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LETTER TO THE EDITOR

The Fertility of Hebephiles and the Adaptationist Argument Against Including Hebephilia in DSM-5

Ray Blanchard

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In a paper that generated a certain amount of controversy, Blanchard et al. (2009) proposed that the paraphilias section of DSM-5 be modified to include *hebephilia*, that is, the erotic preference for pubescent children. Pubescent children were characterized by Blanchard et al. (2009) as children around the ages of 11 through 14 years, but they could be described more precisely as children in Tanner stages 2 and 3 of pubertal development.

Franklin (2009) criticized the proposal to include hebephilia in the DSM on the grounds that "such attractions are evolutionarily adaptive" (p. 319). Franklin did not explain this argument any further. Presumably, Franklin meant something along the following lines: In the environment of evolutionary adaptedness, men with an erotic preference for pubescent females had greater reproductive success, either because they acquired female mates near the onset of their fecundity and thus prevented them from being impregnated by other men, or because they had more years in which to impregnate their mates themselves, or both. Since hebephilia is of evolutionary design, it cannot be a mental disorder. Franklin's hypothesis was probably intended to explain hebephilia only in heterosexual men, since same-sex copulation and pair-bonding with pubescent males in preference to physically mature males would not affect the reproductive success of homosexual men, either now or in the ancestral era.

The contemporary environment obviously differs in important and partly unknowable ways from the environment of evolutionary adaptedness. It does, however, offer modern men considerable latitude regarding the ages of the females they choose to court and to form relationships with. If a North American hebephile cannot marry a pubescent girl, he can still marry one as close to puberty as legally possible. There is, therefore, nothing in the contemporary environment that would completely abolish the relation between hebephilia and fertility postulated by Franklin for the ancestral environment. I therefore conducted the following small study to investigate whether Franklin's hypothesis agrees with the available empirical data.

It was convenient to use, for this investigation, three groups of heterosexual men included in a recent study with a completely different purpose (Blanchard et al., 2010). These men were male patients who were phallometrically classified as heterosexual teleiophiles, heterosexual hebephiles, or heterosexual pedophiles. All had been systematically asked about the number of biological children they had fathered, either in or out of wedlock. For the present investigation, I restricted the sample to white subjects to reduce potential variance in fertility caused by cultural influences. This reduced the groups to 818 teleiophiles, 622 hebephiles, and 129 pedophiles. The mean age of the teleiophiles was 37.25 years ($SD = 12.57$), that of the hebephiles was 39.14 years ($SD = 14.02$), and that of the pedophiles was 36.86 years ($SD = 14.36$). Differences in mean age among the three groups were statistically significant, $F(2, 1566) = 4.03$, $p = .02$.

The raw means showed that the teleiophiles reported 1.39 biological children ($SD = 1.67$), the hebephiles reported 1.30 biological children ($SD = 1.55$), and the pedophiles reported 0.74 biological children ($SD = 1.29$). The differences among mean numbers of children were tested in a one-way analysis of covariance (ANCOVA), with the patient's age at assessment as the single covariate. Levene's test of equality of error variances did not indicate any violation of the homogeneity of variance assumption in the ANCOVA, $F(2, 1566) = 2.52$, ns.

Number of biological children was significantly related to age at assessment, $F(1, 1565) = 463.63$, $p \ll 10^{-6}$, and to group, $F(2, 1565) = 12.11$, $p < .0001$. Pairwise comparisons

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of the three groups were carried out with the Sidak adjustment for multiple comparisons. After accounting for age, all comparisons were statistically significant: The teleiophiles had more children than the hebephiles, $p < .03$; the hebephiles had more children than the pedophiles, $p < .005$; and the teleiophiles had more children than the pedophiles, $p < .0001$.

I am not concluding from these results that hebephilia should be included in the DSM on the grounds of reduced reproductive fitness. That reasoning would imply that homosexual teleiophilia should be reinstated in the DSM, which is not my view at all. My conclusion, rather, is that contemporary heterosexual hebephiles are significantly less fertile than are heterosexual teleiophiles. Thus, there is no empirical basis for the hypothesis that hebephilia was associated with increased reproductive success in the environment of evolutionary adaptedness. That speculative adaptationist argument against the inclusion of hebephilia in the DSM cannot be sustained.

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LETTER TO THE EDITOR

Why the Rush to Create Dubious New Sexual Disorders?

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The seven published critiques to Blanchard et al.'s (2009) study justifying "hebephilia" as a mental disorder identified numerous scientific flaws.[1] These flaws demonstrate the scientifically suspect nature of the construct. My critique (Franklin, 2009) also addressed the broader implications of creating a formal psychiatric disorder that will be used to justify the civil commitment of sex offenders. In his latest salvo in this debate, Blanchard (2010) sidesteps any engagement with the substantive arguments, instead presenting a misshapen little straw man that he then easily demolishes through smoke-and-mirrors statistical machinations.

In Franklin (2009), I mentioned that heterosexual men's sexual attraction to pubescent girls was "evolutionarily adaptive." As Blanchard (2010) rightly notes, that term refers to adaptations that enable a species to better survive across time. Scientists regard heterosexual men's preference for younger female partners as one potential reproductive strategy under harsh environmental conditions, such as those of Neanderthal cave dwellers (Kenrick & Keefe, 1992; see also Heaton, Lichter, & Amoateng, 1989). My argument here is not with Blanchard's definition of evolutionary adaptation, but rather with both his logic and methods in attempting to rebut my previous critique.

As all students of Darwin know, evolutionary success strategies must be understood on a population-wide basis, not an individual level. Moreover, social scientists generally agree that biological evolution is rarely sufficient to understand human behavior in modern, complex social systems. Thus, to say that a trait may have emerged as evolutionarily adaptive in prehistoric times implies nothing of its presence or function on an individual level in contemporary society.

More to the point: Blanchard's (2010) new study is far from a scientifically valid debunking of any evolutionary component. One cannot test the theory that consumption of chili pepper—eaten daily by more than one billion people—is evolutionarily adaptive simply by locating a convenience sample at a random diet clinic, dividing the patients into groups based on their liking for the spice, and then measuring some putatively related outcome variable such as bouts of food poisoning, presence of ulcers, or level of thrill-seeking temperament (Rozin, 2000).

Ergo, one cannot test whether men's attraction to younger females was at one point evolutionarily adaptive by asking a group of white male patients in 21st-century Canada how many children they have fathered. Since the foundational study is yet unpublished, we know little about Blanchard's subject pool or methods. However, from his letter, it appears that—with the exception of race and sexual orientation—the study did not control for any of the myriad co-variables that contribute in complex ways to number of offspring. These include (just to name a few) economic status, urbanicity, culture, fertility, women-controlled birth control strategies, periods of incarceration (particularly relevant here, given that sexual contact with young minors is illegal in Canada), and even gender of first-born child. Plunging birth rates in developed nations alone create a low ceiling effect for this outcome variable; without reported population norms, we cannot properly interpret the findings.

Ultimately, the fertility of so-called hebephiles is a red herring that has no relevance to either the possible evolutionary basis for the attraction or to the broader scientific

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[1] For the interested reader, I have created a web page, www.bit.ly/hebephilia, with the citations for Blanchard et al.'s original study and all seven Letters to the Editor published in *Archives of Sexual Behavior* in 2009. The page has links to the publisher's summaries and contact information for each author.

issues raised in the seven critiques to Blanchard et al.'s (2009) study. The essential question remains: Why the urgency to create this new mental disorder, in the absence of independent cross-validation? Mental illness is not defined by the legality and/or morality of a behavior, nor should it be. Yet forensic experts retained by prosecutors have seized upon hebephilia and two similarly problematic proposed diagnoses—paraphilic coercive disorder and hypersexual disorder—as pretextual tools to civilly incapacitate men with no true psychiatric disorders. In the absence of civil commitment laws, it is doubtful that this pell-mell rush to pathologize would be meeting such an enthusiastic reception.

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ORIGINAL PAPER

Avuncular Tendencies and the Evolution of Male Androphilia in Samoan *Fa'afafine*

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Abstract The kin selection hypothesis for male androphilia holds that genes for male androphilia can be maintained in a population if the fitness costs of not reproducing directly are offset by enhancing indirect fitness. Kin share some proportion of genes identical by virtue of descent. Theoretically speaking, androphilic males can increase their fitness indirectly by allocating altruistic behavior toward kin, which, in turn, allows kin to increase their reproductive success. Research conducted in Independent Samoa has shown that androphilic males (known locally as *fa'afafine*) report significantly higher avuncular tendencies relative to gynephilic men. Here, we replicate this sexual orientation difference, using a larger, independent sample, suggesting that the documented sexual orientation difference in avuncular tendencies in Independent Samoa is genuine. We also extend previous research by showing that *fa'afafine* exhibit significantly higher avuncular tendencies even when compared to a more closely matched control group that also lacks direct parental care responsibilities (i.e., gynephilic men with no children). Although the greater avuncular tendencies of *fa'afafine* relative to gynephilic men are consistent with the predictions of the kin selection hypothesis for male androphilia, further research is needed before deeming male androphilia an adaptation for promoting elevated avuncularity. Likewise, more research is needed before deeming elevated avuncularity in *fa'afafine* an evolved adaptation for promoting indirect fitness. We discuss these findings in the context of alternative evolutionary explanations for male androphilia (i.e., an evolved by-product of an adaptation).

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Introduction

A large body of research indicates that there is a biological basis for male androphilia[1] (Mustanski, Chivers, & Bailey, 2002), and familial studies point to a genetic component (e.g., Bailey, Dunne, & Martin, 2000; Kendler, Thornton, Gilman, & Kessler, 2000). At the same time, research demonstrates that androphilic males reproduce at about one-fifth to one-tenth the rate of gynephilic males (Bell & Weinberg, 1978; Hamer & Copeland, 1994; Saghir & Robins, 1973; Yankelovich Partners, 1994). In light of the apparent fitness benefits associated with male gynephilia, one would expect genes for male gynephilia to have long replaced those for male androphilia. Despite this prediction, archaeologic evidence suggests that male same-sex sexual behavior existed during human prehistory (e.g., Nash, 2001; Yates, 1993). Moreover, male androphilia seems to occur at similar (albeit, low) frequencies across different cultural and environmental landscapes (Whitam, 1983). This situation is perplexing when considered within the context of natural selection, a process that favors the persistence of those traits enabling their bearers to achieve reproductive success. As such, the maintenance of a trait that lowers direct reproduction requires explanation when viewed from a functional perspective.

The kin selection hypothesis has been advanced as one possible explanatory framework to account for male

[1] *Androphilia* refers to sexual attraction to adult males, whereas *gynephilia* refers to sexual attraction to adult females. The usage and meaning of homosexual and heterosexual vary cross-culturally, rendering them poor constructs for the type of cross-cultural research presented here.

androphilia (Ruse, 1982; Weinrich, 1987; Wilson, 1975). The hypothesis holds that genes for male androphilia can be maintained in the population if the fitness costs of not reproducing directly are offset by enhancing indirect fitness. From the perspective of kin selection theory, indirect fitness is a measure of an individual's impact on the fitness of its kin (who share some identical genes by virtue of descent), weighted by the degree of relatedness. Theoretically speaking, androphilic males can increase their indirect fitness by directing altruistic behavior toward kin, which, in principle, allows kin to increase their reproductive success. In particular, androphilic men should allocate altruistic behavior towards close kin, because they share more genes in common with such individuals.

