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SPECIAL SECTION: THE PUZZLE OF SEXUAL ORIENTATION

Assessing the Relationship Between Sexual Concordance, Sexual Attractions, and Sexual Identity in Women

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Abstract On average, there is a gender difference in *sexual concordance*, with men exhibiting greater agreement between genital and self-reported sexual arousal, relative to women. Much less is known about the substantial variation in women's sexual concordance; women's genital and self-reported sexual responses may correlate strongly and positively, not at all, or even strongly negatively. The within-gender variation in sexual concordance suggests that individual differences may be related to sexual concordance. We examined whether sexual concordance varies as a function of sexual orientation (based on self-reported sexual attractions and sexual identity labels) in a sample ($N = 76$) that included exclusively androphilic, predominantly androphilic, ambiphilic, and predominantly/exclusively gynephilic women. Participants viewed sexual and nonsexual stimuli that varied by actor gender while their vaginal vasocongestion and subjective sexual responses were measured. Women's sexual concordance varied as a function of their sexual attractions; women with any degree of gynephilia exhibited higher sexual concordance than exclusively androphilic women across a variety of sexual concordance measures, and these effects were demonstrated using correlation and multi-level modeling analyses. Only sexual concordance based on overall feelings of arousal varied by sexual identity, with heterosexual women exhibiting the lowest sexual concordance. Stimulus gender significantly influenced sexual concordance for most groups of women: Ambiphilic and predominantly/exclusively gynephilic women exhibited greater sexual concordance to female stimuli and exclusively androphilic women exhibited greater sexual concordance to male stimuli. These findings suggest that sexual orientation (particularly one's degree of gynephilia) may explain some of the within-gender variation seen in women's sexual concordance.

Keywords Sexual concordance · Sexual orientation · Vaginal photoplethysmography · Self-reported sexual arousal · Sexual attractions · Sexual identity · Multi-level modeling

Introduction

Sexual arousal consists of interacting components of physiological (particularly genital) changes and emotional expression (Chivers, 2005). A comprehensive assessment of sexual arousal includes both physiological and subjective measures (Rellini, McCall, Randall, & Meston, 2005). Numerous genital changes occur during sexual arousal in women, including increased vaginal vasocongestion (Laan, Everaerd, & Evers, 1995; Sintchak & Geer, 1975; Suschinsky, Lalumière, & Chivers, 2009), increased genital temperature (e.g., Henson & Rubin, 1978; Huberman & Chivers, 2015; Kukkonen, Binik, Amsel, & Carrier, 2007, 2010; Prause & Heiman, 2009; Seeley, Abramson, Perry, Rothblatt, & Masters-Seeley, 1980), increased vaginal lubrication (Dawson, Sawatsky, & Lalumière, 2015), and increased vulvar blood flow (Waxman & Pukall, 2009). Subjective sexual arousal involves self-reports of feelings related to sexual arousal or perceptions of genital response (Chivers, Seto, Lalumière, Laan, & Grimbos, 2010). Despite the ability to measure various aspects of sexual arousal, the relationship between physiological and subjective sexual responses in women remains poorly understood (Rellini et al., 2005); in particular, factors that contribute to individual differences

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in the physiological/subjective sexual response relationship remain relatively unexamined (e.g., Clifton, Seehuus, & Rellini, 2015). A large body of evidence suggests that women's genital and/or subjective sexual responses vary as a function of their sexual orientation, such that the stimuli that evoke genital and subjective sexual responses differ for women with varying sexual attractions (reviewed in Chivers, 2016). The purpose of the current study is to examine the relationship between physiological and subjective sexual arousal in a sample of women with varying sexual orientations to determine whether sexual orientation may influence women's *sexual concordance.*

Sexual Concordance

Sexual concordance refers to the relationship between physiological (i.e., genital) and subjective (i.e., self-reported) facets of sexual arousal. On average, there is a gender difference in sexual concordance, with men exhibiting a higher degree of synchrony between genital and self-reported sexual arousal (Pearson's $r = .66$; Chivers et al., 2010) relative to women (Pearson's $r = .26$; Chivers et al., 2010). Although the gender difference in sexual concordance has been documented for decades (e.g., Heiman, 1977; Steinman, Wincze, Sakheim, Barlow, & Mavissakalian, 1981) and quantified in a recent meta-analysis (Chivers et al., 2010), researchers have recently begun to explore the substantial variation in sexual concordance among women (Clifton et al., 2015).

Women's genital and self-reported sexual responses may correlate strongly and positively, not at all, or even strongly negatively. This variation is seen across multiple genital response measures, including vaginal photoplethysmography (VPP), thermal imaging, and laser Doppler imaging. Women's sexual concordance scores have ranged between Pearson's $r = .08$ to .79 when using VPP to assess vaginal vasocongestion (Rellini et al., 2005). The range is even broader when using methods to assess external genital response. Women's sexual concordance scores have ranged between Pearson's $r = -.30$ to .95 when using thermal imaging to assess changes in labial temperature (Huberman, Dawson, & Chivers, 2016; Kukkonen et al., 2010 report similar values). When using laser Doppler imaging, sexual concordance scores have ranged between Pearson's $r = .11$ to .99 for healthy women and Pearson's $r = -.90$ to .99 for women with a genital pain condition (Boyer, Pukall, & Holden, 2012).

Most research on sexual concordance has relied on VPP as the measure of genital response (Chivers et al., 2010). VPP has been criticized for assessing changes in genital response that are less perceptible to women (reviewed in Kukkonen, 2014). Changes to external genitalia may be more perceptible to women (e.g., Waxman & Pukall, 2009); however, low concordance or even discordance (i.e., a negative relationship between physiological and self-reported sexual arousal) can be seen even when external measures of genital response are used (e.g., Bouchard, Chivers, & Pukall, in press; Boyer et al., 2012; Huberman et al., 2016; Kukkonen et al., 2010). Because the variation in women's sexual concordance is seen across a variety of methodologies, it is unlikely that the within-gender variation in women's sexual concordance is the result of a methodological artifact of VPP. Thus, alternate explanations for the substantial within-gender variability in concordance warrant further exploration.

Sexual Response Patterns and Gynephilia

Noting the substantial within-gender variation in women's sexual concordance, researchers have suggested (Chivers et al., 2010) and subsequently demonstrated (Clifton et al., 2015; Meston, Rellini, & McCall, 2010) that women's sexual concordance is related to individual differences. For example, Clifton et al. found that, using VPP to assess genital response, women high in sexual excitation and those who endorse sexual schemas related to passion and romance exhibit relatively high sexual concordance. Using VPP, Meston et al. (2010) reported that women with sexual arousal disorder tend to have lower sexual concordance compared to sexually healthy women or women with orgasm difficulties. A similar pattern is found when thermal imaging is used as the genital measure: Sarin, Amsel, and Binik (2015) recently reported that women with both sexual desire and arousal difficulties exhibited significantly lower sexual concordance than women without such difficulties. Taken together, there is a growing body of research using different methodologies that suggests that individual differences affect women's sexual concordance.

