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Attention bias for sexual words in females with low sexual functioning: A brief report

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Abstract

Attention bias (i.e., tendency to selectively attend to disorder-relevant stimuli) has been associated with numerous emotional disorders, but few studies have examined attention bias in the context of sexual problems. The current study tested the hypothesis that females with low sexual functioning show an attention bias toward sexual stimuli compared to females with high sexual functioning. We assessed attention bias using a modified probe detection task using sexual and neutral words. Females with low sexual functioning ($n=25$) showed an attention bias toward sexual words, whereas females with high sexual functioning ($n=25$) did not. These results suggest that attention bias may be involved in the maintenance of female sexual dysfunction. Moreover, our findings have implications for both models of sexual dysfunction, as well as clinical interventions.

Keywords

attention bias; female sexual dysfunction; information processing

Problems in female sexual functioning are prevalent, with some studies suggesting that as many as 24% of women report distress about their sexual activity (Bancroft, Loftus, & Long, 2003). Moreover, sexual dysfunction is associated with other mental health problems (e.g., depression; Frohlich & Meston, 2002). Examining potential mechanisms involved in the maintenance of female sexual dysfunction is clearly warranted.

Cognitive models sexual dysfunction suggest that these individuals direct attention away from sexual cues and toward performance related thoughts during a sexual interaction (Barlow, 1986). This attention toward threat-relevant information leads to decreased sexual arousal. Because the model makes predictions about attention focus during a sexual interaction, most studies have examined attention when individuals with sexual dysfunction are under sexual performance demands. Consistent with cognitive models, studies have supported the hypothesis that during a sexual interaction, individuals with sexual dysfunction focus on threat-relevant stimuli (Barlow, 1986; Dove & Wiederman, 2000; Van den Hout & Barlow, 2000). Most of these studies assessed attention indirectly by examining the effect of distraction on sexual arousal. Specifically, distraction reduced sexual arousal in sexually functional men, but it did not affect arousal in individuals with sexual dysfunction. Researchers concluded that distraction did not affect individuals with sexual dysfunction because they were presumably already distracted by threat-relevant thoughts.

The above studies provide evidence for the role of attention processes in sexual dysfunction during a sexual interaction. However, we cannot conclude from these studies that individuals with sexual dysfunction exhibit similar biased attention during their daily life. Indeed, we might expect individuals with sexual dysfunction to display the opposite pattern, i.e., attention toward sexual cues, if they process sexual stimuli in the environment as threatening. Selective attention toward sexual stimuli in the environment could be important, given the high prevalence of sexual stimuli encountered in daily life (e.g., television, Ward, 2003). Modifying paradigms from cognitive psychology developed to directly assess attention bias may provide insight into attention processes outside the context of a sexual interaction.

The role of attention bias has been extensively examined using cognitive paradigms in other emotional disorders. Numerous studies have found an association between anxiety and attention biases toward threat-relevant stimuli (e.g., MacLeod, Mathews, & Tata, 1986; Mogg, Garner, & Bradley, 2007). Attention bias has also been implicated in numerous other emotional problems (e.g. eating disorders, Shafran, Lee, Cooper, Palmer, & Fairburn, 2007; smoking, Bradley, Mogg, Wright, & Field, 2003). To date, the potential role of attention bias in sexual disorders has not been examined. This is surprising, given the substantial research in other disorders and the hypothesized role of attention processes in sexual dysfunction (Barlow, 1986).

Payne, Binik, Amsel, and Khalifé (2005) examined attention bias in women with Vulvar Vestibulitis Syndrome using the emotional Stroop task. Similar to other disorders, they found that women with this sexual problem showed more interference for pain related words compared to controls. To our knowledge, no other studies have examined attention bias in sexual dysfunction.

Thus, in the current study we modified the a probe detection task (MacLeod, Mathews, & Tata, 1986) to assess attention toward sexual versus neutral words in females with high and low sexual functioning. We chose the probe detection task because it has been successfully used in many studies of attention, and it overcomes some of the shortcomings of the Stroop task (see Fox, 1994). We examined attention bias in a low stress context (i.e., no performance demand) to extend the examination of attention in sexual dysfunction beyond the context of a sexual interaction. We predicted that women with low sexual functioning would view sexual words as threat-relevant and thus would show an attention bias toward sexual words compared to the control group.