In formulating this theory, Wilson (1975) stated that "Freed from the special obligations of parental duties, they [androphilic males] could have operated with special efficiency in assisting close relatives" (p. 555). Similarly, Ruse (1982) commented that "…the effect is that in being homosexual, offspring become altruistic towards close relatives in order thereby to increase their own overall inclusive fitness" (p. 20). Given that what is at issue here is a theory that can account for the origin of same-sex sexual attraction, it seems reasonable to interpret these statements as indicating that same-sex sexual attraction, itself, is a prerequisite for the expression of elevated kin-direct altruism, *not* childlessness. If so, then male androphiles should exhibit elevated kin-directed altruism, whereas male gynephiles (childless or otherwise) should not. Such a pattern would be consistent with the notion that male androphilia is a specially designed adaptation for promoting kin-directed altruism.

Bobrow and Bailey (2001) found that androphilic men in the United States did not differ significantly from gynephilic men in terms of their avuncular tendencies. In addition, they found that androphilic men were more estranged than gynephilic men from their respective kin, which runs contrary to the predictions of the kin selection hypothesis for male androphilia. In a similar study conducted in England, Rahman and Hull (2005) also found no evidence that androphilic men were more inclined towards avuncularity compared to their gynephilic counterparts.

Vasey, Pocock, and VanderLaan (2007) compared the altruistic tendencies of androphilic and gynephilic males in the non-Western Polynesian island nation of Independent Samoa using similar methods to those employed by previous researchers working in the US and England (Bobrow & Bailey, 2001; Rahman & Hull, 2005). In Independent Samoa, androphilic males are referred to as *fa'afafine,* which means "in the manner of a woman." Most *fa'afafine* tend to be effeminate, but they range from extremely feminine to unremarkably masculine, although instances of the latter are rare (Bartlett & Vasey, 2006; Besnier, 2000; Schmidt, 2003; Vasey & Bartlett, 2007). Despite this heterogeneity in gender role presentation, *fa'afafine* are, with very few exceptions, exclusively androphilic, but they do not engage in sexual activity with each other. Instead, *fa'afafine* are attracted to, and engage in sexual interactions with, masculine males who self-identify as "straight men" (Bartlett & Vasey, 2006; Danielsson, Danielsson, & Pierson, 1978).

In a Samoan cultural context, "straight men" are those who self-identify as men and are masculine with respect to gender role presentation. Inclusion in this category is not contingent on exclusive sexual activity with women. Most self-identified straight men are gynephilic, but may engage in sexual activity with *fa'afafine* or other straight men on a temporary basis, particularly if female sexual partners are unavailable. Our participants informed us that most straight men in Samoa have engaged in sexual interactions with *fa'afafine* at least once in their lives (see also Croall & Wunderman, 1999).

In contrast to research conducted in Western settings, Vasey et al. (2007) found that *fa'afafine* reported significantly higher avuncular tendencies relative to straight men in Independent Samoa. These findings are consistent with the basic prediction of the kin selection hypothesis for male androphilia, and raise the possibility that androphilic *fa'afafine* may act as "helper-in-the-nest," caring for nieces and nephews and, by extension, increasing their indirect fitness.

Although their findings were consistent with the basic prediction of the kin selection hypothesis for male androphilia, Vasey et al. (2007) were careful to stress that their results did not provide strong evidence in support of the conclusion that either male androphilia or elevated avuncular tendencies in *fa'afafine* represent specially designed adaptations resulting from past selection over evolutionary time. Rather, they suggested that increased avuncular tendencies by *fa'afafine* might simply reflect a generalized adaptive tendency on the part of all biological males to invest in kin, regardless of their sexual orientations. Some males, such as the *fa'afafine*, may, however, be able to exhibit elevated levels of avuncularity because they have no direct parental care responsibilities. In the Vasey et al. (2007) study, none of the *fa'afafine* participants had children ($n = 38$). In contrast, 58% of the gynephilic men ($n = 43$) who participated in that study had at least one child (range = 0–4). Unfortunately, Vasey et al.'s (2007) samples of gynephilic men with, and without, children were too small to perform the necessary analyses to properly test this hypothesis.

In this article, our goal was to ascertain whether the sexual orientation difference in avuncular tendencies originally reported in Vasey et al. (2007) could be replicated using a larger, independent sample. In addition, we extended previous research by comparing avuncular tendencies in *fa'afafine* with two distinct control groups, namely, gynephilic men with and without children. In conducting these latter comparisons, our aim was to test whether *fa'afafine*'s elevated

avuncular tendencies, if present, could be explained in terms of their lack of direct parental care responsibilities. If so, then avuncular tendencies in *fa'afafine* should not differ significantly from those of gynephilic men without children, but both of these groups should differ significantly for this measure from gynephilic men with children.

Method

Participants

All participants were recruited through a network sampling procedure on the two larger and more populated islands of Independent Samoa: Upolu and Savai'i. A network sampling procedure involves contacting initial participants who display qualities of interest (i.e., status as *fa'afafine* or gynephilic men), then obtaining referrals from them to additional participants who, in turn, provide further referrals, and so on. The rate of participation for all groups was greater than 90%.

To replicate the study by Vasey et al. (2007), new data were collected from 56 self-identified *fa'afafine* and 95 self-identified straight men that had not been interviewed previously. These data were collected during two field trips (September–October 2006, April–June 2007). Sexual orientation was assessed using Kinsey ratings of sexual feelings over the previous year (Kinsey, Pomeroy, & Martin, 1948). All 56 of these *fa'afafine* described their sexual feelings as exclusively androphilic (Kinsey rating = 6). Of the 95 straight men for whom Kinsey ratings were obtained, 82 (86.3%) described their sexual feelings as exclusively gynephilic (Kinsey rating = 0). Seven (7.4%) reported most sexual feelings toward females, but occasional fantasies about males (Kinsey rating = 1), and six (6.3%) reported most sexual feelings toward females, but some definite sexual feelings about males (Kinsey rating = 2).

In order to obtain sufficiently large sample sizes to compare *fa'afafine*, gynephilic men with no children, and gynephilic men with at least one child, we combined the data from the 56 *fa'afafine* and 95 gynephilic men in the replication sample with data from the sample of 38 *fa'afafine* and 43 gynephilic men interviewed in Vasey et al. (2007). Of the additional 38 *fa'afafine* interviewed in Vasey et al., 37 (97.4%) described their sexual feelings as exclusively androphilic (Kinsey rating = 6), and one (2.6%) reported most sexual feelings toward males, but some definite feelings toward females (Kinsey rating = 4). Of the additional 43 gynephilic men interviewed in Vasey et al., 35 (81.4%) described their sexual feelings as exclusively gynephilic, five (11.6%) reported most sexual feelings toward females, but occasional fantasies about males (Kinsey rating = 1), and three (7%) reported most sexual feelings toward females, but some definite sexual feelings about males (Kinsey rating = 2). After combining these two samples, there were 94 *fa'afafine*, 66 gynephilic men with no children, and 72 gynephilic men with at least one child.

Procedure and Measures

All participants were interviewed using standardized questionnaires. A Samoan-speaking research assistant was present for those interviews for which participants indicated that they preferred to do the interview in Samoan or for participants who were deemed by the researchers to be insufficiently fluent in English. Questions were read aloud in English by one of the researchers and in Samoan by a research assistant when necessary. The questionnaire used in this study was available in English and Samoan, after being translated and back-translated by two fluent Samoan-English speakers.

The questionnaire employed in this study was a modified version of a previously used Kin Selection Questionnaire (Bobrow & Bailey, 2001; Rahman & Hull, 2005; Vasey et al., 2007). The questionnaire included questions about the following basic biographic information: age, sex, sexual orientation identity (i.e., *fa'afafine* or "straight" man), highest level of education received (i.e., post-secondary, high school, junior high school, and primary school or less), and annual income. Data on the participants' annual incomes were converted to American dollars (USD). Samoans, both inside and outside the *fa'afafine* community, recognize that *fa'afafine* are biological males that are socially distinct from men and women. Nevertheless, for the sake of consistency, participants were told, prior to answering questions pertaining to the Kinsey scale (Kinsey et al., 1948), that the category "males" included straight men and/or *fa'afafine*, whereas the category "females" included women.

Participants were also asked to complete the Avuncular Tendencies Subscale. This subscale is a measurement instrument containing nine items and has been used to quantify willingness to allocate resources to nieces and nephews in previous studies (Bobrow & Bailey, 2001; Rahman & Hull, 2005; Vasey et al., 2007). The nine items of the Avuncular Tendencies Subscale are as follows: babysitting for an evening, babysitting on a regular basis, taking care of the children for a week while their parents are away, buying toys for the children, tutoring one of the children in a subject you know well, helping to expose the children to art and music, contributing money for daycare, contributing money for the children's medical expenses, and contributing money for the children's education. For each item, participants were asked to rate whether they would be willing to exhibit the behavior towards nieces and nephews that were the children of a sibling with whom they were emotionally close and who lived nearby. Responses to these items were based on a 7-point Likert-type scale that ranged from 1 = "Strongly Disagree" to 7 = "Strongly Agree." Participants' avuncular

tendencies scores were calculated as the mean rating given to the nine items.

In keeping with our previous study (Vasey et al., 2007), ordinal data were analyzed using a general linear model (GLM) for an ordinal multi-way frequency analysis (see Vokey, 2003).

Results

Replication Study

Table 1 summarizes results of the replication portion of the present study. Internal consistency reliabilities, standardized item *alpha* (α), were computed for both *fa'afafine* and gynephilic men on the Avuncular Tendencies Subscale. Reliabilities were high on this subscale for both groups (*fa'afafine*: $\alpha = .85$; gynephilic men: $\alpha = .88$). Two-tailed independent *t*-tests revealed that *fa'afafine* and gynephilic men did not differ in terms of age or annual income. A GLM showed that *fa'afafine* and gynephilic men did not differ in terms of the highest level of education they received ($G_1^2 = .001$, *ns*). *Fa'afafine* exhibited greater avuncular tendencies than gynephilic men. A Cohen's *d* indicated a moderate effect size difference between *fa'afafine* and gynephilic men for avuncular tendencies ($d = .57$).

Comparison of *Fa'afafine*, Gynephilic Men with No Children, and Gynephilic Men with at Least One Child

Table 2 summarizes results of the comparisons of *fa'afafine*, gynephilic men with no children, and gynephilic men with at least one child. Internal consistency reliabilities, standardized item *alpha* (α), were computed for *fa'afafine*, gynephilic men without children, and gynephilic men with at least one child (range = 1–12) on the Avuncular Tendencies Subscale. Reliabilities were high for all three groups on this subscale (*fa'afafine*: $\alpha = .84$; gynephilic men with no children: $\alpha = .83$; gynephilic men with at least one child: $\alpha = .91$).

