

# Prepared for Anything? An Investigation of Female Genital Arousal in Response to Rape Cues

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## Abstract

Men's genital arousal occurs in response to a limited number of sexual stimuli, whereas women's genital arousal occurs in response to a wide range of sexual stimuli, including those depicting nonpreferred cues. Researchers have hypothesized that women's nonspecific pattern of genital arousal prepares the body for sexual activity, thus functioning to protect the genital organs against injury. If this hypothesis is correct, women should show genital responses to any cues suggesting sexual activity, even unappealing cues that involve nonconsensual sex and extreme violence. Fifteen men and 15 women listened to fourteen 2-min audiotaped narratives that depicted an interaction between a man and a woman and that varied factorially according to the presence of consent, violence, and sexual activity. The results support the preparation hypothesis: Men showed the greatest genital arousal in response to narratives depicting consensual, nonviolent sex, whereas women showed similar responses to all the narratives involving sexual activities, including those describing a sexual assault.

## Keywords

rape, sexual arousal, genital response, phallometry, photoplethysmography

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Recent research has revealed a reliable sex difference in genital response patterns. Men's genital responses are category-specific, in that men tend to exhibit high responses to only certain stimulus categories. For example, self-identified heterosexual men exhibit large genital responses to sexual stimuli depicting adult women and no response to adult men (Lykins et al., 2010). In contrast, women's genital responses are typically category-nonspecific: Women tend to exhibit similar responses to a variety of sexual stimuli. For example, self-identified heterosexual women show similar responses to stimuli that depict heterosexual, gay, or lesbian sex (Chivers, Rieger, Latty, & Bailey, 2004). In this study, we tested a functional hypothesis for women's category-nonspecific genital responses: that women's genital responses function to prepare the body for sexual intercourse, whether it is wanted or not.

Men's genital arousal is often assessed with penile plethysmography, using mercury-in-rubber strain gauges to measure changes in the circumference of the penis during the presentation of stimuli. Women's genital arousal is typically assessed with vaginal photoplethysmography, which measures changes in vaginal blood flow via changes in light reflectance. Using these devices, researchers have found that men's genital responses typically occur in the presence of stimulus cues that match their sexual interests. Women's genital responses, however, are less connected than men's to their sexual interests

(Chivers, Seto, Lalumière, Laan, & Grimbos, 2010). Women even show some genital responses to nonhuman primates copulating, whereas men do not (Chivers & Bailey, 2005).

This well-replicated sex difference is not caused by poor validity of vaginal photoplethysmography as a measure of sexual arousal. Women, like men, exhibit genital responses only in the presence of sexual stimuli (Suschinsky, Lalumière, & Chivers, 2009). Also, photoplethysmography can detect category-specific response patterns in the neovagina of post-operative male-to-female transsexuals (Chivers et al., 2004). Furthermore, women's genital responses, like men's, are affected by the intensity of sexual stimuli: More intense stimuli (e.g., two nude persons having sex) generate larger responses than less intense stimuli (e.g., one nude person masturbating; Chivers, Seto, & Blanchard, 2007).

Women's genital responses tend to be automatic. They occur shortly after the onset of a sexual stimulus and before self-report of feeling sexually aroused (Laan, 1994; Suschinsky, Chivers, & Lalumière, 2007). Genital responses occur in the presence of sexual stimuli even among women who report

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sexual arousal dysfunctions (Brotto, Klein, & Gorzalka, 2009). Evidence also indicates that women respond genitally to sexual stimuli even when not aware of their presence (Ponseti & Bosinski, 2010).

## The Preparation Hypothesis

Some researchers have suggested a functional hypothesis for the nonspecificity and automaticity of female genital arousal. Because increased vaginal blood flow is a precursor to vaginal lubrication (Levin, 2003), nonspecific and automatic genital responses in women may serve a protective or preparatory function, readying women for sexual intercourse whether it is desired or not (Chivers, 2005; Laan, 1994; Laan & Janssen, 2007; Suschinsky et al., 2009; van Lunsen & Laan, 2004).