Method

Participants

Participants comprised 72 female undergraduate students who received research credit for their participation. We used the Female Sexual Function Index (FSFI, see below) to classify participants (Rosen, et al., 2000, for a review of measures see Meston, 2003). We used a tertiary split to create high and low sexually functioning groups. This resulted in 25 participants in the low sexual functioning group (LSF) and 25 participants in the high sexual functioning group (HSF). Demographic information is presented in Table 1.

Measures

The FSFI (Rosen, Brown, Heiman, Leiblum, Meston, Shabsigh, Ferguson, & D'Agostino, Jr., 2000) comprises 19 items (rated on a Likert scale of 1 to 5) assessing six domains of female sexual functioning: desire, subjective arousal, lubrication, orgasm, satisfaction, and pain. The FSFI has demonstrated good reliability ($\alpha = .82$ or higher) and has been validated in females with sexual arousal disorder (Rosen et al., 2000), orgasmic disorder and hypoactive sexual desire disorder (Meston, 2003). We used the scoring system described in Rosen et al. (2000). Because Meston (2003) found that including individuals who report no sexual activity did not change their results, we did not exclude participants who reported not engaging in sexual activity.

To further characterize the sample, participants completed the *Beck Depression Inventory* (BDI: Beck and Steer, 1987) to assess symptoms of depression and the *Spielberger State-Trait Anxiety Inventory* (STAI: Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) to assess state and trait anxiety.

Procedure

The Institutional Review Board at the participating university approved the study protocol. After providing informed consent, participants completed the FSFI, BDI, and STAI. Participants then completed a variation of the dot probe task (MacLeod, Mathews, & Tata, 1986). Participants were tested individually in a small, windowless room, which was occupied by only the participants once the procedure had been explained to them.

Probe detection Task—We selected 15 sexually relevant words and 15 neutral words matched on word length and word frequency (Francis & Kucera, 1982) for this study (see Appendix). Participants were seated approximately 30 cm from the computer screen. Each trial began with a fixation cross, presented for 500 ms. The computer then presented participants with two words (one on top and one on bottom) for 500 ms. Then, a probe (either the letter “E” or the letter “F”) appeared in the previous location of one of the two words. The participants were instructed to decide if the letter was an E or an F by pressing the corresponding button (left or right) on the computer mouse. The probe remained on the screen until participants responded, and the next trial began as soon as participants responded. Participants were instructed to complete the trials as quickly as possible without sacrificing accuracy. All stimuli were presented in black, 12 pt Arial font against a gray background using lower case letters (3–5mm).

Participants completed 180 trials comprising various combinations of probe type (E or F), probe position (top or bottom), and congruency (probe location congruent with sexual word or probe location incongruent with sexual word). Of the 180 trials, 60 filler trials included only neutral words: 2 (probe type) X 2 (probe position) X 15 (words). The remaining 120 trials included one sexual word and one neutral word: 2 (probe type) X 2 (probe position) X 2 (congruency) X 15 (words). The computer program recorded participants' response and reaction time for each trial.

Results

Self-report measures

Groups did not differ in age, education, level of depression, state anxiety, or trait anxiety ($ps > .12$). As expected, the LSF group had significantly lower FSFI total scores than the HSF group, $t(48) = 11.97, p < .001$, indicating poorer sexual functioning in the LSF group (see Table 1 for means and standard deviations).

Reaction times and attention bias

We eliminated reaction times from inaccurate trials (5.4% of data). Upon visual inspection of reaction times, we excluded reaction times shorter than 100 ms and longer than 1500 ms (2.7% of accurate trials). We submitted mean reaction times from trials that included one sexual word and one neutral word to a 2 (Group: LSF, HSF) X 2 (Probe position: top, bottom) X 2 (Congruency: probe location congruent with sexual word, probe location incongruent with sexual word) ANOVA with repeated measures on the last two factors.¹ This analysis revealed a main effect of probe position, $F(1, 48) = 15.37, p < .001$, with all participants responding faster to probes appearing in the bottom location. There was also a significant interaction of Group X Congruency, $F(1, 48) = 6.34, p < .02$. None of the other main effects or interactions was significant ($ps > .1$).

We examined the Group X Congruency interaction further by conducting independent samples t-tests comparing groups on congruent and incongruent trials. These analyses revealed that groups did not differ in reaction times on congruent trials, $t(48) = 0.86, p > .3$. However, the LSF group was significantly slower on incongruent trials (when the probe appeared in the location opposite of the sexual word) compared to the HSF group, $t(48) = 2.05, p < .05$, suggesting slower disengagement from sexual words in the LSF group. We then conducted paired samples t-tests to examine within-group differences for congruent and incongruent trials. For the HSF group, this analysis did not reveal a significant difference between congruent and incongruent trials, $t(24) = 1.02, p > .3$. However, the LSF group was significantly slower on incongruent trials compared to congruent trials, $t(24) = -2.45, p < .03$. Reaction times for each trial type are presented in Table 1.