An analysis of variance (ANOVA) indicated a main effect of group for age of participant. Post-hoc Fisher's Least Significant Difference (LSD) revealed that *fa'afafine* were significantly older than gynephilic men with no children ($p < .001$), but significantly younger than gynephilic men with at least one child ($p < .001$). Gynephilic men with at least one child were significantly older than gynephilic men with no children ($p < .001$). An ANOVA indicated a main effect of group for annual income. Post-hoc Fisher's LSD revealed that *fa'afafine* had significantly higher annual incomes than gynephilic men with no children ($p < .001$), but did not differ in this regard from gynephilic men with at least one child. Gynephilic men with at least one child had significantly higher annual incomes than gynephilic men with no children ($p = .002$). A GLM showed that *fa'afafine* and gynephilic men did not differ in terms of the highest level of education they received ($G_2^2 = 1.53$, *ns*).

An analysis of covariance (ANCOVA) was performed with Avuncular Tendencies as the dependent variable, group as the fixed factor, and with age and annual income as covariates. This analysis revealed a main effect of group. Post-hoc Fisher's LSD revealed that *fa'afafine* had significantly higher avuncular tendencies scores relative to gynephilic men without children ($p = .001$; Cohen's $d = .65$) and gynephilic men with at least one child ($p = .001$; Cohen's $d = .56$). The two groups of gynephilic men did not differ significantly from each other (Cohen's $d = .01$).

Comparative data on individual Avuncular Tendencies Subscale items for *fa'afafine*, gynephilic men with no children, and gynephilic men with at least one child are presented in Table 3.

A two-tailed Pearson's *r* correlation indicated no significant relationship between avuncular tendencies and number of children parented among gynephilic men ($n = 138$, $r = .02$, $p = .81$).

Partial correlations between avuncular tendencies and age, controlling for income, were calculated for each participant group. There was no significant relationship between these variables for *fa'afafine* ($r = .07, df = 91, p = .52$), gynephilic men without children ($r = .20$, $df = 63$, $p = .12$),

Table 1 Replication sample: results summary

	Fa'afafine ($n = 56$)		Gynephilic men ($n = 95$)		Two-tailed *t*-test		
	M	*SD*	*M*	*SD*	*t*[a]	*df*	*p*
Age (in years)	27.95	5.96	27.82	8.66	<1[b]	145.31	*ns*
Income (USD)	6099.11	9496.57	3661.42	3712.77	1.84[c]	65.05	.07
Avuncular tendencies	6.27	1.04	5.62	1.30	3.49[d]	135.66	.001

[a] Between group equality of variances not assumed

[b] Levene's test for equality of variances, $F = 5.85$, $p = .017$

[c] Levene's test for equality of variances, $F = 4.08$, $p = .045$

[d] Levene's test for equality of variances, $F = 5.49$, $p = .02$

Table 2 Combined sample: results summary

	Fa'afafine ($n = 94$)		Gynephilic men with no children ($n = 66$)		Gynephilic men with at least one child ($n = 72$)		Analysis of variance[a]		
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*	df_{within}	*p*
Age (in years)[c,d,e]	29.48	7.31	21.88	4.22	33.39	7.48	53.33	229	<.001
Income (USD)[c,e]	5956.36	7980.22	2400.50	3517.59	5636.10	5096.89	7.42	229	.001
Avuncular tendencies[b,c,d]	6.20	.92	5.56	1.06	5.55	1.37	9.18	227	<.001

[a] Between-groups $df = 2$ for all analyses

[b] Groups were compared using ANCOVA with age and income included in the model as covariates

[c] Statistically significant difference ($p < .05$) between *fa'afafine* and gynephilic men with no children

[d] Statistically significant difference ($p < .05$) between *fa'afafine* and gynephilic men with at least one child

[e] Statistically significant difference ($p < .05$) between gynephilic men with no children and gynephilic men with at least one child

Table 3 Individual Avuncular Tendencies Subscale items for *fa'afafine*, gynephilic men with no children, and gynephilic men with at least one child, controlling for age and income: results summary

Act	*Fa'afafine* ($n = 94$)		Gynephilic men with no children ($n = 66$)		Gynephilic men with at least one child ($n = 72$)		$F_{2, 227}$	*p*
	M	*SD*	*M*	*SD*	*M*	*SD*		
Babysitting for an evening[a]	6.36	1.35	5.53	1.89	5.84	1.89	4.10	.018
Babysitting on a regular basis[a,b]	5.51	2.01	4.55	2.19	4.90	2.12	3.64	.028
Taking care of the children for a week while their parents are away[a,b]	5.71	1.89	4.77	2.22	4.81	2.30	4.96	.008
Buying toys for the children[a,b]	6.26	1.44	5.36	1.76	5.67	1.67	6.09	.003
Tutoring one of the children in a subject you know well[b]	6.64	0.79	6.36	1.10	6.00	1.70	4.57	.011
Helping to expose the children to art and music[b,c]	6.47	1.16	6.26	1.13	5.45	1.93	8.40	<.001
Contributing money for daycare	5.73	1.80	5.18	1.75	5.17	1.79	2.60	*ns*
Contributing money for the children's medical expenses[a]	6.49	1.17	6.08	1.29	6.10	1.44	2.75	*ns*
Contributing money for the children's education[a,b]	6.67	0.87	5.95	1.41	5.97	1.54	8.54	<.001

[a] Statistically significant difference ($p < .05$) between *fa'afafine* and gynephilic men with no children

[b] Statistically significant difference ($p < .05$) between *fa'afafine* and gynephilic men with at least one child

[c] Statistically significant difference ($p < .05$) between gynephilic men with no children and gynephilic men with at least one child

or gynephilic men with at least one child ($r = -.20, df = 69, p = .10$).

Also, partial correlations between avuncular tendencies and income, controlling for age, were calculated for each participant group. There was also no significant relationship between these variables for *fa'afafine* ($r = -.06, df = 91, p = .57$), gynephilic men without children ($r = .16, df = 63, p = .22$), or gynephilic men with at least one child ($r = .04, df = 69, p = .73$).

Discussion

In contrast to research conducted in Western countries (Bobrow & Bailey, 2001; Rahman & Hull, 2005), Vasey et al. (2007) showed that androphilic males (*fa'afafine*) reported significantly greater avuncular tendencies than gynephilic males ("straight men") in the Polynesian island nation of Independent Samoa. In this study, we replicated this sexual orientation difference in avuncular tendencies using a larger, independent sample. This replication suggests that the documented sexual orientation difference in avuncular tendencies in Independent Samoa is genuine and not the result of sampling bias. This finding is consistent with the kin selection hypothesis prediction that androphilic males should direct more altruism toward kin than gynephilic males.

A number of potentially interrelated proximate factors might account for why the avuncular tendency results obtained for androphilic males (*fa'afafine*) in this study and Vasey et al. (2007) differed from those conducted in Western countries (Bobrow & Bailey, 2001; Rahman & Hull, 2005), despite the fact that all employed very similar methodologies. To begin with, Independent Samoa is a relatively tiny nation consisting of four populated islands, which are closely

situated (2,934 km^2 total; Lal & Fortune, 2000). Owing to its small size, *fa'afafine* may be more geographically connected to their kin compared to androphilic men in Western cultures.

Second, the family unit, or *aiga* (extended family), is of great importance to Samoans (Mageo, 1998; Schmidt, 2003). Samoan families are usually quite large and often live together or in closely situated dwellings. When a distance separates members of a family, emotional proximity is maintained via frequent visits (Mageo, 1998). Due to the "sociocentric" manner in which Samoans organize familial relationships and patterns of residency (Mageo, 1998; Tiffany, 1975), *fa'afafine* may be more socially connected to their kin compared to androphilic men living in Western cultures, which are generally recognized as being more "egocentric" (Mageo, 1998) or individualistic (Hofstede, 1980).

Third, most *fa'afafine* enjoy a high level of acceptance within their families and within Samoan society in general (e.g., Bartlett & Vasey, 2006; Croall & Wunderman, 1999; Danielsson et al., 1978; Mageo, 1996; Vasey & Bartlett, 2007). It would be an over-statement to say that *fa'afafine* never experience *any* discrimination (Schmidt, 2003; Vasey & Bartlett, 2007). Nevertheless, the level of societal acceptance they enjoy, the manner in which they are integrated into the quotidian fabric of Samoan life, and their highly public presence stand in stark contrast to their Western counterparts for whom widespread discrimination is the norm (e.g., Cochran, Stewart, Ginzler, & Cauce, 2002; Namaste, 2000). Indeed, it was not uncommon to hear family members comment on how fortunate they were to have a *fa'afafine* in the family. As one woman stated:

> Sometimes we joke with the mothers of *fa'afafine* and we say "You're so lucky to have a *fa'afafine* son," because they do everything in the house and they do everything for the *fa'alavelave*.[2] Say for a wedding he'll [the *fa'afafine*] be the one cleaning and decorating the church even if he is working another job and he'll contribute money too. He'll do the gowns and the cake.

Another woman we spoke to recounted with sadness the story of her *fa'afafine* cousin who married a woman after being pressured by his church to do so.

> Samoan woman: His sisters felt they lost him. His mother *refused* to believe it when he said he had a girlfriend. The mother told him to stop. It took months for her to accept it. We loved him dearly and we were all very sad he turned into a boy. He doesn't act like a girl now and we can't sleep in the same bed with him. We don't know how to act with him now.
> Interviewer: Why did he turn into a boy?
> Samoan woman: He joined a different church and became "born again" and his church wanted him to be "straight." The church says they are this big evil, but how ironic is that? They help the community *so* much. They do fundraising all the time.
> Interviewer: Does he still have sex with men?
> Samoan woman (smiling): Well, up until the day of the wedding, they [the bride and groom] never kissed, so what do you think?

The preceding dialog illustrates how gaining a man as a relative at the expense of a *fa'afafine* is perceived by some Samoans as a net loss, not a net gain. Given this high level of social acceptance, estrangement of androphilic males from their families may be less likely in a Samoan cultural context (Besnier, 1994; Croall & Wunderman, 1999; Danielsson et al., 1978; Vasey & Bartlett, 2007) when compared to many Western settings, in which hostile attitudes towards androphilic males are more common (Fone, 2000).

