	Premature ejaculation function	Sexual satis- faction	Sexual distress	Cognitive distraction	Behavioral avoidance	Negative sexual schema activation
Mindfulness	+.14	+.14	13	16*	+.23**	+.41***	30***	28***	43***

+p < .10; \*p < .05; \*\*p < .01; \*\*\*p < .001

**Table 3** Correlations between proposed mediators and sexual outcomes (n = 163, mean age = 36.5)

	Sexual desire	Erectile function	Orgasmic function	Premature ejaculation	Sexual satisfaction	Sexual distress
Cognitive distraction	16*	42***	16*	.27**	32***	47***
Behavioral avoidance	44***	37***	+.14	+.24**	44***	50***
Negative sexual schema activation	27**	30***	+.01	+.33***	36***	55***

+p < .10; \*p < .05; \*\*p < .01; \*\*\*p < .001

Table 4	Indirect effects models
(n = 163)	mean age $= 36.5$ )

IV–DV predictor in model	Coefficient	SE	t	Standardized indirect effect (95% CI [LL, UL])	F	<i>R</i> <sup>2</sup>
Mindfulness—satisfaction					9.94***	.22
Constant	8.37	1.55	5.39***			
Cognitive distraction	01	.01	75	.02 [03, .08]		
Avoidance	13	.04	-3.37**	.08 [.03, .17]		
Schema activation	01	.01	-1.46	.05 [03, .15]		
Mindfulness	.01	.01	.88			
Mindfulness-distress					23.23***	.39
Constant	21.97	3.64	6.03***			
Cognitive distraction	05	.02	-2.46*	.06 [.01, .12]		
Avoidance	18	.09	$-1.98^{*}$	.04 [.01, .14]		
Schema activation	09	.02	-3.80***	.13 [.06, .22]		
Mindfulness	.05	.02	2.30*			
Mindfulness—premature ejaculation						.12
Constant	.04	2.88	.01			
Cognitive distraction	.02	.01	1.51	04 [12,01]		
Avoidance	.03	.07	.37	01 [07, .44]		
Schema activation	.04	.02	2.27*	10 [20,01]		
Mindfulness	01	.01	20			

+p < .10; \*p < .05; \*\*p < .01; \*\*\*p < .001

sexual schema activation (standardized CI .06, .22). After controlling for the statistical mediators, the association between mindfulness and sexual distress remained significant (CI .01, .09), although it was significantly weakened by inclusion of the other variables in the model.

### **Premature Ejaculation**

The overall model with premature ejaculation as an outcome was significant, explaining approximately 12% of the variance in premature ejaculation scores. The overall indirect effect was statistically significant (standardized CI - .25, - .07). Unique indirect effects were exhibited by cognitive distraction (standardized CI - .12, - .01) and negative sexual schema activation (standardized CI - .20, - .01). After controlling for the statistical mediators, the association between mindfulness and premature ejaculation was no longer significant (CI - .03, .03).

# Discussion

The purpose of this study was to test whether distraction during sex, activation of negative schemas, or avoidance of sex statistically mediated the association between trait mindfulness and sexual outcomes in men reporting impaired sexual function. Mindfulness was significantly correlated with sexual well-being, premature ejaculation, and all proposed mediators. Counter to hypotheses, however, no significant correlation was found between mindfulness and other aspects of sexual function. Factors that statistically mediated the link between mindfulness and outcomes differed by outcome. The association between mindfulness and sexual distress was uniquely statistically mediated by distraction, avoidance, and negative schema activation. The association between mindfulness and premature ejaculation was uniquely statistically mediated by distraction and schema activation. The association between mindfulness and sexual satisfaction was uniquely statistically mediated only by avoidance.

The observed association between mindfulness and sexual satisfaction (r = .23) was similar to those reported in other studies (e.g., .09–.22; Khaddouma, Gordon, & Bolden, 2015; .11–.19; Pepping et al., 2018). The fact that results are consistent across differing populations (men vs. women, those with and without impaired sexual function) and methods of measuring sexual satisfaction provides fairly strong evidence that higher levels of trait mindfulness are associated with higher satisfaction with one's sex life, but that this effect is only weak to moderate on average.

Alternatively, the finding that mindfulness and male sexual function were generally not significantly related was surprising because it seems to run counter to findings from past studies (e.g., Bossio et al., 2018; Stephenson & Kerth, 2017). There are a number of possible explanations for this finding. The first is that we had insufficient statistical power to detect very weak correlations (Cohen, 1992). Additionally, researchers have questioned the validity of the sexual desire and orgasm subscales of the IIEF (Forbes, Baillie, & Schniering, 2014; however, see Rosen, Revicki, & Sand, 2014) and these questionable psychometric properties could partly explain the null findings.

