



Women, Painful Sex, and Mindfulness

Maathz Pernilla¹ · McCracken Lance¹ · Ekdahl Johanna² · Parling Thomas³ · Dahl JoAnne¹

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Abstract

Objectives Mindfulness-based approaches to treatment of sexual dysfunction associated with vulvar pain appear promising, but little is known about the specific processes of mindfulness in sexual interactions or if mindfulness may be of particular benefit to women who experience pain associated with sexual activity. This study aimed to examine the associations between sexual mindfulness and sexual function and distress among women who currently experience pain with sexual activity as compared to women who do not.

Methods Women over the age of 18 were invited to complete an online survey, including measures of mindfulness in sexual activity, pain associated with sexual activity, sexual function, and sexual distress. Of the participants, 134 (42.1%) were experiencing pain and 184 (57.9%) were pain free.

Results Higher levels of mindfulness during sexual activity were associated with greater sexual functioning and less sexual distress both among women with and without pain. However, the association between Observing skills and sexual functioning among women with pain was weaker if the capacity for nonreactivity was low. Sexual mindfulness contributed significantly to the explanation of sexual function and distress in both groups. Of the mindfulness facets, Acting with awareness consistently contributed, beyond the other facets, to the explanation of sexual outcomes.

Conclusions The capacity to stay mindful in sexual interactions appears to be important to sexual functioning both among women who experience pain with sexual activity and among women who do not. These findings encourage further examination of the role of mindfulness and its facets in sexual outcomes.

Keywords Mindfulness · Sexual function · Vulvar pain · Dyspareunia · Sexual dysfunction

In recent years, there is an increasing interest in incorporating mindfulness into the treatment of sexual difficulties, and there is a growing number of clinical trials reporting beneficial effects of mindfulness interventions for female sexual dysfunction (Stephenson & Kerth, 2017). A common cause of sexual difficulties among women are vulvar pain disorders, estimated to affect between 10 and 28% of adult women (Arnold et al., 2007; Harlow et al., 2001; Reed et al.,

2004). Findings from clinical trials evaluating mindfulness interventions for women with vulvar pain appear promising, with two randomized controlled trials reporting significant reductions in [sexual distress](#) and improved sexual function following mindfulness interventions (Brotto et al., 2019; Guillet et al., 2019). Consistent with the idea that mindfulness enhances sexual well-being, previous studies report a positive association between trait mindfulness and sexual satisfaction in non-clinical community samples (Dunkley et al., 2015; Khaddouma et al., 2015; Newcombe & Weaver, 2016; Pepping et al., 2018). Still, it cannot be assumed that an ability for general mindfulness transfers to the context of sexual interactions. Accordingly, Leavitt et al. (2019) showed that the ability to stay mindful during sexual activity in particular contributes to sexual satisfaction beyond general mindfulness. However, little is still known about the ability to stay mindful during sexual interactions specifically and its associations with sexual outcomes.

✉ Maathz Pernilla
pernilla.maathz@psyk.uu.se

¹ Department of Psychology, Uppsala University, Uppsala, Sweden

² Department of Psychology, Mid Sweden University, Östersund, Sweden

³ Centre for Psychiatry Research, Department of Clinical Neuroscience, Karolinska Institute, & Stockholm Health Care Services, Stockholm County Council, The Centre for Psychotherapy, Education & Research, Stockholm, Sweden

Mindfulness has been described as “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p. 145). Conventionally, this particular way of paying attention entails five facets: Observing, Describing, Acting with awareness, Nonjudging of inner experiences, and Nonreactivity to inner experiences (Baer et al., 2006). Observing and Describing refer to a noticing of internal and external experiences, including thoughts, feelings, or sensations, and an ability to label these experiences with words. Acting with awareness means to act consciously, as opposed to behaving in an automatic or mechanical way, while Nonjudging and Nonreactivity to inner experience refer to noticing thoughts, feelings, and sensations without evaluating them, and being able to let them pass without acting according to what they say.

It is largely unknown why mindfulness has a positive impact on sexual well-being (Stephenson, 2017). However, it has long been recognized that attentional focus influences the sexual response, particularly sexual arousal. While paying attention to sexual cues facilitates arousal, distraction and self-evaluation have the opposite effect (Barlow, 1986; de Jong, 2009). Mindfulness skills have been linked with an enhanced ability to purposefully direct attention and to greater awareness of bodily sensation (Hölzel et al., 2011; Tang et al., 2015), suggesting that individuals who are mindful in sexual interactions would have the capacity to notice sexual cues without being distracted. They may also be attentive to signs of arousal, which may contribute further to excitement, producing a positive feedback loop (Janssen et al., 2000). Indeed, previous studies have shown that mindfulness training increases awareness of physiological responses to sexual stimuli (Silverstein et al., 2011) and subjective arousal among women (Velten et al., 2018). At the same time, cognitive distraction has been found to mediate the association between trait mindfulness and sexual satisfaction (Newcombe & Weaver, 2016), suggesting that the beneficial effect of mindfulness appears partly because mindfulness entails a more present focused attention during sexual activity.