Fourth, in Independent Samoa, almost all *fa'afafine* exhibit *transgendered male androphilia,*[3] not *egalitarian male androphilia.*[4] Archeological evidence suggestive of transgendered male androphilia has been documented (Knüsel & Ripley, 2000) and it is known to occur in a wide variety of cultural regions (e.g., North America: Williams, 1992; Central America: Chiñas, 1995; South America: Kulick, 1998; Africa: Brooks & Bocahut, 1998; Middle East: Wikan, 1977; India: Nanda, 1998; South-east Asia: Coleman, Colgan, & Gooren, 1992; Graham, 2004; Johnson, 1997; Koon, 2002; Polynesia: Besnier, 1994). In contrast, egalitarian male androphilia appears, with very few exceptions, to be a historically recent phenomenon that is quite rare outside of Western settings (e.g., Greenberg, 1988; Murray, 2000). For reasons that remain unclear, transgendered male androphiles are often described by the gender-normative members of their societies as being superior to men and women in terms of various labor practices, often combining the best that both sexes have to offer (Herdt, 1994; Williams, 1992). For example, one woman stated: "A *fa'afafine* is more responsible than a son or a daughter. They contribute more to the family. *Everyone* knows that." Thus, it is possible that the greater avuncular tendencies of *fa'afafine* are somehow tied

[2] The word *fa'alavelave* can be translated in several ways, but is commonly used to imply "trouble." A *fa'alavelave* is a traditional event (i.e., a wedding, a funeral, the opening of a new church) that involves very costly economic contributions (i.e., money, food, livestock) or time-consuming ceremonial activities by the families involved (e.g., decorating a church, sewing special clothing).

[3] *Transgendered male androphilia* occurs between a male who is markedly gender-atypical and another who is more or less gender-typical for his own sex.

[4] *Egalitarian male androphilia* occurs between two males not markedly different in age, gender-related characteristics, or other traits. Within the relationship, partners do not adopt social roles, and they treat each other as equals.

to their status as transgendered male androphiles, whereas this relationship is lacking in the West among egalitarian male androphiles who tend to be more gender normative, relatively speaking.

Alternatively, it is possible that femininity, not transgendered status, per se, is the important proximate factor influencing elevated avuncularity among the *fa'afafine*. Numerous researchers have reported that Samoan women are more involved in childcare activity compared to men (Freeman, 1983; Holmes, 1987; Nardi, 1983; Ochs, 1982; Ritchie & Ritchie, 1983). This raises the possibility that Samoan *fa'afafine,* who behave "in the manner of a woman," might follow culturally-specific feminine gender roles with respect to the care of nieces and nephews. If so, then *fa'afafine's* avuncular tendency scores should be relatively similar to the materteral tendency scores of a feminine class of individuals who also lack direct parental care responsibilities, namely, women without children. At the same time, both of these groups should differ for these measures from more masculine individuals (i.e., gynephilic men with and without children). Future research will be needed to assess this possibility.

In this study, we examined whether *fa'afafine*'s elevated avuncular tendencies were simply owing to the fact that, unlike some gynephilic men, they have no children and, thus, no direct parental care responsibilities. To test this possibility, we compared the avuncular tendencies of *fa'afafine* with gynephilic men whose familial circumstances afforded them similar opportunities to invest in kin (i.e., gynephilic men without children). If direct childcare constrains avuncular tendencies, then *fa'afafine* and gynephilic men without children should not differ in this regard. However, *fa'afafine* had significantly higher avuncular tendencies even when compared to gynephilic men without children. Gynephilic men with, and without, children did not differ significantly from each other for this measure. As such, it seems unlikely that a lack of direct parental care responsibilities can account for the elevated avuncular tendencies of *fa'afafine*.

Given our finding that *fa'afafine* exhibited greater avuncular tendencies relative to gynephilic men, both with and without children, we assessed whether a certain level of parental responsibilities constrained avuncular tendencies. We did so by testing whether number of children correlated negatively with avuncular tendencies scores among gynephilic men. However, there was no such correlation, which again suggested that parental care responsibilities did not affect willingness to allocate altruism to nieces and nephews.

Taken together, these results were consistent with predictions derived from the kin selection hypothesis that male androphiles should exhibit higher altruistic tendencies towards kin compared to male gynephiles, including those without children. Although our results were consistent with these conclusions, we stress our findings do not provide sufficient evidence to make strong conclusions regarding whether the *fa'afafine's* androphilia reflects an adaptation for promoting kin-directed altruism, and thereby offsetting the fitness costs associated with male androphilia. To ascertain whether this is indeed the case, more research will be needed to determine whether *fa'afafine's* androphilia is characterized by special design features that are indicative of adaptations (see Williams, 1966). Some researchers have argued cogently that male androphilia does *not* appear to be specially designed to facilitate elevated kin-direct altruism. As LeVay (1993) states, "To put it crudely, why do gay men waste so much time cruising each other, time that according to this theory would be better spent baby-sitting their nephews and nieces?" (p. 129). Given this apparent contradiction, some theorists have argued that kin selection theory has little explanatory power in terms of the origin of male androphila, but rather is better suited to explaining the existence of asexual individuals or those that actively choose to be celibate (Dickemann, 1995). Although all these groups could be characterized as "non-reproductive" morphs, asexuals and celibates do not invest time or energy in mating effort, whereas male androphiles often do (Saghir & Robins, 1973). As such, asexuals and celibates have more time and energy to invest in kin relative to male androphiles. In line with this reasoning, asexuals or celibates should exhibit elevated kin-directed altruism compared to male androphiles. Future research will be needed to ascertain whether this is indeed the case.

We also stress that our findings do *not* provide sufficient evidence to make strong conclusions regarding whether the *fa'afafine's* elevated avuncular tendencies reflect an adaptation to increase the fitness of kin, and thereby offset the fitness costs associated with male androphilia. To ascertain whether this is indeed the case, more research will be needed to determine whether *fa'afafine's* elevated avuncular tendencies are characterized by special design features that are indicative of adaptations (see Williams, 1966). Some authors have expressed doubt that kin-directed altruism as expressed by androphlic males in real world situations could ever be sufficient to offset the costs associated with not reproducing directly (e.g., Bailey, 2003). Individuals share more genes with their sons and daughters than with nieces and nephews. On average, humans share 50% of their genes with offspring and 25% of their genes with nieces and nephews in populations that mate randomly and are previously outbred (Haldane, 1955; Hamilton, 1963). As such, if an increased tendency towards avuncularity is the sole factor contributing to the evolution and maintenance of male androphilia, then *fa'afafine's* avuncularity would have to be sufficient to compensate for the fitness costs associated with not reproducing directly. Theoretically speaking, for every offspring that an androphilic male failed to produce directly, he would need to compensate for this by facilitating the production of, on average, two additional nieces and/or nephews that would

not otherwise have existed (Haldane, 1955; Hamilton, 1963). From this perspective, it would seem that *fa'afafine* would have to be "super" uncles, dispensing a much greater quantity of avuncular behavior so that their inclusive fitness would be on par with that of gynephilic men (Bailey, 2003). The difference in mean avuncular tendencies observed between *fa'afafine* and gynephilic men was significant, but the effect size was not large. This raises the question of whether moderate increases in avuncular tendencies, as exhibited by *fa'afafine*, are sufficient to make up for the costs associated with not reproducing directly. Future research will be needed to address this question.

Alternatively, quality of avuncular tendencies may be more important than quantity, such that certain kinds of avuncular altruism may result in relatively large fitness gains for both the recipient and the donor. If so, then the significant, but moderate effect size differences in mean avuncular tendencies observed between *fa'afafine* and gynephilic men becomes less of an issue when attempting to account for this pattern within an adaptationist framework. Research from another Pacific island locale, Ifaluk atoll in Yap, Federated States of Micronesia, suggests that moderate increases in particular types of kin directed altruism (e.g., food sharing) by non-reproductive kin (i.e., first and second born pre-reproductive daughters) can have significant fitness effects for reproductively active kin (i.e., mothers; Turke, 1988). In order to evaluate whether the quality of avuncularity is more evolutionarily important than the quantity, it will be necessary to undertake appraisals of the fitness-related benefits accrued by kin as a result of particular types of avuncular altruism that are actually expressed by their androphilic male relatives.

In conclusion, although our results were consistent with some of the basic predictions of the kin selection hypothesis for male androphilia, it is possible that androphilia in *fa'afafine* does not represent an evolved adaptation for increasing kin directed altruism. Likewise, it is equally possible that elevated avuncular tendencies do not represent an evolved adaptation for offsetting the reproductive cost of male androphilia. Despite all this, the *fa'afafine's* elevated avuncular tendencies may, nevertheless, contribute to the fitness of genetic factors underlying male androphilia. Camperio Ciani, Corna, and Capiluppi (2004) reported that the female maternal relatives (i.e., mothers, grandmothers, aunts) of androphilic men exhibit greater fecundity compared to the female maternal relatives of gynephilic men in an Italian sample (see also Camperio Ciani, Cermelli, & Zanzotto, 2008; Iemmola & Camperio Ciani, 2008). Other studies have reported elevated fecundity for the mothers (King et al., 2005; Rahman et al., 2008), maternal grandmothers (McKnight & Malcolm, 2000) and maternal aunts (Bailey et al., 1999; Rahman et al., 2008; Turner, 1995) of androphilic males relative to their gynephilic counterparts. Vasey and VanderLaan (2007a, 2007b) reported that the mothers of *fa'afafine* were significantly more fecund than those of gynephilic men. These findings raise the possibility that reproductive costs associated with genes for male androphilia may be offset by the reproductive benefits that occur if the same genetic factors result in increased reproductive success among female kin. From this perspective, male androphilia, could be conceptualized as a by-product of an adaptation[5] (sensu Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998; Gould & Vrba, 1982) for increased female fecundity. In such a situation, increased avuncularity among male androphiles could potentially facilitate reproduction by female kin and thereby have positive effects (sensu Williams, 1966) on the genetic factors for both increased fecundity in females and, by extension, its conjectured by-product, male androphilia. Williams (1966) invoked the term "effect" to designate the fortuitous operation of a useful character not built by selection for its current role (for further discussion, see Gould & Vrba, 1982). Clearly, more research will be needed to test these various evolutionary perspectives on the origins and maintenance of male androphilia.

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[5] By-products of adaptations are characteristics that evolve in association with particular adaptations because they happen to be coupled with those adaptations (Buss et al., 1998). Although they may have some beneficial effect on fitness, they did not evolve to solve adaptive problems, and thus, do not have an evolved fitness-enhancing function and are not products of natural selection.

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ORIGINAL PAPER

Negotiating Sex and Sexualities: The Use of Sexual Tags in the Brazilian Sex Trade Workplace

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Abstract Based on data from participant observation and interviews with Brazilian sex workers and their clients, I examined the intersections of sexual and gender identities with sexual behaviors. Specifically, I was interested in how sex workers managed and negotiated their sexualities in the workplace. First, I described the layout and the social actors at a popular *termas* in a major Brazilian city. Then, I examined the interactions in the *termas* and how Brazilian sex workers use sexual identity terms to describe themselves. I argued that the use of these terms do not necessarily indicate sex workers' adoption of that sexual identity. Critical to them are the symbolic presentation of gender identity and the presentation of self at the work place. I developed a theoretical construct, *sexual tags*, which contributes to the literature by suggesting that sexual identity is situational and, more importantly, that the terms may not mean as much to the individuals or to be consistent with our understanding of what they ought to imply, especially when individuals are importing western terms to relate to their foreign clients. While using *sexual tags* does not preclude sex workers from eventually adopting that identity, it could also mean that some sex workers are claiming a sexual identity simply for strategic purposes. Another possible scenario is that *sexual tags* reflect the diverse interpretations of sexuality because of the available choices created by the situational manipulation of sexual meanings within a local context.

