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The impact of anxiety on sexual arousal in women

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Abstract

This study examined the impact of state anxiety, trait anxiety, and anxiety sensitivity on physiological and self-report measures of sexual arousal and sexual function in a non-clinical sample of women. Physiological sexual responses to an erotic stimulus were assessed using vaginal photoplethysmography, and subjective reactions were measured using questionnaires. Results suggested a curvilinear relationship between state anxiety and physiological sexual arousal (vaginal pulse amplitude; VPA). Trait anxiety and anxiety sensitivity were correlated with self-reported sexual arousal outside the laboratory. The findings may be interpreted in light of sympathetic nervous system (SNS) influences on sexual arousal and potential cognitive interference mechanisms associated with anxiety.

Keywords: Sexual arousal; Anxiety; Vaginal photoplethysmography

Introduction

Research on the role of anxiety in sexual arousal has focused primarily on anxiety arising from specific concerns about sexual performance (e.g., Cranston-Cuebas & Barlow, 1990), but there is ample evidence to justify a broader study of this relation. A high prevalence of sexual dysfunction has been reported in women with anxiety disorders (e.g., Aksaray, Yelken, Kaptanoglu, Oflu, & Ozaltin, 2001; Bodinger et al., 2002; Figueira, Possidente, Marques, & Hayes, 2001; van Minnen & Kampman, 2000). High–normal levels of anxiety in normal populations may also be a risk factor for sexual problems. In a large community epidemiological survey, Dunn, Croft, and Hackett (1999) reported that women with moderate to high scores on a self-report measure of anxiety were at significantly higher risk for a number of sexual problems, but particularly for arousal difficulties. Heaven et al. (2003) found that neuroticism, a personality feature characterized by anxiousness, was moderately correlated with sexuality-specific fears and negatively related to sexual motivation.

The mechanisms by which anxiety impacts sexual arousal in women are not firmly established. Clearly, anxiety proneness may predispose women to developing worries and fears about their sexual lives and sexual behavior. Sex-related anxiety can make it difficult to psychologically engage in sexual activity, as the woman may be too preoccupied with her sex-related fears to fully attend to sexually arousing stimuli (Barlow, 1986).

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It is also possible that, in the absence of specific sexual concerns, high levels of anxiety may be associated with *non-sexual* cognitive distractions (such as worry, obsessions, and hypervigilance to bodily sensations) that can interfere with sexual responding. Even among women without sexual disorders, laboratory studies have demonstrated that non-sexual cognitive distractions reduce both physiological and subjective arousal to erotic stimuli (e.g., Adams, Haynes, & Brayer, 1985; Elliott & O'Donohue, 1997). Finally, because both acute anxiety and sexual arousal are mediated by changes in autonomic arousal, there may be a physiological basis to impaired sexual responding secondary to anxiety.

Although clinical reports generally link anxiety to impaired sexual arousal, laboratory studies suggest that, under certain conditions, anxiety may facilitate genital sexual arousal responses. For example, Hoon, Wincze, and Hoon (1977) and Palace and Gorzalka (1990) concluded that anxiety induced by an anxiety-evoking film enhanced vaginal vasocongestive responses to erotic stimuli in the laboratory. Discrepancies between experimental and clinical data may be attributable to distinctions between physiological (i.e., vaginal blood flow) and self-report measurement of sexual arousal, with the latter typically being the exclusive focus of clinical assessment. Experimental studies that have assessed both physiological and self-reported sexual arousal often report low correlations between these measures in women (e.g., Laan, Everaerd, van Bellen, & Hanewald, 1994; Laan, Everaerd, van der Velde, & Geer, 1995; Meston & Gorzalka, 1995).

The discrepancy between clinical reports and experimental data concerning the effects of anxiety on sexual arousal may also be explained by the fact that anxiety has been treated as a vague, unitary construct in many studies to date. Although state and trait anxiety could be expected to interfere cognitively with sexual arousal, state anxiety is also uniquely associated with elevations in sympathetic nervous system (SNS) arousal (Hoehn-Saric & McLeod, 1988), which may independently affect sexual responses (e.g., Meston, 2000). Because state anxiety may entail this additional influence on sexual arousal by means of SNS arousal, differentiating between acute and chronic anxiety states in sexual arousal studies may have meaningful implications.