There is strong evidence to suggest that sexual response patterns are linked with sexual attractions in women. Sexual attractions reflect one's sexual orientation (Diamond, 2003), whereas sexual identification labels such as heterosexual or lesbian reflect one's self-concept or how an individual views themselves (Diamond, 2003), and may not always coincide with one's sexual attractions (Diamond, 2008). *Gynephilic attractions* refer to sexual attractions toward adult women or female targets, and *androphilic attractions* refer to sexual attractions toward adult men or male targets.

Predominantly and exclusively *gynephilic* women exhibit patterns of genital and self-reported sexual arousal that are fairly *gender specific*, meaning that they exhibit relatively greater genital responses and report relatively greater sexual arousal to stimuli depicting their preferred sexual partners (i.e., female stimuli; e.g., Chivers, Seto, & Blanchard, 2007; reviewed in Chivers, 2016); in addition, these women exhibit weaker genital responses and report less arousal to male stimuli. *Ambiphilic* women, or those attracted equally to both adult women and men, show a similar pattern: Ambiphilic women exhibit greater genital responses and report more sexual arousal to female stimuli, and lower genital and self-reported responses to male stimuli (Bouchard, Timmers, & Chivers, 2015; Timmers, Bouchard,

& Chivers, 2015). A similar pattern is found among women with an even smaller degree of gynephilia: Women who are predominantly *androphilic (*i.e., predominantly attracted to adult men, but also report some attraction to adult women) exhibit significantly stronger genital responses and report significantly more sexual arousal to female stimuli (Chivers, Bouchard, & Timmers, 2015). Chivers et al. reported that gynephilic attractions significantly predicted both genital and subjective sexual responses in women. Increased gynephilia was associated with weaker genital and subjective responses to male stimuli; increased gynephilia was also associated with increased subjective sexual arousal to female sexual stimuli.

Exclusively androphilic women tend to exhibit a unique pattern of sexual responses compared to other women. Exclusively androphilic women's genital responses tend to be *gender nonspecific,* meaning that they exhibit similar degrees of genital response to male and female sexual stimuli (Chivers et al., 2015). Contrary to their genital responses, exclusively androphilic women's self-reports are characterized as moderately gender specific because some researchers have found gender-specific response patterns (e.g., Chivers & Bailey, 2005; Chivers, Rieger, Latty, & Bailey, 2004; Chivers et al., 2015 Study 2; Suschinsky et al., 2009) but others have not (Chivers et al., 2007, 2015 Study 1; Huberman & Chivers, 2015).

Gynephilic women's genital and self-reported sexual response patterns tend to be associated with their sexual attractions; exclusively androphilic women exhibit sexual response patterns that do not always coincide with their sexual attractions. Therefore, gynephilia is a factor that may also influence the strength of the relationship between genital and self-reported sexual responses. Based on the patterns of genital and self-reported sexual responses described above, it should follow that women with any degree of gynephilia should exhibit greater sexual concordance than exclusively androphilic women. Specifically, women with any degree of gynephilia tend to exhibit greater genital responses and report more sexual arousal to female stimuli, which should result in higher sexual concordance. In contrast, exclusively androphilic women's genital responses do not always coincide with their self-reported sexual arousal, which would result in lower sexual concordance.

There is some preliminary evidence to support this hypothesis. Suschinsky et al. (2009) compared sexual concordance in sample of women who were either predominantly ($n = 15$) or exclusively ($n = 5$) androphilic; the exclusively androphilic women tended to have lower sexual concordance than predominantly androphilic women, though the difference was not statistically significant (likely resulting from low power because of the small sample size). Suschinsky and Lalumière (2010) found that women who self-identified as bisexual ($n = 5$) also tended to exhibit higher sexual concordance than those who self-identified as heterosexual ($n = 15$). Taken together, these results suggest that women's sexual attractions may be related to their sexual concordance.

The Current Study

To explore the substantial within-gender variability in sexual concordance among women, we investigated whether this relationship varies as a function of sexual orientation in a sample of exclusively androphilic, predominantly androphilic, ambiphilic, and predominantly or exclusively gynephilic women. We examined sexual concordance in response to a range of sexual stimuli, including stimuli depicting preferred and nonpreferred sexual partners. Given the patterns of sexual response described above, we hypothesized that women with any degree of gynephilic attraction would exhibit higher sexual concordance than women with an exclusively androphilic attraction, when sexual concordance was based on a range of sexual stimuli including both preferred and nonpreferred sexual targets. To ensure the effect was a result of degree of gynephilia, we also examined the patterns using sexual identity labels (e.g., heterosexual, lesbian), which do not always reflect one's sexual attractions and can also change substantially over time (Diamond, 2008). Finally, given the recent findings of Chivers et al. (2015) documenting that female stimuli produce greater genital and self-reported arousal responses among women with any degree of gynephilia, we expected that sexual concordance would vary as a function of the sex of the actor depicted within the sexual stimulus as well as by the degree of gynephilia reported, with exclusively androphilic women exhibiting lower concordance to female sexual stimuli, and women with any degree of gynephilia exhibiting higher sexual concordance to female stimuli.

Method

Overview

The data presented in the current study were collected as part of two larger studies examining women's genital and subjective sexual response patterns (see Chivers et al., 2015, Study 1 for information on the combined sample). Participants were presented with sexual and nonsexual audiovisual film clips, while their vaginal vasocongestion was assessed using vaginal photoplethysmography. Participants reported their sexual arousal before, during, and after each stimulus.

Participants

Women were recruited using advertisements posted on Queen's University and the University of Toronto campuses, on a student employment university website, and in monthly e-newsletters. Eligibility criteria included: fluency in English; not using medications known to influence sexual responses (e.g., psychotropics, neuroleptics, antihypertensives; Meston & Frohlich, 2000); no history of mental illness, substance abuse, or sexual difficulties; regular menstrual cycles (Chiazze, Brayer, MacIsco,

Parker, & Duffy, 1968); not currently pregnant; and no active sexually transmitted infection.

Overall, 78 women participated in the two studies; however, two participants did not provide usable psychophysiological data. Thus, our final sample consists of 76 women, aged 18–39 years ($M = 23.8$ years, $SD = 5.6$). The majority of the participants were single (65.8 %); fewer were in dating relationships (18.4 %), married or in a common law relationship (9.2 %), or separated or divorced (5.3 %). The remaining participant did not provide her relationship status (1.3 %). The sample was relatively educated, with most participants completing or holding an undergraduate degree (78.9 %), a graduate or professional degree (5.3 %), or a community college diploma (10.5 %).