Keywords Sexual identity · Sexual behavior · Sexual tags · Brazil · Sex workers

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Introduction

Scholars have argued that sexual identities are fluid across life stages (e.g., Esterberg, 1997) and could be an essential part of one's personal identity. Personal identity can be interpreted as being formed by how a person views oneself (Rubington & Weinberg, 2008). According to Goffman (1963), personal identity includes two ideas: "positive marks or identity pegs, and unique combination of life history items that comes to be attached to the individual with the help of these pegs for his identity" (p. 57). Personal identity, in part, helps individuals to organize their lives and, for some, it provides "an anchor and stability that is welcomed—as well as a potential basis for political mobilization" (Esterberg, 1997, p. 171).

Researchers have also argued that individuals possess and manage social identities depending on the situation (e.g., Padilla, 2008; Phua & Caras, 2008). Rubington and Weinberg (2008) explained that social identity is the image others have of an individual. This is consistent with Cooley's (1912) idea of a social self. Cooley posited that the concept of social self "might be called reflected or looking-glass self" (p. 152). According to Cooley, this self-idea has three important elements: the imagination of how one is perceived by others, the judgment of others, and some sort of self-feeling. Goffman (1963) asserted that there are two forms of social identity: virtual social identity and actual social identity. Goffman defined virtual social identity as "the character we impute to the individual" and actual social identity as "the category and attribute [the individual] could in fact be proved to possess" (p. 2). Goffman further argued that a person is likely to be stigmatized if there are discrepancies between a person's virtual social identity and actual social identity. In other words, a person might be stigmatized if that person could not live up to the expectations of others; that is, that person could

not prove to possess the attributes associated with the group that others had categorized him.

The concepts of personal and social identities are particularly critical in examining how sexual identities are represented in different contexts. However, while these two concepts are theoretically distinct, empirically they can overlap. In other words, an individual can choose to present a social identity that is consistent with his personal identity. To add another level of complexity to the question of identity, other studies have also suggested that individuals possess multiple identities (Rubington & Weinberg, 2008). However, not all these identities necessarily constitute their master status and when one identity is more prominently expressed depends on the situation.

To add to the current literature on sexual identities, I develop a new concept, "sexual tags," to capture a relationship between personal and social identities in the context of sex work. Sexual tags are similar to Goffman's (1963, 1969) use of identity tags and pegs in that they can be used as indicators of one's personal identity, social identity or both. However, three major distinctions exist between sexual tags and identity pegs/tags: first, a sexual tag is a verbal claim whereas an identity peg/tag can be both verbal or material; second, a sexual tag could be symbolic in nature and has little to do with one's actual identity; and third, a sexual tag could represent a transitional state of actually being in the process of developing that identity.

In addition, I am contributing to the literature on Brazilian male sexualities. Notably, one of Parker's (1991, 1999) major contributions has been to point out that Brazilians could draw from various sexual systems in representing their sexual identities and that these sexual identities are contingent. However, his analysis remained broad and he did not examine ways in which sexual identities manifest in specific context. I further this line of research by focusing on how Brazilian sex workers manage and negotiate their sexualities in the workplace. I also argue that both sexual systems and gender systems in Brazil concurrently influence how Brazilian sex workers represent their identities.

Brazilian Sex and Sexualities

Scholars posited that traditional Brazilian sexual culture is organized by sexual roles (e.g., Parker, 1999). This mode of sexual life emphasizes how one's sexuality is molded by sexual practices that are reflective of a machismo-based gender system. A man's sexuality and masculinity will not be challenged if he takes on what is considered a man's role in sexual acts, regardless of the sex of his partner. Some men would even boost their virility because they are desired and have willing sexual partners of both sexes catering to their sexual satisfaction. As long as others perceive that he does not express any interest in another man's penis or display any emotional attachment to men, he secures his manhood. In other words, the manly image a man has to maintain in public is more critical than what actually occurs behind closed doors. However, the man who is perceived as a passive sexual partner would alone shoulder the stigma of being a homosexual. This version of the Brazilian sexual system underscores a basic binary gender system as the foundation for sexuality (e.g., Green, 1999). While there is a hierarchy among the non-man group (women and men who are not considered as men), the primary division is between man and non-man (Kulick, 1998).

Parker (1999) reported that "[a] new medical/scientific model of sexual classification… seems to have marked… [the importance of] sexual object choice as central to the very definition of the sexual subject" (p. 37). At the beginning, these discussions were the privilege of the elite class, whose social status and respectability could mask the behaviors and associated stigma. Nowadays, the discussions of respectable alternate sexual desires, practices, and identities are becoming more common but still vary along other socioeconomic divisions, such as class and locations (urban versus rural and by regions and cities). While these jargons may be adopted by many, they are still not universally understood. In some cases, terminologies for sexual identities lose their distinctions and mean essentially the same things to people, except that they are more fashionable words. Further, Green (1999) cautioned that:

> It is important to point out that the fluidity of sexual desires, identity, and erotic practices transgressed the norms that divided same-gender sexuality along active/passive lines and that is commonly ascribed, incorrectly, to same-sex behavior prior to the 1960s and gay liberation… Men in the 1930s (and earlier) at times simply did not conform to the social representation and stereotypes of the active/passive binary. Certain men enjoyed multiple sexual experiences, including both being anally penetrated and penetrating others. The cultural changes in the 1960s merely provided a social context for multiple representations to coexist, and even to develop new space or value in the subculture… Historians should beware of identifying the allegedly more egalitarian model of same-sex activity with progress (pp. 8, 281).

Different terms are used to describe subtle variation in one's sexual orientation (e.g., McLelland, 2000; Padilla, 2008). For example, *entendido* is supposedly less attached to gender roles as an expression of a person who is attracted to a real man, a closeted person, or a less critical term for homosexual (Green, 1999). *Bicha* and *viado* are pejorative terms and "gay" represents a more modern and benign term but carries the stigma of being too Americanized. These terms denote subtlety of differences within the complex sexual system in Brazilian that is reflective of its diverse population.

Class, race, and geographic differences, to name a few, influence how Brazilians evaluate sexual identity. Because the Brazilian population is diverse, we cannot assume that it ascribes to any one monolithic sexual system (e.g., Parker, 1987) nor should we argue that one version of the system is necessarily better than another for every Brazilian.

While I do not attempt to measure which sexual identity model is more prevalent or important in Brazil nor to examine specific factors that affect one's sexual identification, I argue that it is critical to acknowledge the sexual diversity in Brazil and to understand this diversity as an outcome of local context. The sexual system in each country is evolving, impacted by both globalization and local culture (e.g., Altman, 2001; Bereket & Adam, 2006). Here I follow Gross's (2005) argument about "detraditionalization" in his examination of opposite-sex intimacy. His main point is that while individuals may be reflexive in the arena of intimacy, they still cannot completely escape the fact that the tradition of romantic love continues to influence everyday expression and perception of love as well as the organization of intimate life. The same argument can be applied here: even if sexual identity becomes more prominent in popular discourse and the social organization of life in Brazil, sexual identity continues to be influenced by the ideas of gender system (e.g., Muñoz-Laboy, 2004, makes similar arguments for Latinos in the U.S.). Parker (1991) posited that

> the traditional distinctions of gender in Brazilian life have hardly lost their significance. On the contrary, it would be more accurate to suggest that analytically distinct, and obviously diverse, sets of interpretative practices have been built up and superimposed on the definitions of gender in approaching and articulating the significance of sexual life in Brazil. Rather than eclipsing other possibilities, these more rationalized interpretive frameworks have served to diversify the wider structure of sexual meanings in Brazilian culture (pp. 3–4).

More importantly, individual actors can also choose how to express their sexuality, which could depend on the situation, regardless of any pressure from the sexual culture.

Sex and Sexualities in Sex Work

Male sex workers offer a very interesting case study as these distinctions are being concurrently amplified and filtered through the sexual market. Parker (1999) posited that

> [m]uch the same distinction between perceived active and passive roles is even more obvious in the increasingly prominent world of male prostitution, where a sharp distinction is drawn between the *travesti* (transvestite) and the *miche* (hustler)–between an exaggerated, feminine figure who is associated primarily with a passive sexual role, and an almost equally exaggerated masculine figure thought to be generally available for the active role but unwilling to perform the passive role (p. 46).

Within a strong and rigid gender role system, both what a man and what a straight man ought to do sexually overlap. In the Brazilian sex trade workplace, sex workers do not necessarily link the sexual activities with male clients to homosexual desire or identity. This is in accordance with research that documented the inconsistencies between sexual identities and sexual behaviors (e.g., Doll et al., 1992; Muñoz-Laboy, 2004; Sandfort & Dodge, 2008). In fact, few of them considered themselves gay. Some sex workers make the distinction between *comportamento* sexual (behavior) and *identidade* sexual (identity) (e.g., Parker, 1999 on Brazilian men's sexuality). Green (1999) and Longo (1998) argued that the sexual activities sex workers are willing to perform have more to do with financial benefits than with sexual identity.

Researching sexual identity management at the workplace, Chrobot-Mason, Button, and Diclementi (2001) found that "both individual characteristics (i.e., sexual identity development) and perceptions of the organizational context are related to the uses of identity management strategies" (p. 333), namely counterfeiting, avoiding, and integrating. Counterfeiting involves pretending to possess another identity, such as gay men presenting a straight identity at the workplace. Avoiding involves "continuous self-editing and half-truths" and generally appearing asexual (Chrobot-Mason et al., 2001, p. 323). Integrating requires coming out and dealing with its consequences. In the case of sex workers, masculinity is a valued trait (e.g., Phua & Caras, 2008). Thus, for sex workers to assume a heterosexual identity or a heterosexual façade could, in part, be a marketing strategy to solicit more business. However, being gay in sex work is not necessarily detrimental to business as some clients may prefer gay-identified sex workers, assuming that they are more uninhibited in sexual activities and less likely to commit hate crimes (e.g., Phua & Caras, 2008).

The question of sexual identity becomes more complex when the choice of identity could be beneficial to business in the context of sex work. To address this issue, I use data from participant observation and interviews with sex workers and their clients. Specifically, I examine the intersections of sexual identity, sexual activities, and gender identity among Brazilian sex workers, and how they manage these issues in the workplace.

Method

The present analysis is based mainly on participant observation at a popular *termas* in a major city in Brazil. *Termas* is

the Brazilian word for a bathhouse or a sauna. In Brazil, *termas* are essentially divided into two categories: those with sex workers and those (supposedly) without. Excepting the presence of sex workers, Brazilian *termas* share many characteristics with other bathhouses. Some clients prefer soliciting sex workers in *termas* in Brazil over soliciting sex workers through other means.