Mindfulness has also been associated with improved emotion regulation (Guendelman et al., 2017; Tang et al., 2015). In some circumstances, sexual interactions trigger difficult emotions and self-critical or anxiety-provoking thoughts, and approaching these experiences in an open and nonjudgmental way may reduce their impact on the sexual experience and ameliorate sexual distress. Individuals who are mindful in sexual interactions may be able to re-orient attention to present moment sexual sensations, instead of getting caught up with distracting thoughts or negative self-evaluation (Brotto, 2013). They will perhaps also be less likely to respond to challenging inner experiences with avoidance, suppression, or rumination, behaviours known

to be associated with increased distress (Aldao et al., 2010). Accordingly, Silverstein et al. (2011) reported reduced levels of self-judgment and symptoms of anxiety and depression following a mindfulness course, and these reductions were associated with increased awareness of sexual response. In line with this finding, Dunkley et al. (2015) found that trait mindfulness mitigated the negative effect of concerns over appearance and performance on women’s sexual satisfaction.

It has also been proposed that mindfulness and its five component skills help reduce the negative impact of pain. Kabat-Zinn (1982) suggested that mindfulness may relieve pain-related suffering by disconnecting the sensory experience of pain from the appraisal of the pain sensation, reducing the emotional distress connected to that sensation. Accordingly, prior studies report reductions in responses to pain that are known to contribute to distress and pain-related dysfunction, such as pain catastrophizing and hypervigilance, among women with vulvar pain, following mindfulness-based interventions (Brotto et al., 2015, 2019). Higher mindfulness has also been found to predict less negative rumination about pain among individuals with chronic musculoskeletal pain (Schütze et al., 2010). Further, McCracken et al. (2007) note that mindfulness aims to decouple the experiences that go along with persistent pain, whether it is thoughts, emotions, or the pain sensation itself, from the immediate behavioural responses that they can elicit. In that way, mindfulness may moderate behaviour patterns that contribute to the impact of vulvar pain, such as pervasive avoidance of sexual interactions (Engman et al., 2018; Thomtén & Linton, 2013). As mindfulness encourages acceptance and other adaptive responses to distressing experiences such as pain (Brotto et al., 2020), the beneficial effects of mindful awareness during sexual interactions may be enhanced for individuals who experience vulvar pain with sexual activity, but no studies have examined this in the context of vulvar pain.

Given that individuals who stay mindful in sexual interactions might attend more effectively to sexual cues and engage less with distracting or negative cognitive content during sexual interactions, sexual mindfulness may play an important role in **sexual functioning**. Still, sexual mindfulness is sparsely examined, both among women who experience pain with sex and women who do not. This study aimed to examine if sexual mindfulness is associated with sexual function and distress, and to do this in women who currently experience pain associated with sexual activity compared to women who do not. We predicted that higher levels of sexual mindfulness would be associated with greater sexual function and less sexual distress in both groups. The constituent facets of mindfulness have been shown to contribute differentially to sexual outcomes (Adam, Géonet, et al., 2015; Adam, Heeren, et al., 2015; Khaddouma et al., 2015; Newcombe & Weaver, 2016), so we examined the five

mindfulness facets separately. Prior works also suggest that the beneficial effects of the Observing facet of mindfulness may depend on the level of nonreactivity to inner experience (Baer et al., 2008; Desrosiers et al., 2014). For that reason, Nonreactivity was also examined as a moderator of the effect of Observing on sexual outcomes. An additional aim was to examine mindfulness facets as predictors of sexual function and distress. In relation to this aim, we hypothesized that the contribution of mindfulness to sexual function and distress would be greater among women who experienced pain with sexual activity, as compared to women who did not.

Method

Participants

Participants in the study represent a convenience sample recruited through social media. Inclusion criteria required participants to be women and at least 18 years old at the time of the study. In total, 387 women responded to the questionnaire. Women who did not respond to the items assessing pain with sexual activity ($n = 15$, 3.9%) or had not been sexually active during the last month ($n = 54$, 14.0%) were excluded from the study. This resulted in a final sample consisting of 318 women. The participants were between 18 and 65 years of age, with a mean age of 31.37 ($SD = 8.3$). Most of the participants had a college or university degree ($n = 237$, 74.5%), and a partner at the time of the study ($n = 268$, 84.3%). Of the participants, 70 (20%) reported

persistent vulvovaginal pain associated with sexual activity, lasting > 3 months or longer (20.0%). Additional participant characteristics appear in Table 1.

Procedures

This study was part of a broader research project, examining factors associated with sexual adjustment among women. Participants were recruited through social media announcements that included a link to a webpage detailing the scope of the research project and the nature of the questionnaire, as well as the procedure for voluntary participation. On the same webpage, participants could indicate their consent and access the web-based questionnaire. They were first asked to provide demographic and background information, and then to complete the measures included in this study. In addition to the measures used in this study, participants completed sexuality-related measures that pertained to the broader research project.