Alternatively, trait mindfulness (as measured here) may be less important in predicting sexual outcomes than state mindfulness during sexual situations. Researchers have pointed out the important conceptual distinction between trait-like measures of mindfulness and state measures that assess levels of mindfulness in the current moment, or in specific situations (Thompson & Waltz, 2007). Indeed, studies have often found relatively weak associations between trait and state mindfulness (e.g., Bravo, Pearson, Wilson, & Witkiewitz, 2018). This distinction is likely relevant to sexual experiences. For example, Adam, Heeren, Day, and de Sutter (2015b), Adam, Géonet, Day, and de Sutter (2015a) found that a scale measuring state mindfulness during sex was only moderately associated with broader trait mindfulness. They also found that mindfulness during sex was a stronger predictor or female orgasmic function and sexual distress than was a more general trait mindfulness scale. The same may be true for male sexual function.

It is also possible that men's sexual function is not affected by mindfulness in the same way as for women. Indeed, the one study of which we are aware that tested MBT for both women and men (Brotto et al., 2017b) reported significant improvements in all aspects of sexual function for women, but no significant improvement for men (although increased desire was marginally significant). Similarly, a recent correlational study using an undergraduate sample found little to no association between mindfulness and sexual function for male participants (Dunkley, Goldsmith, & Gorzalka, 2015). Why might men and women differ in terms of the link between mindfulness and sexual function?

It is possible that this pattern stems from gender differences regarding the nature of common sexual complaints and related mechanisms of action for mindfulness. For women, the most common sexual problems are those involving subjective desire and arousal (Hayes, Dennerstein, Bennett, & Fairley, 2008). These complaints are often present even in the context of unimpaired genital arousal and other physiological processes (Maserejian et al., 2012). Multiple studies have shown that mindfulness can increase concordance between physiological and subjective sexual arousal in women (Brotto, Chivers, Millman, & Albert, 2016; Velten, Margraf, Chivers, & Brotto, 2018). Researchers have suggested that this increased concordance is driven by women's increased awareness of their existing physical responses, and that this awareness may constitute a key reason that mindfulness improves women's sexual experiences more broadly (Arora & Brotto, 2017).

For men, however, the most common complaints regarding sexual dysfunction tend to focus on relatively physiological processes such as erection, rather than subjective arousal or sexual desire (McCabe et al., 2016). Men also exhibit a strong concordance between physiological and subjective sexual arousal independent of any intervention (Chivers, Seto, Lalumière, Laan, & Grimbos, 2010). As such, an important benefit of mindfulness—increasing interoceptive awareness may be less relevant for men who tend to already be aware of their physical responses. In other words, using mindfulness to improve male sexual function may be less effective because limited bodily awareness is less likely to impair their function in the first place.

Relatedly, it is interesting that the one aspect of male sexual function that did correlate significantly with mindfulness was premature ejaculation. Experts have long suggested that premature ejaculation may stem partly from a lack of sensory awareness regarding signs of impending orgasm (e.g., Althof, 2014; Kaplan, Kohl, Pomeroy, Offit, & Hogan, 1974) and treatments meant to increase such awareness continue to be recommended (e.g., Albaugh, 2018; Perelman, 2006). As such, MBT of premature ejaculation may exhibit parallels to MBTs for women where limited bodily awareness has been established as a central target of treatment. Clearly, more research that includes both genders is needed to directly test possible differences and similarities.

It is also noteworthy that results regarding sexual well-being differed depending on which aspect was considered. Specifically, our observed correlation between mindfulness and sexual distress (r=.41) was over three times stronger than that between mindfulness and sexual satisfaction (r=.23). Additionally, avoidance was the only unique statistical mediator of the association between mindfulness and sexual satisfaction, whereas all three potential mediators were uniquely significant for sexual distress. While these findings must be replicated, they provide additional evidence that the positive and negative aspects of subjective well-being may not simply be opposite poles of a single continuum (e.g., Keyes, 2005; Stephenson & Meston, 2010).

In interpreting possible reasons for this difference, it is important to note an important difference between our measures: The scale of sexual satisfaction encompassed both intrapersonal and interpersonal aspects (e.g., "Over the past 4 weeks, how satisfied have you been with your sexual relationship with your partner?"; Rosen et al., 1997), while the scale of sexual distress included only intrapersonal experiences (e.g., "My sexual difficulties are frustrating to me"; Meston & Trapnell, 2005). The inclusion of relational components within the construct of sexual satisfaction has been supported by theoretical models of sexual satisfaction (e.g., Lawrance & Byers, 1995) and by various empirical studies (e.g., Pascoal, Narciso, & Pereira, 2014; Velten & Margraf, 2017). However, the fact that the broader relationship has typically not been included in measures of sexual distress (with exceptions; e.g., Hendrickx, Gijs, Janssen, & Enzlin, 2016) may have created an important difference which could explain the inconsistent results across the outcomes.

