ORIGINAL RESEARCH—PSYCHOLOGY

How Changes in Depression and Anxiety Symptoms Correspond to Variations in Female Sexual Response in a Nonclinical Sample of Young Women: A Daily Diary Study

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DOI: 10.1111/jsm.12692

ABSTRACT

Introduction. A large body of literature supports the co-occurrence of depression, anxiety, and sexual dysfunction. However, the manner in which affective symptoms map onto specific female sexual response indices is not well understood.

Aims. The present study aimed to examine changes in depression and anxiety symptoms and their correspondence to fluctuations in desire, subjective arousal, genital response, orgasmic function, and vaginal pain.

Methods. The study used a 2-week daily diary approach to examine same-day and temporal relations between affective symptoms and sexual function.

Main Outcome Measures. The unique relations between shared and disorder-specific symptoms of depression and anxiety (i.e., general distress, anhedonia, and anxious arousal) and female sexual response (i.e., desire, subjective arousal, vaginal lubrication, orgasmic function, and sexual pain) were examined, controlling for baseline levels of sexual distress, depression, and anxiety, as well as age effects and menstruation.

Results. Analyses revealed that changes in depression and anxiety severity corresponded to same-day variations in sexual response. Specifically, anhedonia (depression-specific symptom) was related to poorer same-day sexual desire, whereas greater anxious arousal (anxiety-specific symptom) was independently related to simultaneous increases in subjective sexual arousal, vaginal lubrication, and sexual pain. Increases in general distress (i.e., shared symptoms) were associated with greater same-day difficulties achieving orgasm. Notably, only one temporal relation was found; it indicated that higher levels of anhedonia predicted a next-day decrease in sexual desire.

Conclusions. It is proposed that the simultaneous changes in affective symptoms and sexual function may indicate that they are products of shared underlying mechanisms. That is, in response to stress, the processes manifesting as feelings of weak positive affect and amotivation are the very same processes responsible for diminished capacity for sexual desire. In contrast, the physiological hyperarousal associated with anxiety also gives rise to sexual arousal difficulties and vaginal pain. **Kalmbach DA, Kingsberg SA, and Ciesla JA. How changes in depression and anxiety symptoms correspond to variations in female sexual response in a nonclinical sample of young women: A daily diary study. J Sex Med 2014;11:2915–2927.**

Key Words. Depression; Anxiety; Female Sexual Function; Anhedonia; Sexual Desire; Sexual Arousal; Vaginal Pain

Introduction

A large body of research has shown that women who suffer from depression or anxiety experience greater sexual dysfunction [1], that the severity of these sexual difficulties corresponds to the overall severity of the mood disorder [2], and that depression can have a scarring effect on female sexual functioning even after remission of affective symptoms [3]. Some evidence also

suggests that mood disorders constitute vulnerabilities to sexual dysfunction and vice versa [4]. Recently, studies have demonstrated that depression- and anxiety-specific symptoms map onto different aspects of female sexual function [5,6]. Prospective assessments have shown that affective symptoms and sexual function indices concurrently fluctuate within individuals. In other words, irrespective of diagnostic status for a mood disorder, when women become more depressed (even on the more healthy end of the depression symptom continuum), their desire decreases simultaneously [6]. However, a number of methodological limitations of past research have limited current knowledge. Notably, much of the current literature is based on cross-sectional data. Moreover, in the studies using repeated measures, women reported their affective symptoms and sexual response over the prior week or longer [6]. As evidence has supported concurrent relations, assessment windows of a week or longer may have failed to capture important variability in day-to-day affective or sexual experiences, thus reducing statistical power to detect significant relations. To address these limitations, the current study used ecological momentary sampling to examine daily changes in symptoms of depression and anxiety and corresponding variation in female sexual function.

Sexual complaints are common in the contexts of depression and anxiety in their many diagnostic forms (e.g., generalized anxiety disorder, posttraumatic stress disorder) [1]. Importantly, these studies suggest that diminished libido, arousal and orgasm difficulties, and sexual pain are similarly reported among individuals with mood and anxiety disorders. However, given the high comorbidity between mood and anxiety disorders, as well as their shared features resulting in overlapping items on measurement tools, prior research may have been at a methodological disadvantage to detect specificity between affective symptoms and sexual response. Thus, it has been hypothesized that a transdiagnostic approach (i.e., examining both overlapping and unique dimensions of clinical disorders) seeking to identify both shared and disorder-specific features facilitating these relations would offer a more nuanced understanding of the interplay between affective and sexual health [1,5,6].

Clark and Watson's [7] tripartite model of anxiety and depression describes both shared and unique features of each disorder. Specifically, the element of *general distress* represents the shared features of depression and anxiety, including fear, sadness, low self-esteem, and feelings of being on edge. As these features are common in both depression and anxiety, they do not distinguish between the two disorders. Specific to anxiety is *anxious arousal*, characterized by physiological hyperarousal symptoms, such as shaky hands, muscle tension, and shortness of breath. Unique to depression is *anhedonia*, characterized by buffered positive affect and diminished motivation. In other words, just as sexual function is complex and multifactorial with several correlated yet distinct aspects consisting of desire, subjective arousal, physiological arousal, and orgasmic function (among others), the structures of depression and anxiety are intricate, with both shared and unique components. Thus, as much of the current knowledge is based on studies utilizing depression and anxiety measures that have focused on general distress and other correlated symptoms (e.g., change in appetite or sleep quality), disorder-specific symptoms and their relations to these various aspects of sexual response have been largely overlooked.