Measures

Demographics and Background Information

Participants reported basic demographic characteristic such as age, education, and relationship status, as well as frequency of sexual activity with a partner.

Sexual Mindfulness

Mindfulness during sexual activity was assessed using the Sexual Five Facet Mindfulness Questionnaire (FFMQ-S;

Table 1 Descriptive statistics of participant characteristics ($N = 318$)

	Full sample ($N = 318$)	Without pain ($n = 184$)	With pain ($n = 134$)
Age, M (SD)	31.37 (8.47)	33.28 (8.83)	28.75 (7.20)
Education, n (%)			
Lower secondary school	6 (1.9)	2 (1.1)	4 (3.0)
Higher secondary school	72 (22.6)	36 (19.6)	36 (26.9)
College/university	237 (74.5)	143 (77.7)	94 (70.1)
Relationship status, n (%)			
Single	50 (15.7)	31 (16.8)	19 (14.2)
Male partner	231 (72.6)	130 (70.7)	101 (75.4)
Female partner	13 (4.1)	8 (4.3)	5 (3.7)
Other	24 (7.5)	15 (8.2)	9 (6.7)
Relationship duration (years), Mdn	3.75	3.96	3.0
Sexual activity with partner, n (%)			
<Once per month	32 (10.1)	14 (7.6)	18 (13.4)
1–3 per month	103 (32.4)	63 (34.2)	40 (29.9)
1–2 per week	117 (36.8)	64 (34.8)	53 (39.6)
3–4 per week	47 (14.8)	31 (16.8)	16 (11.9)
> 4 per week	19 (6.0)	12 (6.5)	7 (5.2)
Pain duration of ≥ 3 months, n (%)	70 (20.0)	0 (0)	70 (52.2)

Adam, Géonet, et al., 2015; Adam, Heeren, et al., 2015). This is a measure comprised of 19 items, originally derived from the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) and adapted to sexual interactions (e.g. “I have the feeling that I have sex in an automatic way...”). The FFMQ-S contains the same five subscales as the original FFMQ: Observing, Describing, Acting with awareness, Nonjudging of inner experience, and Nonreactivity to inner experience. Items are rated on a scale from 1 (“never or very rarely true”) to 5 (“very often or always true”). The total score ranges from 38 to 95, with higher scores representing greater sexual mindfulness. Analysis of the FFMQ-S confirmed the five-factor structure of the original FFMQ and found moderate to strong correlations between the FFMQ-S subscales and the original FFMQ (Adam et al., 2015; Adam, Heeren, et al., 2015). The internal consistency of the FFMQ-S total scale was $\alpha = 0.87$ (Adam, et al., 2015a, 2015b), and $\alpha = 0.85$ in the current sample. Low internal consistency was found in the Nonjudging ($\alpha = 0.36$ and $\omega = 0.73$) and Nonreactivity ($\alpha = 0.64$ and $\omega = 0.72$) subscales. The remaining three subscales showed acceptable internal consistencies ($\alpha = 0.73$ to $\alpha = 0.80$ and $\omega = 0.73$ to $\omega = 0.79$). The scale was translated into Swedish using a standard translation-back translation procedure.

Sexual Function

Sexual function was assessed with the Female Sexual Function Index (FSFI; Rosen et al., 2000). The FSFI is a well-established measure of female sexual function that includes subscales assessing the domains desire, arousal, lubrication, orgasm, sexual satisfaction, and pain over the past 4 weeks. It contains 19 items (e.g. “How would you rate your level of arousal during sexual activity...”), with five or six answer options scored from 1 to 5 or 0 to 5, respectively. A score of 0 corresponds to the answer option “no sexual activity”. A full scale score is obtained by multiplying each subscale score with a domain score factor, so that each subscale is weighed evenly. Full scale scores range between 2 and 36, with higher scores representing greater sexual functioning. In this study, the Pain subscale was omitted from the total score, giving an adjusted full scale score of 2–30. The FSFI has demonstrated good psychometric quality (Rosen et al., 2000), and high temporal stability ($r = 0.95$) also in the Swedish version (Ryding & Blom, 2015). In this sample, the internal consistency of the FSFI was $\alpha = 0.94$ and $\omega = 0.92$, and among the subscales, Cronbach’s alpha ranged between $\alpha = 0.87$ and $\alpha = 0.97$ and McDonald’s omega ranged between $\omega = 0.88$ and $\omega = 0.90$.

Pain Severity

Pain severity was assessed using the Pain subscale of the FSFI. The subscale contains three items, where participants rate the frequency and intensity of pain with sexual activity (“How often did you experience pain or discomfort during vaginal penetration”). Items are scored on a 6-point scale, ranging from 0 to 5 with 0 corresponding to the answer option “Did not attempt vaginal penetration”. The total score ranges from 0 to 15. To aid interpretation of the results, scoring was reversed before analysis so that higher scores reflect more severe pain. In this sample, internal consistency of the Pain subscale was $\alpha = 0.97$ and $\omega = 0.88$.

