

Women's Sexual Responses to Heterosexual and Lesbian Erotica: The Role of Stimulus Intensity, Affective Reaction, and Sexual History

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Abstract Past research has demonstrated that women do not show a “category-specific” genital response to erotic stimuli. That is, on average, heterosexual and lesbian women are indistinguishable in terms of their physiological genital responses to heterosexual versus lesbian erotica. In two studies with heterosexual women ($n = 28$ for Study 1; $n = 30$ for Study 2) and lesbians ($n = 24$ for Study 1; $n = 25$ for Study 2), results confirmed that, on average, women did not show category-specific genital responses or category-specific subjective sexual arousal. However, there was evidence of notable within-group variability; many women did respond to the stimuli in a category-specific manner. Heterosexual women were more likely than lesbian women to demonstrate category-specificity. Findings also revealed that category-specificity was associated with multiple factors, including affective responses to the erotic stimuli and sexual history. Results of this study highlight the complexity of women's sexual identities and sexual responses.

Keywords Sexual orientation · Sexual identity · Sexual arousal · Affect · Vaginal photoplethysmography · Psychophysiology

Introduction

Several studies have found that men show “category-specificity” in their genital responses to visual sexual stimuli (e.g., Chivers & Bailey, 2005; Chivers, Rieger, Latty, & Bailey, 2004; Freund, 1963; Mavissakalian, Blanchard, Abel, & Barlow, 1975; McConaghy & Blaszczynski, 1991; Sakheim, Barlow, Beck, & Abrahamson, 1985; Tollison, Adams, & Tollison, 1979). That is, men's physiological sexual responses are greatest when they are observing erotica depicting the “categories” of people for whom they have a stated preference. In other words, men who self-identify as heterosexual demonstrate greater genital response to erotic stimuli depicting women than to erotic stimuli depicting men, and men who self-identify as gay demonstrate greater genital response to erotic stimuli depicting men than to erotic stimuli depicting women.

In contrast, a number of studies have found that women's genital responses to sexual stimuli are *not* category-specific (for a review, see Chivers, 2005). That is, self-identified heterosexual and lesbian women tend to be indistinguishable in terms of their genital sexual arousal in response to same-sex versus other-sex erotic stimuli (e.g., Chivers & Bailey, 2005; Chivers, Seto, & Blanchard, 2007; Chivers et al., 2004; Suschinsky, Lalumiere, & Chivers, 2009). Given these findings, Chivers et al. (2004) concluded, “Women have a nonspecific pattern of sexual arousal that is quite different from men's category-specific pattern...the relation between sexual arousal and sexual orientation differs fundamentally between women and men” (p. 741). Yet, there is evidence of significant individual variability in women's category specificity. Chivers et al. (2004) reported that

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37% of women in their study did not show greater genital response to their preferred stimulus as compared to their non-preferred stimulus (p. 738). This leaves 63% of women who *did* demonstrate category-specificity (i.e., their genital response was greater to their preferred than to their non-preferred stimulus).¹ Thus, the conclusion that the relation between arousal and orientation is fundamentally different for women and men may involve an overgeneralization. Category-specificity likely is, in reality, a continuum; that is, a few women will likely show a much stronger response to their preferred versus non-preferred stimuli, a few women will show a much stronger response to their non-preferred stimuli, and most women will fall somewhere between those two extremes.

It is notable that some researchers have found evidence of category-specificity in relation to women's *self-reported* subjective sexual arousal. That is, when heterosexual and lesbian women were shown erotic stimuli depicting sexual acts between a man and woman, two women, or two men, heterosexual women self-reported the highest level of subjective sexual arousal in response to the male–female pairing whereas lesbian women reported the highest level of subjective sexual arousal in response to the female–female pairing (Chivers & Bailey, 2005; Chivers et al., 2004). However, inconsistent with these results, Chivers et al. (2007) did not find group differences in heterosexual and lesbian women's self-reported arousal to heterosexual, gay, or lesbian erotica.

Emotional Reactions to Erotic Stimuli

The finding that heterosexual and lesbian women do not show evidence of category specificity in genital response patterns does not imply that women necessarily enjoy watching heterosexual and lesbian films equally. It is possible that women's affective reactions may differ in response to their preferred versus non-preferred stimuli. For example, Laan, Everaerd, van Bellen, and Hanewald (1994) showed women participants male- and female-produced erotica. They found that, although the women's genital responses to the two films did not differ significantly, the women reported significantly more positive affect in response to the female-produced than to the male-produced erotica and significantly more negative affect to the male-produced than to the female-produced erotica. These findings were replicated recently (Laan, 2008).

Research on the relation between affect and sexual response offers evidence that negative affect in response to an erotic stimulus does not necessarily interfere with sexual response to

that stimulus (e.g., Laan & Everaerd, 1995). Although affective state influences subjective and genital sexual response, at least among men, it appears to be the absence of positive affect, rather than the presence of negative affect, that leads to diminished sexual response (Koukounas & McCabe, 2001; Mitchell, DiBartolo, Brown, & Barlow, 1998; Nobre et al., 2004); it is not clear whether the results of these studies apply to women. However, in one study of ambivalent affect in both men and women, negative affect, especially when it was combined with positive affect, was found to enhance genital and subjective sexual response to particular erotic stimuli (Peterson & Janssen, 2007). This may be because any positive or negative affective response reflects interest in, attention to, and absorption with the erotic stimulus. Thus, women may experience a negative emotional response to their non-preferred stimuli, and yet they may still experience sexual arousal in response to the stimuli.

Multiple Components of Sexual Orientation

Sexual orientation consists of many components, including sexual identity, sexual desires, sexual fantasies, and sexual behavior. For some women, these components may not be completely consistent or stable over time (Diamond, 2005; Peplau, 2001). For example, a self-identified heterosexual woman may fantasize about sex with a woman or may have engaged in sex with a woman in the past. Further, women's sexual self-identity may change over time.

Prior studies of category-specificity have used sexual feelings in adulthood as a measure of sexual orientation. There is currently no research on the relationship between women's genital response patterns and other aspects of women's sexual orientation. For example, it is possible that past sexual behavior (e.g., sexual experiences with male versus female partners) may be a better predictor of genital response to heterosexual versus lesbian films than self-reported sexual feelings.

The Present Studies

The two studies presented here sought to replicate the work of past researchers, which demonstrated that women's genital sexual arousal is not category-specific, while extending that work in the following four ways.

First, although prior studies have measured women's subjective sexual arousal, researchers' conclusions about women's category-specificity have been based primarily on genital response rather than on subjective measures of arousal. We wanted to explore more systematically women's subjective sexual arousal as well as other positive and negative affective responses to heterosexual versus lesbian erotica.

Second, prior research has evaluated women's sexual arousal only in response to visual presentations of heterosexual or lesbian stimuli. Some authors have suggested that women's genital

¹ In the Chivers et al. (2004) study, the majority of women demonstrated category specificity. Based on a simple binomial test, the proportion of women who *did* demonstrate category specificity was not significantly greater than proportion who *did not* demonstrate category specificity, although there was clearly a trend in that direction ($p = .07$).

response and subjective sexual arousal are more likely to converge at higher levels of arousal (Laan & Everaerd, 1995); thus, perhaps women also would show stronger evidence of category-specificity at higher levels of sexual arousal. To test this assumption, this project assessed whether women showed different patterns of arousal with erotic films alone versus erotic films that were paired with direct genital stimulation via a “hands-off” vibrator (Laan & van Lunsen, 2002).

Third, prior studies have focused on between-group differences (i.e., comparing heterosexual and lesbian women’s genital sexual arousal to varying stimuli and finding no significant group differences) without explicitly assessing or discussing within-group variation. This project sought to address the question: Are all women sexually “non-specific” or, as with most aspects of sexuality, are there notable within-group variations in sexual specificity?

Finally, past research has demonstrated that, on average, women’s sexual identity is not associated with their genital responses to heterosexual versus lesbian erotica. In this project, we explored other potential predictors of women’s differential sexual arousal to heterosexual versus lesbian erotica, including (1) women’s affective responses to the films and (2) sexual history variables, which assessed women’s sexual orientation from a variety of different perspectives (e.g., past sexual behavior with men versus women, attraction to men versus women, etc.).