State anxiety is an acute emotional response characterized by subjective feelings of apprehension and increased activation of the SNS (Hoehn-Saric & McLeod, 1988; Spielberger, 1966). Because state anxiety is transitory and can easily be manipulated (e.g., Stoudenmire, 1975), this construct is most relevant to previous laboratory studies of anxiety and sexual arousal, which have used anxiety induction procedures to experimentally manipulate anxiety. The results of two such studies (Hoon et al., 1977; Palace & Gorzalka, 1990) suggest that elevations in state anxiety can be expected to facilitate increases in physiological indices of sexual arousal (e.g., vaginal blood volume, vaginal pulse amplitude (VPA)). With regard to subjective anxiety, however, state anxiety could theoretically distract the individual from cognitively processing sexually arousing stimuli (Barlow, 1986), leading to lower self-reported sexual arousal. Indeed, Palace and Gorzalka noted that, in contrast to physiological measures, subjective arousal responses to an erotic film were *lower* when preceded by an anxiety-provoking film than by a neutral film. It is not surprising, therefore, that Palace and Gorzalka also noted a lack of correlation between physiological and subjective measures of sexual arousal. While consistent with other studies that describe a low concordance between physiological and self-reported sexual arousal (for a review, see Rellini, McCall, Randall, & Meston, 2005), it remains unclear to what extent affective states such as state anxiety might influence these relations. Research to date has relied on the use of anxiety-evoking stimuli to induce state anxiety reactions, but the impact of spontaneous anxiety reactions on sexual arousal has, to our knowledge, not been examined in the laboratory.

Trait anxiety, by contrast, is a relatively stable measure that reflects an individual's dispositional tendency to experience state anxiety. According to Spielberger (1975), individuals higher in trait anxiety experience more frequent and more intense acute anxiety states. From a cognitive perspective, high trait anxiety may interfere with psychological sexual arousal because the individual is biased to perceive threatening information, which may distract her from sexually arousing stimuli or cause negative interpretations of those stimuli. Although trait anxiety is necessarily related to state anxiety, previous research has indicated that it is not as reliably predictive of autonomic responses to stressors (Lamb, 1973). Given that trait anxiety represents only a *tendency* toward autonomic excitation (state anxiety), it is reasonable to assume that it would be less predictive of acute physiological sexual responses mediated by autonomic arousal. However, with regard to measuring the generalized effects of anxiety on sexual function over the long term, trait anxiety would be the more stable, and therefore preferred, construct.

Anxiety sensitivity can be described as a fear of the anxiety response itself, and is related to, but distinct from, trait anxiety (for a review, see Reiss, 1997; Taylor, 1995). Individuals with high anxiety sensitivity are prone to misinterpret anxiety symptoms, such as flushing and shakiness, as inherently threatening (Reiss & McNally, 1985). Indeed, anxiety sensitivity may encompass the fear of perceived changes in autonomic arousal in general. Because sexual arousal also entails a series of bodily responses mediated by autonomic arousal, it follows that individuals with high anxiety sensitivity could react anxiously to the physical experience of sexual arousal.

The present study examined state and trait anxiety, and anxiety sensitivity in relation to women's physiological and subjective sexual arousal responses to erotic stimuli. Based on laboratory studies indicating that physiological sexual arousal increased in the presence of an anxiety-provoking stimulus (Hoon et al., 1977; Palace & Gorzalka, 1990), it was expected that state anxiety would be associated with greater physiological sexual arousal (i.e., VPA). Self-reported sexual arousal in the laboratory, on the other hand, was expected to decrease as a function of state anxiety, consistent with previous findings (Palace & Gorzalka, 1990). In light of previous findings that suggest a negative effect of dispositional anxiety on sexual function (e.g., Dunn et al., 1999), it was predicted that stable measures of anxiety (trait anxiety and anxiety sensitivity) would be negatively associated with participants' self-reported sexual arousal, both in the laboratory setting and measured using a validated index of sexual arousal function.