Using the tripartite model of anxiety and depression, two studies have taken a transdiagnostic approach to investigate the disorder-specific features facilitating the co-occurrence of depression, anxiety, and sexual dysfunction. First, Kalmbach et al. [5] used a cross-sectional design to examine interindividual differences in severity of anhedonia, anxious arousal, and general distress and their relations to female sexual response. Results indicated that women with greater anhedonia reported lower desire, subjective arousal, vaginal lubrication, and orgasmic function, and greater sexual pain. In comparison, women with greater anxious arousal reported worse lubrication and greater pain. General distress was not independently related to any of these sexual function indices. These findings suggested that depression-specific symptoms (i.e., traitlike anhedonia) may constitute a vulnerability to a wide variety of female sexual dysfunctions, whereas anxious arousal was more specific to genital response and sexual pain. Next, Kalmbach and colleagues [6] examined intra-individual variations between the same constructs. Specifically, a sample of healthy premenopausal women reported weekly levels of affective symptoms and sexual function. Evidence supported some specificity, such that when women were more anhedonic, they experienced poorer libido and subjective arousal during the

same week. Additionally, when women felt more anxiously aroused, they experienced simultaneous changes in vaginal pain. Notably, the associations between affective and sexual health indices were more consistently concurrent than temporal. The inability of a weeklong assessment window to detect more transient fluctuations in affect and sexual response was identified as a potential methodological weakness. To illustrate, if Ms. A experiences high levels of desire on Monday and low levels of desire on Tuesday and Wednesday, then moderate desire on Thursday and finally high desire on Friday, Saturday, and Sunday, all of that meaningful variation in sexual desire cannot be captured if the daily experiences are averaged across the week. If variations in affective symptoms and sexual response levels are truly concurrent, a shorter assessment window would be necessary to detect these effects.

Aims

The present study is an extension of the prior research on depression, anxiety, and female sexual function using this transdiagnostic approach. Specifically, a two-week daily ecological momentary sampling approach was used to examine how changes in depression and anxiety symptoms correspond to variations in female sexual response. A sample of young women completed daily measures of sexual response (desire, subjective arousal, lubrication, orgasmic function, and sexual pain), affective symptoms (general distress, anxious arousal, and anhedonia), and daily menstruation, as well as baseline age and higher-order symptoms of sexual distress, depression, and anxiety. As the women in the present sample were relatively healthy, they were less likely to be encumbered by confounding medical and psychological comorbidities that are more prevalent in clinical samples. Yet, as depression and anxiety are dimensional constructs (rather than categorical), with symptom severity continuous and normally distributed in the general population [8,9], findings were anticipated to follow a similar pattern in unmedicated clinical populations. Based on findings of past research on affective symptoms and sexual response [5,6], anhedonia was predicted to be the most consistently related to sexual desire, as well as the most consistent predictor of overall female sexual difficulties. In contrast, anxious arousal was predicted to be related to poorer lubrication and greater sexual pain.

Methods

Participants

The participants and procedure of this study have been described elsewhere [10]. One hundred seventy-one women (age 20.07 ± 3.32) participated in the present study. The sample was largely Caucasian (81.5%), with some ethnic diversity observed (13.3% African American, 1.2% Latino or Hispanic, 2.3% East Asian or Pacific Islander, and 1.8% "other"). Additionally, a majority of participants identified as mostly or completely heterosexual ($n = 143$), whereas three participants identified as equally sexually attracted to men and women, and eight participants identified as mostly or completely homosexual. Approximately 51% of the sample reported having a significant other, and the average length of these relationships was 20.71 months (±18.56). Fifty-sex percent of participants ($n = 96$) reported having at least one current sexual partner at baseline. Participants were recruited from psychology courses at a Midwestern university and received course credit for their participation. To be eligible to participate, individuals needed to have reliable internet access at home and to have been free of antidepressants for at least 4 weeks prior to participation. The local institutional review board approved this study, and all participants provided written informed consent.

Procedure

The study protocol involved a baseline assessment and 14 daily assessments. At baseline, individuals reported demographic information, sexual distress, and symptoms of depression and anxiety over the past month. Participants then received instructions on the daily web-delivered questionnaires, to be completed upon waking each morning at their habitual wake time. Questionnaires assessed affective symptoms and sexual function over the previous 24 hours.

Baseline Measures

The Center for Epidemiologic Studies Depression Scale (CES-D) [11] is a 20-item self-report inventory used to measure symptoms of depression. It was modified to assess these symptoms over the previous month. Scores on the CES-D range from 0 to 60. In the present sample, the CES-D achieved high internal consistency ($\alpha = 0.90$).

State-Trait Anxiety Inventory Form X—State (STAIXS) [12] is a 20-item self-report inventory intended to assess levels of anxiety. It was modified to assess these symptoms over the previous month.

Table 1 Descriptive statistics and zero-order correlations between depression and anxiety scales and sexual function indices

Factor	Mean ± SD (range)	α	Desire	Arousal	Lubrication	Orgasm	Pain	General distress	Anxious arousal
Desire†	24.71 ± 10.45 (9–54)	0.94	—						
Arousal†	17.19 ± 2.15 (3–18)	0.99	0.23	—					
Lubrication‡	18.57 ± 2.55 (4–20)	0.96	0.28	0.62	—				
Orgasm†	20.46 ± 3.93 (4–24)	0.97	0.30	0.46	0.46	—			
Pain‡	5.21 ± 2.56 (4–20)	0.99	–0.16	–0.45	–0.32	–0.25	—		
General distress§	10.60 ± 4.23 (8–40)	0.89	–0.04	–0.24	–0.13	–0.35	0.15	—	
Anxious arousal§	11.47 ± 3.23 (10–45)	0.86	–0.02	–0.28	–0.22	–0.20	0.29	0.47	—
Anhedonia§	22.23 ± 6.12 (8–40)	0.84	–0.28	–0.11	–0.08	–0.16	0.07	0.37	0.16

†Measured using the Profile of Female Sexual Function
‡Measured using the Female Sexual Function Index
§Measured using the Mood and Anxiety Symptom Questionnaire—Short Form
Significance values are not reported as these correlations are for descriptive purposes only

Possible scores on STAIXS range from 20 to 80. Internal consistency of STAIXS was high ($\alpha = 0.94$) in the present sample.

The Female Sexual Distress Scale—Revised (FSDS-R) [13] is a 13-item self-report questionnaire used to assess sex-related personal distress in women. In the present study, respondents indicated the extent to which they experienced sexual distress over the past month on a six-point Likert-type response scale, with higher scores indicating higher levels of sexual distress. Internal consistency in the present study's sample was good ($\alpha = 0.74$).

Main Outcome Measures

Daily Measures

The Mood and Anxiety Symptom Questionnaire—Short Form (MASQ) [14,15] is a 29-item self-report measure of depression and anxiety that was modified to ask about experiences over the past 24 hours. Three main factors assess the facets of the tripartite model: general distress (i.e., overlapping features of depression and anxiety; e.g., "felt tense or high strung," "felt depressed"), anxious arousal (i.e., anxiety-specific symptoms; e.g., "was short of breath," "was trembling or shaky"), and anhedonia (i.e., depression-specific symptoms; e.g., "felt like I had a lot to look forward to," "felt really happy" [both reverse-coded]). This measure has been validated for use in students and nonclinical samples [15] and has been shown to have good convergent and discriminant validity [16]. See Table 1 for descriptives.