Substantial ethnographic, historical, and comparative evidence suggests that the threat of unwanted sexual activity has been considerable over human evolutionary history (Lalumière, Harris, Quinsey, & Rice, 2005). Therefore, there would have been strong selection pressure on women to avoid unwanted sex, or to minimize its costs should it occur (Smuts, 1992). The social and metabolic costs of nonspecific genital responses in women (i.e., increased vaginal blood flow and lubrication) are not known but are probably low. Women's genital responses, unlike men's, are not easily observed. Also, because women's genital arousal is likely restricted to sexual cues, there is no need to maintain a constant state of lubrication and preparedness.

Conversely, the benefits of nonspecific and automatic genital responses are probably high. Increased vaginal blood flow and lubrication facilitate sexual activity and protect the genital tract from injury. Penile penetration, whether consensual or nonconsensual, can result in injuries in women, such as tears and ecchymoses (Anderson, McLain, & Riviello, 2006), although nonconsensual penetration produces a larger number of injuries than consensual sex (Anderson et al., 2006; Slaughter, Brown, Crowley, & Peck, 1997). Lack of a genital response during sexual activity may have important negative reproductive consequences for women; for example, injuries to the reproductive tract increase the likelihood of contracting infections, which can result in infertility (e.g., pelvic inflammatory disease) or death (e.g., syphilis).

Some evidence already supports the preparation hypothesis. For instance, some women report experiencing lubrication during unwanted sexual activity (for a review, see Levin & van Berlo, 2004). Postmenopausal women, who typically lubricate less than premenopausal women during sexual activity, are more likely to sustain injuries during sexual assault (for a review, see Poulos & Sheridan, 2008). Also, women show some genital responses to stimuli that depict sexual threat or nonconsensual sexual activity (Laan, Everaerd, & Evers, 1995; Suschinsky et al., 2009).

Previous studies have typically shown that women's genital responses to sexually threatening cues are lower than their responses to consensual sexual cues, a pattern of results

inconsistent with the preparation hypothesis. The sexual threat stimuli in prior studies, however, were qualitatively different from the consensual stimuli in terms of the intensity of sexual activity and the amount of nudity. No study has examined women's responses to stimuli depicting nonconsensual sexual interactions that are otherwise identical to stimuli depicting consensual sexual interactions.

If nonspecific genital responding functions to prepare women for a possible sexual encounter, women should exhibit a genital response to any stimulus that contains sexual content, regardless of the presence or absence of consent or violence, and regardless of whether they find the stimulus subjectively arousing or not. On the basis of previous research (Lalumière, Quinsey, Harris, Rice, & Trautrimas, 2003), we predicted that men would show their highest genital responses to stimuli depicting consensual, nonviolent sexual activity. We also expected women and men to report little subjective sexual arousal in response to stimuli depicting violent or nonconsensual sexual activity. Because we expected women to show genital arousal, but little subjective sexual arousal, to most sexual stimuli, we predicted that women, relative to men, would exhibit low correlations between genital and subjective sexual arousal. More specifically, we predicted a stronger negative relationship between rated unpleasantness of the sexual stimuli and genital responses among men than among women.

## Method

### Participants

Thirty-six participants were recruited from a university campus. All reported that they were between 18 and 28 years old, involved in a dating relationship, nulliparous, heterosexual, sexually experienced, and free from mental illnesses and sexual dysfunctions. Data from 1 man were excluded because he exhibited his highest genital arousal in response to the neutral stimuli, and data from 5 women could not be used because of movement artifacts. Of the remaining participants, the mean age for men ( $n = 15$ ) was 23.2 years ( $SD = 2.8$ ), and the mean age for women ( $n = 15$ ) was 21.5 years ( $SD = 2.5$ ).