Hypotheses

The present studies addressed the following hypotheses:

1. Based on the findings of Chivers and Bailey (2005), Chivers et al. (2004, 2007), and Suschinsky et al. (2009), we predicted that, on average, women would not demonstrate category-specificity in their genital sexual responses to the erotic stimuli. In other words, there would be no significant between-group differences in lesbian and heterosexual women’s genital responses to heterosexual and lesbian films. Thus, we predicted that we would not be able to reject the null hypothesis.
2. We predicted that women would show category-specificity in their self-reported sexual arousal to the erotic stimuli (e.g., lesbian women would self-report more arousal to the lesbian erotica than to the heterosexual erotica and heterosexual women would self-report more arousal to the heterosexual than to the lesbian erotica). We also predicted that women would report more positive affect and less negative affect in response to their preferred erotic stimuli.
3. Based on the suggestion of Laan and Everaerd (1995), we predicted that more women would show category-specificity (i.e., congruence between genital response and sexual self-identity) in response to greater sexual stimulation (i.e., in conditions combining film with vibrotactile stimulation) as compared to less intense sexual stimulation (i.e., in film-only conditions).
4. We predicted noteworthy within-group variation in heterosexual and lesbian women’s genital response patterns, such that, although on average we did not expect women to demonstrate category-specificity, we did expect that a large minority of women would show greater genital response to their preferred sexual stimulus. Because very little research exists on within-group variations in women’s category-specificity, this hypothesis was exploratory in nature; we were not able to make specific predictions about what proportion of straight and lesbian women would demonstrate category-specificity.
5. We predicted that differences in women’s affective responses to the heterosexual versus lesbian erotica would be predictive of their genital response patterns (i.e., their degree of category specificity) to the erotica. For example, stronger positive response to the lesbian versus heterosexual erotica was hypothesized to correspond to stronger genital response to the lesbian versus heterosexual erotica. Further, based on the findings of Peterson and Janssen (2007), we predicted that negative affect (when combined with positive affect) in response to the lesbian versus heterosexual erotica would be positively related to genital response to the lesbian versus heterosexual erotica.
6. We predicted that sexual history variables (i.e., measures of the women’s past sexual experiences and preferences) also would be predictive of their genital response patterns to the erotic films. For example, self-identified heterosexual women who reported same-sex experiences and same-sex attraction would demonstrate less category specificity than heterosexual women with no same-sex experiences or attraction.

These hypotheses were addressed in two studies. Study 1 addressed the hypotheses by comparing women’s responses to erotic films depicting heterosexual and lesbian couples engaging in oral sex. Study 2 involved the use of different erotic stimuli (i.e., erotic films depicting vaginal penetration) and included a more thorough test of Hypothesis 6 through the incorporation of a larger number of sexual history variables as potential predictors of category-specificity.

Study 1

Method

Participants

All heterosexual participants and half of the lesbian participants were recruited through newspaper advertisements in the Netherlands in 1995. The advertisements recruited “healthy

heterosexual and lesbian women of all ages” for a study investigating “sexual arousal in women.” The ads explained that the study would involve “watching films and undergoing vibration.” Additional lesbian participants were recruited by word of mouth and personal networks of the initially identified lesbian participants. There were no identified exclusion criteria for participation in the study. Consistent with other research on this topic (i.e., Chivers et al., 2007), all participants were required to have a stated sexual preference for either women or men. Participants were asked, “Do you consider yourself to be heterosexual or homosexual?” Participants responded using one of five descriptions—exclusively homosexual, predominantly homosexual, bisexual, predominantly heterosexual, and exclusively heterosexual. Of the 28 self-identified heterosexual women (M age, 32 years), 13 self-identified as “exclusively heterosexual” and 15 identified as “predominantly heterosexual.” Of the 24 self-identified lesbian women (M age, 34 years), 11 identified as “exclusively homosexual” and 13 identified as “predominantly homosexual.” Participants ranged in age from 18 to 47 with a mean age of 33 ($SD = 7.16$). The majority (67%) of the women had attended college or university, and the majority (63%) indicated that they were currently in a steady intimate relationship.

Measures

Erotic Stimuli Four 3-min erotic film excerpts were used in this study. The two heterosexual film excerpts depicted a man performing oral sex on a woman, and the two lesbian film excerpts depicted a woman performing oral sex on another woman.

All participants were exposed to five different erotic conditions—two *Film Only* conditions, in which they watched heterosexual and lesbian erotic videos²; two *Film-Plus-Vibrotactile Stimulation* conditions, in which participants observed heterosexual and lesbian erotic videos while experiencing clitoral stimulation delivered by a “hands-off” vibrator (Laan & van Lunsen, 2002); and one *Vibrotactile Stimulation Only* condition, in which participants experienced clitoral stimulation but did not watch an erotic video. Data from this last condition were not used for the analyses presented here. Five order-groups were created using a Latin Square design (Kirk, 1968), so that, to the extent possible, each condition was preceded or succeeded by each of the other conditions only once. Participants were randomly assigned to one of the five order-groups.

The clitoral vibrator used in the Vibrotactile conditions consisted of a rubber stopper 2 cm in diameter, which contained the vibrator. The vibrator was mounted on a flexible metal strap lined with washable lycra cloth. The subject was instructed to place the rubber stopper against the clitoris. The vibrator was

designed such that minimal interference on physiological measurements of genital response was expected.

Physiological Measures Genital responses were measured using a vaginal photoplethysmograph (Sintchak & Geer, 1975). This device is made of clear acrylic plastic and shaped like a menstrual tampon. The photoplethysmograph contains a light-emitting diode and a photo transistor as a light detector. Changes in blood volume within the vaginal tissue were recorded as changes in the output of the light detector. The AC signal was taken as a measure of vaginal pulse amplitude (VPA). The AC signal (time constant 1 s) was band-pass filtered (0.5–30 Hz) and digitized (40 Hz). Depth and orientation of the light emitting diode were pre-determined by a small acrylic plate attached to the photoplethysmograph (Laan, Everaerd, & Evers, 1995). The photoplethysmograph and the placement device were sterilized in a solution of Cidex-activated glutaraldehyde between uses (Janssen, Prause, & Geer, 2007). VPA was recorded and digitized continuously during baseline and stimulus conditions. After removal of movement artifacts, the calculation of peak-to-trough amplitude was calculated for each pulse. For analyses, VPA scores were transformed into standardized z -scores.³ The unit of measurement for VPA was in millivolts (mV).

Subjective Measures After each of the five conditions, participants provided ratings of their subjective sexual arousal and their affective state. Subjective arousal was measured with an item asking participants to rate on a scale from 1 to 7 their average level of sexual arousal during the experimental condition. Participants were also asked to rate on a 7-point scale the extent to which they experienced each of 24 positive and negative affective states during the experimental condition. From participants’ ratings on these 24 affect items, we created four affect scales: The Positive Affect scale was calculated as the mean of each participant’s ratings of passion, pleasantness, safety, and sensuality (α ranged from .78 to .81 across conditions). The Angry Affect scale was equal to the mean ratings on the angry, furious, and annoyed items (α ranged from .61 to .92). The Tense Affect scale was equal to the mean ratings on the insecure, tense, and nervous items (α ranged from .46 to .67), and the Threatened Affect scale was equal to the mean ratings on the disgusted, contemptuous, threatened, and ashamed items (α ranged from .63 to .76). Creation of the affect scales was guided by theory, prior research, and scale reliability analyses.

Procedure

Participants were asked to refrain from alcohol and drug use for 24 hours prior to their participation in this study. Prior to

² The erotic stimuli used in these studies are available upon request from the corresponding author.

³ Further information about the standardization of VPA is available upon request from the corresponding author.

participation, participants were interviewed by a female research psychologist. The procedure of the study was explained in detail. Participants were assured confidentiality and the option of voluntary withdrawal from the study.

In each experimental session, participants were tested individually by a female experimenter. Participants completed a series of questionnaires pertaining to demographic and sexual history variables. Specifically, they were asked about their sexual experience with male and female partners, their lifetime number of male and female partners, and the valence of their sexual experiences with male and female partners (rated on a scale from 1 [*always pleasant*] to 5 [*never pleasant*]). Participants were then instructed in the placement of the photoplethysmograph and left alone to place the device. Once the device had been placed, participants provided baseline ratings of affect and subjective sexual arousal. This was followed by a 7-min adaptation period during which participants listened to music. Participants were then exposed to the five erotic conditions (heterosexual film, lesbian film, heterosexual film plus vibrotactile stimulation, lesbian film plus vibrotactile stimulation, and vibrotactile stimulation alone) in counterbalanced order. Each erotic condition was followed by subjective ratings and a 3-min return-to-baseline interval during which participants worked on paper-and-pencil concentration tasks to distract them from any sexual thoughts. At the end of the experiment, participants were asked to respond to a series of questions pertaining to their reactions to the experimental procedure, their use of the genital device, and their expectancies concerning the objectives of the study.

Ethics approval for this study was obtained by the Psychology IRB at the University of Amsterdam.

Results

Between-Group Differences in Sexual Arousal and Affect

To evaluate the effects of the various film conditions on women's sexual arousal and affect, we performed a series of 2 (Sexual Orientation) \times 2 (Film Type) \times 2 (Vibrotactile Stimulation) mixed factor ANOVAs, with Sexual Orientation as a between-subject factor and Film Type (Heterosexual Film, Lesbian Film) and Vibrotactile Stimulation (Film-Plus-Vibrotactile conditions, Film-Only conditions) as a within-subject factors. Genital response, subjective sexual arousal, and scores on the four affect scales were dependent variables. Descriptive data are summarized in Table 1.