Sexual Distress

Sexual distress was measured using the Female Sexual Distress Scale-Revised (FSDS-R; DeRogatis et al., 2008). The FSDS-R consists of 13 items reflecting negative responses to sexual difficulties, such as feeling worried about sex or sexually inadequate. Participants rate how often they have felt concerned or distressed on scale ranging from 0 (“never”) to 4 (“always”), yielding a total score ranging from 0 to 52. Higher scores on the FSDS-R reflect more severe sexual distress. Psychometric evaluations of FSDS-R indicate satisfactory internal consistency and test–retest reliability (Derogatis et al., 2002, 2008; Ter Kuile et al., 2006). In this sample, internal consistency of the FSDS-R was $\alpha = 0.94$ and $\omega = 0.94$.

Data Analyses

Before the main analyses, missing data within otherwise completed self-report measures was replaced with the mean of the available subscale items, provided that the subscale contained more than three items. Missing data did not exceed 2% on any individual items. Internal consistency was estimated using Cronbach’s alpha and McDonald’s omega. The Observing subscale of the FFMQ-S did not meet the assumption of normality. Attempts to transform the variable did not achieve normality. Hence, both parametric and non-parametric analyses were used for this variable. As results of the analysis were comparable, only results of the parametric analysis are detailed here.

As could be expected in a non-clinical sample, the distribution of scores on the FSFI Pain subscales was markedly skewed, with approximately 60% of participants reporting no pain with sexual activity and 40% reporting some level of pain. For that reason, participants were categorized either as women with pain or women without pain (FSFI pain subscale score, 15 = no pain and < 15 = pain), and the two groups were analysed separately.

Potential differences in background characteristics between the groups of women with and without pain were examined using chi-square analysis and independent samples *t*-test or, when data did not meet the assumptions of parametric tests, the Mann–Whitney test. Differences between women with and without pain on facets of mindfulness, sexual function, sexual distress, and age were then examined using *t*-test and the effect size for the difference was estimated using Hedge's *g*. The associations between mindfulness, sexual function, pain severity, and sexual distress were examined with bivariate correlations between the subscales of the FFMQ-S and the FSFI Total score, the FSFI Pain subscale score, and FSDS-R scores. Correlations between the FFMQ-S subscales in relation to the FSFI Total score and the FSDS-R were compared by calculating *z*-scores for the difference in the coefficients between the groups. To examine the possible moderating effect of Nonreactivity on the association between observing and sexual outcomes among women with and without pain, regression analyses were performed that included the Observing subscale of the FFMQ-S, the Nonreactivity subscale of the FFMQ-S, and the interaction term, with the FSFI and the FSDS-R as outcome variables. To examine the facets of mindfulness in sexual interactions as predictors of sexual function and distress, hierarchical regression analysis was performed. Background variables showing significant bivariate associations with the outcome variables were entered in the first step, followed by the mindfulness facets in the second step. The Nonjudging subscale of the FFMQ-S showed poor internal consistency and was therefore not included in the regression models. In the models predicting sexual function, age and relationship status were entered in the first step, followed by the FFMQ-S subscales. Separate models for women with and without pain were analysed, and the model for women with pain was also adjusted for pain severity. In the regression models predicting sexual distress, age was entered in the first step, followed

by the FFMQ-S subscales, with FSDS-R as the outcome variable. Again, analysis of data from women experiencing pain was adjusted for pain severity. All analyses were checked for multivariate outliers and multicollinearity. Data analysis was performed using IBM SPSS Statistics version 25, the PROCESS-macro v 3.3 for SPSS (Hayes, 2017), and the OMEGA-macro for SPSS (Hayes & Coutts, 2020).

Results

Of the 318 participants, 134 (42.1%) who reported some level of pain with sexual activity during the last month were categorized as women with pain and 184 (57.9%) were categorized as women without pain. Results of comparisons between the two groups on background characteristics showed a significant difference in age between the two groups, with women who experienced pain being younger on average ($t(312) = 5.04, p < 0.001$). No other significant differences were found between the two groups in background characteristics. Results also show differences between the two groups on main study variables. Women experiencing pain with intercourse, compared to without pain, reported significantly poorer sexual function and more sexual distress. Effect sizes for the differences were medium and large, respectively ($g = 0.68$ and $g = 0.90$). Results also show significant differences between the two groups in levels of sexual mindfulness ($g = 0.60$), with women experiencing pain reporting lower scores than women without pain. Results of group comparisons are shown in Table 2.