### Materials

The stimuli consisted of audio recordings of 2-min narratives previously designed to investigate the relative importance of cues of consent, violence, and sex for men's genital arousal (Harris, Lalumière, Seto, & Rice, 2008). Narratives were read by a woman from her point of view and followed a standard format: a few sentences to set the scene, a description of the initial contact between a man and a woman, the woman's reaction, the man's response, the woman's experience, the man's final acts, and the woman's final condition. The narratives varied factorially on three elements: *consent* (female consent and enjoyment vs. refusal and displeasure), *violence* (injury and

suffering vs. none), and *sexual content* (sexual acts and nudity vs. none). Of the eight resulting combinations, one (no consent, no violence, no sex) was not used. For each category, five narratives were available, and two were randomly selected for each participant. Two other narratives, a neutral interaction (consent, no violence, no sex) and a consensual, nonviolent sexual interaction, were presented before the experimental session to acquaint participants with the procedure. The 14 experimental narratives were presented in a quasirandom order for each participant, such that no participant heard two narratives from the same stimulus category consecutively.

All genital and continuous subjective data were sampled using the same procedure as in our previous study (Suschinsky et al., 2009). Participants continuously rated how sexually aroused they felt during each narrative by pushing a button on a computer keypad. When participants pushed the button to signal increased or decreased arousal, a vertical bar appeared on a computer monitor situated 5 ft in front of them. Changes in subjective arousal were depicted as changes in the height of the bar. Following each narrative, six questions were presented on the monitor one at a time, and participants responded using the keypad. The questions addressed participants' overall sexual arousal and genital arousal, how calm and anxious they felt, and how pleasant and unpleasant the narrative was. The rating scale ranged from 1 (*emotion not present*) to 9 (*emotion definitely present*).

## Procedure

Participants were assessed individually and were left alone in a dimly lit private room to apply the genital gauge. The narratives (presented with headphones) were separated by inter-stimulus intervals lasting 30 to 300 s, during which time participants answered the poststimulus questions. After listening to all the narratives, participants completed a biographical questionnaire. The University of Lethbridge human ethics committee approved the procedure.

Scores for genital and continuous subjective responses were calculated by subtracting the baseline response (at the start of the trial) from the peak response (during the trial), separately for each narrative. The genital responses were then transformed into *z* scores (within subjects) because the response outputs for men and women are not on the same scale. Responses to the two narratives within a stimulus category were averaged to produce a mean score for each category.

## Results

Figure 1 presents the standardized genital responses for men and women. A 2 (participant's sex)  $\times$  7 (stimulus category) analysis of variance (ANOVA) revealed that men and women showed different patterns of genital arousal,  $F(6, 168) = 3.88$ ,  $p = .001$ ,  $\eta^2 = .12$ . Men's genital responses were largest for the consensual, nonviolent sexual stimuli and lower for all other

stimulus categories, whereas women's genital responses tended to be more evenly distributed across the stimulus categories. Planned contrasts revealed that men exhibited significantly higher genital responses to the consensual, nonviolent sexual narratives than to all other categories of narratives ( $ps < .002$ ,  $ds = 1.79\text{--}4.32$ ). Women's genital responses to the consensual, nonviolent sexual narratives were significantly higher than their responses to the three nonsexual stimulus categories and only one sexual category, nonconsensual, nonviolent sex ( $ps < .03$ ,  $ds = 0.96\text{--}2.48$ ).