For the ANOVA with the genital response scores as the dependent variable, the data revealed a significant main effect for Film Type, $F(1, 50) = 7.46, p < .01$. Regardless of sexual orientation, participants demonstrated significantly greater genital responses to the Heterosexual Film conditions than to the Lesbian Film conditions. There was also a main effect for Vibrotactile Stimulation, $F(1, 50) = 4.50, p < .05$. Heterosexual

Table 1 Sexual and affective responses as a function of sexual self-identity for Study 1

Sexual and affect variables	Heterosexual women ^a		Lesbians ^b		All women	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Heterosexual Film condition</i>						
Genital response ^c	1.40	0.70	1.46	0.64	1.43	0.66
Subjective sexual arousal ^d	4.61	1.64	4.46	1.25	4.54	1.46
Positive affect ^d	4.57	1.25	4.39	1.28	4.49	1.26
Angry affect ^d	1.11	0.26	1.35	1.00	1.22	0.70
Tense affect ^d	1.51	0.67	1.51	0.69	1.51	0.67
Threatened affect ^d	1.21	0.37	1.39	0.79	1.29	0.60
<i>Lesbian Film condition</i>						
Genital response ^c	1.01	0.79	1.10	0.74	1.05	0.76
Subjective sexual arousal ^d	3.79	1.45	3.71	1.68	3.75	1.55
Positive affect ^d	4.38	1.22	4.49	1.20	4.43	1.20
Angry affect ^d	1.06	0.31	1.14	0.37	1.10	0.34
Tense affect ^d	1.46	0.84	1.33	0.45	1.40	0.68
Threatened affect ^d	1.20	0.57	1.13	0.21	1.16	0.44
<i>Heterosexual Plus Vibrotactile condition</i>						
Genital response ^c	1.53	0.97	1.68	1.04	1.60	1.00
Subjective sexual arousal ^d	4.64	1.59	4.33	1.40	4.50	1.50
Positive affect ^d	4.57	1.10	4.16	1.38	4.38	1.24
Angry affect ^d	1.10	0.28	1.53	1.32	1.29	0.94
Tense affect ^d	1.36	0.61	1.58	0.84	1.46	0.73
Threatened affect ^d	1.14	0.38	1.48	0.89	1.30	0.68
<i>Lesbian Plus Vibrotactile condition</i>						
Genital response ^c	1.44	0.85	1.35	0.83	1.40	0.84
Subjective sexual arousal ^d	4.79	1.34	4.50	1.50	4.65	1.41
Positive affect ^d	4.65	1.19	4.72	1.21	4.68	1.19
Angry affect ^d	1.15	0.53	1.10	0.30	1.13	0.44
Tense affect ^d	1.33	0.45	1.64	0.68	1.47	0.58
Threatened affect ^d	1.27	0.67	1.10	0.21	1.19	0.51

^a $n = 28$

^b $n = 24$

^c Measured in millivolts (mV)

^d Absolute range, 1–7

and lesbian film combined with vibration yielded greater genital responses than film alone.

The ANOVA with subjective sexual arousal as the dependent variable revealed, in addition to a main effect of Vibrotactile Stimulation, $F(1, 50) = 11.54, p < .001$, a significant Film Type \times Vibrotactile Stimulation interaction, $F(1, 50) = 12.11, p < .001$. Participants reported significantly less sexual arousal to the Lesbian Film-Only condition than to any of the other three conditions.

To test our hypothesis that women would show more positive affect and less negative affect to their preferred versus non-preferred stimuli, we compared women's affective responses to the film conditions. For the ANOVAs with positive and angry

affect as the dependent variables, no significant main or interaction effects were found. However, for the ANOVA with tense affect as the dependent variable, there was a significant Sexual Orientation \times Vibrotactile Stimulation interaction, $F(1, 50) = 7.09, p < .05$, such that lesbians reported greater tense affect in the Vibrotactile conditions as compared to the Film-Only conditions.

For the ANOVA with threatened affect as the dependent variable, there was a significant Sexual Orientation \times Film Type interaction, $F(1, 50) = 4.60, p < .05$, such that lesbians reported significantly greater threat in response to the heterosexual film conditions than to the lesbian film conditions. There was no significant difference among the conditions for the heterosexual women.

Within-Group Differences in Sexual Arousal Patterns

Although there were no significant between-group differences in genital response to the different film stimuli (suggesting a lack of category specificity), within-group comparisons revealed that many women's genital response pattern *did* correspond to their self-reported sexual identity (see Table 2). In other words, some lesbian women did demonstrate greater genital arousal in response to the lesbian film as compared to the heterosexual film, and some heterosexual women demonstrated greater genital arousal in responses to the heterosexual film as compared to the lesbian film. For these analyses,

any differences found between responses to the heterosexual and lesbian films were included; the magnitude of the difference was not considered.

In the Film-Only conditions, there was a match between self-identified sexual orientation and genital arousal in approximately 40% of the women (16 or 57% of heterosexual women and 5 or 21% of lesbians). Based on a chi-square test with Yates' correction for continuity, heterosexual women were significantly more likely than lesbians to demonstrate a match between their self-identity and their genital response pattern, $\chi^2(1, N = 52) = 5.65, p < .01$.

In the Film-Plus-Vibrotactile conditions, there was a match between self-identified orientation and genital arousal in approximately 46% of the women (16 or 57% of heterosexual women and 8 or 33% of lesbians). Based on a chi-square test with Yates' correction, there was no significant difference between heterosexual and lesbian women in terms of the match between self-identity and their genital response patterns, $\chi^2(1, N = 52) = 2.07$.

We did not find support for our hypothesis that the conditions with more intense stimulation (i.e., the Film-Plus-Vibrotactile conditions) would be associated with higher rates of category-specificity than conditions with less intense stimulation (i.e., the Film Only conditions). Based on a McNemar test, there was no significant difference in the proportion of women who demonstrated category specificity in the Film-Only versus the Film-Plus-Vibrotactile conditions.

Table 2 Study 1 participants' genital and subjective sexual arousal patterns as a function of self-identified sexual identity

	Exclusively heterosexual	Predominately heterosexual	Predominately homosexual	Exclusively homosexual
	% of hetero women (<i>n</i>)	% of hetero women (<i>n</i>)	% of lesbian women (<i>n</i>)	% of lesbian women (<i>n</i>)
<i>Genital response pattern</i>				
Film-Only				
VPA greater in heterosexual condition	29% (8)	29% (8)	42% (10)	38% (9)
VPA greater in homosexual condition	18% (5)	25% (7)	13% (3)	8% (2)
Film-Plus-Vibrotactile Stimulation				
VPA greater in heterosexual condition	25% (7)	32% (9)	38% (9)	29% (7)
VPA greater in homosexual condition	21% (6)	21% (6)	17% (4)	17% (4)
<i>Subjective arousal pattern</i>				
Film-Only				
Subjective arousal greater in hetero condition	39% (11)	29% (8)	25% (6)	33% (8)
Subjective arousal equal across conditions	4% (1)	0% (0)	17% (4)	8% (2)
Subjective arousal greater in lesbian condition	4% (1)	25% (7)	13% (3)	4% (1)
Film-Plus-Vibrotactile Stimulation				
Subjective arousal greater in hetero condition	21% (6)	11% (3)	13% (3)	29% (7)
Subjective arousal equal across conditions	11% (3)	21% (6)	13% (3)	0% (0)
Subjective arousal greater in lesbian condition	14% (4)	21% (6)	29% (7)	17% (4)

Note: Participants whose sexual arousal patterns were consistent with their stated sexual identity are shown in bold

To evaluate the degree or magnitude of difference between women's genital responses to their preferred versus nonpreferred stimuli, we calculated standardized VPA difference scores (i.e., mean VPA in the heterosexual film condition minus mean VPA in the lesbian film condition). We evaluated standard deviations and ranges of scores to provide further information about within-group differences. For heterosexual women in the Film-Only conditions, the mean difference score for genital responses was 0.39, the *SD* was 0.83, and scores ranged from -1.24 (with negative numbers indicating greater arousal in the lesbian film condition) to 2.16 (with positive numbers indicating greater arousal in the heterosexual film condition). For lesbian women in the Film-Only conditions, the mean difference score was 0.37, the *SD* was 0.89, and scores ranged from -1.85 to 1.73.

For heterosexual women in the Film-Plus-Vibrotactile conditions, the mean difference score for genital responses was 0.09, the *SD* was 0.98, and scores ranged from -1.51 to 1.96. For lesbian women in the Film-Plus-Vibrotactile conditions, the mean difference score was 0.33, the *SD* was 1.12, and scores ranged from -1.88 to 2.83.

We were also interested in category specificity in women's subjective sexual arousal. Again, although there were no significant between-group differences in subjective sexual arousal between the lesbian and heterosexual women, many women's subjective arousal pattern did correspond to their self-reported sexual identity (see Table 2).

In the Film-Only conditions, there was a match between self-identified sexual orientation and subjective sexual arousal in approximately 44% of the women (19 or 68% of heterosexual women and 4 or 17% of lesbians). Based on a chi-square test with Yates' correction, heterosexual women were significantly more likely than lesbians to demonstrate a match between their self-identity and their subjective sexual arousal pattern, $\chi^2(1, N = 52) = 11.73, p < .001$.