Method

Participants

Thirty-eight pre-menopausal women between the ages of 19 and 41 ($M = 25.4$ years, SD = 4.6 years) agreed to participate in the study. Participants were recruited from advertisements posted in a local newspaper and on a local website. All participants were sexually active at the time of the study and reported no sexual concerns or difficulties. Prior to participation, women who were interested in the study were screened to rule out any medical conditions (e.g., diabetes mellitus) or medications (e.g., selective serotonin reuptake inhibitors, beta blockers) known to affect physiological sexual responses. Women who reported current distress related to a history of sexual abuse or assault were also excluded from participation due to the potentially upsetting nature of the procedures. Participants were compensated $25.00 for taking part in the study.

Participants included 35 women who identified as White/Caucasian, two women who identified as Black/African-American, and one woman who identified as Asian. Four participants (10.5%) also identified as Hispanic/Latina. Participants were predominantly unmarried (89.5%) and had received at least some college education (90%). At the time of the study, 52% of the participants were involved in long-term relationships (1 year or longer in duration). Although most participants were predominantly heterosexual, 13 (34.2%) endorsed considerable same-sex sexual experience or desire in addition to heterosexual experience. The extent of participants' previous experience with erotica was not assessed, although prospective participants were informed of the nature of the stimuli during the screening process and were advised not to participate if they expected to feel uncomfortable viewing a sexually explicit film.

Stimulus materials

The film stimulus used in this study consisted of a 1-min display of the word "Relax," a 3-min neutral travel documentary clip, and a 10-min erotic film clip depicting a heterosexual couple engaging in foreplay and sexual intercourse. Both clips were excerpted from commercially available films and digitally edited. The erotic film clip was selected based on data indicating that women found the clip sexually arousing (Rellini et al., 2005).

Measures and data reduction

Physiological sexual arousal

An infrared vaginal photoplethysmograph was used to record VPA responses. The AC component of the photoplethysmograph signal (VPA) was sampled at 80 Hz, band-pass filtered (0.5–30 Hz), and digitized using

a BIOPAC Systems MP100 data acquisition unit (BIOPAC Systems, Goleta, CA). Data from the MP100 were recorded to a Windows PC in real time using the software program AcqKnowledge version 3.7.3 (BIOPAC Systems).

VPA data were analyzed by first measuring the peak-to-trough amplitude (expressed in mV) of each individual pulse recorded during the film presentation, omitting movement artifacts identified by visual inspection of the data. The average VPA was then calculated separately across neutral and erotic film segments for each participant. Because of the lack of scaling for absolute VPA scores, as well as considerable between-subject variability in baseline VPA levels (Janssen, 2001), change in VPA during the erotic film was expressed as a percentage relative to baseline using the formula: (Average Erotic VPA)/(Average Neutral VPA) $\times$ 100. This value was used as the dependent variable; larger values indicated greater relative increases in VPA during the erotic stimulus. The conversion of VPA to a percentage difference score not only accounted for variability in baseline VPA levels but also eliminated "law of initial value" concerns (Meuwissen & Over, 1993) by eliminating any significant correlation between baseline values and the magnitude of increase during the erotic stimulus. Psychophysiological data from two participants were not interpretable due to extreme and sustained increases in VPA that could not clearly be attributed to movement artifacts. Therefore, only 36 participants are represented in analyses that include VPA data.

Subjective sexual arousal in the laboratory

Participants were asked to rate the intensity of perceived physiological reactions to the film using a post-film questionnaire adapted from Heiman and Rowland (1983). Using a 7-point Likert scale, with responses ranging from "Not at all" (1) to "Intensely" (7), participants rated the extent to which they experienced sensations such as genital warmth, vaginal wetness, and breast sensations (hereafter referred to as "subjective physical sexual arousal").