Tewksbury (2002) posited that participant observation allows research "to assess the actual activities and culture of the settings, while avoiding obstacles of response bias and respondent selection" (p. 84). In early stages of this research project, I surveyed several similar settings in various Brazilian cities. This particular *termas* was selected because it was one of the most popular *termas* in Brazil. The situations at this location were similar to other sites I visited. However, its popularity ensured high traffic and frequent transactions at the site, and thus enabled the collection of data within a short period of time. After determining the site, I spent a week going to the site from the time it opened to the time it closed. This effort enabled me to understand the daily activities and I was also able to make friends with the staff members which greatly eased my (initially conspicuous) non-participatory presence. Most of my observations were on Fridays and Saturdays. However, I also visited the *termas* during non-peak hours to track the presence of clients and sex workers. I was also interested in the management's effort in attracting business during these times. The effort was also to verify that what I observed at peak times were just an intensified trend and were consistent with the general activities. At the same time, these were also social visits to reconnect with those individuals who had helped me with my research.

Participant observation data were cross-referenced with formal and informal interview data I collected with sex workers and their clients. The formal interviews were part of a larger research project where appointments were scheduled for a location outside of the facilities of the interviewees' choosing. Informal interviews were shorter conversations when the clients and sex workers were willing to talk. Some of the veteran clients provided me with the profiles and reviews of sex workers as they walked by us. In some cases, some of these sex workers actually sat down with us and participated in the gossip. Both clients and sex workers who were fluent in English and Brazilian Portuguese helped in the translation of part of the conservations when I could not understand certain colloquial words or phrases. In between conversations, I would either excuse myself to the restroom or to what I would call "my spot" to record the notes. "My spot" was a corner that had little foot traffic where I tended to relax when I became overwhelmed with the activities in the facility. Initially, some of them were puzzled that I was not always there in the midst of activities. Over time, they joked that I needed my escape or I had gone for a quick rendezvous with someone. In fact, both parties enjoyed teasing me but, in doing so, they accepted me as part of the scene. In the process, I also learned that the more I defended or explained the more they would tease me. In this article, interview data are used to illuminate the findings through participant observations.

Results and Discussion

Brazilian Sex Trade Workplace

In this section, I describe the field site to provide some context to better understand my analysis presented in later sections. In the context of a *termas*, sex workers are commonly known as "boys." Thus, I use "boys" throughout this article to refer to sex workers in the context of a *termas*. I will continue to use "sex workers" only in reference to a broader group of workers.

In Brazil, major cities were more conducive for such a business to establish a storefront. Parker (1999) described Copacabana in Rio de Janeiro as such a place with more organized forms of male sex work: *casas de massagem* and *saunas de programa*. Most of these establishments were not isolated but located among residential or commercial areas. Their façade was generally not conspicuous and reflected little of its trade. However, these establishments had a distinctive feature: a security post with security guards and valet service.

This *termas* resembled a bungalow from the outside and was located near a metro train station, amidst a middle-class neighborhood. The presence of a security post with security guards dressed in suits and ties, and a few more parked cars for a residential house, marked it as either a residence of an important person or a house converted to a club. Otherwise, the building was not conspicuous.

Specialized Spaces

Inside the building, there were very distinct areas, each having a specialized function. The building had two floors. The first floor provided a mix of leisure and business interactions. There were two areas with weights. The first was near the entrance where boys usually hung out to see and to be seen by clients. The other area was at one end of the facility. This area had more work-out machines but was less visible and, thus, was less utilized. These areas served as a workout space but also allowed boys to literally flex their muscles for potential clients to evaluate as muscles are often associated with masculinity (e.g., Klein, 1989) and that masculinity is prized (e.g., Phua, 2002). Three areas had television sets installed. One was a small smoke-free television room where little action took place. Most people here were just taking a break from the activities elsewhere. Another was surrounded by a swimming pool that was rarely used, a whirlpool for eight

people, and a hallway of showers, and the third area was a hallway with lounge chairs.

Another corner near the entrance had a short stairway that led to the movie room, a massage room, a barber room, and the manicure/pedicure room. This movie room opened in the evening and screened two blockbuster movies a night. These movies were usually screened in Portuguese with English subtitles. Sexual activities were less prevalent in this movie room. At most, boys would masturbate and display their erection to entice potential clients to desire more, and be willing to pay for further sexual engagement. The three rooms that provided saloon services were staffed with the respective professionals and clients were served on a first come, first serve basis.

One main area was the stage area where daily events took place. Tables and chairs were placed in front of a stage and by the bar which served both food and drinks. To the left of the sitting area were open showers, and the dry and wet saunas. In addition to watching performances (e.g., drag and strip-tease shows) on stage, people could also watch the boys or clients showering.

The cabins for the consummation of any sexual deals were located on the second floor. The cabins' prices depended on the size and whether it had a shower. These areas were for cabin renters only. Another part of the second floor, with a separate stairway, had three massage rooms, a dark room, two rooms showing pornographic movies and a restroom. The one showing straight pornographic movies was much bigger than the one showing gay pornographic movies. Sexual tension was much higher in these locations as they were more secluded from the rest of the building and functions of these rooms were sexually charged.

Out of more than 20 *termas* in Brazil that I had visited during the initial site review, this *termas* was the largest and the most efficiently run one. Ironically, this *termas* was also viewed as more impersonal and elitist by some clients and other smaller *termas*.

The Route

The clients and the boys entered the *termas* through different entrances. For security reasons, the clients needed to be buzzed in. Upon entry, clients were right in front of the reception for check in. On the immediate right was the client locker room. The client locker room was off limits to the boys. The cleaning crew would come to pick up dirty towels and trash frequently. The boys' main locker room was in an open space further in the building. The boy had to parade through two hallways before reaching their locker room. Beginning from entering the building to changing into their towels or whatever clothes they planned to don, they were under the watchful eyes of potential clients. As one client put it, "If you want them fresh, you got to grab them as soon as possible when they enter the building. Otherwise, the popular or really cute ones will be taken by others before they reach their locker room."

The Actors

At this site, the main staff members included security guards, receptionists, cleaning crew, and bartenders/cooks. Other contract employees included the drag performers, the disc jockey, the strippers, and live sex show performers who mainly worked at night.

Boys were not employees of the establishment. An advantage of self-proclamation as a boy was a lower entrance fee. However, they were subject to the rules of etiquette of the establishment. If they caused any trouble, they could be evicted from the establishment and banned from returning. While some *termas* may allow any boys to enter, this particular one was strict on entry criteria. First, the owner or another staff member might interview potential boys or someone they trust must vouch for these boys. Second, upon entering, boys had to go through a security search for weapons and drugs. This process reduced risks of foul play and solidified the establishment's reputation as one of the safest and most professional *termas* in Brazil—a business model for others. It also had a large following of international tourists.

Tourists (domestic and international) constituted a large percentage of the revolving clients. Among the tourists, some showed up every vacation they could earn. A few of them were flight attendants at major American airlines. Locals were always a permanent feature of the location. While local and non-local clients co-existed in this location peacefully, a tension between the groups existed. Non-local clients, especially foreigners, were perceived by the boys to be more generous and easier to ask for more money. Thus, they were sometimes the target for business more than locals were. As a Brazilian client commented, "I am here so often, the boys know me so they won't ask for more money. They know I won't pay more. But when they see tourists, they are like a hungry wolf." Likewise, a boy confessed that he would ask a foreigner for more money than he would from a local for the same service. On some websites, some individuals had posted advice to inform tourists not to overpay and upset the local economy, especially if they were not regular visitors.

One stereotypic distinction between clients and boys was their age difference. The clients' ages ranged from their 20s to 70s whereas the boys' ranged from late teens to the 30 plus years. Boys who were over 30 were generally veterans in this trade and had regulars that they still saw, or generally tended to possess special features, such as a bodybuilder's physique, a charming personality, or a large penis. In some cases, they may have the reputation of providing excellent or specialty services. As one client said, "there is always something for

everyone," underscoring not only preferences for certain body types and looks but race and skin color as well (e.g., Perlongher, 1987).

Interactions

Generally, boys would try to strike a conversation with potential clients or pose in a seductive way to indicate their availability; clients would watch the boys and have their pick. In most cases, a nod with a smile, as an expression of interest, was enough to lure the boys over. While a client might make an offer to another client or a boy offering to pay another boy, these were rare cases and were generally underground activities that would risk a negative role reversal. In most cases, the boys were usually proactive in sexual seduction in their approach. This can be seen from the way they spoke to potential clients, their choice of words, and their body language to a blatant display of his body parts or simulated sex acts. What is interesting here was that most boys actively encouraged potential clients to touch and or "sample the goods." From my observations in similar settings in other countries where sex workers congregated, I have rarely come across sex workers who, as a group, allowed or ever actively encouraged potential clients to fondle them. There were clearly some Brazilian sex workers who did not want such attention but, in general, most of them I observed seemed to view touching as part of the trade. In fact, when I spoke with some of them, they just shrugged and said "no problem." Some of them actually viewed the fact that clients wanted to touch them as an affirmation of their desirability while others were proud of their body and their endowment. A few clients informed me that they preferred coming here over going to other countries because they felt that Brazilian sex workers were more "open-minded and less mechanical sexually." One client specifically mentioned his dislike of some American sex workers with the "no pay no touch," the "no money no honey," or the "pay upfront" attitude; he felt that it was much easier to hang out with Brazilian sex workers and have a good time. If he did not end up being with them at the end of the day, he would still be willing to provide some monetary compensation as they all had fun.

Holzman and Pines (1982) reported that "[s]ome of the bars and massage parlors or brothels provided a causal atmosphere in which an individual could take as much time as desired before a verbal interaction occurred" (p. 107). The staff members were friendly and would converse with clients; some boys, especially during non-peak hours when they had more free time, would also engage in conversation with clients. The food and drinks were reasonably priced and quite delicious. There were places to relax and take a nap, places to watch television programs and videos, and places to work out. A person could spend a whole day there and be entertained even without engaging in any sexual activities. In fact, some regular clients were quite nonchalant about whether they would engage services of a boy and literally just drop-in for a drink and some conversation. Some boys would drop by before dinner while others would come by right after their day jobs or before their night shift to see if they could pick up some extra cash for the day. In some cases, they started a conversation with the receptionists and checked out available clients to evaluate if it was worth their while to pay the entrance fee and spend time there. Others would enter and hang out for an hour or two; if they cannot find any clients, they would at least solicit a free drink or two from friendly clients who were typically regulars or former clients.

Gender, Sex, and Sexualities

From the previous section, readers should have a sense of the *termas* where sex workers work. In this section, I first examine the distinction between the usage of the terms "boy" and "man." Then, I discuss the intersections of gender, sexual acts, and sexualities.