Results show that higher levels of mindfulness during sexual activity were associated with greater sexual functioning in the group of women without pain ($r = 0.60$) and with pain ($r = 0.62$) (see Table 3). Higher levels of sexual mindfulness were also associated with less sexual distress in both groups ($r = -0.55$ and $r = -0.62$, respectively). All

Table 2 Descriptive statistics, mean difference, and effect sizes of mean differences on study variables

	Mean (<i>SD</i>)			<i>t</i>	<i>p</i>	<i>g</i>
	Full sample (<i>N</i> = 318)	No pain (<i>n</i> = 184)	Pain (<i>n</i> = 134)			
FFMQ-S total	73.54 (10.41)	76.03 (9.97)	70.03 (10.03)	5.20	<.001	0.60
Observing	17.57 (2.6)	18.00 (2.40)	16.98 (2.70)	3.50	.001	0.40
Describing	15.34 (3.30)	15.98 (3.10)	14.43 (3.36)	4.18	<.001	0.48
Acting	16.30 (2.82)	16.83 (2.67)	15.57 (2.87)	3.96	<.001	0.46
Nonjudging	13.94 (3.24)	14.47 (3.22)	13.23 (3.14)	3.31	.001	0.38
Nonreactivity	10.42 (2.52)	10.80 (2.46)	9.88 (2.51)	3.20	.002	0.37
FSFI	23.19 (4.21)	24.34 (3.90)	21.62 (4.13)	−5.96	<.001	0.68
FSDS-R	12.78 (10.79)	9.06 (9.21)	17.97 (10.71)	−7.82	<.001	0.90
FSFI Pain	4.71 (2.70)		7.06 (2.78)			

FFMQ-S, Sexual Five Facet Mindfulness Questionnaire total score and subscales (Observing, Describing, Acting with awareness, Nonjudging, and Nonreacting); *FSFI*, Female Sexual Function Index total score; *FSDS-R*, Female Sexual Distress Scale-Revised; *FSFI Pain*, Female Sexual Function Index Pain subscale

Table 3 Bivariate correlations among FFMQ subscales, sexual functioning, sexual distress, and pain severity by group

		1	2	3	4	5	6	7	8	9
1	FFMQ-S									
2	Observing	.64***	.74***	.81***	.81***	.66***	.58***	.16*	.60***	-.55***
3	Describing	.77***	.41***	.60***	.57***	.27***	.29***	.13	.56***	-.42***
4	Acting	.76***	.33***	.60***	.60***	.36***	.31***	.15*	.54***	-.44***
5	Nonjudging	.60***	.21*	.21*	.27**	.39***	.35***	.16*	.59***	-.55***
6	Nonreactivity	.66***	.30***	.33***	.41***	.32***		.18*	.22*	-.32***
7	Age	.10	.08	.01	-.03	.07	.26**		.12*	-.19*
8	FSFI	.62***	.36***	.53***	.70***	.22*	.37***	-.03		-.67***
9	FSDS-R	-.62***	-.35***	-.41***	-.62***	-.31***	-.47***	-.11	-.71***	
10	FSFI Pain	-.20*	-.17	-.13	-.27**	.05	-.20*	.16	-.25**	.29***

Correlations in the group without pain are presented above the diagonal and correlations for the group with pain are presented below the diagonal

FFMQ-S, Sexual Five Facet Mindfulness Questionnaire total score and subscales (Observing, Describing, Acting with awareness, Nonjudging, and Nonreacting); FSFI, Female Sexual Function Index total score; FSDS-R, Female Sexual Distress Scale-Revised; FSFI Pain, Female Sexual Function Index Pain subscale

* $p < .05$; ** $p < .01$; *** $p < .001$

facets of mindfulness showed positive associations with sexual function both in the group of women without pain ($0.22 \leq r \leq 0.59$) and in the group of women with pain ($0.22 \leq r \leq 0.70$), and negative associations with sexual distress ($-0.55 \leq r \leq -0.24$ and $-0.62 \leq r \leq -0.31$, respectively). Among women with pain, lower levels of mindfulness during sexual activity were associated with more severe pain ($r = -0.20$). Further, pain severity was negatively associated with sexual function ($r = -0.25$) and positively associated with sexual distress ($r = 0.29$) in this group. Comparisons between the groups showed a significantly weaker association between the Observing facet of sexual mindfulness and sexual function among women with pain, as compared to women without pain ($z = 2.24$, $p = 0.013$). No other correlations between mindfulness facets and outcome variables were significantly different in the two groups.

The analysis examining the conditional effect of Observing on sexual function showed that Nonreactivity significantly moderated the association between the two variables among women with pain ($\beta = -0.14$, $p = 0.008$, $\Delta R^2 = 0.05$), indicating that Observing was positively associated with sexual functioning only at average or high levels of Nonreactivity. The analysis of conditional effects showed that when the value of the Nonreactivity subscale of the FFMQ-S was > 9.28 (43th percentile), there was a significant positive association between Observing and sexual function. The moderating effect of Nonreactivity on the association between Observing and sexual function is depicted in Fig. 1. There were no significant moderating effects of Nonreactivity on the association between Observing and sexual function among women without pain ($\beta = -0.05$, $p = 0.115$) or on the association between Observing and sexual distress