The Profile of Female Sexual Functioning (PFSF) [17,18] is a self-report measure of sexual functioning that was modified for daily use in the present study and has been validated for use in nonclinical samples [19]. For the present study, women reported their sexual desire, subjective sexual arousal, and orgasmic function over the previous 24 hours. Scales consist of items on a six-point Likert-type response scale. Each scale was scored using raw scores, with higher scores indicating better sexual function. Items specific to sexual activity were provided with the response choice of "no sexual activity."[1] See Table 1 for descriptives.

The Female Sexual Function Index (FSFI) [20] is a 19-item self-report measure of sexual functioning has been validated for use in normative samples [19,21,22]. To avoid construct overlap with the PFSF and minimize time demand of daily assessments on participants, only the lubrication and pain scales were administered. Both scales were modified to measure experiences with sexual function over the previous 24 hours and were scored on a five-point Likert-type response scale. In the present study, each scale was scored using raw scores, with higher scores on the lubrication scale indicating better sexual functioning and higher scores on the pain scale indicating higher levels of vaginal pain. FSFI items were presented with a "no sexual activity" option [1]. See Table 1 for descriptives.

To assess the presence of menstruation, participants were asked each day "Have you menstruated

[1]These responses were treated as missing data. For individuals who had less than 25% missing data in a given scale, proration using participants' mean scores (within that same scale) was used to estimate total factor scores. However, individuals' scale scores were treated as missing if more than 25% of data in a factor were missing. The rationale was that scoring a response of "no sexual activity" as 0 would artificially bias scores into indicating higher dysfunction, whereas proration allows us to estimate the total scale score based on women's other responses in the same scale. However, proration was employed only when the response rate was 75% and above so as to minimize the impact of estimation on the data.

over the past 24 hours?" and responded either "Yes" (coded as 1) or "No" (coded as 2).

Data Analysis

To estimate time-varying outcomes, analyses were conducted using hierarchical linear modeling (HLM; also known as multilevel modeling). HLM is appropriate for data that are hierarchically structured, such that level-1 variables (i.e., daily data in the present study) are nested within level-2 units (i.e., individual participants in the present study) [23,24]. As such, HLM allows for the simultaneous examination of differences between individuals and changes within individuals. As such, this analytic approach can test the predictive qualities of baseline reports of sexual distress, depression, and anxiety on later sexual function; same-day associations between depression and anxiety symptoms and female sexual response; and bidirectional temporal relations between the two constructs. Importantly, HLM is robust to missing data, which are common in repeated-measures studies [24].

Preliminary Analyses

To investigate the influence of baseline characteristics on female sexual function (for individual *i* at time *t*), it was tested whether index of sexual response was predicted by age (for individual *i*) and baseline sexual distress, depression, and anxiety (for individual *i*), controlling for presence of menstruation (for individual *i* at time *t*). These analyses were conducted to determine relevant covariates for the models testing study hypotheses. An example model (Example 1) follows.

$$\begin{aligned}\text{Desire}_{it} = {} & \beta_{0i} + \beta_1 \text{Depression}_i + \beta_2 \text{Anxiety}_i \\ & + \beta_3 \text{Sexual Distress}_i + \beta_4 \text{Age}_i \\ & + \beta_5 \text{Menstruation}_{it} + \zeta_{0i} + \varepsilon_{it}\end{aligned}$$

Example 1 revealed differences in sexual response outcomes for women with varying levels of baseline depression, anxiety, and sexual distress. Additionally, this model revealed any influence of age effects and menstruation. Subsequent analyses included significant predictors as covariates to allow for the testing of relations between daily affect and sexual function independent of higher-order symptoms of anxiety and depression, sexual distress, age effects, and impact of daily menstruation.

Substantive Hypotheses

To examine day-to-day covariation between symptoms of anxiety or depression and female sexual function, sexual function was first regressed onto the same day's anhedonia, anxious arousal, and general distress while controlling for relevant covariates, as in Example 2 below.

$$\begin{aligned}\text{Desire}_{it} = {} & \beta_{0i} + \beta_1 \text{General Distress}_{it} \\ & + \beta_2 \text{Anxious Arousal}_{it} + \beta_3 \text{Anhedonia}_{it} \\ & + \beta_4 \ldots \text{Covariates}_{i(t)} + \zeta_{0i} + \varepsilon_{it}\end{aligned}$$

To examine temporal relations, sexual function was regressed on the previous day's depression and anxiety symptoms while controlling for relevant covariates and the lagged value of the outcome variable. When the previous day's outcome variable is controlled for (i.e., at time $t - 1$), any significant relations between affect at time $t - 1$ and sexual function at time t are independent of the impact of the previous day's sexual functioning and represent a change from the previous day's sexual function. In examining sexual function's impact on the following day's affective experience, analyses were run in the same manner in which the lagged relations in the opposite direction were conducted.

Results

Preliminary Analyses

Based on scores on the FSDS-R,[2] 19.30% of women in the present study reported clinically relevant sexual distress (mean score 19.81 ± 11.24). Regarding affective symptoms, 3% of participants reported clinical levels of baseline depression (mean CES-D score 13.37 ± 9.78) [25], whereas 9% reported clinical anxiety (mean STAIXS score 41.92 ± 10.98) [26]. See Table 1 for bivariate correlations between daily affective symptoms and sexual function indices, which are presented for descriptive purposes to orient the reader to the data. Finally, participants were highly compliant, as evidenced by the average number of daily assessments completed being 13 (SD ± 1.79; out of a possible total of 15 [baseline + 14 daily assessments]).

Concurrent Models

Desire

First, an unconditional-means (i.e., null) model was run with sexual desire regressed on an intercept, a level-1 (within-person) residual, and a

[2]Rather than the original 0–4 scale, the present study administered the FSDS-R using a 1–6 scale. As such, a clinical cutoff of 27, rather than 11, was used to adjust for the scaling difference.