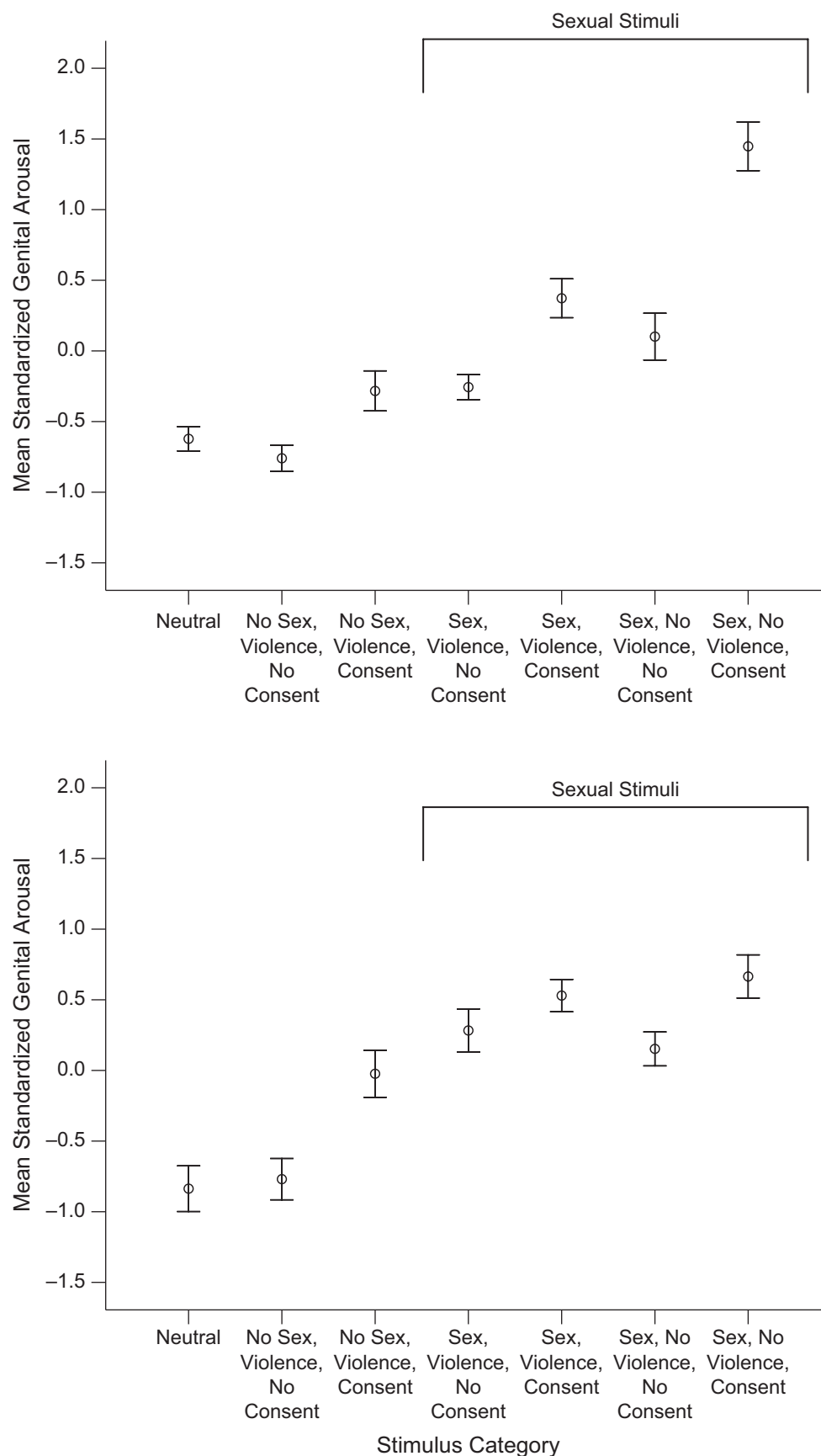
Next, we performed a Kolmogorov-Smirnov test for each participant in order to compare the distribution of responses to all nonneutral stimuli against a theoretical uniform (i.e., flat) response distribution. A higher *Z* score indicates that the response pattern differed to a greater extent from a uniform distribution. An independent-samples *t* test of these scores showed that men's genital response patterns ( $M = 1.56$ ,  $SD = 0.42$ ) were significantly less uniform than women's ( $M = 1.16$ ,  $SD = 0.51$ ),  $t(28) = 2.31$ ,  $p = .03$ .