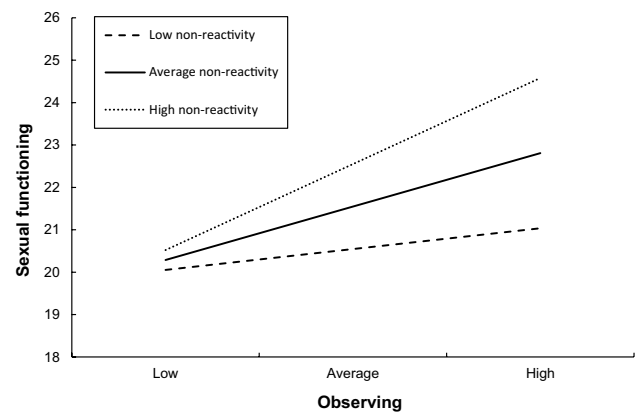


Fig. 1 The moderating effect of Nonreactivity on the association between Observing and sexual function

among women with pain ($\beta = -0.20$, $p = 0.141$) or without pain ($\beta = -0.13$, $p = 0.189$).

To examine the relative contribution of the different facets of sexual mindfulness to sexual function and distress, four multiple regression analyses were conducted. Results from the first analysis, predicting sexual function in women without pain, indicate a significant overall model ($R^2 = 0.44$, $F(6, 170) = 22.38$, $p < 0.001$). The mindfulness facets accounted for 42% of the variance in sexual functioning. Of the FFMQ-S subscales, Observing, Describing, and Acting with awareness uniquely predicted sexual functioning ($\beta = 0.26$, $p = 0.001$; $\beta = 0.18$, $p = 0.021$; and $\beta = 0.35$, $p < 0.001$, respectively). Nonreactivity to inner experience did not uniquely contribute to the explanation of sexual functioning in women without pain. Also, the second model, predicting sexual function in women with pain, was

significant ($R^2=0.54$, $F(7, 119)=19.53$, $p<0.001$), with mindfulness explaining sexual function above and beyond what was explained by pain severity. The FFMQ-S subscales accounted for 48.4% of the variance in sexual function, with only Acting with awareness emerging as a unique predictor ($\beta=0.54$, $p<0.001$). Results from regression analysis predicting sexual functioning in both groups are presented in Table 4.

The models predicting sexual distress in women without and with pain were both significant ($R^2=0.35$, $F(5, 170)=18.58$, $p<0.001$ and $R^2=0.46$, $F(6, 119)=16.98$, $p<0.001$, respectively). In women without pain, sexual mindfulness accounted for 34.6% of the variance in sexual distress, with Acting with Awareness emerging as the only unique predictor ($\beta=-0.39$, $p<0.001$). In women with pain, sexual mindfulness accounted for 37.2% of the explained variance, and of the FFMQ-S subscales, Acting

with Awareness and Nonreactivity to inner experiences uniquely contributed to the explanation of sexual distress ($\beta=-0.47$, $p<0.001$ and $\beta=-0.20$, $p=0.014$). Results from regression analysis predicting sexual distress in both groups are presented in Table 5.

Discussion

The aim of this study was to examine the associations between mindfulness in sexual interactions and sexual function and distress in women who currently experience pain during sexual activity and women who do not. In line with our predictions, the results show that women who were more mindful during sexual activity reported greater sexual function and less sexual distress whether they experienced pain or not. Further, results from bivariate analyses showed that all facets of sexual mindfulness were associated with sexual function and sexual distress in both groups. The strength of these associations was comparable in the two groups, with the exception of the Observing facet, which showed a weaker

Table 4 Sexual function (FSFI) predicted by mindfulness during sexual activity in women without pain (model 1) and with pain (model 2)

	R^2	b	SE	β	p
Model 1: Women without pain					
Step 1	.02				
Constant		22.19	1.27		<.001
Age		0.06	0.03	.13	.080
Relationship status		0.20	0.81	.02	.800
Step 2	.44				
Constant		5.11	1.93		.009
Age		0.01	0.03	.02	.698
Relationship status		-0.20	0.63	-.02	.753
FFMQ-S Observing		0.42	0.12	.26	.001
FFMQ-S Describing		0.23	0.10	.18	.021
FFMQ-S Acting		0.50	0.11	.35	<.001
FFMQ-S Nonreactivity		-0.07	0.10	-.04	.489
Model 2: Women with pain					
Step 1	.05				
Constant		17.83	2.48		<.001
Age		-0.01	0.05	-.02	.855
Relationship status		0.75	1.01	.07	.460
FSFI Pain		-0.32	0.13	-.22	.017
Step 2	.54				
Constant		4.42	2.40		.220
Age		-0.05	0.04	-.08	.222
Relationship status		1.09	0.74	.09	.165
FSFI Pain		-0.75	0.10	-.05	.447
FFMQ-S Observing		0.08	0.11	.06	.450
FFMQ-S Describing		0.15	0.10	.13	.121
FFMQ-S Acting		0.81	0.12	.54	<.001
FFMQ-S Nonreactivity		0.21	0.12	.13	.082

FFMQ-S, Sexual Five Facet Mindfulness Questionnaire with four subscales (Observing, Describing, Acting with awareness, and Non-reactivity); FSFI Pain, Female Sexual Function Index Pain subscale