Sexual Attractions and Sexual Identity

We characterized sexual attractions using participants' responses to a modified Kinsey Sexual Attraction Scale (Kinsey, Pomeroy, Martin, & Gebhard, 1953). The modified Kinsey Sexual Attraction Scale focused on the gender of the person(s) that respondents were attracted to, rather than using terms such as "heterosexual," "bisexual," and "homosexual." For example, exclusive androphilia was described as "sexually attracted to men only" and exclusive gynephilia was described as "sexually attracted to women only," rather than "exclusively heterosexual" and "exclusively homosexual," respectively. Participants were grouped based on relative androphilia and gynephilia, with 14 women reporting exclusive androphilia (Kinsey 0), 19 women reporting predominant androphilia (Kinsey 1), 21 women reporting ambiphilia (Kinsey 2–4), and 22 women reporting predominant or exclusive gynephilia (Kinsey 5 and 6).

Sexual identity labels endorsed by the participants included: heterosexual, lesbian, bisexual, queer, other, and no label. All exclusively androphilic women identified as heterosexual. There was substantial variability among the sexual identity labels used by women with any degree of gynephilia. See Fig. 1 for details.

Apparatus and Materials

Data Acquisition

All genital and subjective responses were sampled and recorded using a Limestone Technologies Data-Pac_USB system (Limestone Technologies, Odessa, ON, Canada).

Genital Responses

A vaginal photoplethysmograph equipped with an orange-red spectrum light source (Technische Handelsonderneming Coos, The Netherlands) was used to assess changes in vaginal pulse amplitude (VPA). Higher amplitudes in VPA indicate greater vaginal vasocongestion during each heart beat (Hatch, 1979). Increases in VPA are specific to sexual stimuli (Laan, Everaerd, van der Velde, & Geer, 1995; Suschinsky et al., 2009). The photoplethysmograph signal was sampled at a rate of 10 Hz and band-pass filtered (.5–10 Hz).

Subjective Sexual Arousal

Participants reported their sexual arousal before, during, and after each stimulus by pressing buttons on a keypad. Participants used a scale of 0 (*no arousal at all*) to 9 (*most arousal ever experienced/arousal associated with orgasm*) to answer the following questions before and after each stimulus: "How sexually aroused do you feel?" and "How strong are your genital sensations?"

Subjective sexual arousal was also measured continuously throughout each stimulus. During each stimulus, participants continuously reported "how turned on they were feeling," using a scale of 0 (*not at all sexually aroused*) to 100 (*extremely sexually aroused, most arousal ever felt, feelings experienced right before reaching an orgasm*). Button presses on a keypad lowered or raised a vertical bar on the television screen that displayed the audiovisual stimuli (see below). Continuously reported sexual arousal allows for the calculation of within-subjects concordance and the use of multi-level modeling, providing the opportunity to assess the agreement between genital and self-reported responses within individual participants. See below for more information on the procedures followed to calculate concordance using within-subjects correlations and multilevel modeling.

Experimental Stimuli

The experimental stimuli consisted of 90-s film clips presented with sound (i.e., vocalizations and background music; Chivers et al., 2007, 2015). Two exemplars from each of the following categories were presented in a random order: female nude exercise, female masturbation, female–female intercourse, male nude exercise, male masturbation, male–male intercourse, male–female intercourse, and neutral. All actors featured in the stimuli were adults. Participants in Chivers et al. (2007) also saw two film clips of nonhuman primate (bonobo) sexual activity. All participants were presented with a 3-min adaptation stimulus depicting scenery of landscapes and buildings. See Chivers et al. (2007) for more information on the stimulus content.

Demographic Information

Participants completed a brief questionnaire assessing their demographic information (see above), as well as a brief sexual history questionnaire.

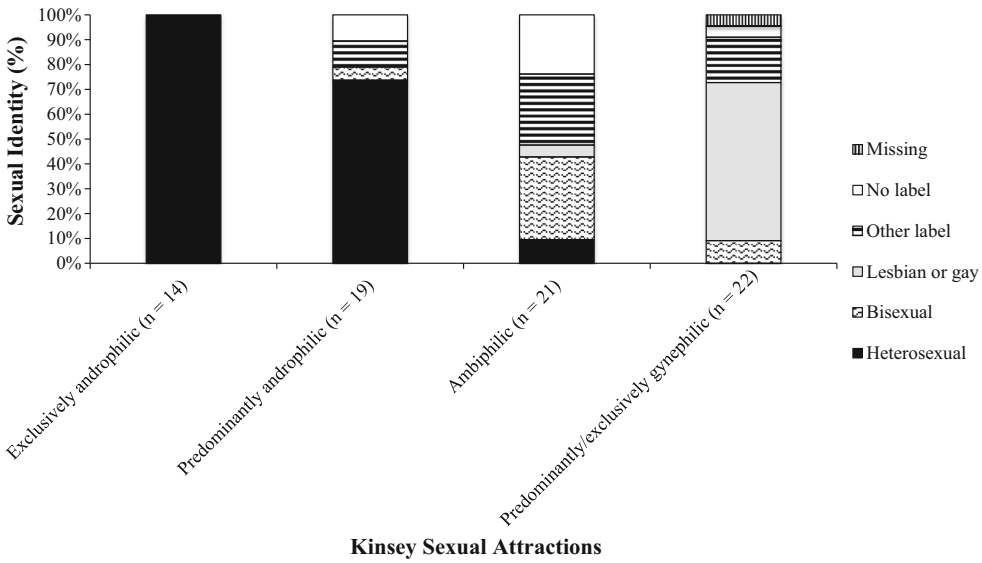

Fig. 1 Sexual attractions and sexual identity labels. *Note*: The "Missing" label refers to participants that did not answer the sexual attraction and/or sexual identity questions

Procedure

The testing procedure was identical to the procedure reported by Chivers et al. (2007, 2015). Potential participants responded to advertisements and were then screened for eligibility; testing sessions were scheduled for eligible women such that they did not occur during participants' menstrual period. Prior to the testing session, participants were asked to avoid the following: engaging in partnered and/or solitary sexual activity for 24 h, engaging in all forms of physical exercise for 1 h, and consuming alcohol or recreational drugs on the day of testing. Participants reported complying with these requests on the questionnaire.

All participants were tested individually. A female experimenter explained the study procedures, including how to position the vaginal photoplethysmograph and report subjective responses. Participants were instructed to pay attention to the experimental stimuli, avoid touching and/or contracting their genitals, and remain as still as possible to minimize the potential for movement artifacts (Hatch, 1979). All participants provided written consent prior to the psychophysiological assessment.

Participants inserted the vaginal photoplethysmograph themselves while seated in a comfortable recliner in a private, dimly lit room. The 3-min adaptation stimulus was presented on a computer monitor positioned approximately 1.5 m away from the recliner. The remaining stimuli were presented in a randomized order. Participants reported their subjective sexual arousal and perception of genital sensations before and after each stimulus. Participants also rated their subjective sexual arousal continuously during each stimulus. Stimuli were separated by inter-stimulus intervals of 3 min, during which time participants were instructed to relax and to allow their genital responses to return to neutral levels. After the sexual psychophysiological assessment, participants completed a brief questionnaire. Participants were then debriefed and received $25 as compensation. All procedures were approved the University's ethics committees.