Table 2 Regression of desire (Desire$_{it}$) on depression and anxiety symptoms

Outcome	Predictor	$B^{\dagger}$	$z^{\ddagger}$	P value§	χ^2 (P value)
Determination of covariates (N = 171, Obs = 2,186)					
	Level 1				14.31 (0.01)
	Intercept	28.07	6.65	<0.001	
	Menstruation$_{it}$	1.64	3.03	<0.01	
	Level 2				
	Anxiety$_i$	–0.05	–0.56	0.58	
	Depression$_i$	–0.06	–0.70	0.49	
	Sexual Distress$_i$	0.10	1.84	0.07	
	Age	–0.22	1.36	0.18	
Concurrent model (N = 171, Obs = 2,182)					
	Level 1				188.45 (<0.001)
	Intercept	33.66	21.53	<0.001	
	General Distress$_{it}$	–0.10	–1.45	0.15	
	Anxious Arousal$_{it}$	0.01	0.09	0.93	
	Anhedonia$_{it}$	–0.50	–11.40	<0.001	
	Menstruation$_{it}$	1.66	3.20	<0.01	
Temporal model (N = 171, Obs = 1,906)					
	Level 1				65.89 (<0.001)
	Intercept	20.77	11.20	<0.001	
	General Distress$_{it-1}$	0.07	0.95	0.34	
	Anxious Arousal$_{it-1}$	0.04	0.50	0.62	
	Anhedonia$_{it-1}$	–0.17	–3.51	<0.001	
	Menstruation$_{it}$	1.81	3.08	<0.01	
	Desire$_{it-1}$	0.12	5.24	<0.001	

[†]Unstandardized beta coefficient
[‡]Test of statistical significance for individual predictors
[§]Significance value
Desire measured using the Profile of Female Sexual Function
General distress, anxious arousal, and anhedonia measured using the Mood and Anxiety Symptom Questionnaire—Short Form
Depression measured using the Center for Epidemiologic Studies Depression Scale
Anxiety assessed using State-Trait Anxiety Inventory Form X—State
Obs = number of observations

level-2 (between-person) residual. Results showed that approximately 54% of the total variance in sexual desire was due to day-to-day fluctuations, thus supporting the examination of time-varying outcomes. Next, a multilevel model regressing sexual desire on menstruation, age, and baseline anxiety, depression, and sexual distress was run (see Table 2).[3] Analyses showed that women reported greater sexual desire when they were not menstruating ($P < 0.01$). As such, menstruation was included as a covariate in all subsequent models in which sexual desire was the outcome variable. No other predictors were significant.

Next, a HLM model examining the concurrent relations between desire and anhedonia, anxious arousal, and general distress, controlling for menstruation, was run (see Table 2). Analyses revealed that women experienced poorer sexual desire when they were more anhedonic ($P < 0.001$). Neither anxious arousal nor general distress was independently related to same-day sexual desire. Menstruation remained a significant predictor, such that women reported greater desire for sex when they were not menstruating ($P < 0.01$).

Subjective Arousal

The null model estimated that approximately 44% of the total variance in subjective arousal was due to daily fluctuations. Next, analyses revealed that greater age ($P = 0.02$) and sexual distress ($P < 0.01$) predicted lower levels of arousal (see Table 3). Then, a HLM model testing covariation between affective symptoms and sexual response indices, controlling for age and sexual distress, was run. Results revealed that women reported poorer subjective arousal when they experienced greater anxious arousal ($P = 0.03$). Further, the relation between general distress and arousal approached significance ($P = 0.06$), suggesting that women

[3]In multilevel modeling, the χ^2 statistic reflects the difference between the tested model and a null model with no predictors. Thus, a significant χ^2 is desirable, as it is indicative of a model that accounts for significant variance in the outcome. This is in contrast to the use of χ^2 in structural equation modeling, in which significant χ^2 statistics are undesirable and reflect a lack of model fit.

Table 3 Regression of subjective arousal ($Arousal_{it}$) on depression and anxiety symptoms

Outcome	Predictor	B†	z‡	P value§	χ^2 (P value)
Determination of covariates (N = 144, Obs = 584)					
	Level 1				19.53 (<0.01)
	Intercept	20.81	16.27	<0.001	
	$Menstruation_{it}$	–0.27	–1.21	0.23	
	Level 2				
	$Anxiety_i$	–0.01	0.30	0.76	
	$Depression_i$	0.01	0.34	0.73	
	$Sexual\ Distress_i$	–0.06	–2.79	<0.01	
	Age_i	–0.12	–2.33	0.02	
Concurrent model (N = 144, Obs = 583)					
	Level 1				34.93 (<0.001)
	Intercept	21.43	21.41	<0.001	
	$General\ Distress_{it}$	–0.04	–1.89	0.06	
	$Anxious\ Arousal_{it}$	–0.05	–2.22	0.03	
	$Anhedonia_{it}$	–0.01	–0.42	0.68	
	Level 2				
	$Sexual\ Distress_i$	–0.04	–2.74	<0.01	
	Age_i	–0.12	–2.67	<0.01	

†Unstandardized beta coefficient
‡Test of statistical significance for individual predictors
§Significance value
Arousal measured using the Profile of Female Sexual Function
General distress, anxious arousal, and anhedonia measured using the Mood and Anxiety Symptom Questionnaire—Short Form
Depression measured using the Center for Epidemiologic Studies Depression Scale
Anxiety assessed using State-Trait Anxiety Inventory Form X—State
Obs = number of observations

may experience diminished subjective arousal when feeling distressed. Notably, age ($P < 0.01$) and sexual distress ($P < 0.01$) remained significant predictors, whereas anhedonia was nonsignificant.

Vaginal Lubrication

The null model indicated daily fluctuations accounted for 48% of the total variance in vaginal lubrication. Next, analyses revealed that increased age predicted poorer lubrication ($P < 0.01$; see Table 4). Then, a HLM model examining how affective symptoms predicted daily sexual response, controlling for age, was run. Estimation suggested that women reported more difficulty producing and maintaining vaginal lubrication when they experienced greater anxious arousal ($P < 0.01$). Neither anhedonia nor general distress was significant. Age remained a significant predictor ($P < 0.01$).

Orgasmic Function

The null model estimated that day-to-day changes accounted for approximately 43% of the variance in orgasmic function. Next, results revealed that older women ($P = 0.02$) and women with greater sexual distress ($P < 0.05$) reported poorer orgasmic function later on (see Table 5). Next, orgasmic function was predicted by affective symptoms, controlling for age and sexual distress. Results of the HLM model showed that women reported poorer orgasmic function when they were more distressed ($P = 0.02$). Neither anehdonia nor anxious arousal was significant, whereas age ($P = 0.02$) and sexual distress ($P = 0.01$) remained significant.