Table 5 Sexual distress predicted by mindfulness during sexual activity in women without pain (model 3) and with pain (model 4)

	R^2	b	SE	β	p
Model 3: Women without pain					
Step 1	.04				
Constant		15.93	2.65		<.001
Age		-0.21	0.08	-.20	.008
Step 2					
Constant	.35				
Age		-0.91	0.07	-.09	.167
FFMQ-S Observing		-0.32	0.31	-.08	.310
FFMQ-S Describing		-0.32	0.25	-.11	.196
FFMQ-S Acting		-1.33	0.29	-.39	<.001
FFMQ-S Nonreactivity		-0.43	0.25	-.12	.090
Model 4: Women with pain					
Step 1	.11				
Constant		16.35	4.00		<.001
Age		-0.24	0.13	-.17	.057
FSFI Pain		1.21	0.33	.32	<.001
Step 2	.46				
Constant		60.01	6.46		<.001
Age		-0.11	0.10	-.08	.275
FSFI Pain		0.44	0.27	.12	.111
FFMQ-S Observing		-0.39	0.29	-.10	.186
FFMQ-S Describing		-0.01	0.28	.00	.977
FFMQ-S Acting		-1.73	0.33	-.47	<.001
FFMQ-S Nonreactivity		-0.84	0.34	-.20	.014

FFMQ-S, Sexual Five Facet Mindfulness Questionnaire with four subscales (Observing, Describing, Acting with awareness, and Non-reactivity); FSFI Pain, Female Sexual Function Index Pain subscale

association with sexual function among women with pain, as compared to women without pain.

Overall, the results are consistent with previous findings that point to a positive association between trait mindfulness and sexual satisfaction (Dunkley et al., 2015; Khaddouma et al., 2015; Newcombe & Weaver, 2016; Pepping et al., 2018), and between mindfulness in sexual activity and sexual satisfaction and distress (Adam, Géonet, et al., 2015; Adam, Heeren, et al., 2015; Leavitt et al., 2019). They extend upon these findings by showing that the ability to stay mindful in sexual interactions is associated with greater sexual function. Additionally, they indicate a difference between women with and without pain in the way that Observing skills are related to sexual function. It appears from the group comparisons that the capacity to observe present moment experiences may be less beneficial when sexual activity triggers pain sensations. However, we also examined if the association between observing skills and sexual outcomes was conditional upon Nonreactivity. Results from the analysis of interaction effects show that when Nonreactivity was at average levels or higher, there was a significant positive association between Observing and sexual function also in the group of women with pain. It seems then that women who experience pain with sexual activity may also benefit from the capacity to observe thoughts, feelings, and sensations, but that this requires the ability to react to those experiences in adaptive ways (Curtiss et al., 2017; Desrosiers et al., 2014). This interaction effect did not emerge in analysis examining sexual distress as an outcome, or in the group of women without pain.

Some additional differences between women with and without pain appeared. Women who were experiencing pain with sexual activity reported, on average, poorer sexual function and more sexual distress than women who were not. These findings are consistent with prior work showing reduced sexual function among women with pain (Brauer et al., 2008; Sutton et al., 2009), and point to a significant impact of pain on emotional and sexual well-being. In this study, women with pain also reported significantly lower levels of mindfulness in sexual interactions than women without pain. Few studies have examined differences in mindfulness between pain and non-pain groups, and findings have been mixed (Mun et al., 2014; Waldron et al., 2018). Possibly, reduced mindfulness appears among women with pain because pain by nature has the ability to capture attention (Eccleston & Crombez, 1999; Legrain et al., 2009), but it may also be the results of efforts to cope with distressing sexual experiences. Another possible interpretation is that individuals who are not mindful may be more likely to disregard physical discomfort and endure painful sexual activities, which is a behaviour pattern that has been associated with increased dysfunction among women with vulvar pain (Brauer et al., 2014; Engman et al., 2018). As the

cross-sectional design of this study does not allow inferences regarding relations between processes and outcomes over time, further research will be needed to give a more precise understanding of the association between mindfulness and pain associated with sexual activity.

A further aim was to examine the contribution of mindfulness during sexual activity to sexual function and distress in both groups. Results showed that mindfulness during sexual activity significantly contributed to the explanation of sexual function and distress among women with pain and pain-free women alike. Contrary to our prediction that mindfulness would be of particular benefit to women experiencing pain associated with sexual activity, the overall contribution of mindfulness to sexual functioning and distress was substantially the same in the two groups. These findings extend upon existing literature by showing that mindfulness in the context of sex contributes to sexual function and that it does so to an equal degree among women who experience pain as among women who do not. In the group of women with pain, mindfulness made a significant contribution to sexual function and distress also when pain severity was taken into consideration. These results are consistent with findings from chronic pain research (McCracken & Thompson, 2009; McCracken et al., 2007) and suggest that the beneficial effect of mindfulness for pain-related functioning extends also to vulvar pain.