While "I am a boy" was used to describe their occupational status, most of them would self-proclaim to be *homem* (a real man). Few boys actually would self-identify as gay. More of them called themselves "bi" (pronounced like the letter "b," meaning bisexual), "*dois*" (two), "half and half," or "50-50"—all these terms indicated that they were willing to play both active and passive roles in anal sex. I have yet to meet or hear of a boy who would claim to be *só passivo* (only passive, the one being penetrated in anal sex). Most boys would initially maintain that they were *só ativo* (only active, the one who penetrates in anal sex) or *os dois* (both active and passive or versatile). Boys joked around with each other and would sometimes teased their fellow co-workers by telling the potential client that the boys they were interested in were *passivos*. What is interesting here is that many boys assumed that clients were there to seek men or *ativos*, suggesting that they associated clients with being gay and thus being *passivos*. This is consistent with Parker's (1999) findings that "foreign gay men, who, no matter how masculine in style, will inevitably be referred to laughingly as *ela* (she) or *aquela* (that one [woman]). And the presumed superiority of socioeconomic status will typically be relativized in an active/passive calculus of gender hierarchy" (p. 200). In most cases, boys would refer clients who were looking for *passivos* to gay sex workers. Such referrals implied either some boys had self-proclaimed to be gay and other boys simply assumed that, as such, these boys were *passivos*, or some boys were known to be *passivos* and thus were labeled gay, or some boys used this label to mock their competitors.

What they proclaimed to be and what they would actually do behind closed doors may be different. Whether one is willing to perform more sexual roles in private rooms depends, in part, on how much more money they will be

receiving. Money in this case served two purposes: First, a boy may be willing to do more or pretend to be willing to do more in order to earn more. One client complained to me that a particular boy had always claimed to be *só ativo* in the past but was willing to be *passivo* with him for a little more money because business was slow that night. However, the boy was screaming "in pain" during the act and the client lost his excitement. The client complained that "I can understand that it might hurt but I wasn't even in him yet. My cock barely touched his ass and he was already screaming as if he was dying. I got really pissed off so I just stopped and paid him." Second, even if a boy may enjoy being *passivo*, getting paid for doing it helps secure his masculinity and status as man. Longo (1998) reported that some "boys can use their lack of money as an alibi for an extremely repressed homosexuality, with the excuse 'I don't like men, I do it for cash'" (p. 233).

In the Brazilian sexual system, where the status of being a man lies more heavily in what they do more than who they do it with, a boy has no incentive to openly declare his desire to be *passivo*. Several incidents happened at the beginning of my field work when the boys assumed that I was a potential client. As such, many of them solicited my business. In a few cases, the boys would ask me if I wanted to have sex with them quite openly with other boys and clients nearby. Their solicitation was generally accompanied by the thrusting of their pelvis as to suggest that they were the active partner in anal sex and to make sure potential clients understood their proposition and their sexual role (particularly for foreign tourists whom they assumed speak little Portuguese but could definitely interpret their actions). However, as I politely declined their offers and walked away, a few of them would actually follow me and whisper in my ears that they would do more sexually. Several clients also informed me that, in many cases, though not all, the offer of a higher fee would make the sexual acts boys were willing to perform negotiable. However, they also cautioned that these propositions should be discreet and non-threatening as to enable boys to save face in front of their peers and to maintain their masculine social identity. One client put it this way: "Get them in the room and then money talks."

In a few exceptions, like being paid or engaging in *troca-troca* (equal exchanges of sexual favors that are more commonly practiced at younger ages), this stigma may be minimized though not completely erased. Still, most Brazilian men would not represent themselves as being *só passivo*. A boy who adopts a gay identity might do that. However, in a society that privileges manhood and emphasizes their sexual pride, the stigma of not being a man and of not enjoying the full range of sexual activities plagues the gay community. Protecting and defending one's gender identity is paramount. Boys have to manage both their sexual role preferences (especially those that threaten their masculinity) as well as the image of their manhood. This form of management reflects both the influence of Brazilian sexual and gender systems.

The importance of being *ativo* or *passivo* refers generally to anal intercourse. While a *homem* in Brazil ought not to show interest in another man's penis, some exceptions were made in the case of male sex workers. Even among some of the boys who considered themselves a *homem*, several of them had confessed that they were willing to perform oral sex on or masturbate their clients to the point of ejaculation. These disclosures were verified through discussions with their clients. What is particularly interesting here are the different interpretations of the events by the two parties. The clients shared the information with me in the form of a conquest—they were boasting that they could get a straight boy to perform sexual favors that in a way undermined the boy's manhood. Some offered the information as a recommendation: "If you like straight men, I mean those who are not gay, who are willing to do more than fuck you, then I suggest you go with him." For some of these *homem* sex workers, their main goal for performing these sexual acts was to expedite the transaction. "Lending a hand or a mouth" would make the client ejaculate faster and thus would end the transaction faster. This means that they could move on to another client and make more money in the course of the evening. Of course, the fact that they were then considered a better straight lover by clients only added to their business.

I am not suggesting that these sex workers may not enjoy the "forbidden" sexual acts. Regardless of whether they enjoy such acts, these acts have clear utilitarian values in the trade. It is also important to note that not all clients like when their apparently straight sex workers performed what these clients would consider gay acts. One client actually complained that "I thought he was all man but when we were in the room, he just wanted to play with my dick!"

Another important sexual act was the ejaculation of the sex workers. On the one hand, some sex workers claimed to be virile by being able to ejaculate, especially several times a night for different clients. One boy boosted that he still could do it for this third client on one particular night. However, ejaculation, also known as "money shots" in the pornography industry, could potentially command a higher price. Some sex workers might go with a client on an agreed price but they would ask for more money when the client expected them to ejaculate during their encounter. Sex workers' justification was usually that they will have a harder time performing for another client if they ejaculate. Ironically, this justification contradicts their usual boost of the ability to ejaculate several times a night. Some clients actually felt that this was another trick to raise the price. Other extra costs may include kissing on the mouth, oral sex, and so on. Several veteran clients offered the advice to new clients: "Always be

clear what you want for the price you are paying. Some sex workers will ask for more money for each add-on service." Some sex workers offered sexual services on an *a la carte* basis and, in some cases, body parts were being commodified where not all clients were not allowed access to every part of the body or were only allowed access with additional charges. The bottom line is that some clients try to get as much as they could for the lowest price while some sex workers try to do as little or as quickly for the highest price.

Sexual Tags as Symbolic Sexuality

Male sex workers are subjected to the constraints of the Brazilian gender system that favors men over women. According to Bereket and Adam (2006), gay "identification offers little reward in a gender system that allows masculinity to be preserved if a man acts as the insertor in anal intercourse" (p. 147). Being a *man* is not only culturally desirable but also economically beneficial. Not only do boys have to worry about defending their manhood, they also need to protect the market share. Phua and Caras (2008) argued that sex workers need to present the image in high demand to maximize their profits. Green (1999) reported that some older gay men were attracted to the young men's masculinity. By explicitly stating their preference for women and that they would eventually marry, these young men reaffirmed his virility, and maintained the older man's attraction.

"Gay-for-pay" is a term coined to describe non-gay men who are willing to engage in homosexual acts in exchange for payment. This term suggests that individuals can commodify sexual acts and separate them from an essential sexual identity. It also illustrates how supply and demand affect one's sexualities and suggest that situational sexual behaviors could be market-driven (e.g., Phua & Caras, 2008). This is consistent with Chrobot-Mason et al.'s (2001) argument that individuals use identity management strategies to adapt to the work environment. However, who they claim to be and who they are may be not be consistent as they represent themselves differently depending on the clients. This is akin to counterfeiting (Chrobot-Mason et al., 2001) as boys may just be claiming to be gay or straight, and their claims have little to do with their personal identities. The boys were, in fact, exercising a form of strategic sexuality, representing sexual acts and sexual identity that were most advantageous to them at that time. Or, at times, these boys may, in fact, be integrating and come out as gay or straight to their clients. What could be potentially problematic is the discrepancy between these boys' virtual and actual social identities. For example, clients may develop certain expectations in terms of the boys' mannerism or sexual performance based on their virtual social identity but might be disappointed by their actual personalities and performance. The inability to meet clients' expectation or mismanagement of a virtual social identity may lead to unsatisfied clients who would not return. These clients also could start spreading unfavorable review of their services that would affect their business.

What is interesting to note is that clients' preference and sex workers' valuation of their sexual identities may not be consistent. For example, sex workers might think that maintaining their manhood was paramount to their sense of self and for business. Some clients might think that gay sex workers may be sexually less inhibited and less likely to commit hate crimes and straight sex workers are a prize that is harder to solicit in real life. For other clients, the sexual identity of a sex worker was not an issue as illustrated by a client's claim: "If they are gay, I will pay. If they are bi, I will buy. If they are tri, I will try."

Regardless of whether the boys were counterfeiting or integrating, my observations and conservations with the boys and their clients suggested that claiming membership to a sexuality or gender group does not necessarily imply that sex workers possess that as an identity or would adopt that as an identity. This idea is consistent with Esterberg's (1997) that some individuals would welcomed an identity that provide them with political expediency and affiliation, and help them organize a particular life style beyond the walls of a *termas*, while other individuals might prefer not to be categorized. This also suggests a discrepancy between their social and personal identities. It is possible that some of these boys might consider their gay identity temporary or situational but eventually develop or accept an identity through constant self-identification as well as performance consistent with that identity. However, this may not be the case. One could also claim membership for strategic business reasons and thus may never develop that identity even if they may enjoy the practices and lifestyle associated with that identity. Here, instead of a sexual identity, what boys are adopting is what I would call a sexual tag. Like price tags, boys may change it at will depending on the situation. While sexual tags could be seen as overlapping with situational identity, the critical difference here is that claiming that one is straight or gay may just simply be that—a claim.

The use of sexual tags is consistent with the premise that individuals' sexual identities are fluid over the life course and, in part, depend on the criteria they would use to affirm their sexual identity (e.g., Esterberg, 1997; Laumann, Gagnon, Michael, & Michaels, 1994). For example, Parker (1989) posited that "a sense of self is built up not only through the meanings attached to one's sexual role… but through the nature of one's relationships" in Brazil (p. 284). Bockting, Miner, and Rosser (2007) reported that some Latinos claim to be bisexual or straight but have sex with transgendered individuals. Specifically, these variations open the doors of varying use and interpretation of "sexual identity." This is similar to Parker's (1991) argument that "[b]ecause the fit between… various perspectives is imperfect, their simultaneous existence offers… room for choice, for both the

conscious and unconscious manipulation of cultural meanings" (pp. 3–4).

Considering the fact that individuals could use different criteria to affirm their sexual identity and the validity of Kinsey's seven-point scale (e.g., Diamond, 1993), the interpretations of sexual identity vary among individuals. For example, the term "gay" can mean adhering to a particular lifestyle to one individual or to simply engaging in a set of sexual acts to another individual. More importantly, some could choose their sexual identity to be just a representation of themselves instead of having their sexual identity as an essential part of themselves. Sexual tags as a way of representing their sexual identity is more symbolic than our conventional understanding of identity. I am not suggesting that these boys are merely performing. I am positing that using sexual identity terminologies to describe themselves does not mean that these boys have adopted or would adopt that identity. When sex workers interpret these sexual identity terms as sexual tags, then being gay, bisexual or straight becomes more fluid as if no criterion, beyond a simple claim, is needed and they do not need to reconcile their personal and social identities, or their identities and their behavior. This interpretation is similar to Butler's (1993, 1999) idea of performativity, in which sexual performance, in their repetition, could establish the appearance of a personal identity or a core identity. However, sexual tags depart from the idea of performativity in that they could eventually develop into a personal identity. More importantly, sexual tags can be voluntary, and represent deliberate efforts on the part of individuals in representing their identities in specific situations, thereby emphasizing their human agency. The social cultural context is also critical in requiring one to maintain one's privileged gender identity—the masculine identity (e.g., Parker, 1991). In the sex work context where masculinity is prized by both sex workers themselves and the clients, one's sexual identity is secondary to one's gender identity (at least in the way many western scholars conceptualize these identities). This is when the use of sexual tags becomes more prevalent.