Vaginal Pain

The null model indicated that approximately 46% of the total variance in vaginal pain was due to daily fluctuations. Next, analyses revealed that women with greater baseline sexual distress reported greater vaginal pain ($P = 0.05$; see Table 6). Then, covariation between affective symptoms and vaginal pain was tested, controlling for sexual distress. Analyses estimated that women reported greater vaginal pain when they were more anxiously aroused ($P = 0.01$). Neither general distress nor anhedonia was significant, whereas sexual distress remained a significant predictor of vaginal pain ($P = 0.01$).

Temporal Relations

Temporal relations between symptoms of depression and anxiety and female sexual response were next examined. First, sexual response was regressed on the previous day's affective symptoms

Table 4 Regression of vaginal lubrication (Lubrication$_{it}$) on depression and anxiety symptoms

Outcome	Predictor	$B^{\dagger}$	$z^{\ddagger}$	P value§	χ^2 (P value)
Determination of covariates (N = 137, Obs = 483)					
	Level 1				15.09 (0.01)
	Intercept	23.20	15.13	<0.001	
	Menstruation$_{it}$	–0.32	–0.89	0.37	
	Level 2				
	Anxiety$_i$	–0.01	–0.46	0.65	
	Depression$_i$	0.01	0.34	0.73	
	Sexual Distress$_i$	–0.03	–1.64	0.10	
	Age$_i$	–0.16	–2.96	<0.01	
Concurrent model (N = 137, Obs = 484)					
	Level 1				26.67 (<0.001)
	Intercept	23.94	19.96	<0.001	
	General Distress$_{it}$	–0.04	–1.33	0.18	
	Anxious Arousal$_{it}$	–0.09	–2.72	<0.01	
	Anhedonia$_{it}$	–0.02	–0.82	0.41	
	Level 2				
	Age$_i$	–0.18	–3.43	<0.01	

†Unstandardized beta coefficient
‡Test of statistical significance for individual predictors
§Significance value
Lubrication measured using the Female Sexual Function Index
General distress, anxious arousal, and anhedonia measured using the Mood and Anxiety Symptom Questionnaire—Short Form
Depression measured using the Center for Epidemiologic Studies Depression Scale
Anxiety assessed using State-Trait Anxiety Inventory Form X—State
Obs = number of observations

while controlling for the previously identified covariates and the outcome variable's lagged value. However, given the large number of correlated predictors (particularly the lagged outcome value's addition), overdetermination of the model was a concern. Thus, to rule out spurious findings, any models with significant predictors were rerun without covariates, as replication would suggest

Table 5 Regression of orgasmic function (Orgasm$_{it}$) on depression and anxiety symptoms

Outcome	Predictor	$B^{\dagger}$	$z^{\ddagger}$	P value§	χ^2 (P value)
Determination of covariates (N = 136, Obs = 533)					
	Level 1				17.16 (<0.01)
	Intercept	26.57	11.41	<0.001	
	Menstruation$_{it}$	–0.06	–0.14	0.89	
	Level 2				
	Anxiety$_i$	0.02	0.36	0.72	
	Depression$_i$	–0.06	–1.12	0.26	
	Sexual Distress$_i$	–0.07	–1.99	<0.05	
	Age$_i$	–0.20	–2.36	0.02	
Concurrent model (N = 136, Obs = 533)					
	Level 1				27.51 (<0.001)
	Intercept	26.59	14.54	<0.001	
	General Distress$_{it}$	–0.11	–2.36	0.02	
	Anxious Arousal$_{it}$	–0.03	–68	0.50	
	Anhedonia$_{it}$	–0.01	–0.45	0.66	
	Level 2				
	Sexual Distress$_i$	–0.07	–2.51	0.01	
	Age$_i$	–0.18	–2.28	0.02	

†Unstandardized beta coefficient
‡Test of statistical significance for individual predictors
§Significance value
Orgasmic function measured using the Profile of Female Sexual Function
General distress, anxious arousal, and anhedonia measured using the Mood and Anxiety Symptom Questionnaire—Short Form
Depression measured using the Center for Epidemiologic Studies Depression Scale
Anxiety assessed using State-Trait Anxiety Inventory Form X—State
Obs = number of observations

Table 6 Regression of vaginal pain ($Pain_{it}$) on depression and anxiety symptoms

Outcome	Predictor	$B^{\dagger}$	$z^{\ddagger}$	P value[§]	χ^2 (P value)
Determination of covariates (N = 130, Obs = 447)					
	Level 1				12.53 (<0.001)
	Intercept	2.30	1.46	0.15	
	$Menstruation_{it}$	0.42	1.16	0.25	
	Level 2				
	$Anxiety_i$	0.05	1.72	0.09	
	$Depression_i$	–0.04	–1.12	0.26	
	Sexual $Distress_i$	0.04	1.94	0.05	
	Age_i	0.02	0.42	0.67	
Concurrent model (N = 130, Obs = 448)					
	Level 1				15.10 (<0.01)
	Intercept	3.54	5.59	<0.001	
	General $Distress_{it-1}$	–0.02	–0.76	0.45	
	Anxious $Arousal_{it}$	0.09	2.55	0.01	
	$Anhedonia_{it}$	–0.00	–0.08	0.93	
	Level 2				
	Sexual $Distress_i$	0.05	2.67	0.01	

[†]Unstandardized beta coefficient
[‡]Test of statistical significance for individual predictors
[§]Significance value
Pain measured using the Female Sexual Function Index
General distress, anxious arousal, and anhedonia measured using the Mood and Anxiety Symptom Questionnaire—Short Form
Depression measured using the Center for Epidemiologic Studies Depression Scale
Anxiety assessed using State-Trait Anxiety Inventory Form X—State
Obs = number of observations

findings were not due to multicollinearity artifacts (i.e., "bouncing betas").