The post-film questionnaire also contained items assessing psychological sexual arousal in response to the film. Using the same 7-point Likert scale, participants rated the intensity of mental sexual arousal (feeling psychologically "turned on") during the film. Participants also rated the intensity of positive and negative affective reactions to the film (e.g., "happy," "embarrassed," "bored"), which were analyzed separately.

Sexual function during the past month

The Female Sexual Function Index (FSFI; Rosen et al., 2000) was used to assess participants' sexual function. The FSFI is a 19-item self-report measure assessing sexual desire, sexual arousal, orgasm, sexual satisfaction, and sexual pain over the past 4-week period. Subscores pertaining to six domains of sexual function may be derived from FSFI responses. Of particular interest to this study were the Arousal domain, consisting of four items assessing consistency and satisfaction with psychological arousal during sexual activity, and the Lubrication domain, consisting of four items assessing consistency and satisfaction with physiological sexual arousal (vaginal lubrication) during sexual activity. Previous studies supported the internal consistency of the Arousal and Lubrication FSFI domains (Cronbach's alphas $>$ .90; Meston, 2003; Rosen et al., 2000; Wiegel, Meston, & Rosen, 2005). Both domains have been shown to discriminate between women diagnosed with female sexual arousal disorder and controls (Wiegel et al., 2005).

Anxiety

Participants completed the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). Using a 4-point scale, participants answered 20 items assessing state (momentary, reactive) anxiety and 20 items assessing trait (stable, dispositional) anxiety. Raw scores were computed separately for state and trait anxiety by adding the individual item scores. The raw scores were then converted to *T*-scores based on the appropriate age and gender group norms.

Anxiety sensitivity was measured using the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986), a 16-item questionnaire that respondents used to indicate the degree to which symptoms of anxiety or physiological arousal (e.g., rapid heart beat) caused them fear or concern.

Procedure

Participants attended a single laboratory session during which they completed questionnaires and a psychophysiological assessment of their sexual responses to the film stimulus. The procedures in this study were approved by an institutional review board prior to commencement of the study.

Participants were asked to refrain from caffeine, alcohol, and sexual activity for 24 h prior to the study session to minimize potential physiological sources of variation between responses. Upon arrival, participants were oriented to the laboratory and asked to read and sign an informed consent document. Participants then completed questionnaires and the psychophysiology session in counterbalanced order.

The psychophysiology session took place in an internally locked room in which participants were able to insert the vaginal photoplethysmograph in privacy. Participants sat in a reclining chair that was placed a comfortable viewing distance from a 107-cm television screen that displayed the film. In order to limit the occurrence of movement artifacts in the signal from the photoplethysmograph, participants were instructed to remain as motionless as possible after placing the device and being seated.

Depth and orientation of probe insertion were standardized between women using a 9- × 2-cm plate attached to the photoplethysmograph cable. The plate was adjusted to rest approximately 2.5 cm from the proximal end of the probe and oriented so that the light-emitting diode would illuminate the anterior vaginal wall. Between each use, the photoplethysmograph and the placement device were sanitized in a solution of 3.4% gluteraldehyde (Cidex Plus 28-Day Solution, Johnson & Johnson).

After each participant placed the probe and was seated comfortably, an adaptation recording of 5 min was taken to ensure that a stable baseline VPA was established prior to beginning the film stimulus. More time was allowed to establish a stable baseline in the event that a participant moved frequently during the adaptation period. VPA was recorded continuously throughout the film. Immediately after viewing the film, participants rated their subjective reactions using the post-film questionnaire.