Similar to other dot probe studies, we calculated attention bias scores (Mathews & MacLeod, 1988). Reaction times from trials in which the probe replaced the sexual word were subtracted from trials in which the probe replaced the neutral word, and the result was divided by two. Thus, a positive bias score indicates attention directed toward sexual words, while a negative bias score indicates attention allocated toward neutral words. As expected, the LSF group had significantly larger bias scores compared to the HSF group, $t(48) = 2.52, p < .02$ (see Table 1). We also examined whether each group's attention bias score differed significantly from zero. One-sample t-tests revealed that the LSF group had a positive bias score that was significantly larger than zero, $t(24) = 2.45, p < .02$, whereas the HSF group

¹We conducted analyses after removing participants who did not engage in sexual activity ($n = 15$), and obtained a similar pattern of results: The LSF group ($n = 10$) had larger bias scores compared to the HSF group ($n = 25$), $t(1,33) = 1.97, p = .057$. We also examined data from filler trials that included only neutral words. The 2 (Group) X 2 (Probe position) ANOVA revealed a main effect of probe position, $F(1, 48) = 17.60, p < .001$, with faster reaction times on trials in which the probe appeared in the bottom location. None of the other effects were significant ($ps > .1$).

had a negative bias score that was not significantly different from zero, $t(24) = -1.02$, $p = .32$.

Hi court. This really comes out of nowhere and not sure why you need it if you have nice results already. I really like it but if you want to do this you may want to get the ocd paper from Sadia do it from the intro, talking about practice effects habituation etc. up to you.

(Optional section) Time course of attention bias

Several studies of attention bias in anxious individuals have shown that time course affects results such that attention bias attenuates over the course of the experimental trials, most likely due to participants' habituation to stimuli (e.g., McNally, Riemann, & Kim, 1990; McKenna & Sharma, 1995; Cohen, Eckhardt, & Schagat, 1998). Because this is the first study to utilize the dot probe task in female sexual dysfunction, we did not have specific hypothesis regarding the time course of attention bias. However, we conducted an exploratory 2 (Group: LSF, HSF) X 2 (Probe position: top, bottom) X 2 (Congruency: probe location congruent with sexual word, probe location incongruent with sexual word) X 2 (Block: 1st half of trials, 2nd half of trials) ANOVA with repeated measures on the last three factors. This analysis revealed a significant Group X Congruency X Time interaction, $F(1, 48) = 7.47$, $p < .01$. None of the other effects was significant ($ps > .1$).

To explore the 3-way interaction further, we conducted Group X Congruency repeated measure ANOVAs separately for the 1st half and 2nd half of trials. For the 1st half of trials, the main effects and the Group X Congruency interaction were not significant. For the 2nd half of trials, this analysis revealed a main effect of Congruency, $F(1, 48) = 8.20$, $p < .01$, that was modified by a Group X Congruency interaction, $F(1, 48) = 16.56$, $p < .001$. Simple effects revealed a similar and stronger pattern of results as the overall analysis. Specifically, the LSF group was significantly slower on incongruent trials compared to the HSF group, $t(48) = 2.20$, $p < .04$. Groups did not differ on congruent trials, $t(48) = 0.12$, $p > .9$. Paired samples t-tests revealed that the LSF group was slower on incongruent trials than congruent trials, $t(24) = -3.90$, $p = .001$, whereas the HSF group did not differ ($p > .2$). Reaction times and attention bias scores for the 1st and 2nd half of trials are presented in Table 1.

Discussion

In the current study we examined attention bias to females with sexual dysfunction. Results from a modified dot probe task supported our hypothesis that females with poor sexual functioning would show an attention bias toward sexual words. These results are consistent with numerous other experimental psychopathology studies examining attention bias, as well as a study examining sexual pain. Thus, female sexual dysfunction may be similar to other psychopathologies (e.g., anxiety, eating disorders, smoking) that are associated with attention bias toward disorder-relevant stimuli.