In the Film-Plus-Vibrotactile conditions, there was a match between self-identified sexual orientation and subjective sexual arousal in approximately 39% of the women (9 or 32% of heterosexual women and 11 or 46% of lesbians). Based on a chi-square test with Yates' correction, there was no significant difference between heterosexual and lesbian women in terms of the match between self-identity and their subjective sexual patterns, $\chi^2(1, N = 52) = 0.53$.

Based on a McNemar test, there was no significant difference in the proportion of women who demonstrated category-specificity in their subjective arousal in the Film-Plus-Vibrotactile conditions as compared to the Film-Only conditions.

Affective Predictors of Category Specificity

To evaluate whether affective response patterns to the films influenced genital response patterns to the films, we conducted multiple regression analyses for the heterosexual and lesbian groups with standardized VPA difference scores (i.e., mean

VPA in the heterosexual film condition minus mean VPA in the lesbian film condition) as the dependent variable. We used VPA difference scores as the dependent variable because this variable can be thought of a continuous measure of category specificity, so that, for heterosexual women, higher scores indicate greater match between genital response and self-identified sexual orientation and, for lesbian women, lower scores indicate greater match. The difference scores for positive, angry, tense, and threatened affect (e.g., positive affect in response to the heterosexual film minus positive affect in response to the lesbian film, etc.) were the independent variables for the regressions. Bivariate correlations are presented in Table 3.

For heterosexual women, the regression model was not significant for either the Film-Only or the Film-Plus-Vibrotactile conditions. Affective reactions to the heterosexual versus lesbian films were not predictive of heterosexual women's category-specificity.

For the lesbian women, the regression model for the Film-Only conditions was not significant. However, for the Film-Plus-Vibrotactile conditions, the regression model was significant and explained 60% of the variance in women's genital response patterns, $F(4, 23) = 6.99, p < .01$ (see Table 4). For the lesbian women in the Film-Plus-Vibrotactile conditions, genital response patterns were significantly and independently associated with difference scores in positive and tense affect. Thus, in the Film-Plus-Vibrotactile conditions, higher positive and higher tense affect in response to the lesbian versus heterosexual film were associated with greater category specificity (i.e., relatively higher genital response to the lesbian versus heterosexual film). This finding provides some support for our hypothesis that both positive and negative affect would be positively related to genital response.

Sexual History Variables as Predictors of Category Specificity

To evaluate whether sexual history influenced participants' genital response patterns, we conducted multiple regression analyses with standardized VPA difference scores (i.e., the continuous measure of category specificity) as the criterion variable and sexual history variables as predictors. For the heterosexual women, predictor variables were age (entered in Step 1) and three sexual history variables (entered in Step 2)—a dichotomous variable assessing whether the women had ever had a homosexual experience, a variable assessing their number of previous heterosexual partners, and a variable assessing the valence of their heterosexual experiences (rated on a scale from 1 [*always pleasurable*] to 5 [*never pleasurable*]). Bivariate correlations between criterion and predictor variables are presented in Table 5.

For the heterosexual women in the Film-Only conditions, the final regression model was significant, $F(4, 26) = 4.62$,

Table 3 Bivariate correlations between sexual response patterns and affect variables in Study 1

	1	2	3	4
	Hetero ^a /lesbian ^b	Hetero/lesbian	Hetero/lesbian	Hetero/lesbian
<i>Film-Only conditions</i>				
1. Genital response				
2. Positive affect ^c	.34/.19			
3. Angry affect ^c	.07/.05	-.11/-.42*		
4. Tense affect ^c	.12/.10	-.34/-.41*	-.43*/.21	
5. Threatened affect ^c	.00/-.11	-.47*/-.54**	-.20/.77***	.49**/.14
<i>Film-Plus-Vibrotactile conditions</i>				
1. Genital response				
2. Positive affect ^c	.01/.41*			
3. Angry affect ^c	.06/-.30	.40*/-.74***		
4. Tense affect ^c	.00/.45*	.02/-.38	-.20/.33	
5. Threatened affect ^c	-.09/-.27	.48**/-.76***	-.82***/.84***	-.22/.33

Note: All variables represent differences in scores in the heterosexual versus the lesbian erotica conditions; higher scores indicate greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

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

^a $n = 28$

^b $n = 24$

^c Absolute range, 1–7

Table 4 Summary of hierarchical linear regression analysis for lesbians in the Film-Plus-Vibrotactile conditions of Study 1 with genital response pattern as the dependent variable and affective responses as the independent variables

Independent variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Positive affect	.48	.17	2.84	.01
Angry affect	-.07	.23	-0.29	ns
Tense affect	.93	.21	4.44	<.001
Threatened affect	.11	.37	0.28	ns

Note: All variables represent differences in scores in the heterosexual versus the lesbian erotica conditions; higher scores indicate greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

$p < .01$, explaining 28% of the variance. Age and homosexual experience were significant independent predictors of genital response pattern, such that older age and past homosexual experience were associated with a relatively lower genital difference score (i.e., a less exclusively heterosexual response pattern or less category specificity; see Table 6). For heterosexual women in the Film-Plus-Vibrotactile conditions, the final regression model was not significant.

For the lesbian women, we conducted multiple regression analyses with the genital response difference scores as the criterion variable. The predictor variables were age (entered in Step 1), and three sexual history variables (entered in Step 2)—a dichotomous variable assessing whether the women had ever

Table 5 Bivariate correlations between sexual response patterns and sexual history variables for heterosexual women in Study 1

	1	2	3	4	5
1. Genital response in Film-Only conditions ^a					
2. Genital response in Film-Plus-Vibrotactile ^a	.21				
3. Age	-.44*	.31			
4. Lesbian experience ^b	-.50**	-.34	.11		
5. Number of male partners	-.17	.06	.13	-.23	
6. Valence of heterosexual experiences	.17	-.12	-.02	.08	-.14

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

^a Variable represents a difference in scores in the heterosexual versus the lesbian erotica conditions; higher scores indicate greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

^b Dichotomous variable; 0 = No; 1 = Yes

Table 6 Summary of hierarchical linear regression analysis for heterosexual women in the Film-Only conditions of Study 1 with genital response pattern as the dependent variable and sexual history variables as the independent variables

Independent variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
<i>Step 1</i>				
Age	−.05	.02	−2.32	.03
<i>Step 2</i>				
Age	−.04	.02	−2.21	.04
Number of heterosexual partners	−.19	.16	−1.18	ns
Valence of heterosexual experience ^a	.33	.31	1.09	ns
Homosexual experience ^b	−.86	.27	−3.18	<.01

Note: The dependent variable (genital response pattern) represents a difference score with higher scores indicating greater response to the heterosexual versus the lesbian film, and lower scores indicating greater response to the lesbian versus heterosexual film

^a Absolute range, 1–7. Lower scores indicate a more positively valenced history

^b Dichotomous variable; 0 = No; 1 = Yes

had a heterosexual experience and variables assessing their number of previous homosexual partners and the valence of their homosexual experiences (rated on a scale from 1 to 5). Bivariate correlations between criterion and predictor variables are presented in Table 7.

For the lesbian women in the Film-Only conditions, the final regression model was significant, $F(4, 23) = 5.55, p < .01$, explaining 36% of the variance. Number of homosexual partners and valence of homosexual experience were significant independent predictors of genital response pattern, indicating that a larger number of homosexual partners and a less positively valenced history of homosexual experience were associated with *less* exclusively lesbian response patterns (or less category-specificity; see Table 8). For the Film-Plus-Vibrotactile conditions, the final regression model was not significant.

Table 8 Summary of hierarchical linear regression analysis for lesbian women in the Film-Only conditions of Study 1 with genital response pattern as the dependent variable and sexual history variables as the independent variables

Independent variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
<i>Step 1</i>				
Age	−.06	.03	−2.20	.04
<i>Step 2</i>				
Age	−.02	.03	−0.96	ns
Number of same-sex partners	.71	.25	2.86	.01
Valence of same-sex experience ^a	.85	.31	2.70	.01
Heterosexual experience ^b	.37	.45	0.83	ns

Note: The dependent variable (genital response pattern) represents a difference score with higher scores indicating greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

^a Absolute range, 1–7. Lower scores indicate a more positively valenced history

^b Dichotomous variable; 0 = No; 1 = Yes

Study 2

The between-group analyses of Study 1 did not reveal significant differences in sexual arousal patterns for heterosexual versus lesbian women; thus, by that definition, our Study 1 participants did not demonstrate category-specificity in their genital or subjective sexual arousal. However, we found that heterosexual women were more likely to demonstrate category-specificity than lesbian women; in fact, heterosexual women on average did experience greater genital response to heterosexual versus lesbian erotica. Thus, we could conclude that the heterosexual women in our sample demonstrated category specificity and the lesbian women did not. This pattern may reflect the fact that the lesbian film clip that we chose for our study was ineffective or inappropriate for the lesbian women—a possibility that is consistent with the fact that, in

Table 7 Bivariate correlations between sexual response patterns and sexual history variables for lesbian women in Study 1

	1	2	3	4	5
1. Genital response in Film-Only conditions ^a					
2. Genital response in Film-Plus-Vibrotactile ^a	.44*				
3. Age	−.43	−.11			
4. Heterosexual experience ^b	.04	.02	−.24		
5. Number of female partners	.50*	.42*	−.22	−.27	
6. Valence of lesbian experiences	.50*	.17	−.27	−.04	.04

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

^a Variable represents a difference in scores in the heterosexual versus the lesbian erotica conditions; higher scores indicate greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

^b Dichotomous variable; 0 = No; 1 = Yes

Study 1, both heterosexual and lesbian women experienced smaller genital responses and reported less subjective arousal to the lesbian film than to the heterosexual film. Given that all four film clips in Study 1 depicted cunnilingus, the heterosexual and lesbian clips may not have been sufficiently different to elicit different responses from heterosexual and lesbian women. For those reasons, in Study 2, we sought to replicate these findings using a different set of erotic stimuli.