Results

State anxiety and physiological sexual arousal

Participants' *T*-scores for both state ($M = 49.7$, SD = 10.1) and trait ($M = 55.5$, SD = 10.0) anxiety were within the expected range for women from a non-clinical population. There was no significant linear correlation between state anxiety and VPA. However, on examination of the raw data, a non-linear pattern seemed to better characterize the relationship between state anxiety and VPA responses. To further investigate this pattern, participants were grouped into equal terciles ($n = 12$) on the basis of their state anxiety *T*-scores. The groups were defined as "low" ($M = 38.6$, SD = 3.7), "moderate" ($M = 49.4$, SD = 2.2), or "high" ($M = 61.2$, SD = 5.3) in state anxiety. The "moderate" group mean approximated the state anxiety *T*-score adult population norm of 50. The "low" and "high" group means corresponded to scores roughly one population SD (10 points) below and above the norm, respectively. Variances did not significantly differ between state anxiety groups (Levene's test statistic = .854, $p = .435$).

Participant age was not associated with anxiety group membership nor significantly correlated with VPA response, and was therefore excluded from further analyses. A one-way ANOVA was conducted to assess whether VPA responses differed between state anxiety groups. The overall test was statistically significant, $F(2, 33) = 5.410$, $p = .009$. Participants classified as "moderate" in state anxiety displayed the greatest VPA responses relative to baseline (mean percent of baseline = 170.06; SD = 28.6%). Pairwise comparisons using Tukey's honestly significant difference criterion revealed that "low" and "high" state anxiety groups did not differ from each another in terms of VPA response, but both differed significantly from the "moderate" group ($p's < .05$). Fig. 1 displays means and 95% confidence intervals for VPA responses of the three state anxiety groups.

State anxiety, trait anxiety, anxiety sensitivity, and measures of subjective sexual arousal in the laboratory

State anxiety was significantly correlated with higher ratings of negative affect in reaction to the erotic film ($r = .406$, $p = .011$). Further analysis of individual items comprising the negative affect composite score

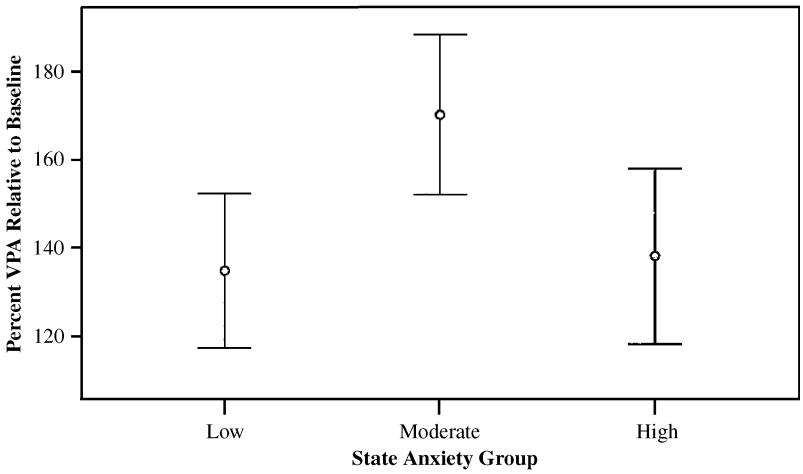

Fig. 1. Vaginal pulse amplitude difference score by state anxiety group.

revealed that anxiety was significantly correlated with reports of feeling "worried," "anxious," "embarrassed," "guilty," "dirty," and "inhibited," but not "angry," "disgusted," "incompetent," "offended," or "bored". Thus, state anxiety appeared to be largely related to affective reactions reflecting anxiety and shame. State anxiety was not significantly correlated with positive affect ($r = -.082$, $p > .05$), or with subjective physical ($r = .103$, $p > .05$) or mental ($r = -.284$, $p = .084$) sexual arousal in response to the erotic film.

Anxiety sensitivity was positively associated with negative affect ratings ($r = .388$, $p = .016$). Further analysis of individual items comprising the negative affect composite score revealed that anxiety sensitivity was significantly correlated with reports of feeling "worried," "disgusted," "embarrassed," and "guilty," but not "anxious," "angry," "dirty," "inhibited," "incompetent," "offended," or "bored." Similar to state anxiety, anxiety sensitivity was associated with feelings related to shame, but was additionally related to feelings of disgust. Anxiety sensitivity was not associated with positive affect ($r = .085$, $p > .05$), or with subjective physical ($r = .012$, $p > .05$), or mental ($r = -.084$, $p > .05$) sexual arousal.