As anticipated, fewer temporal effects were found. Specifically, results indicated that anhedonia predicted a next-day decrease in sexual desire, but did not predict any other sexual function outcome ($P < 0.001$; see Table 2). The follow-up model without the menstruation covariate or previous day's lagged outcome variable (i.e., regressing desire only on previous-day anhedonia, general distress, and anxious arousal) replicated this finding ($\beta = -0.22$, $z = -4.59$, $P < 0.001$). The only other significant temporal finding was that anxious arousal predicted poorer orgasmic function the following day ($\beta = -0.12$, $z = -1.97$, $P < 0.05$). To rule out poor beta estimation, a HLM model was run regressing orgasmic function only on previous-day general distress, anxious arousal, and anhedonia. Analyses revealed that anxious arousal was no longer a significant predictor of next-day orgasmic function ($\beta = -0.08$, $z = -1.59$, $P = 0.11$). Thus, the finding was interpreted as a Type I error.

Models regressing affective symptoms on previous-day sexual functioning were conducted in the same manner as the previously described models. Null models revealed large day-to-day variation in affective symptoms (47–52%). However, when regressing general distress, anxious arousal, and anhedonia on previous-day female sexual function indices, no significant temporal relations were found.

Discussion

Using a 2-week repeated-measures design, the present study sought to describe changes in depression and anxiety symptoms and their correspondence to day-to-day variations in female sexual response. Evidence supported specificity between depression and anxiety, as disorder-specific symptoms fluctuated with indices of sexual desire, arousal, vaginal lubrication, orgasmic function, and sexual pain. Notably, these relations were more concurrent than temporal.

As clinically significant depression and anxiety involve chronically severe levels of anhedonia (depression-specific), anxious arousal (anxiety-specific), and general distress (both depression and anxiety), these findings offer insight into the evolution of comorbid depression, anxiety, and sexual dysfunction. Notably, depression-specific anhedonia and sexual desire were found to be closely related, both concurrently and temporally. Specifically, when women were less motivated and less happy, they desired less sexual activity. Further, these feelings of anhedonia corresponded to decreases in desire the following day, though the

effect size was smaller in the temporal relation (see Table 2). This result is consistent with the finding that greater feelings of happiness and enthusiasm co-occur with higher levels of desire as well as increased desire the following day in this sample [27]. The simultaneous changes in anhedonia and desire suggest a shared pathophysiology. Dopaminergic activity is related to a lack of pleasure and depression (see Treadway and Zald [28] for review) and to the neurobiology of sexual desire [29], which may represent a direct link between desire and anhedonia. Alternatively, these covariations may be the product of hormonal changes related to the hypothalamic–pituitary–adrenal and hypothalamic–pituitary–gonadal axes (see [30] for review on the neuroendocrinology of anhedonia). These hypotheses are for potential future study. Regarding directionality, the temporal relation found in this study is consistent with depression-specific symptoms conferring a unique affective vulnerability to hypoactive sexual desire. That is, experiences of anhedonia have a lingering impact on later desire levels in women.

In comparison, the physiological hyperarousal component of anxiety was related to subjective and physiological arousal and vaginal pain. That is, when women experienced more somatic tension, shortness of breath, and other anxious arousal symptoms, they experienced poorer subjective arousal and vaginal lubrication, as well as greater sexual pain. Importantly, these relations were strictly concurrent. Unlike the relation between anhedonia and desire, today's physiological hyperarousal has no independent impact on tomorrow's sexual response. However, these associations are consistent with autonomic dysregulation as a shared risk factor for comorbid anxiety and dysfunctional female sexual arousal and vaginal pain. That is, physiological hyperarousal symptoms in response to stress may manifest as both anxiety and sexual difficulties.

Finally, general distress was related to same-day orgasmic function. When women were more fearful, more discouraged, and experiencing poorer self-worth, they had greater difficulty achieving orgasm. This suggests that symptoms common to both depression and anxiety interfere with the ability to achieve orgasm. Past research has shown that cognitive distraction from erotic stimuli is related to orgasmic dysfunction [31]. Given that intrusive and perseverative thoughts in the forms of worry and rumination are common to both depression and anxiety disorders [32,33], it is possible that these cognitive processes drive the relation between general distress and orgasmic function.

To sum, the relations between affective and sexual health have been traditionally viewed as bidirectional, such that depression and anxiety can lead to sexual dysfunction and vice versa. However, given that relations were largely concurrent, an alternative (though not mutually exclusive) explanation may be that affective and sexual dysfunction symptoms may be manifestations of the same underlying processes. That is, in the face of a stressor, a woman is likely to experience some degree of change in depression and/or anxiety symptoms (irrespective of higher-order or baseline symptoms, as demonstrated in this study) and that the same neurobiological, physiological, and cognitive processes effecting change in affective presentation produce corresponding changes in one's capacity for sexual response. For instance, Ms. X is exposed to a stressor, which results in reduced happiness, low motivation, and less capacity for mentally connecting with sexual interests or fantasies. In contrast, Ms. Y faces a stressor and develops co-occurring anxious hyperarousal and sexual arousal difficulties, whereas Ms. Z perseverates on a stressor, which increases feelings of both fear and discouragement and interferes with her ability to achieve orgasm. In other words, the mechanisms facilitating these relations are the same within individuals. However, not all individuals who experience greater anhedonia or anxious arousal will also experience significantly diminished desire or sexual arousal, or vice versa. Thus, premorbid vulnerabilities and protective factors for depression, anxiety, and sexual dysfunction would differentiate between individuals who develop symptoms following stressors and those who are more resistant. That affective symptoms and capacity for female sexual response may be manifestations of the same cognitive, neurobiological, and autonomic processes is consistent with these findings, but it is a hypothesis to be more fully explored in future study.

Additionally, these findings have implications for the replacement of the DSM-IV-TR's [34] hypoactive sexual desire disorder (HSDD) and female sexual arousal disorder (FSAD) with female sexual interest/arousal disorder in the DSM-5 [35]. Past research has offered conflicting evidence regarding whether or not HSDD and FSAD capture distinct disorders [36–39] or are better described by one overarching disorder [40–43]. As, in our study, desire was uniquely related to blunted positive affect and amotivation, whereas both

arousal indices (subjective and genital response) were uniquely related to physiological hyperarousal, it appears that the affective symptoms complicit in desire and arousal difficulties differ. Merging desire and arousal disorders into a single disorder suggests, though perhaps not intentionally, that desire and arousal comprise a unitary construct. This conceptualization is not consistent with their relations with different psychological factors, as evidenced in this study as well as in an investigation of daily normative affect and female sexual response [27]. If desire and arousal do not comprise a singular construct, the appropriateness of merging dysfunctional sexual desire and arousal into a single disorder must be called into question.