Figure 2 presents the raw mean scores for continuous subjective sexual arousal. A 2 (participant's sex)  $\times$  7 (stimulus category) ANOVA revealed that men and women showed different patterns of subjective arousal,  $F(6, 168) = 3.45$ ,  $p = .003$ ,  $\eta^2 = .11$ . However, planned contrasts indicated that men and women exhibited similar patterns of subjective sexual responses in that both men and women showed significantly higher responses to the consensual, nonviolent sexual narratives than to all the other narrative categories ( $ps < .001$ ). Men ( $M = 29.4$ ,  $SD = 18.1$ ), however, reported significantly more sexual arousal in response to the consensual, violent sexual narratives than women did ( $M = 15.7$ ,  $SD = 14.4$ ),  $t(28) = 2.30$ ,  $p = .03$ , and this difference caused the significant interaction between participant's sex and stimulus category.

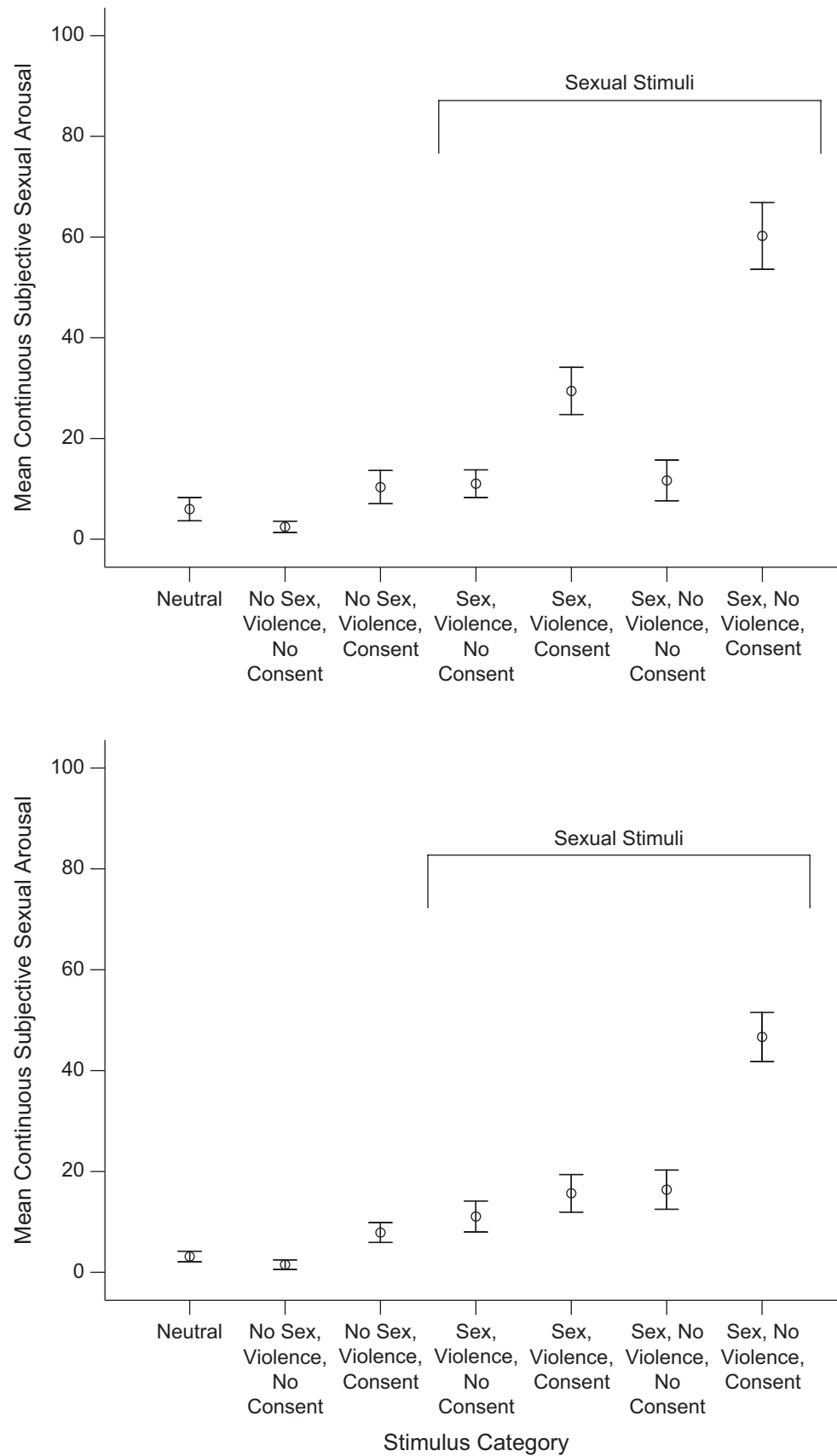
A Kolmogorov-Smirnov test was performed for each participant's continuous subjective sexual arousal. The results from an independent-samples *t* test of the *Z* scores indicated that men's ( $M = 1.63$ ,  $SD = 0.55$ ) and women's ( $M = 1.75$ ,  $SD = 0.74$ ) patterns of subjective sexual arousal did not differ significantly,  $t(27) = 0.48$ , *n.s.*