Practically speaking, while activation of negative schemas and distraction during sex may be internally distressing to the individual, they are not necessarily externally observable. Avoidance of partnered sex, on the other hand, would likely be known to the partner and thus may have a unique impact on the relational components of sexual satisfaction. For example, partners may interpret this avoidance as an indication that the relationship is in jeopardy (e.g., Birnbaum, Reis, Mikulincer, Gillath, & Orpaz, 2006), or that partners are no longer mutually attracted or in love (Nobre, 2010; Stephenson, Truong, & Shimazu, 2018). Additionally, Pascoal et al. (2014) have suggested that "sexual satisfaction derives from positive sexual experiences and not from the absence of conflict or dysfunction" (p. 22). So, while avoidance of sex may provide short-term benefits (i.e., reducing the individual's negative affect), it likely comes with long-term costs such as contributing to partner concern about the relationship and/or reducing opportunities for positive sexual experiences that foster sexual satisfaction. This conceptualization is similar to how avoidance functions in the context of anxiety disorders (e.g., Abramowitz, Deacon, & Whiteside, 2011).

### Implications

The current results generally replicated the findings of past studies that assessed distraction as a statistical mediator of the association between trait mindfulness and sexual outcomes (e.g., Newcombe & Weaver, 2016; Pepping et al., 2018). The results also provide the first direct evidence of which we are aware that decreased activation of negative schemas and reduced avoidance of sex may similarly statistically mediate the link between mindfulness and sexual experiences. However, it is important to note that none of these possible mechanisms has yet been sufficiently tested using experimental or treatment outcome research. We urge researchers to consider including these factors in future treatment studies to simultaneously identify active components of therapies and empirically test theoretical models of sexual problems.

The findings also suggest that researchers should carefully consider their choice of outcome measures in clinical trials of MBT. The current findings, as well as past treatment outcome studies (e.g., Brotto & Basson, 2014; Stephenson, Rellini, & Meston, 2013), suggest that: (1) subjective sexual well-being may respond differently to treatment than sexual function, and (2) that sexual satisfaction may respond differently than sexual distress. As such, researchers should strive to explicitly define their outcomes of interest and use validated measures of those constructs.

### Limitations

The current study had important limitations. Due to the crosssectional and correlational methods, no causal conclusions can be inferred from the statistical mediation effects. While our proposed directions of causality are based on past intervention and experimental research, no variables were manipulated in the current study. Furthermore, our study relied exclusively on retrospective self-report from our participants, who all volunteered to participate in a study on sexual experiences. These methods can result in non-representative samples (e.g., Strassberg & Lowe, 1995) and a variety of response biases such as inaccurate retrospective recall (McCallum & Peterson, 2012).

Furthermore, although participants all identified as experiencing current problems with sexual function, they were not formally assessed for diagnostic criteria of sexual dysfunction and it is unknown how many were currently seeking treatment. The pattern of results may differ for treatment-seeking populations who meet full criteria for sexual dysfunction. Similarly, the sample excluded men who were not in relationships, men in relationships with men, or sexually inactive men. While these exclusions followed recommendations for use of our primary measures (e.g., Meyer-Bahlburg & Dolezal, 2007; Yule, Davison, & Brotto, 2011), it is important to note that the current findings may not generalize to these populations.

In addition, while all the included scales have been used with male samples, some have not been formally validated for use with men (specifically, our measures of distraction during sex and sexual distress). Further validation of these scales and replication of these results with alternative assessment methods would be useful. Replication using alternative scales may be particularly important in the case of sexual schemas. By their nature, sexual schemas are thought to operate below the level of conscious awareness (Segal, 1988), which makes assessing schematic content via self-reporting a difficult task. The scale used in the current study has demonstrated strong psychometric properties, including associations with the more widely used and validated Schema Questionnaire (Young & Brown, 1994). However, as with any self-report scale of schema content, it is a less-than-comprehensive measure. Other scales have attempted

to improve measurement by using implicit assessment (e.g., Andersen & Cyranowski, 1994; Andersen et al., 1999). It will be important for future research to use alternative methods of assessing schematic content, and all variables included here, to assure that the effects are not dependent on specific measures.

# Conclusion

In sum, the current study built on recent reviews identifying potential mechanisms of action for MBT in treating sexual dysfunction (e.g., Stephenson, 2017). Utilizing a sample of men reporting impaired sexual function, we found evidence that avoidance of sex, distraction during sex, and activation of negative sexual schemas may statistically mediate the association between levels of trait mindfulness and multiple aspects of male sexual experiences. These mechanisms should be further tested in treatment outcome research and/or experimental studies to more firmly establish causal relationships. If these effects are supported, the findings can be used to make treatments for MSD more focused, efficient, and flexible, maximizing ease of dissemination and real-world impact.

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### **Compliance with Ethical Standards**

**Conflict of interest** The authors have no conflicts of interest to report that would influence the conduct or outcomes of the study.

**Ethical Approval** This study complied with all APA ethical guidelines and was approved by the IRB at Willamette University.

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

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