The results of this study should be interpreted in the context of certain limitations. Notably, the sample consisted of young women, who are less likely to present with severe medical or psychological health issues as compared with older or clinical samples. This study benefited from a relatively healthy sample, which allowed the study of affective symptoms and sexual response in women who were less likely to be encumbered by other potentially confounding medical or psychological comorbidities as compared with a clinical sample. However, it is important to test these relations in less psychologically or sexually healthy populations to identify potential characteristics that may impact or moderate these relations, such as cardiovascular disease and various health behaviors. Future studies are also necessary to determine whether these results generalize to older women and men. An additional potential limitation regards range restriction and statistical power. A number of affective symptoms (i.e., general distress and anxious arousal) and sexual response indices (i.e., subjective arousal, lubrication, orgasmic function, and sexual pain) were marked by range restriction. Specifically, the mean values of these indices were within a single standard deviation of the "healthy" end of the scale. As such, it is possible that this restriction reduced statistical power to detect some effects. Also, the present study consisted of 14 daily assessments. Given the relation between phases of the menstrual cycle and female sexual response [29,44], future endeavors may consider examining how hormonal changes may influence daily affect and sexual response, or even moderate this relation.

Conclusions

The findings of the present study indicated that changes in affective symptoms and sexual response occur simultaneously. Notably, sexual problems did not appear to be symptoms of depression or anxiety, nor did depression or anxiety appear to be symptoms of sexual dysfunction. As such, it is proposed that symptoms of depression, anxiety, and psychogenic sexual dysfunction may represent manifestations of the same underlying processes. This conceptualization is a shift from other theories proposing that depression and anxiety cause sexual dysfunction, or vice versa; however, it is not mutually exclusive with these aforesaid theories regarding causation. That is, it is possible that anhedonic depression may lead to clinically hypoactive desire (which is consistent with the finding of a temporal association for anhedonia, which predicted next-day desire) and simultaneously be a product of the same neurobiological, physiological, or cognitive processes (consistent with the many findings of concurrent associations).

The results of the present study may inform clinical decisions in tailoring intervention based on the presenting affective and sexual complaints. Mindfulness therapy has been gaining support as a viable treatment option for women presenting with a wide variety of sexual dysfunction presentations, including desire, arousal, and pain complaints [45–48]. Notably, increased mindfulness has been shown to reduce perseverative thoughts [49–51] and physiological arousal [51], and these may constitute some of the key ingredients of mindfulness therapy for sexual dysfunction, particularly arousal, orgasm, and pain difficulties. Additionally, owing to the evidence showing a close relation between physiological hyperarousal and sexual arousal and pain, increased emphasis on adjunctive relaxation training is recommended for women presenting with these sexual difficulties. On the other hand, emphasizing techniques aimed at targeting the wandering mind (e.g., "turning the mind") and emotion regulation for individuals who present with otherwise treatment-refractory orgasmic dysfunction may enhance treatment outcomes. Importantly, adding a behavioral activation component to increase overall positive affect and reinforce engagement in pleasurable and mastery activities (thus improving global motivation) may increase capacity for sexual desire, thus increasing the effectiveness of other current practices targeting diminished libido. Of course, as the many aspects of sexual response are interrelated, symptom relief in one area is likely to correspond to improvements in other areas of functioning. Overall, the evidence provided in this study has

important implications for the nosology of depression, anxiety, and sexual function disorders and their treatment.

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Conflict of Interest: The authors report no conflicts of interest.

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References

1 Laurent SM, Simons AD. Sexual dysfunction in depression and anxiety: Conceptualizing sexual dysfunction as part of an internalizing dimension. Clin Psychol Rev 2009;29:573–85.
2 Fabre LF, Smith LC. The effect of major depression on sexual function in women. J Sex Med 2012;9:231–9.
3 Cyranowski JM, Hofkens TL, Frank E, Seltman H, Cai H-M, Amico JA. Evidence of dysregulated peripheral oxytocin release among depressed women. Psychosom Med 2008;70: 967–75.
4 Atlantis E, Sullivan T. Bidirectional association between depression and sexual dysfunction: A systematic review and meta-analysis. J Sex Med 2012;9:1497–507.
5 Kalmbach DA, Ciesla JA, Janata JW, Kingsberg SA. Specificity of anhedonic depression and anxious arousal with sexual problems among sexually healthy young adults. J Sex Med 2012;9:505–13.
6 Kalmbach DA, Pillai V, Kingsberg SA, Ciesla JA. The transaction between depression and anxiety symptoms and sexual functioning: A prospective study of premenopausal, healthy women. Arch Sex Behav 2014.
7 Clark LA, Watson D. Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. J Abnorm Psychol 1991;100:316–36.
8 Prisciandaro JJ, Roberts JE. A taxometric investigation of unipolar depression in the National Comorbidity Survey. J Abnorm Psychol 2005;114:718–28.
9 Watson D. Rethinking the mood and anxiety disorders: A quantitative hierarchical model for DSM-V. J Abnorm Psychol 2005;114:522–36.
10 Kalmbach DA, Pillai V, Roth T, Drake CL. The interplay between daily affect and sleep: A 2-week study of young women. J Sleep Res 2014.
11 Radloff LS. The CES-D scale a self-report depression scale for research in the general population. Appl Psychol Meas 1977;1:385–401.
12 Spielberger CD, Gorssuch RL, Lushene PR, Vagg PR, Jacobs GA. Manual for the state-trait anxiety inventory. Palo Alto, CA: Consulting Psychologists Press; 1983.
13 Derogatis L, Clayton A, Lewis-D'Agostino D, Wunderlich G, Fu Y. Validation of the Female Sexual Distress Scale—Revised for assessing distress in women with hypoactive sexual desire disorder. J Sex Med 2008;5:357–64.
14 Watson D, Weber K, Assenheimer JS, Clark LA, Strauss ME, McCormick RA. Testing a tripartite model: I. Evaluating the convergent and discriminant validity of anxiety and depression symptoms scales. J Abnorm Psychol 1995;104:3–14.
15 Watson D, Clark LA, Weber K, Assenheimer JS, Strauss ME, McCormick RA. Testing a tripartite model: II. Exploring the symptom structure of anxiety and depression in student, adult, and patient samples. J Abnorm Psychol 1995;104:15–25.
16 Keogh E, Reidy J. Exploring the factor structure of the Mood and Anxiety Symptom Questionnaire (MASQ). J Pers Assess 2000;74:106–25.
17 McHorney C, Rust J, Golombok S, et al. Profile of Female Sexual Function: A patient-based, international, psychometric instrument for the assessment of hypoactive sexual desire in oophorectomized women. Menopause 2004;11:474–83.
18 Derogatis L, Rust J, Golombok S, et al. Validation of the Profile of Female Sexual Function (PFSF) in surgically and naturally menopausal women. J Sex Marital Ther 2004;30:25–36.
19 Kalmbach DA, Kingsberg SA, Janata JW, Ciesla JA. The validation of the Female Sexual Function Index, Male Sexual Function Index, and Profile of Female Sexual Function for use in healthy, young adults. Arch Sex Behav 2014.
20 Rosen RC, Brown C, Heiman J, et al. The Female Sexual Function Index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. J Sex Marital Ther 2000;26:191–208.
21 Carvalho J, Vieira AL, Nobre PJ. Latent structures of female sexual functioning. Arch Sex Behav 2012;41:907–17.
22 Opperman EA, Benson LE, Milhausen RR. Confirmatory factor analysis of the Female Sexual Function Index. J Sex Res 2013;50:29–36.
23 Raudenbush SW, Bryk AS. Hierarchical linear models: Applications and data analysis methods. London: Sage; 2002.
24 Singer JD, Willett JB. Applied longitudinal data analysis: Modelling change and event occurrence. New York: Oxford University; 2003.
25 Santor DA, Zuroff DC, Ramsay JO, Cervantes P, Palacios J. Examining scale descriminability in the BDI and CES-D as a function of depressive severity. Psychol Assess 1995;7:131–9.
26 Kvaal K, Ulstein I, Nordhus IH, Engedal K. The Spielberger State-Trait Anxiety Inventory (STAI): The state scale in detecting mental disorders in geriatric patients. Int J Geriatr Psychiatry 2005;20:629–34.
27 Kalmbach DA, Pillai V. Daily affect and female sexual function. J Sex Med 2014.
28 Treadway MT, Zald DH. Reconsidering anhedonia in depression: Lessons from translational neuroscience. Neurosci Biobehav Rev 2011;35:537–55.