Data Reduction and Analyses

All analyses were performed using SPSS Statistics version 23 (IBM Corporation).

Assessing Sexual Concordance Based on a Range of Stimuli

Subjective Responses Subjective sexual arousal (based on overall feelings and perception of genital sensations) was converted to change scores; pre-stimulus ratings were subtracted from post-stimulus ratings. Continuous self-reported (CSR) sexual arousal ratings represent mean minus pre-stimulus baseline scores. Change scores for discretely measured sexual arousal and continuous ratings are less susceptible to impression management biases, relative to post-stimulus ratings alone (Huberman, Suschinsky, Lalumière, & Chivers, 2013).

Genital Responses Movement artifacts were removed by a trained researcher blind to the stimulus conditions through visual inspection of the waveforms prior to data analysis. Change scores were then computed for genital responses, with the pre-stimulus baseline subtracted from the mean genital response to each experimental stimulus.

The Relationship Between Genital Responses and Subjective Sexual Arousal Within-subjects Pearson *r* correlations between VPA responses and subjective reports of arousal were calculated for each participant (Chivers et al., 2010). Within-subjects correlations assess the degree to which changes in VPA responses correspond with changes in subjective reports

within an individual (Chivers et al., 2010); each participant has their own correlation, which may then be averaged with other participants' correlations from their group (Bland & Altman, 1995). Responses to the nude exercise, masturbation, and coupled sex stimuli were included in the concordance calculations; neutral stimuli were excluded from the sexual concordance scores because including responses to nonsexual stimuli spuriously increases sexual concordance values (Suschinsky et al., 2009). Nude exercise stimuli are capable of eliciting a genital and subjective sexual response in some women (Chivers et al., 2007). Thus, sexual concordance scores were based on 14 pairs of points. Three types of sexual concordance were calculated: (1) *overall sexual concordance*, based on the relationship between genital responses and change in self-reported overall feelings of sexual arousal; (2) *genital sexual concordance*, based on the relationship between genital responses and change in self-reported perception of genital sensations; and (3) *continuous sexual concordance*, based on the relationship between genital responses and continuous subjective reports of sexual arousal.

Sexual Concordance, Sexual Attractions, and Sexual Identity Separate one-way analyses of variance (ANOVAs) were performed on the different sexual concordance scores (i.e., overall, genital, and continuous concordance). Sexual Attraction (exclusively androphilic, predominantly androphilic, ambiphilic, predominantly/exclusively gynephilic) was the between-subjects factor. Similar ANOVAs were performed with Sexual Identity (heterosexual, bisexual, lesbian, other label, no label) as the between-subjects factor. A group's average sexual concordance score for either Sexual Attraction or Sexual Identity was calculated as the average of all participants' Pearson *r* correlations within the same group.

Multi-level Modeling of Sexual Concordance Based on a Range of Sexual Stimuli Within-subjects Pearson *r* correlations based on average responses violate a core assumption, namely that observations are independent (Tabachnick & Fidell, 2007). Despite this concern, within-subjects correlations are commonly used to assess sexual concordance (e.g., Chivers et al., 2010; Kukkonen et al., 2010; Suschinsky et al., 2009). Multi-level modeling (MLM) is an alternative statistical approach that accounts for multiple measurements that are nonindependent enabling the assessment of sexual concordance within an individual (e.g., Clifton et al., 2015; Rellini et al., 2005).

In order to justify the use of MLM, a baseline model (with no predictors) was run and an intraclass correlation coefficient (ICC) was computed. The ICC can be interpreted the same way as a correlation coefficient, such that an ICC can be classified as small ($.10 \leq \text{ICC} < .30$), medium ($.30 \leq \text{ICC} < .50$), or large ($\text{ICC} \geq .50$; Cohen, 1992; Page-Gould, in press). If the ICC is very small (<.10), then MLM is not necessary because the data are independent. The ICC for the baseline model was moderate ($\rho = 0.43$), suggesting that CSR data were clustered, justifying the use of a multi-level approach for the current data.

The raw CSR and VPA data for each stimulus were binned into 10-s epochs. The bins represent the average CSR rating and VPA in millivolts (mV). CSR was modeled as a function of raw VPA and Sexual Attraction; Stimulus Category was entered as a covariate because we were uninterested in its effect when examining sexual concordance across the range of stimuli. Raw VPA was group mean centered and Sexual Attraction was treated as a categorical variable with four levels (exclusively androphilic, predominantly androphilic, ambiphilic, predominantly/exclusively gynephilic). Data were positively skewed; the distribution of VPA data could be corrected with transformations, however, CSR data could not be fully corrected by transformation. The 0 values responsible for the significant positive skew in the CSR data are meaningful because they likely indicate an absence of self-reported subjective sexual arousal, and thus we decided to not submit these data to a transformation. To address the issues related to nonnormally distributed data, we adopted a bootstrapping approach to MLM. A bootstrapped, two-level multi-level model with 5000 iterations, unstructured covariance matrix, and random intercepts and random slopes (VPA was nested within participant) was used to examine the relationship between CSR and VPA (level 1) and whether this relationship differed as a function of Sexual Attraction (level 2):

$$\begin{aligned} y(\text{CSR})_{ij} = {} & \beta_0 + \beta_1(\text{Stimulus Category})_j + \beta_2(\text{VPA})_{ij} \\ & + \beta_3(\text{Sexual Attraction})_j \\ & + \beta_4\left(VPA_{ij} * \text{Sexual Attraction}_j\right) + e_{ij} \end{aligned}$$

Fixed and random effects were both specified in the model. Fixed effects are those that are expected to generalize or replicate in other populations, that is, fixed effects do not vary across individuals (Page-Gould, in press). The fixed effects were the main effects and interaction terms specified in the equation above (i.e., those factors expected to influence CSR and the relationship between CSR and VPA). Random effects are those effects that are not expected to generalize, but rather reflect variability specific to the sample being studied; random effects are the residuals or error terms from the model (Page-Gould, in press) and account for some of the variance in CSR and its relationship with VPA, but would not be consistent across studies. Semi-partial R^2 was calculated to represent the amount of variance in the dependent variable (CSR) that was uniquely explained by the model parameter for each of the fixed effects. The magnitude of the semi-partial R^2 values can be classified as small (0.02), medium (0.13), or large (0.26; Cohen, 1992; Edwards, Muller, Wolfinger, Qaqish, & Schabenberger, 2008; Page-Gould, in press). We followed up significant cross-level interactions using Aiken and West's (1991) method for assessing simple effects. For the follow-up simple slopes analyses,

Sexual Attraction was dummy coded into three new variables for each Sexual Attraction (12 dummy coded variables in total), with 0 as the reference group for each Sexual Attraction level (i.e., exclusively androphilic, predominantly androphilic, ambiphilic, predominantly/exclusively gynephilic) in order to examine the effects for each of the groups separately. These new variables were then used in the two-level model described above.