In contrast to the other anxiety measures, trait anxiety was not associated with participants' ratings of negative affect in reaction to the erotic film ($r = .186$, $p > .05$), nor was trait anxiety significantly associated with subjective mental sexual arousal ($r = -.247$, $p > .05$), subjective physical sexual arousal ($r = -.001$, $p > .05$), or positive affect ($r = -.065$, $p > .05$).

There was no evidence of a curvilinear relationship among subjective arousal or affective variables as a function of anxiety measures. Table 1 displays intercorrelations of scores on anxiety, subjective arousal, and affective measures.

Correlations between physiological and subjective sexual arousal

The correlation between subjective mental sexual arousal and VPA response was statistically significant ($r = .350$, $p = .036$) and slightly increased when controlling for state anxiety ($r = .400$, $p = .019$). Subjective physical sexual arousal was also correlated with VPA at the trend level ($r = .322$, $p = .060$) but did not change when controlling for state anxiety. Although positive affect correlated weakly with VPA response ($r = .298$, $p = .082$), negative affect was unrelated to VPA.

Anxiety and sexual arousal function

The FSFI Total score, a global indicator of sexual function during the past month, correlated negatively with state ($r = -.410$, $p = .011$) and trait ($r = -.530$, $p = .001$) anxiety. Scores on the FSFI Arousal domain were negatively associated with state ($r = -.429$, $p = .007$) and trait ($r = -.582$, $p < .001$) anxiety, and also

Table 1
Intercorrelations of anxiety measures and subjective reactions to the film stimulus

Measure	1	2	3	4	5	6	7
1. State anxiety	—	.74**	.44**	.10	−.28***	−.08	.41*
2. Trait anxiety	—	—	.40*	.00	−.25	−.07	.19
3. Anxiety sensitivity	—	—	—	.01	−.08	.09	.39*
4. Subjective physical sexual arousal	—	—	—	—	.77**	.79**	.00
5. Subjective mental sexual arousal	—	—	—	—	—	.75**	−.29***
6. Positive affect	—	—	—	—	—	—	−.11
7. Negative affect	—	—	—	—	—	—	—

*Correlation is significant at the 0.05 level, 2-tailed.
**Correlation is significant at the 0.01 level, 2-tailed.
***Correlation is significant at the trend (0.10) level, 2-tailed.

Table 2
Correlations between anxiety measures and FSFI domain scores

Measure	FSFI Desire	FSFI Arousal	FSFI Lubrication	FSFI Orgasm	FSFI Satisfaction	FSFI Pain	FSFI Total Score
State anxiety	.00	−.43**	.00	−.32***	−.59**	−.29***	−.41*
Trait anxiety	−.08	−.58**	−.06	−.46**	−.70**	−.12	−.53**
Anxiety sensitivity	−.08	−.26***	.03	−.23	−.31***	−.18	−.27

*Correlation is significant at the 0.05 level, 2-tailed.
**Correlation is significant at the 0.01 level, 2-tailed.
***Correlation is significant at the trend (0.10) level, 2-tailed.

tended to be negatively associated with anxiety sensitivity, although this relationship did not reach statistical significance ($r = -.285$, $p = .083$). Notably, none of the anxiety measures were correlated with the FSFI Lubrication domain. State and trait anxiety scores were also negatively correlated with FSFI domains assessing orgasm and sexual satisfaction (see Table 2 for correlations among each of the FSFI domain scores and anxiety measures). However, after controlling for trait anxiety, neither state anxiety ($r = .005$, $p > .05$) nor anxiety sensitivity ($r = -.071$, $p > .05$) remained associated with the FSFI Arousal score.