Additionally, findings from Study 1 suggested that, regardless of self-identified sexual orientation, a history of same-sex sexual experience was associated with lower category specificity. Thus, consistent with our hypothesis, for heterosexual women, any same-sex experience was predictive of a less exclusively heterosexual pattern of genital response. More surprising was the finding that, for lesbian women, a higher number of same-sex partners and a history of less positively valenced same-sex experiences were associated with lower category specificity (or a less exclusively lesbian pattern of genital response). In Study 2, we attempted to explore these relationships further by assessing a larger number of sexual history variables, including past and current sexual behavior and feelings.

Method

Participants

Participants ($N = 55$) were recruited through newspaper advertisements and flyers in the Netherlands in 1996. The majority of the lesbian participants were recruited through flyers at a GLBT organization (COC), a lesbian women's café, and a women's bookstore in Amsterdam. Of the 30 self-identified heterosexual women (M age, 33 years) who participated in our study, 15 self-identified as "exclusively heterosexual" and 15 identified as "predominantly heterosexual." Of the 25 self-identified lesbian women (M age, 34 years) who participated, 7 identified as "exclusively homosexual" and 18 identified as "predominantly homosexual."

Participants ranged in age from 19 to 63 with a mean age of 33 ($SD = 9.80$). The majority (60%) of the women had attended college or university, and 49% of the women indicated that they were currently in a steady intimate relationship.

Procedure and Stimuli

The procedure for Study 2 was identical to Study 1 except that Study 2 participants completed additional questionnaire items related to their sexual history. As in Study 1, participants provided information about their experience with male and female partners, their number of male and female partners, and the valence of their experiences with male and female partners. In Study 2, they were also asked to rate their sexual feelings and

sexual behavior in adolescence, adulthood, and the past year using a scale ranging from 0 (*exclusively heterosexual*) to 6 (*exclusively homosexual*). Additionally, the erotic stimuli in Study 2 depicted vaginal penetration rather than oral sex as in Study 1; thus, the heterosexual film excerpts depicted a man and a woman engaged in penile-vaginal intercourse, and the lesbian film excerpts depicted a woman penetrating another woman's vagina with a sex toy.

Ethics approval for this study was obtained by the Psychology IRB at the University of Amsterdam.

Results

Between-Group Differences

As in Study 1, we evaluated the effects of the various film conditions on women's sexual arousal and affect by performing a series of 2 (Sexual Orientation) \times 2 (Film Type) \times 2 (Vibrotactile Stimulation) mixed factor ANOVAs, with Sexual Orientation as a between-subject variable and Film Type (Heterosexual Film, Lesbian Film) and Vibrotactile Stimulation (Film-Plus-Vibrotactile conditions, Film Only conditions) as within-subject factors. Genital response, subjective sexual arousal, and scores on the four affect scales were dependent variables. Descriptive data are summarized in Table 9.

For the ANOVA with genital response as the dependent variable, only a significant main effect for Vibrotactile Stimulation was found, $F(1, 53) = 17.14, p < .001$, with all participants demonstrating significantly greater genital response to the two Film-Plus-Vibrotactile conditions than to the two Film-Only conditions. The women did not show evidence of category-specificity in genital response.

The ANOVA using subjective sexual arousal as the dependent variable revealed a main effect of Vibrotactile Stimulation, $F(1, 53) = 16.58, p < .001$. Participants reported significantly less subjective sexual arousal to the two Film-Only conditions as compared to the two Film-Plus-Vibrotactile conditions. There was no significant interaction or main effect for Sexual Orientation. As in Study 1, there was no evidence of category-specificity in women's subjective sexual arousal.

For the ANOVA with positive affect as the dependent variable, there was a significant Sexual Orientation \times Film Type interaction, $F(1, 53) = 9.01, p < .01$, and a main effect of Vibrotactile Stimulation, $F(1, 53) = 6.82, p < .05$. For the heterosexual women, the Heterosexual Films resulted in greater positive affect than the Lesbian films, and for the lesbian women, the Lesbian Films produced greater positive affect than the Heterosexual Films. For all women, the Vibrotactile conditions produced greater positive affect than the Film-Only conditions.

For angry affect, there was a significant main effect for Film Type, $F(1, 53) = 5.64, p < .05$; participants reported

Table 9 Sexual and affective responses as a function of sexual self-identity for Study 2

Sexual and affect variables	Heterosexual women ^a		Lesbians ^b		All women	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Heterosexual Film condition</i>						
Genital response ^c	1.51	0.71	1.46	0.69	1.49	0.69
Subjective sexual arousal ^d	3.40	1.61	3.48	1.42	3.44	1.51
Positive affect ^d	3.24	1.34	3.26	1.23	3.25	1.28
Angry affect ^d	1.43	1.06	1.83	1.40	1.61	1.23
Tense affect ^d	1.48	0.55	1.95	0.90	1.69	0.76
Threatened affect ^d	1.44	0.67	2.16	1.21	1.77	1.01
<i>Lesbian Film condition</i>						
Genital response ^c	1.20	0.67	1.27	0.80	1.23	0.73
Subjective Sexual arousal ^d	3.30	1.58	3.64	1.58	3.45	1.57
Positive affect ^d	3.14	1.32	3.74	1.37	3.41	1.36
Angry affect ^d	1.29	0.84	1.42	0.70	1.61	1.23
Tense affect ^d	1.58	0.69	1.89	0.76	1.72	0.73
Threatened affect ^d	1.68	0.95	1.53	0.64	1.61	0.82
<i>Heterosexual Plus Vibrotactile condition</i>						
Genital response ^c	1.82	0.59	1.65	0.68	1.74	0.63
Subjective sexual arousal ^d	4.13	1.81	3.96	1.49	4.05	1.66
Positive affect ^d	3.73	1.34	3.25	1.15	3.51	1.27
Angry affect ^d	1.47	0.98	1.71	1.11	1.58	1.04
Tense affect ^d	1.63	0.82	2.05	0.89	1.82	0.87
Threatened affect ^d	1.51	0.79	2.01	1.05	1.74	0.95
<i>Lesbian Plus Vibrotactile condition</i>						
Genital response ^c	1.75	0.70	1.69	0.59	1.72	0.65
Subjective sexual arousal ^d	3.97	1.61	4.40	1.66	4.16	1.63
Positive affect ^d	3.41	1.48	4.00	1.36	3.68	1.44
Angry affect ^d	1.10	0.22	1.37	0.81	1.22	0.58
Tense affect ^d	1.71	0.72	1.84	0.88	1.77	0.79
Threatened affect ^d	1.57	0.71	1.57	0.85	1.57	0.77

^a $n = 30$ ^b $n = 25$ ^c Measured in millivolts (mV)^d Absolute range, 1–7

more anger in response to the Heterosexual Film conditions than to the Lesbian Film conditions.

For tense affect, no main or interaction effects were found.

For threatened affect, there was a significant Sexual Orientation \times Film Type interaction, $F(1, 53) = 8.75, p < .01$. Lesbian women reported significantly greater threat in the Heterosexual Film conditions as compared to the Lesbian Film conditions. There was no significant difference among the conditions for the heterosexual women. As with Study 1, we found some minimal support for our hypothesis that women would show more positive affect and less negative affect in response to their preferred versus non-preferred stimuli. Specifically, in both Study 1 and Study 2, the lesbian

women reported more threatened affect in response to the heterosexual films as compared to the lesbian films.

Within-Group Differences in Sexual Arousal Patterns

As in Study 1, although there were no significant between-group differences in genital response between the lesbian and heterosexual women (suggesting a lack of category specificity), many women's genital response pattern did correspond to their self-reported sexual identity (see Table 10).

In the Film-Only conditions, there was a match between self-identified sexual orientation and arousal in approximately 47% of the women (18 or 60% of heterosexual women and 8 or 32% of lesbians). Based on a chi-square test with Yates' correction, there was no significant difference between heterosexual women and lesbians in their likelihood of demonstrating a match between their self-identity and their genital response pattern, $\chi^2(1, N = 55) = 3.24$.