Assessing Sexual Concordance Based on Categories of Sexual Stimuli and Sexual Orientation

Subjective and Genital Responses The raw 10-s binned CSR and VPA data for the male and female masturbation stimuli (described above) were used for the following analyses.

MLM The ICC generated from the baseline model was large, $\rho = 0.55$, suggesting that CSR data were not independent and confirming that a multi-level approach was appropriate for the data. Raw CSR was modeled as a function of raw VPA, Stimulus Gender, and Sexual Attraction. Prior to analysis, raw VPA was group mean centered, Stimulus Gender was effects coded such that the female stimuli was coded with "−1" and the male stimuli was coded with "1" and Sexual Attraction was treated as a categorical variable with four levels. A bootstrapped three-level multi-level model with 5000 iterations, unstructured covariance matrix, and random intercepts and random slopes (to account for the fact that VPA was nested within participant) was used to examine the relationship between CSR and VPA (level 1) and whether this relationship differed based on Stimulus Gender (level 2) or as a function of Sexual Attraction (level 3):

$$\begin{aligned} y(\mathrm{CSR})_{ij} = {} & \beta_0 + \beta_1(\mathrm{VPA})_{ij} + \beta_2(\text{Stimulus Gender})_j \\ & + \beta_3(\text{Sexual Attraction})_j \\ & + \beta_4\left(\mathrm{VPA}_{ij} * \text{Stimulus Gender}_j\right) \\ & + \beta_5\left(\mathrm{VPA}_{ij} * \text{Sexual Attraction}_j\right) \\ & + \beta_6(\text{Stimulus Gender} * \text{Sexual Attraction})_j \\ & + \beta_7\left(\mathrm{VPA}_{ij} * \text{Stimulus Gender}_j \right. \\ & \left. * \text{ Sexual Attraction}_j\right) + e_{ij} \end{aligned}$$

Fixed and random effects were specified in the model. The fixed effects were the main effects and interaction terms specified in the equation, namely those factors expected to influence CSR and the relationship between CSR and VPA. Random effects are the residuals or error terms from the model; they account for some of the variance in CSR and its relationship with VPA, but these effects are not expected to be consistent across studies (Page-Gould, in press). Similar to the MLM of sexual concordance based on a range of sexual stimuli described above, semi-partial R^2 was calculated to represent the amount of variance in the dependent variable (CSR) that was uniquely explained by the model parameter for each of the fixed effects, with effect sizes being classified as small (0.02), medium (0.13), or large (0.26; Cohen, 1992; Edwards et al., 2008; Page-Gould, in press). Significant cross-level interactions were followed up using the Aiken and West (1991) method for assessing simple effects. For the simple slopes analyses, Stimulus Gender was dummy coded into two variables, with 0 as the reference group for the male stimulus dummy coded variable and 0 as the reference group for the female stimulus dummy coded variable. Sexual Attraction (i.e., Kinsey group) was also dummy coded into three new variables for each Sexual Attraction group (12 dummy coded variables in total) in order to examine the effects for each of the groups separately. These new variables were then used in the three-level model described above.

Results

Sexual Concordance, Sexual Attractions, and Sexual Identity

Table 1 presents mean sexual concordance and standard deviations as a function of Sexual Attraction for each type of sexual concordance (i.e., overall sexual concordance, genital sexual concordance, and continuous sexual concordance). Each of the three types of sexual concordance varied as a function of Sexual Attraction (all Fs ≥ 3.21, all ps $\leq .03$, all η^2s ≥ 0.12). LSD post hoc tests revealed that exclusively androphilic women exhibited significantly lower sexual concordance compared to predominantly androphilic women for overall sexual concordance ($p = .003$, Cohen's $d = -0.99$) and continuous sexual concordance ($p = .002$, $d = -1.08$); the difference was not statistically significant, though the effect size was moderate for genital sexual concordance ($p = .05$, $d = -0.60$). Exclusively androphilic women exhibited significantly lower sexual concordance than predominantly/exclusively gynephilic women for all three types of sexual concordance (all ps $\leq .013$, ds ranged between -0.79 and -1.18). For overall sexual concordance, exclusively androphilic women exhibited significantly lower sexual concordance than ambiphilic women, $p < .05$, $d = -0.61$. There were no significant differences between women with varying degrees of gynephilia for any of the three types of sexual concordance, though two differences were moderate based on their effect sizes (Cohen, 1992). Predominantly androphilic women had higher continuous sexual concordance than ambiphilic women ($p = .05$, $d = 0.67$) and predominantly/exclusively gynephilic women had higher genital sexual concordance

Table 1 Sexual concordance as a function of sexual attractions

	Exclusively androphilic $n = 14$	Predominantly androphilic $n = 19$	Ambiphilic $n = 21$	Predominantly/exclusively gynephilic $n = 22$
Overall	.36 (.26)[a]	.59 (.20)[b]	.51 (.23)[b]	.62 (.17)[b]
Genital	.42 (.28)[a]	.56 (.17)[b]	.51 (.23)[a]	.63 (.15)[b]
Continuous	.24 (.37)[a]	.58 (.25)[b]	.39 (.31)[a]	.50 (.28)[b]

Correlations are the average within-subjects Pearson *r* correlation for each sexual identity group. Overall = sexual concordance based on overall feelings of sexual arousal; Genital = sexual concordance based on perception of genital sensations; Continuous = sexual concordance based on continuous reports of sexual arousal

Different superscripts denote significant group differences. For example, Overall Sexual Concordance for exclusively androphilic women was significantly different than Overall Sexual Concordance for predominantly androphilic, ambiphilic, and predominantly/exclusively gynephilic women

than ambiphilic women ($p = .06, d = 0.62$); all other post hoc ps $\geq .11$, ds ≤ 0.44.

Although the average correlations for exclusively androphilic women were in line with and even higher than those reported in previous research (e.g., Chivers et al., 2010), they were not statistically significant (i.e., significantly different from 0). All types of sexual concordance were statistically significant for the predominantly androphilic, ambiphilic, and predominantly/exclusively gynephilic women ($p < .05$).

Table 2 presents mean sexual concordance and standard deviations as a function of Sexual Identity for each type of sexual concordance. Only overall sexual concordance varied significantly as a function of Sexual Identity, $F(4, 70) = 2.96$, $p = .03$, $\eta^2 = 0.14$. Genital sexual concordance and continuous sexual concordance did not (Fs ≤ 1.10, ps $\geq .37$, η^2s ≤ 0.06). LSD post hoc analyses on overall sexual concordance revealed that self-identified heterosexual women had significantly lower sexual concordance than self-identified bisexual women ($p = .01$, $d = -0.88$) and women who adopted other labels ($p = .01, d = -0.91$). Women who adopted no labels had lower overall sexual concordance than self-identified bisexual women ($p = .05$, $d = -1.11$) and women who adopted other labels ($p = .05$, $d = -1.18$). There were no other significant differences.