Table 1 presents the mean poststimulus ratings. Independent-samples *t* tests revealed no significant sex differences for any question for any stimulus category. Men and women rated the consensual, nonviolent sexual stimuli as the most sexually arousing. Both sexes rated the neutral stimuli and the consensual, nonviolent sexual stimuli as most pleasant, whereas the remaining stimulus categories were all rated as unpleasant. Similarly, both sexes felt most calm and least anxious during the neutral stimuli and the consensual, nonviolent sexual stimuli.

Following the method we used previously (Suschinsky et al., 2009), we calculated a nonparametric correlation (Spearman rank correlation coefficient) to examine sex differences in the relationship between genital arousal and self-reported sexual arousal (i.e., sexual concordance). A concordance score was calculated for each participant using the data for the eight sexual



**Fig. 1.** Standardized mean genital responses as a function of stimulus category, in men (top panel) and women (bottom panel). Error bars denote standard errors of the mean.



**Fig. 2.** Mean continuous subjective sexual arousal as a function of stimulus category, in men (top panel) and women (bottom panel). Error bars denote standard errors of the mean.

**Table 1.** Mean Poststimulus Ratings

Question and gender of participant	Nonsexual stimulus categories			Sexual stimulus categories			
	Neutral	Violence, no consent	Violence, consent	Violence, no consent	Violence, consent	No violence, no consent	No violence, consent
Sexual arousal							
Men	1.2 (0.5)	1.1 (0.3)	2.0 (1.4)	1.8 (1.0)	3.7 (1.8)	2.2 (1.2)	6.5 (1.8)
Women	1.1 (0.3)	1.1 (0.3)	1.7 (0.8)	1.8 (1.0)	2.7 (1.5)	2.5 (1.5)	5.5 (1.5)
Genital arousal							
Men	1.1 (0.2)	1.2 (0.4)	1.9 (1.4)	2.0 (1.3)	3.6 (1.9)	2.2 (1.2)	5.8 (1.9)
Women	1.2 (0.4)	1.3 (0.5)	1.9 (0.9)	2.1 (1.2)	3.0 (1.6)	3.1 (1.5)	5.1 (1.6)
Pleasant							
Men	6.5 (1.9)	1.1 (0.4)	1.8 (1.0)	1.7 (1.1)	3.2 (1.6)	1.7 (1.0)	7.1 (1.9)
Women	5.5 (1.9)	1.1 (0.3)	1.7 (0.8)	1.6 (1.0)	2.6 (1.1)	2.2 (1.3)	6.3 (1.7)
Unpleasant							
Men	2.0 (2.2)	8.3 (1.4)	7.2 (1.2)	7.4 (1.5)	5.8 (1.8)	7.6 (1.5)	1.7 (1.9)
Women	1.7 (1.4)	8.3 (0.9)	6.5 (2.0)	7.7 (1.7)	5.6 (1.9)	6.8 (2.0)	1.8 (0.8)
Calm							
Men	7.4 (1.5)	2.6 (2.1)	3.6 (2.0)	3.1 (1.7)	4.1 (1.8)	3.3 (2.3)	6.0 (1.4)
Women	6.4 (2.0)	2.3 (1.0)	2.7 (1.5)	2.3 (1.4)	3.4 (1.9)	2.8 (1.5)	5.7 (2.0)
Anxious							
Men	2.2 (1.8)	5.7 (2.7)	4.7 (1.8)	5.1 (2.7)	4.6 (1.7)	5.1 (2.5)	2.9 (1.8)
Women	1.7 (1.1)	5.7 (2.2)	4.4 (2.2)	5.5 (2.1)	4.2 (2.0)	4.9 (1.9)	2.5 (1.5)