29 Pfaus JG. Reviews: Pathways of sexual desire. J Sex Med 2009;6:1506–33.
30 Taylor GT, Cabrera O, Hoffman J. The neuroendocrinology of anhedonia. Anhedonia: A comprehensive handbook. Vol. I. New York: Springer; 2014:209–43.
31 Cuntim M, Nobre P. The role of cognitive distraction on female orgasm. Sexologies 2011;20:212–4.
32 McEvoy PM, Watson H, Watkins ER, Nathan P. The relationship between worry, rumination, and comorbidity: Evidence for repetitive negative thinking as a transdiagnostic construct. J Affect Disord 2013;151:313–20.
33 Nolen-Hoeksema S, Wisco BE, Lyubomirsky S. Rethinking rumination. Perspect Psychol Sci 2008;3:400–24.
34 American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 4th edition, text revision. Washington, DC: American Psychiatric Association; 2000.
35 American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 5th edition. Washington, DC: American Psychiatric Association; 2013.
36 Derogatis LR, Clayton AH, Rosen RC, Sand M, Pyke RE. Should sexual desire and arousal disorders in women be merged? Arch Sex Behav 2011;40:217–9.
37 Derogatis LR, Laan E, Brauer M, et al. Responses to the proposed DSM-V changes. J Sex Med 2010;7:1998–2014.
38 Clayton AH, Derogatis LR, Rosen RC, Pyke R. Intended or unintended consequences? The likely implications of raising the bar for sexual dysfunction diagnosis in the proposed DSM-V revisions: 1. For women with incomplete loss of desire or sexual receptivity. J Sex Med 2012;9:2027–39.
39 Clayton AH, Derogatis LR, Rosen RC, Pyke R. Intended or unintended consequences? The likely implications of raising the bar for sexual dysfunction diagnosis in the proposed DSM-V revisions: 2. For women with loss of subjective sexual arousal. J Sex Med 2012;9:2040–6.
40 Brotto LA, Graham CA, Binik YM, Segraves RT, Zucker KJ. Should sexual desire and arousal disorders in women be merged? A response to DeRogatis, Clayton, Rosen, Sand, and Pyke (2010). Arch Sex Behav 2011;40:221–5.
41 Mitchell KR, Wellings KA, Graham C. How do men and women define sexual desire and sexual arousal? J Sex Marital Ther 2014;40:17–32.
42 Brotto LA. The DSM diagnostic criteria for hypoactive sexual desire disorder in women. Arch Sex Behav 2010;39:221–39.
43 Graham CA. The DSM diagnostic criteria for female sexual arousal disorder. Arch Sex Behav 2010;39:240–55.
44 Salonia A, Nappi RE, Pontillo M, et al. Menstrual cycle-related changes in plasma oxytocin are relevant to normal sexual function in healthy women. Horm Behav 2005;47:164–9.
45 Brotto LA, Basson R, Smith KB, Driscoll M, Sadownik L. Mindfulness-based group therapy for women with provoked vestibulodynia. Mindfulness 2014.
46 Brotto LA, Basson R. Group mindfulness-based therapy significantly improves sexual desire in women. Behav Res Ther 2014;57:43–54.
47 Brotto LA, Smith KB. Applications of mindfulness in the treatment of women's sexual dysfunction. In: Ie A, Ngoumen CT, Langer EJ, eds. The Wiley Blackwell handbook of mindfulness. Hoboken, NJ: Wiley Blackwell; 2014:864–80.
48 Silverstein RG, Brown AH, Roth HD, Britton WB. Effects of mindfulness training on body awareness to sexual stimuli: Implications for female sexual dysfunction. Psychosom Med 2011;73:817–25.
49 Hawley LL, Schwartz D, Bieling PJ, et al. Mindfulness practice, rumination and clinical outcome in mindfulness-based treatment. Cogn Ther Res 2014;38:1–9.
50 Delgado LC, Guerra P, Perakakis P, Vera MN, Reyes del Paso G, Vila J. Treating chronic worry: Psychological and physiological effects of a training programme based on mindfulness. Behav Res Ther 2010;48:873–82.
51 Evans S, Ferrando S, Findler M, Stowell C, Smart C, Haglin D. Mindfulness-based cognitive therapy for generalized anxiety disorder. J Anxiety Disord 2008;22:716–21.