All types of sexual concordance were significantly different from 0 for heterosexual women, lesbian women, and women who used other labels to identify themselves ($p < .05$). Overall sexual concordance and genital sexual concordance were statistically significant for bisexual women, but continuous sexual concordance was not. None of the types of sexual concordance were statistically significant for the women who chose to use no label to identify themselves. Although continuous sexual concordance scores for bisexual women and all three types of sexual concordance scores for women who chose to use no label were not statistically significant, they were similar to, or higher than, averages reported in the past (e.g., Chivers et al., 2010).

MLM of Sexual Concordance

Sexual Concordance Across All Sexual Stimuli

There was a significant interaction between VPA and Sexual Attraction, $F(3, 66.81) = 3.92$, $p = .012$, semi-partial $R^2 = .15$. Simple slopes analyses were used to examine the relationship between genital and self-reported sexual arousal within each Sexual Attraction group. These analyses revealed that change in VPA significantly predicted CSR in all Sexual Attraction groups, though the relationship was strongest for predominantly androphilic women, $b = 1.59$, SE $= 0.05$, $t(9580.99) = 30.03$, $p < .001$, semi-partial $R^2 = 0.09$, followed by predominantly/exclusively gynephilic women, $b = 0.65$, SE $= 0.03$, $t(9580.99) = 20.46$, $p < .001$, semi-partial $R^2 = .04$, and ambiphilic women, $b = 0.66$, SE $= 0.66$, $t(9580.99) = 17.02$, $p < .001$, semi-partial $R^2 = .03$. Exclusively androphilic women had the weakest relationship between genital response and CSR, $b = 0.29$, SE $= 0.06$, $t(9580.99) = 4.50$, $p < .001$, semi-partial $R^2 = .002$, assessed using a range of sexual stimuli.

Sexual Concordance for Female and Male Stimuli

There was a significant three-way interaction between VPA, Stimulus Gender, and Sexual Attraction, $F(3, 3004.16) = 6.00$, $p < .001$, semi-partial $R^2 = .006$ in the initial model. Simple slopes analyses were examined within each Sexual Attraction group and Stimulus Condition to follow this interaction. These analyses revealed that, for gynephilic women, change in VPA during the female stimuli was a stronger predictor of CSR, $b = 0.95$, SE $= 0.07$, $t(2942.21) = 13.55$, $p < .001$, semi-partial $R^2 = .06$, than was change in VPA during the male stimuli, $b = 0.38$, SE $= 0.09$, $t(2989.16) = 4.38$, $p < .001$, semi-partial $R^2 = .006$. For ambiphilic women, change in VPA during the female stimuli predicted change in CSR, $b = 0.61$, SE $=$ 0.09, $t(2931.21) = 6.44$, $p < .001$, semi-partial $R^2 = .01$; however, change in VPA during the male stimuli did not significantly

Table 2 Sexual concordance as a function of sexual identity

	Heterosexual $n = 30$	Bisexual $n = 10$	Lesbian $n = 15$	Other label $n = 12$	No Label $n = 8$
Overall	.46 (.26)[a]	.66 (.19)[b]	.53 (.19)[a]	.66 (.17)[b]	.46 (.17)[a]
Genital	.49 (.25)	.58 (.18)	.59 (.22)	.58 (.18)	.50 (.13)
Continuous	.38 (.35)	.51 (.24)	.45 (.27)	.56 (.30)	.34 (.32)

Correlations are the average within-subjects Pearson *r* correlation for each Kinsey attraction group. Overall = sexual concordance based on overall feelings of sexual arousal; Genital = sexual concordance based on perception of genital sensations; Continuous = sexual concordance based on continuous reports of sexual arousal

Different superscripts denote significant group differences. For example, the Overall Sexual Concordance differed significantly between heterosexual women and women who used another label; Overall Sexual Concordance was not significantly different between heterosexual women, lesbian women, and women who used no label

predict change in CSR, $b = 0.20$, SE = 0.13, $t(2987.62) = 1.49$, $p = .14$, semi-partial $R^2 = .0007$. For predominantly androphilic women, Stimulus Gender did not influence the predictive relationship between VPA and CSR, $b = 1.89$, SE = 0.10, $t(3010.19) = 19.52$, $p < .001$, semi-partial $R^2 = .11$. For exclusively androphilic women, change in VPA during the female stimuli was a weaker predictor of CSR, $b = 0.38$, SE = 0.17, $t(3027.34) = 2.25$, $p = .02$, semi-partial $R^2 = .002$, compared to change in VPA during the male stimuli, $b = 1.01$, SE = 0.20, $t(3017.92) = 4.92$, $p < .001$, semi-partial $R^2 = .008$.

Post Hoc Analyses of CSR

It is possible that the lower concordance scores reported for nonpreferred stimuli were the result of less variance in CSR for nonpreferred compared to preferred stimuli. We explored this possibility using Levene's test for homogeneity of variances in mean minus baseline CSR to male stimuli and to female stimuli for each Sexual Attraction group. Levene's tests suggested that, for exclusively androphilic, predominantly androphilic, and ambiphilic women, variances in CSR for male and female stimuli were homogenous (all Levene's statistics ≤ 1.20, all $ps \geq .28$). Variances in CSR to male and female stimuli were not homogeneous for predominantly/exclusively gynephilic women (Levene's statistic = 8.41, $p = .006$). Although predominantly/exclusively gynephilic women exhibited relatively less variance in CSR to male stimuli ($\sigma^2 = 86.7$) relative to female stimuli ($\sigma^2 = 419.0$), there was still variation in CSR to the nonpreferred stimulus.

One-sample *t* tests also revealed that both male and female stimuli elicited changes in CSR that were, on average, significantly different from 0 for all Sexual Attraction groups (male stimuli: all $ps \leq .02$, female stimuli: all $ps \leq .02$). The t-test results indicate that all Sexual Attraction groups reported a significant change in mean CSR from baseline for both male and female stimuli. Thus, differences in sexual concordance are unlikely to be attributed to differences in CSR to preferred relative to nonpreferred stimuli.

Discussion

The purpose of the current study was to examine whether sexual attractions may account for some of the substantial within-gender variation in women's sexual concordance. Based on patterns of genital and self-reported sexual responses previously documented (Bouchard et al., 2015; Chivers et al., 2004, 2007, 2015; Timmers et al., 2015), we hypothesized that sexual concordance would vary as a function of sexual attractions (Diamond, 2003) and not sexual identity (Diamond, 2008), as well as by the sex of the actor depicted within a sexual stimulus (Chivers et al., 2015). Specifically, we expected exclusively androphilic women to exhibit lower sexual concordance when based on a range of sexual stimuli. We also expected exclusively androphilic women to exhibit lower sexual concordance to female sexual stimuli, and women with any degree of gynephilia to exhibit higher sexual concordance to female stimuli. Our hypotheses were supported, in that exclusively androphilic women had the lowest sexual concordance across the full set of sexual stimuli, and across a variety of calculation methods.