In the Film-Plus-Vibrotactile conditions, there was a match between self-identified orientation and arousal in approximately 49% of the women (15 or 50% of heterosexual women and 12 or 48% of lesbians). Again, based on a chi-square test with Yates' correction, there was no significant difference between heterosexual and lesbian women in terms of the match between self-identity and their genital response patterns, $\chi^2(1, N = 55) < 0.01$.

Based on the results of a McNemar test, a significantly higher proportion of women demonstrated category-specificity in their genital responses in the Film-Plus-Vibrotactile condition as compared to the Film-Only conditions, $p < .001$. This is inconsistent with the results of Study 1 but consistent with our hypothesis that rates of category specificity would be higher in conditions with more intense arousal.

We calculated standardized VPA difference scores (i.e., mean VPA in the heterosexual film condition minus mean VPA in the lesbian film condition). We evaluated standard deviations and ranges of scores to provide further information about within-group differences. For heterosexual women in the Film-Only conditions, the mean difference score for genital responses was 0.31, the *SD* was 0.88, and scores ranged from -1.31 (with negative numbers indicating greater arousal in the lesbian film condition) to 2.56 (with positive numbers indicating greater arousal in the heterosexual film condition). For lesbian women in the Film-Only conditions, the mean difference score was 0.19, the *SD* was 0.89 and scores ranged from -1.99 to 2.41.

For heterosexual women in the Film-Plus-Vibrotactile conditions, the mean difference score for genital responses was 0.06, the *SD* was 0.91, and scores ranged from -1.77 to 2.61. For lesbian women in the Film-Plus-Vibrotactile conditions, the mean difference score was -0.04 , the *SD* was 0.77, and scores ranged from -1.94 to 1.39.

Table 10 Study 2 participants' genital and subjective sexual arousal patterns as a function of self-identified sexual identity

	Exclusively heterosexual	Predominately heterosexual	Predominately homosexual	Exclusively homosexual
	% of hetero women (<i>n</i>)	% of hetero women (<i>n</i>)	% of lesbian women (<i>n</i>)	% of lesbian women (<i>n</i>)
<i>Genital response pattern</i>				
Film-Only				
VPA greater in heterosexual condition	33% (10)	27% (8)	48% (12)	20% (5)
VPA greater in homosexual condition	17% (5)	23% (7)	24% (6)	8% (2)
Film-Plus-Vibrotactile Stimulation				
VPA greater in heterosexual condition	20% (6)	30% (9)	40% (10)	12% (3)
VPA greater in homosexual condition	30% (9)	20% (6)	32% (8)	16% (4)
<i>Subjective arousal pattern</i>				
Film-Only				
Subjective arousal greater in hetero condition	13% (4)	13% (4)	28% (7)	12% (3)
Subjective arousal equal across conditions	27% (8)	13% (4)	12% (3)	4% (1)
Subjective arousal greater in lesbian condition	10% (3)	23% (7)	32% (8)	12% (3)
Film-Plus-Vibrotactile Stimulation				
Subjective arousal greater in hetero condition	13% (4)	17% (5)	20% (5)	8% (2)
Subjective arousal equal across conditions	27% (8)	20% (6)	8% (2)	0% (0)
Subjective arousal greater in lesbian condition	10% (3)	13% (4)	44% (11)	20% (5)

Note: Participants whose sexual arousal patterns were consistent with their stated sexual identity are shown in bold

In relation to the category-specificity of women's subjective arousal, we again found that many women's subjective sexual arousal pattern did correspond to their self-reported sexual identity (see Table 10). In the Film-Only conditions, there was a match between self-identified sexual orientation and subjective sexual arousal in approximately 35% of the women (8 or 27% of heterosexual women and 11 or 44% of lesbians). Based on a chi-square test with Yates' correction, the heterosexual and lesbian women were equally likely to have a match between self-identity and subjective arousal patterns, $\chi^2(1, N = 55) = 1.13$.

In the Film-Plus-Vibrotactile conditions, there was a match between self-identified sexual orientation and subjective sexual arousal in approximately 45% of the women (9 or 30% of heterosexual women and 16 or 64% of lesbians). In Film-Plus-Vibrotactile conditions, a chi-square with Yates' correction revealed that lesbian women were more likely than heterosexual women to demonstrate a match between self-identity and subjective arousal, $\chi^2(1, N = 55) = 5.06, p < .05$.

Based on a McNemar test, there was no significant difference in the proportion of women who demonstrated category-specificity in their subjective arousal in the Film-Plus-Vibrotactile conditions as compared to the Film-Only conditions.

Affective Predictors of Category Specificity

To evaluate whether affective responses to the films influenced genital response to the films, we conducted multiple

regression analyses for the lesbian and heterosexual women with standardized VPA difference scores (i.e., mean VPA in heterosexual film condition minus mean VPA in the lesbian film condition) as the criterion variable. Predictor variables were difference scores for positive, angry, tense, and threatened affect (e.g., positive affect in the heterosexual film condition minus positive affect in the lesbian film condition, etc.). Bivariate correlations are presented in Table 11.

For heterosexual women in the Film-Only conditions, the regression analysis was significant, $F(4, 29) = 5.14, p < .01$, explaining 45% of the variance. Genital response pattern was significantly predicted by difference scores in positive and angry affect after controlling for tense and threatened affect. Specifically, higher positive and higher angry affect in the heterosexual film versus the lesbian film condition were associated with greater genital response in the heterosexual condition versus the lesbian film condition (i.e., greater category-specificity; see Table 12). For heterosexual women in the Film-Plus-Vibrotactile conditions, the final regression model was not significant. For lesbian women, neither of the regression analyses for the Film-Only or the Film-Plus-Vibrotactile conditions were significant.

Sexual History Variables as Predictors of Category Specificity

To evaluate whether sexual history influenced participants' genital response patterns, we conducted multiple regression

Table 11 Bivariate correlations between sexual response patterns and affect variables in Study 2

	1 Hetero ^a /lesbian ^b	2 Hetero/lesbian	3 Hetero/lesbian	4 Hetero/lesbian
<i>Film-Only conditions</i>				
1. Genital response				
2. Positive affect ^c	.19/.22			
3. Angry affect ^c	.35/-.14	-.61*/-.78***		
4. Tense affect ^c	.23/-.06	-.15/-.45*	.36*/.64**	
5. Threatened affect ^c	-.06/-.15	-.65**/-.88***	.72***/.90***	.30/.62**
<i>Film-Plus-Vibrotactile conditions</i>				
1. Genital response				
2. Positive affect ^c	.42*/-.19			
3. Angry affect ^c	-.15/.06	-.44*/-.47*		
4. Tense affect ^c	-.12/-.08	.11/-.53**	-.14/.23	
5. Threatened affect ^c	-.21/.07	-.71**/-.64**	.72***/.74***	.06/.52**

Note: All variables represent differences in scores in the heterosexual versus the lesbian erotica conditions; higher scores indicate greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

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

^a $n = 30$

^b $n = 25$

^c Absolute range, 1–7

Table 12 Summary of hierarchical linear regression analysis for heterosexual women in the Film-Only conditions of Study 2 with genital response pattern as the dependent variable and affective responses as the independent variables

Independent variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Positive affect	.44	.19	2.31	.03
Angry affect	.67	.17	3.99	.001
Tense affect	.14	.22	0.62	ns
Threatened affect	-.40	.21	-1.89	ns

Note: All variables represent differences in scores in the heterosexual versus the lesbian erotica conditions; higher scores indicate greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

analyses for the lesbian and heterosexual women with standardized VPA difference scores (i.e., the continuous measure of category specificity) as the criterion variable and sexual history variables as predictor variables.

For the heterosexual women, predictor variables were age (entered in Step 1), and the following sexual history variables (entered in Step 2)—experience with homosexual activity (a dichotomous variable); number of prior heterosexual partners; valence of heterosexual experiences; ratings of heterosexual versus homosexual feelings in adolescence, adulthood, and the past year; and ratings of heterosexual versus homosexual activity in adulthood and the past

year.⁴ Bivariate correlations are shown in Table 13. For the Film-Only and the Film-Plus-Vibrotactile Conditions, neither regression model was significant.

For the lesbian women, predictor variables were age (entered in Step 1), and the following sexual history variables (entered in Step 2)—experience with heterosexual activity (a dichotomous variable); number of prior homosexual partners; valence of homosexual experiences; ratings of heterosexual versus homosexual feelings in adolescence, adulthood, and the past year; and ratings of heterosexual versus homosexual activity in adolescence, adulthood, and the past year. Bivariate correlations are shown in Table 14.

For lesbians in the Film-Only conditions, the final regression model was significant $F(10, 20) = 4.65, p < .05; R^2\Delta = 0.82, p < .01$, explaining 82% of the variance. Because of the unusually large R^2 value, we were concerned about the possibility of inflation due to multicollinearity. However, all tolerance and VIF statistics were acceptable (tolerances ≥ 2.7 ; VIFs ≤ 3.7). Thus, controlling for the other sexual history variables, genital response pattern was significantly predicted by heterosexual experience. As compared to other lesbians, lesbians with prior heterosexual experience demonstrated a less exclusively lesbian genital response pattern (i.e., less category-specificity; see Table 15).