Most previous studies have examined attention when participants are under performance demands (e.g., participants' physiological sexual response to sexual stimuli is measured in the laboratory). Under performance demands, individuals with sexual dysfunction attend away from sexual cues and presumably toward performance related cues (e.g., Barlow,

1986; Dove & Wiederman, 2000; Van den Hout & Barlow, 2000). The current finding of attention bias toward sexual words suggests that context may influence the direction of attention bias associated with sexual dysfunction. In the current study's no performance demand context, sexual cues may have represented potential threat and consequently captured attention. As suggested by Helfinstein, White, Bar-Haim, and Fox (2008), disorder-relevant stimuli may become irrelevant when an actual threat is present. For example, socially anxious individuals' show an attention bias *away* from threat faces under conditions of social-evaluative threat (e.g., Mansell, Clark, Ehlers, & Chen, 1999). Thus, one explanation for the divergence between the current findings and previous studies is that individuals with sexual dysfunction show biased attention toward sexual cues under low stress conditions, but their attention shifts *away* from sexual cues when an actual threat is present (i.e., performance demand). Future research examining attention bias across different contexts is necessary to test this hypothesis.

The current findings may have implications for models of sexual dysfunction. Should the current findings be replicated in other samples and with other measures of attention bias, then cognitive models will need to incorporate selective attention bias toward sexual cues in their conceptualization of female sexual dysfunction. Specifically these models will need to expand their scope to include cognitive mechanisms operating outside a sexual interaction. These findings may also inform clinical intervention. For example, in the anxiety literature researchers have experimentally modified cognitive biases with promising effects on anxiety symptoms (e.g., Mathews, Ridgeway, Cook, & Yiend, 2007; Amir, Beard, Burns, & Bomyea, in press; Beard & Amir, in press).

The current study was a preliminary investigation, and several limitations should be noted. First, we utilized a university, non-clinical sample in this initial study. These findings require replication in a sample of females with clinical sexual disorders. Second, we did not assess participants' sexual orientation, medication usage, or phase of menstrual cycle. It is unclear whether these variables would influence the current findings. Our findings may not generalize to males. Several studies have shown gender differences in information processing of sexual stimuli (for a review see Geer & Manguno-Mire, 1996); thus, we cannot assume that males would also show an attention bias or that the same stimuli would be appropriate for males. We did not include non-sexual, emotional word types (e.g., general threat, positive), and future studies are needed to determine the specificity of attention bias in female sexual dysfunction. Finally, due to the correlational design we cannot determine the causal relationship between attention bias and sexual dysfunction. Only studies that directly manipulate attention and examine the effect on sexual functioning can conclude that attention bias causally affects sexual functioning.

The above limitations notwithstanding, this is the first study to show that the dot probe task may be a useful tool to examine attention bias in sexual dysfunction. Female sexual dysfunction may be associated with an attention bias for sexual cues under low stress conditions. Future research is warranted to determine the robustness and importance (e.g., predictive ability) of this bias.

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Appendix. Dot Probe Words

<u>Sexual</u>	<u>Neutral</u>
seduce	staple
breast	chorus
wetness	trustful
climax	jingle
naked	outer
porn	friar
erection	rainfall
ejaculate	announcer
intercourse	quotation
masturbate	windmill
erotic	compact
foreplay	haystack
sex	agent
penis	rodeo
nipple	muffin

Table 1

Demographic Information, Self-report, and Reaction Time Measures

	LSF (n=25)	HSF (n=25)
Self-report Measures	M (SD)	M (SD)
Age	18.4 (4.04)	19.5 (2.25)
Education (in years)	13.1 (3.06)	14.0 (1.06)
FSFI-Total Score	12.14 (7.47)	30.87 (2.34)
STAI-state	37.64 (11.21)	37.20 (8.18)
STAI-trait	41.00 (10.28)	41.32 (7.54)
BDI	10.04 (6.50)	9.00 (6.07)
Reaction Times_(ms)		
Congruent	582 (82)	561 (90)
Incongruent	597 (73)	555 (71)
Attention Bias Score	15 (31)	-5 (27)
<i>1st half of trials only</i>		
Congruent	602 (91)	565 (101)
Incongruent	595 (92)	559 (72)
Attention Bias Score	-7 (49)	-5 (44)
<i>2nd half of trials only</i>		
Congruent	561 (77)	558 (90)
Incongruent	600 (74)	552 (79)
Attention Bias Score	38 (49)	-7 (25)

Note. FSFI = Female Sexual Function Index (Rosen et al., 2000); STAI = Spielberger State-Trait Anxiety Inventory (Spielberger, et al. 1983); BDI = Beck Depression Inventory (Beck et al., 1987); Congruent = probe appeared in same location as sexual word; Incongruent = probe appeared in opposite location as sexual word.