Interestingly, predominantly androphilic women had higher continuous sexual concordance than ambiphilic women when sexual concordance was based on the full set of sexual stimuli. This is not completely unexpected, because previous research with predominantly androphilic women has observed that they exhibit greater genital and subjective responses to female stimuli compared to male stimuli (Chivers et al., 2015). Thus, high sexual concordance is consistent with predominantly androphilic women's sexual response patterns, because their genital and subjective responses are both higher for female stimuli and both lower for male stimuli, ultimately resulting in higher sexual concordance. It might be unexpected that these women would show greater genital and subjective arousal to female stimuli because they report being predominantly sexually interested in men and should (in theory) be more responsive to male stimuli. The MLM analyses in the current study, however, suggest that stimulus gender similarly influenced the predictive relationship between VPA and CSR for predominantly androphilic women. Thus, the results of the MLM analyses suggest that gen-

der cues may be equally important for sexual concordance among predominantly androphilic women.

Further highlighting that degree of gynephilia was a salient factor influencing concordance, sexual concordance did not consistently differ when examined as a function of sexual identity labels. Only one of three types of sexual concordance varied by sexual identity label. Specifically, overall sexual concordance varied by sexual identity, with heterosexual women exhibiting lower overall sexual concordance than bisexual women and women who chose other sexual identity labels. Genital sexual concordance and continuous sexual concordance did not vary with sexual identity. Also consistent with our hypotheses, we found that stimulus gender significantly influenced sexual concordance for most groups of women: Ambiphilic and predominantly/exclusively gynephilic women exhibited greater sexual concordance to female stimuli, whereas exclusively androphilic women exhibited greater sexual concordance to male stimuli. Taken together, these results suggest that women's sexual attractions are related to the integration of genital and subjective aspects of sexual response that result in sexual concordance.

Measuring Sexual Concordance

Sexual concordance was assessed in a variety of ways, leading to mostly convergent results. Sexual concordance based on change in overall feelings, change in perception of genital sensations, and continuously reported sexual arousal yielded similar patterns of results, with exclusively androphilic women and self-identified heterosexual women exhibiting the lowest sexual concordance, regardless of the way sexual concordance was assessed. These results are somewhat consistent with the results of Chivers et al.'s (2010) meta-analysis, which found that women's sexual concordance was not substantially influenced by the timing of subjective reports and that women's sexual concordance was significantly lower when based on perception of genital sensations (average Pearson $r = .20$, $K = 32$) compared to overall feelings (average Pearson $r = .31$, $K = 65$). The results of the current study continue to support the use of either change scores or continuously reported sexual arousal based on overall feelings or perception of genital sensations for calculating sexual concordance (Huberman et al., 2013).

Interestingly, within-subjects correlations yielded a pattern of results that was consistent with the results produced by more rigorous multi-level modeling. Using both within-subjects correlations and MLM, the relationship between genital and self-reported sexual responses was weakest in women with exclusively androphilic sexual attractions; women with any degree of gynephilia had higher sexual concordance. Specifically, predominantly androphilic women had the highest sexual concordance, followed by predominantly/exclusively gynephilic women, followed by ambiphilic women. Although within-subjects correlations based on average responses are not ideal for studying sexual concordance (reviewed in Clifton et al., 2015), the results of the current study suggest that previous research using within-subjects correlations may still provide useful insights when interpreting women's sexual response patterns. It is important to note, however, that the within-subjects correlations may over-estimate the strength of the relationship between VPA and CSR. For example, the strength of the relationship between VPA and CSR for exclusively/predominantly gynephilic women can be considered moderate based on the Pearson r within-subjects correlations, but it would be considered small based on semi-partial R^2 from the MLM. The within-subjects correlation for exclusively androphilic women is weak, but the semi-partial R^2 from the MLM did not meet the cutoff to be considered a small effect (Edwards et al., 2008). Based on the current study, it is possible that previous results based on within-subjects correlations are accurate when examining relative patterns (but not the magnitude of the relationship between VPA and CSR) and should not be disregarded. Further research comparing multi-level modeling with within-subjects correlations could test this hypothesis.

Sexual Response Patterns, Sexual Attractions, and Sexual Identity Labels

We found that women's sexual concordance consistently differed based on their degree of gynephilic sexual attractions. Interestingly, sexual concordance did not consistently differ based on sexual identity labels; only overall sexual concordance varied with sexual identity labels, but genital and continuous sexual concordance did not vary with sexual identity. There are several reasons for why sexual attractions may be more useful for categorizing samples in sexuality research, relative to sexual identity labels. For example, although one's sexual identity label can certainly be informed by one's sexual attractions (Alderson, 2014), sexual identity labels and sexual attractions are not always perfectly overlapping, particularly in women (e.g., Diamond, 2008). Vrangalova and Savin-Williams (2012) found that 41 % of their female sample that identified as "exclusively heterosexual" reported sexual attractions to both women and men. Similarly, Chandra, Mosher, and Copen (2011) found that 93.7 % of their national sample of women ($n = 56{,}032$) self-identified as "heterosexual or straight," but only 83.3 % of this sample of women reported that their sexual attractions were directed toward the opposite sex only. Indeed, other factors such as political allegiances can influence one's choice of identity labels (e.g., Alderson, 2014), which may obscure group differences. In addition, sexual identity labels indirectly assume the direction of sexual attractions; assessing sexual attractions allows respondents to specify their degree of sexual interest in same and opposite sex partners, resulting in a more accurate representation of their sexual orientation (Diamond, 2003). Interestingly, the individual responses that comprise sexual concordance do vary

consistently based on both sexual attractions and sexual identity labels, at least in ambiphilic women. Recent research shows that ambiphilic women's genital and subjective sexual responses are consistently stronger to adult female relative to adult male stimuli, regardless of whether participants are grouped based on sexual attractions, romantic attractions, sexual fantasies, sexual behaviors, or sexual identities (Bouchard et al., 2015; Timmers et al., 2015). Further research is needed to better understand why the relationship between genital and subjective aspects of sexual arousal may be more affected by sexual attractions than sexual identity labels.

The traditional sexual identity labels of "heterosexual," "bisexual," and "lesbian" used in the current study are one limitation because they may be insufficient representations of women's sexual attractions, experiences, interests, and identities. For example, recent research suggests that there are meaningful differences in sexual histories and interests between women who identify as exclusively heterosexual and "mostly heterosexual," such that women who identify as "mostly heterosexual" (i.e., women who are predominantly androphilic) have more female sex partners, have more sexual experience overall, and report significantly more sexual attractions toward women (Thompson & Morgan, 2008; Vrangalova & Savin-Williams, 2012). Likewise, a substantial proportion of our own sample adopted a label outside the traditional, tripartite categories (15.7 %) or no label at all (10.5 %). Taken together with these recent findings, our results contribute to a growing body of research indicating that women's sexual response patterns are best investigated using a continuum of andro/gynephilic sexual attractions, rather than discrete sexual identity labels (e.g., Chivers et al., 2015; Dawson, Fretz, & Chivers, 2016) when researchers are interested in examining correlates of sexual orientation (Diamond, 2003). Sexual identity labels may be useful when researchers are interested in how sexual self-identification, not sexual orientation, is associated with sexual response patterns (Diamond, 2003), because sexual identity labels refer to how an individual views themself, whereas sexual orientation is based on one's sexual attractions (Diamond, 2003).