⁴ Ratings of activity during adolescence were excluded from the analyses because this value was constant among the heterosexual women (i.e., all heterosexual women reported “exclusively heterosexual” activity during adolescence).

Table 13 Bivariate correlations between sexual response patterns and sexual history variables for heterosexual women in Study 2

	1	2	3	4	5	6	7	8	9	10
1. Genital response in Film-Only conditions ^a										
2. Genital response in Film-Plus-Vibrotactile ^a	-.08									
3. Age	-.13	-.25								
4. Lesbian experience ^b	-.02	-.15	-.20							
5. Number of male partners	-.06	.01	.31	-.33						
6. Valence of heterosexual experiences	-.18	.19	.19	.00	-.13					
7. Feelings in adolescence ^c	-.07	.23	-.31	-.14	-.12	.11				
8. Feelings in adulthood ^c	-.15	.04	-.08	-.33	-.07	.04	.36			
9. Feelings in last year ^c	.01	.25	-.24	-.19	-.20	-.11	.20	.75***		
10. Activity in adulthood ^c	-.02	.12	.11	-.93***	.30	-.03	.34	.35	.10	
11. Activity in last year ^c	-.11	.02	-.06	-.47*	.16	-.10	.38*	.21	.13	.51**

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

^a Variable represents a difference in scores in the heterosexual versus the lesbian erotica conditions; higher scores indicate greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

^b Dichotomous variable; 0 = No; 1 = Yes

^c Lower scores indicate a more heterosexual orientation; higher scores indicate a more homosexual orientation

Table 14 Bivariate correlations between sexual response patterns and sexual history variables for lesbian women in Study 2

	1	2	3	4	5	6	7	8	9	10	11
1. Genital response in Film-Only conditions ^a											
2. Genital response in Film-Plus-Vibrotactile ^a	.09										
3. Age	-.05	.40									
4. Heterosexual experience ^b	.44*	.30	.05								
5. Number of female partners	.07	.18	.28	-.44*							
6. Valence of lesbian experiences	-.02	.05	.35	.10	.21						
7. Feelings in adolescence ^c	-.37	.20	.02	.25	-.17	.22					
8. Feelings in adulthood ^c	.06	-.09	-.08	.17	-.06	-.29	.18				
9. Feelings in last year ^c	.04	-.15	.00	-.02	.03	-.34	.24	.69***			
10. Activity in adolescence ^c	-.15	.08	.09	.45*	.03	.31	.59**	-.18	-.06		
11. Activity in adulthood ^c	.45**	.05	-.27	.28	-.05	-.20	-.11	.21	-.05	-.36	
12. Activity in last year ^c	.27	-.23	-.21	.24	-.34	-.10	-.04	-.04	.10	.06	.08

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

^a Variable represents a difference in scores in the heterosexual versus the lesbian erotica conditions; higher scores indicate greater response to the heterosexual versus the lesbian film, and lower scores indicate greater response to the lesbian versus heterosexual film

^b Dichotomous variable; 0 = No; 1 = Yes

^c Lower scores indicate a more heterosexual orientation; higher scores indicate a more homosexual orientation

In the Film-Plus-Vibrotactile conditions, only Step 1 of the regression was significant $F(1, 20) = 5.30, p < .05$, explaining 22% of the variance. Older age was associated with a less exclusively lesbian genital response pattern (see Table 15).

Discussion

Our between-group comparisons of genital responses of heterosexual and lesbian women to heterosexual and lesbian

erotica yielded results that confirmed those of prior researchers (Chivers & Bailey, 2005; Chivers et al., 2004). Based on comparisons of group differences, we did not find evidence that women's genital arousal was category-specific. The non-specific responses were found in both the Film-Only and the Film-Plus-Vibrotactile conditions. This finding held up across both studies.

More surprisingly, we also did not find evidence of category-specificity in women's subjective reports of sexual arousal in either condition or in either study. In other words, on average,

Table 15 Summary of hierarchical linear regression analyses for lesbian women in Study 2 with genital response pattern as the dependent variable and sexual history variables as the independent variables

Independent variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
<i>Film-Only conditions</i>				
Step 2				
Age	−.03	.02	−1.61	ns
Number of same-sex partners	.17	.15	1.12	ns
Valence of same-sex experience ^a	−.18	.37	−0.48	ns
Heterosexual experience ^b	2.95	.68	4.35	.001
Feelings in adolescence ^c	−.15	.11	−1.31	ns
Feelings in adulthood ^c	−.49	.27	−1.84	ns
Feelings in last year ^c	.37	.24	1.53	ns
Activity in adolescence ^c	−.16	.12	−1.36	ns
Activity in adulthood ^c	.04	.11	0.36	ns
Activity in last year ^c	.03	.27	0.13	ns
<i>Film-Plus-Vibrotactile conditions</i>				
Step 1				
Age	.04	.02	2.31	.03

Note: This table shows the results of each statistically significant step in the regression analyses. The dependent variable (genital response pattern) represents a difference scores with higher scores indicating greater response to the heterosexual versus the lesbian film, and lower scores indicating greater response to the lesbian versus heterosexual film

^a Absolute range, 1–7. Lower scores indicate a more positively valenced history

^b Dichotomous variable; 0 = No; 1 = Yes

^c Lower scores indicate a more heterosexual orientation; higher scores indicate a more homosexual orientation

the women self-reported approximately equal sexual arousal in response to their “preferred” and “non-preferred” stimuli. This is inconsistent with the findings of some prior research in which heterosexual women reported more arousal to erotica depicting male–female pairings than to erotica depicting female–female or male–male pairings whereas lesbian women reported the greatest arousal to female–female pairings (e.g., Chivers et al., 2004). The fact that our findings were inconsistent with other researchers’ findings may reflect cultural differences in the samples used in the Chivers et al. (2004) study versus our study. Our participants were recruited in the Netherlands, where sexual mores are more liberal and accepting than the US; thus, the women in our sample may have been more willing to admit to sexual arousal in response to non-preferred stimuli than were the US women in Chivers et al.’s (2004) sample. Interestingly, consistent with our results, Chivers et al. (2007) did not find clear evidence of category-specificity in women’s subjective sexual arousal using a sample of Canadian women. It is possible that Canadian and Dutch women are more similar to each other than to U.S. women in this regard.

It also is noteworthy that over half of the women in our studies identified their sexual orientation as *predominantly* heterosexual or *predominantly* homosexual rather than exclu-

sively heterosexual or lesbian. Given this, it is logical (and consistent with their stated identity) that the women in our particular sample would experience at least some genital and subjective sexual arousal in response to both the heterosexual and lesbian erotica.

Despite the lack of group differences in genital and subjective arousal patterns, evaluations of within-group variations revealed a more complex pattern of results. There were notable within-group variations in women’s category specificity. Nearly half of the women in our studies *did* demonstrate category specificity in their genital responses to the erotic stimuli. In both studies, heterosexual women were more likely to show genital category-specificity than lesbian women in the Film-Only conditions (this difference was significant in Study 1 and simply a trend in Study 2). In fact, the *majority* of lesbian women in the Film-Only conditions responded more strongly to the heterosexual than the lesbian films; however, this difference disappeared in the Film-Plus-Vibrotactile conditions. It is possible that the lack of category-specificity among the lesbian women was attributable, in part, to the content of the erotic films used in these studies. In Study 1 in particular, the lesbian Film-Only condition was clearly less arousing to all participants than the other conditions; thus, in Study 1, our selection of the lesbian stimulus may have contributed to the lack of category-specificity among the lesbian women. Notably, our finding that heterosexual women were more likely than lesbian women to demonstrate category-specificity is in contrast to findings by Chivers et al. (2004) and Chivers et al. (2007) in which lesbian women seemed to demonstrate greater category-specificity than heterosexual women (although the researchers did not statistically compare the two groups in terms of likelihood of demonstrating category specificity). However, Chivers et al. (2007) found that lesbian women demonstrated category specificity *only* when viewing less explicit sexual stimuli (i.e., images of nude figures exercising or a solitary individual masturbating as opposed to a couple engaged in intercourse). Rullo, Strassberg, and Israel (2009) also found that lesbian women demonstrated a clearly category-specific pattern of sexual interest, but the researchers measured sexual interest by time spent viewing preferred versus non-preferred sexual pictures and by self-report ratings of the sexual appeal of preferred versus non-preferred sexual pictures; their study did not include a comparison group of heterosexual women. The fact that lesbian women in our study did not demonstrate category specificity unlike lesbian women in several other studies could offer further support for the idea that the selection of heterosexual and lesbian erotic stimuli may be an important influence on women’s category-specificity (perhaps especially for lesbian women).