This study examined the relative contributions of four mindfulness facets to sexual function and distress in the two groups: Observing, Describing, Acting with awareness, and Nonreactivity. Acting with awareness appeared as a unique predictor of sexual function in all regression analyses. Notably, previous studies consistently show that Acting with awareness contributes to sexual well-being (Adam, Géonet, et al., 2015; Adam, Heeren, et al., 2015; Khaddouma et al., 2015; Leavitt et al., 2019). Overall, these findings indicate that the ability to act consciously and purposefully in sexual interactions may be of particular importance to sexual well-being. It has been suggested that mindfulness is associated with behaviour that is adaptive, more context sensitive, and more flexible (Shapiro et al., 2006), meaning that it is possible that individuals who are mindful will be more likely to act in ways that allow them to contact positive aspects of sexual interactions, for example pleasure or feelings of connection with a partner. Individuals who are actively engaged in the sexual interaction may be more susceptible to erotic cues, and more likely to act upon them in ways that make the sexual interaction rewarding, than individuals who are distracted and act on habit. To women experiencing pain with sexual activity, this behavioural flexibility may be an advantage in that it may enable them to act in ways that allow continued, positive, sexual interactions despite pain.

The individual contributions of Observing, Describing, and Nonreactivity to sexual outcomes varied in this study.

The results showed that non-reactivity uniquely contributed to the explanation of sexual distress among women who experience pain with sexual activity. Inasmuch as Nonreactivity might mitigate rumination and worry over pain and distressing sexual experiences (Klaassen & Ter Kuile, 2009; Schütze et al., 2010), it can be expected that Nonreactivity is associated with sexual distress in this group. Observing and Describing emerged as unique predictors of sexual function among women without pain specifically. These facets of mindfulness entail abilities that might enhance awareness of physiological responses to sexual stimulation, such as arousal. Considering that the individual contributions of Observing, Describing, and Nonreactivity to sexual well-being vary also in prior studies (Adam, Géonet, et al., 2015; Adam, Heeren, et al., 2015; Khaddouma et al., 2015; Leavitt et al., 2019), it might be that these facets play distinct roles in different sexual outcomes and in different populations. More studies examining the facet mindfulness in sexual interactions will be needed to advance our understanding of their relative contributions to sexual outcomes, including studies with a larger sample sizes.

Limitations and Future Research

This study has limitations, including the cross-sectional and correlational design. Further experimental and longitudinal studies will be needed to determine the direction of the association between mindfulness and sexual functioning. The participants in the study represent a convenience sample of Swedish women. The method of recruitment resulted in a sample consisting mostly of highly educated, young adults with partners. These findings may not be generalizable to more diverse populations, particularly to women of other age groups and cultural contexts. Moreover, the study uses a non-clinical sample and there may be some differences in the way that mindfulness relates to sexual functioning between clinical and non-clinical samples. Studies in clinical samples will be needed, considering that the characteristics of women with a clinically confirmed vulvar pain syndrome may differ from the subsample of women with pain in this study. However, a large number of women report vulvovaginal pain and only a limited number seek treatment (Harlow et al., 2014; Thomtén, 2014), meaning there is value in studies in non-clinical samples. Other limitations concern the method of assessment used in this study. Generally, mindfulness is assessed as a general trait, leaving a paucity of reliable measures of mindfulness in sexual interactions. Although the internal consistency of the FFMQ-S full scale was good in this study, the Nonjudging subscale and the Nonreactivity subscales showed low internal consistency, and this should be considered particularly when interpreting the results from the analyses of interactions. Further, all variables in this study were assessed by self-report, meaning that shared method variance may affect the results.

The measure used to assess pain in this study is a subscale of the FSFI, used to assess sexual function. Even though the Pain subscale of the FSFI was not included in the total score of the FSFI, using the same self-report measure assessing the two variables may inflate correlations between the variables. Still, as the correlation between the Pain subscale and the full scale with the Pain subscale omitted was moderate, this impact appears to be small. Given these limitations, further development of measures of mindfulness and pain, adapted to a sexual context, would be valuable. Future studies could also consider using ecological momentary assessment to further explore the role of mindfulness in sexual interactions.

In summary, the results from this study provide evidence of an association between mindfulness in the context of sexual interactions and sexual function. Results in general suggest that women who stay mindful in sexual interactions experience greater sexual function and less distress concerning sexual problems, regardless of whether they experience pain associated with sex or not. At the same time, it appears that the five facets of mindfulness represent component skills that may play distinct roles, and that a more precise understanding of their contributions to sexual outcomes could be used to augment mindfulness interventions in different populations. Particularly, the findings of this study suggest that Acting with awareness plays a key role in sexual well-being among women and that sexual behaviour may be an important link connecting mindfulness and sexual outcomes.

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LM, JE, TP, and JD: contributed to the study conception and design, contributed with comments to the manuscript, and read and approved the final manuscript.

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Declarations

Ethics Approval All procedures performed involving human participants were in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval for this study was obtained from the Regional Ethics Board in Uppsala, Dnr 2017–250.

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

Conflict of Interest The authors declare no competing interests.

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