Discussion

The present study aimed to elucidate the relationships of three distinct anxiety-related constructs with sexual arousal in a sample of sexually healthy women. State anxiety was expected to have positive associations with physiological sexual arousal in response to an erotic film and negative associations with subjective (self-report) sexual arousal to the film. It was predicted that trait anxiety and anxiety sensitivity would show negative relationships with self-reported sexual arousal to the erotic film and with scores on a validated questionnaire assessing sexual arousal function.

Consistent with predictions, participants with state anxiety scores in the moderate range showed greater increases in VPA in response to an erotic film than participants who endorsed relatively low levels of state anxiety, suggesting a positive association between state anxiety and physiological sexual arousal. Unexpectedly, however, state anxiety scores in the high range were not associated with greater increases in VPA. Low and high state anxiety scores were associated with similar mean VPA responses that were significantly lower than VPA responses associated with moderate state anxiety scores. In contrast to state anxiety, trait anxiety was not associated with VPA responses. This is not surprising given that trait anxiety reflects only general anxiety-proneness and not an acute reaction to a stimulus (Zuckerman, 1976).

The indication of a curvilinear relationship between state anxiety and VPA may help to explain why some studies have found a facilitative effect of state anxiety on physiological sexual responses in women

(Hoon et al., 1977; Palace & Gorzalka, 1990), whereas others have not (Elliott & O'Donohue, 1997; Sipski, Rosen, Alexander, & Gómez-Marín, 2004). It is possible that divergent findings can be attributed to the varying extent to which prior anxiety manipulations have been successful at inducing an anxiety state. This explanation is speculative, however, because to our knowledge no prior studies examining sexual arousal in the laboratory have examined such relationships using comprehensive measures of state anxiety.

SNS activation associated with state anxiety is a potential mediating factor that may in part explain, albeit speculatively, the observed relationship between state anxiety and VPA. Previous studies have demonstrated that levels of vanillylmandelic acid (VMA), the metabolic end product of norepinephrine in the peripheral SNS, correlated with state anxiety (Fukuda et al., 1996; Garvey, Noyes, Woodman, & Laukes, 1995; Santagostino et al., 1996), particularly when measured repeatedly within one individual (Fukuda et al., 1996). Thus, the effects of state anxiety on genital arousal may be tentatively interpreted in light of a growing body of the literature that suggests moderate levels of SNS activation, induced using ephedrine (Meston & Heiman, 1998) or intense acute exercise (e.g., Meston & Gorzalka, 1995), facilitates physiological sexual arousal in women. In one such study, the authors reported a level-dependent relationship between SNS activation and VPA responses such that moderate levels facilitated, high levels inhibited, and low levels of SNS activation had less of a facilitatory effect on sexual arousal responses (Meston & Gorzalka, 1996). The curvilinear relationship between SNS activation and VPA reported by Meston and Gorzalka (1996) is consistent with the relationships between levels of state anxiety and VPA observed in the present study. However, because biological indicators of sympathetic activation were not obtained, there is no way to directly examine whether the influence of state anxiety on VPA was attributable to increased SNS activation in the present study.

The relationship between state anxiety and subjective laboratory ratings of mental sexual arousal showed a trend in the predicted direction, providing tentative support to the hypothesis that state anxiety negatively affects subjective sexual arousal. This is consistent with the previous finding that pre-exposure to an anxiety-provoking stimulus decreased subjective sexual arousal (Palace & Gorzalka, 1990), although this effect has not been observed consistently (Elliott & O'Donohue, 1997). The lack of correlation between trait anxiety and subjective sexual arousal, though not anticipated, has some precedent in previous findings (Pawlowski, 1979). Anxiety sensitivity, which to our knowledge has not been investigated in previous studies of anxiety and sexual function, was likewise unrelated to laboratory ratings of subjective sexual arousal, inconsistent with our predictions.

Although anxiety measures were not strongly associated with subjective sexual arousal responses to an erotic film, state anxiety and anxiety sensitivity were both positively correlated with the extent to which participants endorsed negative *affective* reactions to the erotic film. The influence of anxiety on affective, but not specifically sexual, responses in a sexually relevant context may appear inconsistent. However, negative affect and negative mood states have not been associated with consistent positive or negative influences on sexual arousal (Graham, Sanders, Milhausen, & McBride, 2004; Heiman, 1980). Numerous confounds of laboratory-based sex research, particularly the artificial context, may also obscure the relationship between anxiety and subjective sexual arousal that seems more apparent in research based on self-report measures of sexual function (e.g., Dunn et al., 1999).