Note: Ratings were provided on a scale from 1 (*emotion not present*) to 9 (*emotion definitely present*). Standard deviations are given in parentheses.

narratives (for a total of eight pairs of data). Following Chivers et al. (2010), we used poststimulus self-reported sexual arousal for our concordance calculations. An independent-samples *t* test revealed that men were significantly more sexually concordant ( $r_s = .77$ ) than women were ( $r_s = .18$ ),  $t(27) = 4.54$ ,  $p < .001$ . Men also exhibited a significantly stronger negative correlation between their genital arousal in response to sexual stimuli and the reported degree of stimulus unpleasantness ( $r_s = -.54$ ) than women did ( $r_s = -.15$ ),  $t(28) = -2.77$ ,  $p = .01$ .

## Discussion

The results support the preparation hypothesis for the low category-specificity of women's genital arousal. Men's genital responses were directed toward stimuli that depicted their preferred activity—consensual, nonviolent sex—whereas women showed similar genital arousal to most sexual stimuli. Similarly, men's genital responses were more likely than women's to differ from a uniform distribution, a pattern indicating that men's genital responses were more discriminating. Men's and women's subjective sexual-arousal responses were similar (with one exception): Both sexes reported their highest sexual arousal in response to consensual, nonviolent sex. Men were more sexually concordant than women, and genital arousal was more negatively correlated with unpleasantness ratings in men than in women. Both sexes reported that they found narratives involving violence or nonconsent to be highly unpleasant and somewhat anxiety provoking.

Notably, women did show elevated genital responses to the stimuli depicting nonsexual consensual violence. Although narratives in this category included no sexual cues, it is possible that participants perceived the narratives as sexual, because the narrator described the characters as receiving much pleasure from the activities—the kind of pleasure that is usually associated with sexual activities. It is also notable that one sexual stimulus category (nonconsensual, nonviolent sex) unexpectedly evoked lower genital responses than the consensual, nonviolent sex category in women, although it still produced much higher responses than the neutral category ( $d = 1.48$ ). In addition, the size of the difference in arousal between the non-consensual, nonviolent sexual narratives and the consensual, nonviolent sexual narratives was much smaller for women ( $d = 0.97$ ) than for men ( $d = 2.06$ ). These results are consistent with the results of the Kolmogorov-Smirnov analyses and show that women produce less discriminating responses than men do.

Although the results of this study support the preparation hypothesis, there are methodological limitations that must be noted. All narratives were told from a woman's perspective and read by a woman, and it is possible these narratives prompted women to imagine themselves as the female character in the story, whereas the men may have felt less connected with the male character. Narratives that use a woman's perspective, however, are known to increase men's arousal, even for rape stimuli (Lalumière et al., 2003). Participants were relatively young and in sexual relationships, and our results cannot necessarily be generalized to other groups. Also, individuals willing



to participate in sexual-arousal studies typically are more sexually experienced and report less sex guilt than individuals who are not willing to participate in such studies (Strassberg & Lowe, 1995). We recommend that this study be replicated with a larger and more diverse sample.

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### Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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