Although it is clear that characterizing samples using a continuum of sexual attractions is useful for examining sexual response patterns, the connection between degree of gynephilia and sexual concordance remains unclear. Sexual concordance tends to be gendered, with men exhibiting higher sexual concordance, on average, than women (Chivers et al., 2010). Gynephilic sexual attractions in women are associated with male typicality on several variables, including recalled childhood gender nonconforming behaviors (e.g., Bailey & Zucker, 1995; Burri, Spector, & Rahman, 2015), adult interests and self-concepts (e.g., Lippa, 2005), neuroanatomy (reviewed in Rieger, Savin-Williams, Chivers, & Bailey, 2016), and motor behaviors (Johnson, Gill, Reichman, & Tassinary, 2007); for more examples, see Rieger et al. (2016). Given men's higher sexual concordance and gynephilic women's increased masculinity relative to androphilic women, one might expect that male typicality (or perhaps factors that contribute to masculinity) to be related to the relationship between these sexual responses.

To date, however, the hypothesis that male typicality contributes to women's sexual response patterns, including sexual concordance, has not been supported. Rieger et al. (2016) examined pupil dilation, genital response, and self-reported sexual response patterns in relation to self-reported and observer-rated male typicality in a large sample of women ($n = 345$) reporting varying sexual attractions. Although gynephilic women exhibited more male-typical sexual response patterns (i.e., gender-specific responses) and were considered more masculine based on self-reported and observer-rated gender typicality, the relationships between sexual response patterns and self-reported and observer-rated masculinity were not statistically significant. More germane to the current study is work by Suschinsky (2006), who examined sexual concordance in relation to masculinity in a small sample of women ($n = 20$). Masculinity was assessed as a composite score derived from responses to a variety of questionnaires (Bem, 1974; Buss & Perry, 1992; Lalumière, Chalmers, Quinsey, & Seto, 1996). Sexual concordance was calculated using within-subjects correlations between vaginal pulse amplitude and both continuous self-reported sexual arousal and post-stimulus ratings of sexual arousal. Contrary to the hypothesis, Suschinsky reported a significant negative relationship between sexual concordance based on continuous reports of sexual arousal and self-reported masculinity in women, suggesting that higher concordance is not related to increased masculinity. Given the results of the current study, future research aimed at assessing how the relationship between sexual concordance and gender expression is moderated by sexual attraction may prove more useful than examining the influence of gender expression alone on sexual concordance.

Limitations and Future Directions

There are several limitations associated with the current study. For example, there is a well-known ascertainment bias in sexual psychophysiology research; women with more sexual experience and more liberal sexual attitudes are more likely to participate in sexual psychophysiological research (reviewed by McInnis, 2015). Thus, it is possible that the patterns found in the current study would not generalize to other samples. Our study also focused on internal measures of genital response, namely vaginal vasocongestion. Variation in sexual concordance is found across measures of both internal (e.g., Rellini et al., 2005) and external genital responses (e.g., Bouchard et al., in press; Boyer et al., 2012; Huberman et al., 2016; Kukkonen et al., 2010), and future research should investigate the relationship between sexual concordance and sexual attractions using measures of external genital responses (e.g., thermal imaging or laser Doppler imaging) for a more comprehensive assessment.

Other limitations reflect the archival nature of the study. For example, masculinity was not assessed during the initial study. Therefore, we cannot conclude whether the relationship between women's sexual concordance and sexual attractions is affected by degree of masculinity. The current study used data from previous studies that focused on assessing patterns of genital and subjective sexual responses separately (Chivers et al., 2007, 2015). Therefore, the results of the current study may be specific to the stimuli that were selected for the original study, or the study sample. The stimuli used in the current study, however, are well suited to the study of sexual concordance, as Chivers et al. (2010) reported that variation in stimulus content or modality yielded higher sexual concordance. Even when using a limited range of sexual stimuli (i.e., either male or female masturbation stimuli), we found differences in the relationship between genital and subjective sexual responses across women. Future research could use different stimuli to ensure that the effect is not a result of the stimuli used in the current study.

The results of the current study may have potential implications for women's sexual health more generally. High sexual concordance is not necessary for women's sexual activity (Chivers et al., 2010)—women engage in sexual activity for a variety of reasons, many of which do not directly follow from sexual arousal (Meston & Buss, 2009). It is possible, however, that stronger sexual concordance is associated with greater sexual activity, such that awareness of sexual arousal triggers sexual desire and motivates sexual behavior (Both, Everaerd, Laan, & Janssen, 2007). Sexual arousal, in turn, may bias sexual decision making (Chivers et al., 2010; Laan, Everaerd, van der Velde et al., 1995; Suschinsky et al., 2009), leading to more frequent engagement in sexual activity, including riskier sexual behaviors that may increase the likelihood of sexually transmitted infections (e.g., Skakoon-Sparling, Cramer, & Shuper, 2016). To our knowledge, the relationship between sexual concordance and subsequent sexual behavior has not been empirically tested. Given the potential sexual health implications, further research is needed to replicate and extend the current findings and continue to explore the relationship between sexual attractions, sexual identity, sexual response patterns, and sexual behavior.

Conclusion

The current study is among the first to empirically examine correlates of the substantial within-gender variation in women's sexual concordance. We found that women's sexual concordance consistently varies as a function of their sexual attractions, such that women with gynephilic sexual attractions exhibited higher sexual concordance than women with exclusive androphilic sexual interests. This finding was consistent across a variety of sexual concordance measures. Sexual concordance did not vary consistently with sexual identity; only overall sexual concordance differed based on sexual identity labels, with heterosexually identified women exhibiting the lowest sexual concordance. Stimulus content also affected women's sexual concordance, based on their sexual attractions. The novel findings of the current study contribute to recent research, suggesting that women's response patterns are nuanced and subject to individual differences (e.g., Clifton et al., 2015). Further research is required to better understand the relationship between sexual response patterns and sexual attractions, as there may be important implications for women's sexual health.

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Compliance with Ethical Standards

Conflict of interest Kelly D. Suschinsky declares that she has no conflict of interest. Samantha J. Dawson declares that she has no conflict of interest. Meredith L. Chivers declares that she has no conflict of interest.

Ethical Standards All procedures performed in the current study were in accordance with the ethical standards of Queen's University and the University of Toronto, the Canadian Tri-Council Policy, and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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