The results of the present study suggest that state anxiety may differentially affect physiological and subjective sexual arousal in a laboratory context. This is consistent with the conceptualization of sexual arousal in women as a system of distinct cognitive/subjective and physiological/genital processes, which may be less integrated than previously imagined (e.g., Basson et al., 2003). The fact that genital sexual arousal is mediated to some extent by autonomic, pre-cognitive processes may in part explain the widely observed inconsistency between physiological and subjective measures of sexual arousal (for further discussion of this issue, see Basson et al., 2003; van Lunsen & Laan, 2004). It is important to note, however, that in the present study subjective mental sexual arousal and VPA were significantly correlated, more so when controlling for state anxiety. It is possible that anxiety-related body vigilance may increase the concordance between subjective appraisals and physiological measures. Indeed, exploratory post-hoc analyses revealed that, when examining the correlation between subjective mental sexual arousal and VPA by state anxiety group, the correlation was statistically significant only in the "high" state anxiety group. Unfortunately, the study was not sufficiently powered to more thoroughly investigate this preliminary finding.

With regard to clinically relevant measures, a strong negative correlation was observed between trait anxiety and scores on the FSFI Arousal domain, which assesses the extent to which women become and stay mentally excited (e.g., "turned on") during sexual activity. This is consistent with the hypothesis that dispositional anxiety would be associated with lower sexual arousal function scores. Anxiety sensitivity also tended to be associated with lower FSFI Arousal scores, although trait anxiety appeared to account for this relationship. In contrast to the strong relation between trait anxiety and mental sexual arousal function (FSFI Arousal), trait anxiety was unrelated to measures of physical sexual arousal function (i.e., FSFI Lubrication). Anxiety sensitivity was also unrelated to FSFI Lubrication scores. These findings indicate that women with higher dispositional anxiety reported less frequent, consistent, and/or satisfying mental sexual arousal ("turn on") during sexual activity, but no impairment in vaginal lubrication. This novel finding suggests that the impact of dispositional anxiety on sexual function may be more cognitive than physiological in nature. Future research may consider the possibility that highly anxious women have difficulty becoming and remaining engaged sexually for different reasons than those of women with primary sexual dysfunctions, although cognitive distraction may be a general underlying mechanism (e.g., Adams et al., 1985; Elliott & O'Donohue, 1997; Przybyla & Byrne, 1984).

In conclusion, the results of the present study point to the relevance of measuring anxiety-related constructs in both clinical and laboratory research contexts. Future research involving the physiological measurement of sexual arousal should take into consideration the wide range of reactions that participants may experience to a sensitive and somewhat invasive study protocol. Although many sexuality studies have attempted to offset self-report biases through measurement of social desirability (e.g., Brody, Laan, & van Lunsen, 2003), the impact of emotional reactions on *objective* measures has not been discussed in the literature as a potential methodological problem. The present study has provided evidence to warrant monitoring state anxiety in studies that measure physiological responses, such as VPA, to sexual stimuli. Although the differential effects of state anxiety on VPA and subjective arousal are not entirely inconsistent with previous studies, it remains unclear whether this dissociation is attributable to cognitive interference, a physiological process, or both. Future studies in populations with anxiety disorders may clarify the mechanisms by which anxiety impacts physiological and subjective sexual arousal and their concordance. The present study also suggests a relationship between dispositional anxiety and psychological aspects of sexual arousal functioning, even within a sample of women who were not selected from populations with sexual disorders or anxiety disorders. Whether anxiety impacts sexual function by predisposing women to sex-specific fears, or by more general cognitive mechanisms, remains to be seen and should be evaluated in future research involving women with anxiety disorders.

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