In addition to the erotic stimuli, differences between our heterosexual and lesbian samples may also have influenced the differences in category-specificity. For example, based on their responses to the sexual history questions, the lesbian women in

our study had more diverse sexual experiences (e.g., experiences with both men and women) than the heterosexual women. It is possible that these diverse sexual experiences contributed to or were reflective of a more flexible sexual response pattern.

Interestingly, results from Study 1 suggested that past same-sex sexual experiences seemed to be associated with a lack of category specificity regardless of whether the women self-identified as heterosexual or lesbian. It is evident why same-sex experience in heterosexual women would be associated with non-specific responses, but it is less clear why a larger number of same-sex partners among lesbians would be associated with non-specific responses. One possibility is that heterosexual women who engage in same-sex activity and lesbian women with greater numbers of same-sex partners are simply higher in sexual excitation or sexual arousability, and thus they are more likely to become aroused to any sexual stimulus. Of course, given that the relationship between non-specific responses and same-sex experiences was not found in Study 2, more research is needed to address this association.

It is important to note that there is some dispute over which erotic stimuli are best suited for measuring category-specificity in genital response. For this study, we compared heterosexual erotica (i.e., films depicting sex between a man and a woman) and lesbian erotica (i.e., films depicting sex between two women). Chivers et al. (2004) suggested that heterosexual erotic stimuli are not ideal for measuring differences in sexual arousal patterns because heterosexual erotic films contain both men and women and thus can be arousing to a viewer attracted to either sex. Consistent with this, on average, our heterosexual erotica did result in higher self-reported arousal among both lesbian and heterosexual women than did our lesbian erotica. Based on the literature on male sexual arousal, Chivers et al. proposed that, to achieve the most effective contrast between heterosexual and lesbian women, a purely female stimulus (i.e., sex between two women) should be compared to a purely male stimulus (i.e., sex between two men). While such an approach may have some advantages over our approach, it also has some important disadvantages (see also Chivers et al., 2007 for a discussion of this point). Specifically, while a purely female stimulus presumably depicts lesbians' preferred sexual pairing (i.e., a sexual act between two women), a purely male stimulus presumably would fail to represent heterosexual women's preferred sexual pairing (i.e., a sexual act between a man and a woman). Consistent with this, Chivers et al. (2004) and Chivers and Bailey (2005) found that heterosexual women reported greater subjective sexual arousal in response to male–female erotica than to female–female or male–male erotica whereas lesbian women reported the greatest arousal to female–female erotica. More research is needed to assess women's sexual and affective responses to a variety of erotic images.

Additionally, future studies could investigate the within-group differences in men's category-specificity. Although prior studies suggest that “nearly all men” show a category-specific

genital responses (Chivers et al., 2004), little is known about the few men who do not show the expected genital arousal pattern. The findings of these studies suggest that it is valuable to explore within-group variability in category-specificity.

Finally, it is worth mentioning that, throughout this article, we have used the same terminology employed by other researchers. However, “category-specificity” as a term is somewhat problematic in that it implies that men and women are clear and distinct “categories,” an idea that has been challenged by many gender theorists (see e.g., Butler, 1990; Wittig, 1981). Additionally, “preferred” stimulus and “non-preferred” stimulus are not entirely accurate terms, as participants usually are not asked to provide specific ratings of how much they *prefer* same-sex versus other-sex stimuli.

Affective Responses to the Heterosexual and Lesbian Erotica

Although heterosexual and lesbian women, on average, did not differ in their sexual responses to the lesbian and heterosexual films, there was some evidence that women's emotional reactions to the films differed as a function of their self-identified sexual orientation. In Study 2, heterosexual women reported more positive affect in response to the heterosexual versus lesbian erotica, whereas the lesbian women reported more positive affect to the lesbian erotica than to the heterosexual erotica. In both Studies 1 and 2, lesbian women reported feeling more threatened by the heterosexual films than by the lesbian films. Thus, there was some support for our hypothesis that women would report more positive affect and less negative affect in response to their preferred versus non-preferred stimuli.

Perhaps somewhat paradoxically, research on affect and sexual response suggests that negative affect may sometimes enhance sexual response (e.g., Laan & Everaerd, 1995). In particular, ambivalent affect (positive affect combined with negative affect) has been shown to be associated with strong genital and subjective arousal (Peterson & Janssen, 2007). It is possible that this may help explain the fact that many women in our study experienced strong genital and subjective arousal in response to their non-preferred stimuli. Non-preferred sexual stimuli may tend to evoke ambivalent emotions, and those emotions actually may function to enhance women's genital and subjective sexual responses to the non-preferred stimuli. For example, for the lesbians in the Film-Plus-Vibrotactile condition of Study 1, tense affect combined with positive affect in response to a film was associated with greater genital response to that film. Similarly, for the heterosexual women in the Film-Only condition of Study 2, angry affect combined with positive affect was associated with greater genital response.

It is noteworthy that many of the items on the tense and angry affect scales were less strongly negative than the items on the threatened affect scale. It is possible that mild negative emotions (such as tension or anger) do not interfere with (and

may even enhance) sexual response whereas stronger negative emotions (such as threatened affect) may reduce sexual response.

Novelty also may have played a role in the relationship between affect and genital response. In laboratory studies, women who have had no prior exposure to erotic stimuli tend to have stronger genital responses to erotica than women who have had prior exposure (Laan & Everaerd, 1995). The women in our study may have had more prior exposure to sexual stimuli of their preferred category; thus, the non-preferred sexual stimuli may have evoked stronger reactions, including more ambivalent emotions and stronger genital responses. The fact that men generally do show clear evidence of category-specificity suggests that novelty may not have the same effect on men. Indeed, we are not aware of data that clearly demonstrate that novelty impacts the genital responses of men.

Vibrotactile Stimulation

A robust finding in both studies was that, in all participants, vibrotactile stimulation combined with visual stimulation generated significantly greater genital responses than visual stimulation alone. In Study 2, this enhancing effect of vibrotactile stimulation was evident in subjective sexual arousal responses as well. The effect of vibrotactile stimulation was absent or modified by Film Type for subjective sexual arousal in Study 1 and for affective responses in both studies. The design of the vibrator did not compromise the VPA measurements. To the best of our knowledge, this is the first study showing an enhancing effect of combined visual and vibrotactile stimulation over visual stimulation alone using vaginal photoplethysmography. These findings mimic studies in men, in which it was demonstrated that vibrotactile stimulation enhances genital response to erotic film (e.g., Janssen, Everaerd, van Lunsen, & Oerlemans, 1994; Rowland, den Ouden, & Slob, 1994; Rowland & Slob, 1992).

Interestingly, in a different study of women, use of this same vibrator did not enhance genital response as measured by labium minus temperature assessed via a labium thermistor (Slob, Bax, Hop, Rowland, & van der Werff ten Bosch, 1996). The differences between the findings in this study and the Slob et al. (1996) study may reflect the fact that labium temperature is a less sensitive measure than VPA. Alternatively, the device to which the vibrator was mounted in the thermistor study—consisting of a girdle to which the vibrator was attached using a velcroband—may have delivered the vibrotactile stimulation in a less efficient way than the mounting used in this study.

What Factors Influence Sexual Self-Identity?

Based on research findings of gender differences in category specificity, Chivers et al. (2004) concluded that:

A self-identified heterosexual woman would be mistaken to question her sexual identity because she was aroused watching female–female erotica; most heterosexual women experience such arousal. A self-identified heterosexual man who experienced substantial arousal to male–male erotica, however, would be statistically justified in reconsidering his sexual identity. (p. 741)

This conclusion seems to assume that genital sexual arousal patterns are likely to be an important influence on individuals' sexual identity (rightly so for men and wrongly so for women). In reality, we know little about the factors that influence an individual's sexual identity.

In the present study, bivariate correlations generally revealed weak associations between different aspects of women's sexual orientation (e.g., see Tables 7 and 8), particularly among the lesbian women in our sample. For example, homosexual versus heterosexual sexual *feelings* in adulthood were unrelated to homosexual versus heterosexual *behavior* in adulthood. This is consistent with a growing body of evidence that women's sexual identities do not necessarily correspond (or do not *always* correspond) to their sexual arousal in response to men versus women, to their sexual fantasies about men versus women, or to their sexual behavior with men versus women (e.g., Baumeister, 2000; Diamond, 2003, 2005). Women's sexual identity also may change over time and sometimes may be determined, at least in part, by context, partner availability, and political ideology (Diamond, 2005; Peplau, 2001). Interestingly, in the Film-Only conditions of Study 2, we found that a very large proportion (82%) of the variance in lesbian women's genital response to the heterosexual versus lesbian erotica was accounted for by a model that combined many different aspects of sexual orientation (including current and past behavior and feelings). This points to the fact that genital response patterns may reflect a combination of multiple components of sexuality. Given these complexities, perhaps it is not surprising that, for many women, genital response patterns are not strongly associated with a simple measure of self-identified sexual orientation. Nevertheless, the fact that many women in our sample did show evidence of category-specificity is a reminder of the importance of considering within-group variations when drawing conclusions about the nature of women's arousal and sexual orientation.

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