Conclusion

In this article, I described the layout and the social actors at a popular *termas* in a major Brazilian city. The results confirm that, in sex work, "[s]ystems of symbolic classification are consciously manipulated by the social actors who give them practical form" (Parker, 1985, p. 160). The results suggest that Brazilian sex workers put more emphasis on gender identity than on sexual identity. What is more important to them in terms of their social identity is defining themselves as a man than whether they consider themselves gay or straight. Sexual behaviors are fluid and do not necessarily determine their sexual or gender identities. I also examined how Brazilian sex workers use sexual identity terms to describe themselves. I argued that these terms can be considered sexual tags that do not necessarily indicate sex workers' adoption of that sexual identity as their personal identity. Critical to them are the symbolic presentation of gender identity and the presentation of self at the work place. In this article, this representation was negotiated at different stages of the exchange between the clients and the boys, and was subject to sex trade rules. While using sexual tags does not preclude sex workers from eventually adopting that identity, it could also mean that some sex workers were claiming a sexual identity simply for strategic purposes. Another possible scenario is that sexual tags reflect the diverse interpretations of sexuality enabled by having room for choice created by the situational manipulation of sexual meanings within a local context (e.g., Parker, 1991). Bereket and Adam (2006) found that for some of their interviewees, "[g]ay ideas… function neither as an inevitability nor an imposition but more as a resource to be employed or tried out" (p. 143). They also argued that the meaning of gay was variable.

This is similar to the argument that individuals proclaiming that they are gay are different across different subcultural contexts (e.g., Altman, 2001). Reviewing Parker's research on Brazilian sexuality, Muñoz-Laboy (2004) commented that "[Parker] argues that sexual identity may be situationally contingent; depending on the circumstances, one sexual identity may be chosen over others" (pp. 57–58). The theoretical construct, sexual tags, contributes to the literature by suggesting that sexual identity is situational and, more importantly, that the terms may not mean as much to the individuals or be consistent with our understanding with what they ought to imply, especially when individuals are importing western terms to relate to their foreign clients. For example, a Brazilian sex worker might call himself gay but would not call himself *entendido*, *bicha*, and *viado*, as these terms are not only negative but have specific local meaning within its cultural context. As Parker (1999) posited, becoming gay could be seen as "a much broader process of 'becoming' in contemporary Brazilian society, and is linked to the complex ideology of *desenvolvimento* and *progresso* in a range of different ways" (p. 118).

Research has shown that sexual identities are fluid over the life course and, in part, depend on the criteria individuals use to affirm their sexual identity (e.g., Laumann et al., 1994; Phua & Caras, 2008). What is interesting is that fewer studies have argued that a person may concurrently have multiple sexual identities that they could call upon when appropriate, even though studies have accepted that individuals can have multiple identities, such as a racial identity and a sexual

identity (e.g., Phua, 2007). These two interpretations have different meanings: the first (sexual identities being fluid) posits that identity categories are not fixed but one assumes only one sexual identity at a specific life stage; and the second (multiple sexual identities) suggests that sexual identity categories can co-exist concurrently at a specific life stage. The latter may seem contradictory only if one perceives gay and straight as mutually exclusive sexual categories.

This article relied on data predominantly from ethnographic observations and supplemented with interviews of sex workers and their clients (a non-probability sample). As such, the generalizability of the results could be challenged. However, this site allowed us to observe the interactions between sex workers and their clients in their natural setting. I have observed the diversity of the social class and city of origin of sex workers (more so than the clients) over time. This diversity partly reflects the migration of different sex workers in and out of the city as well as in and out of the trade (or the *termas*). As some of the clients and sex workers have mentioned to me: once you have tried this work, it will always remain an option in the future. Future studies should study the movement of these sex workers both within the city and in the trade as these differences contribute to even more diverse interpretations of sexual meanings and identities (e.g., Parker, 1999). Future research should also examine similar *termas* with female sex workers to examine how gender roles play out in those sites. In addition, future studies should examine how the sexuality of transsexual/transgender sex workers adds to the nuances of how sexuality and gender roles are configured in Brazil. These groups were not in the current study as they were mainly there as stage performers in part because their presence either as sex workers or clients was discouraged.

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ORIGINAL PAPER

Consistency of Self-Reported Sexual Behavior in Surveys

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Abstract Accurate data on sexual behavior have become increasingly important for demographers and epidemiologists, but self-reported data are widely regarded as unreliable. We examined the consistency in the number of sexual partners reported by participants in seven population-based surveys of adults in the U.S. Differences between studies were quite modest and much smaller than those associated with demographic attributes. Surprisingly, the mode of survey administration did not appear to influence disclosure when the questions were similar. We conclude that there is more consistency in sexual partnership reporting than is commonly believed.

Keywords Sexual behavior · Epidemiology · Partner number · Sex surveys

Introduction

For most of the last century, demographers were the only social scientists that routinely and unobtrusively collected data on sexual behavior in population based surveys. The importance of fertility in the demographic paradigm provided the justification needed to conduct empirical studies of this sensitive topic. With the rapid emergence of incurable life threatening sexually transmitted infections (STIs) like HIV, there is now a broader interest in sexual behavior research to support public health. As a result, data on sexual behavior are now collected more often and in more disciplinary contexts. Once a rare and controversial topic of study, sex has become sufficiently mainstreamed that it is now a routine item in surveys like the General Social Survey (GSS) and the National Health and Nutrition Examination Survey (NHANES).

The renewed scientific interest in this information has again focused attention on the reliability and validity of self-reported sexual behavior. Data on sensitive behaviors are generally regarded as prone to various forms of misreporting (Weinhardt et al., 1998a) and self reports of sexual behavior are thought to have particularly low reliability and validity, especially in the context of risk for HIV (Brody, 1995). Embarrassing or socially stigmatized behaviors like sex are subject to a wide range of reporting problems in surveys (Bancroft, 1997; Bradburn, 1983; Catania, Gibson, Chitwood, & Coates, 1990; Fenton, Johnson, McManus, & Erens, 2001; Weinhardt, Forsyth, Carey, Jaworski, & Durant, 1998b).

The quality of sexual behavior data is difficult to assess because the private nature of the subject is not conducive to direct observation or proxy measures, in contrast to abortion, for example, where provider records can be used to cross-validate self-reports (Fu, Darroch, Henshaw, & Kolb, 1998). While there is no "gold standard" that can be used to evaluate the accuracy of reports, self-administered questionnaires (SAQ) are widely thought to elicit better data (Gribble, Miller, Rogers, & Turner, 1999; Tourangeau & Smith, 1996). If participants are reluctant to admit to another person that they have engaged in illegal or otherwise embarrassing activities, they may be more forthcoming if they can instead

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disclose it on a confidential form. Studies have also shown that audio computer assisted self-interviewing and computer assisted self-interviewing generally yield higher levels of reporting than does computer assisted personal interviews across a range of items involving sexual behavior and drug use (Jones, 2003; Metzger et al., 2000; Tourangeau & Smith, 1996; Turner et al., 1998).

Another potential influence on reporting is question sequence and response format. Prior items in a survey have been shown to affect responses to later items, since participants tend to eliminate information from their responses if the information has already been captured through previous questions (Schwarz, Strack, & Mai, 1991; Tourangeau, Rasinski, & Bradburn, 1991). For example, if a respondent has been asked about partners in the last year, he or she may subtract those partners in answering subsequent questions about partners in the lifetime. The format of response coding can also affect reporting. When the responses are coded in categories, for example, women tend to report greater numbers of sexual partners if the codes are geared toward higher numbers (Smith, 1992; Tourangeau & Rasinski, 1988). When responses are coded as a continuous variable, participants tend to heap estimates around multiples of 5 or 10, and for values above 20 around 80% of responses are rounded this way (Huttenlocher, Hedges, & Bradburn, 1990; Morris, 1993).

The reliability of self-reports of sexual behavior have been studied for many populations, including gay men (McLaws, Oldenburg, Ross, & Cooper, 1990; Saltzman, Stoddard, McCusker, Moon, & Mayer, 1987), heterosexual men and women (Durant & Carey, 2002; Taylor, Rosen, & Lieblum, 1994; Van Duynhoven, Nagelkerke, & Van de Laar, 1999; Weinhardt et al., 1998a), different racial groups (Sneed et al., 2001), and the mentally ill (Carey, Carey, Maisto, Gordon, & Weinhardt, 2001; Sohler, Colson, Meyer-Bahlburg, & Susser, 2000). The test-retest correlations have been as low as .3 and as high as .9 across these various populations (Catania, Binson, van der Straten, & Stone, 1995). Given the range of correlations, Durant and Carey (2002) suggested that the assessment of sexual behavior might be uniquely difficult to report or particularly difficult to elicit.

While there is a general expectation that participants are reluctant to divulge sensitive information, there is no consensus on the magnitude of misreporting, the variation in estimates across surveys, or the relative impact of the various survey design components on reporting of the number of partners. It is possible that partner number reporting may not be prone to the same biases because it does not elicit the same self-presentation concerns as more taboo sexual behaviors or activities which might be illegal. The purpose of this article is to begin to answer these questions by conducting a systematic comparison of the available empirical data.

We focused on seven population-based surveys that solicited data on the number of sexual partners a person has had in the last year and/or over their lifetime: the General Social Survey (GSS), National College Health Risk Behavior Survey (NCHRBS), National Health and Social Life Survey (NHSLS), National Survey of Family Growth (NSFG), National Survey of Men (NSM), National Survey of Women (NSW), and the Behavioral Risk Factor Survey (BRFS). These surveys were not identical in purpose, design or implementation. However, the samples utilized in these surveys were all population based and they were sufficiently similar that a comparison of their results could shed light on the consistency of sexual behavior reporting and the impact of survey design on the level of disclosure.

There has been some previous work evaluating the sensitive data in a few of these surveys. Jones and Forrest (1992) compared abortion rates reported as part of the NSFG to abortion rate data collected from abortion clinics. The results suggested that fewer than half of all abortions were reported in the NSFG.

This analysis is the first time that these seven surveys have been brought together for comparison. Without a gold standard, we are not in a position to establish the validity of these data. We can, however, show the extent to which responses differ across surveys, after controlling for sample demographic composition, response category coding, year of data collection, and mode of survey administration. This can help to identify the magnitude and sources of variation in self-reported sexual behavior data and provide some guidelines for good study design.

Method

Surveys

Table 1 provides a general summary of the data sets used in this comparative analysis: the GSS, NCHRBS, NHSLS, NSFG, NSM, NSW and the BRFS. There were many differences among these surveys. Some of them had a single, simple question to capture the number of partners, others asked for categories of partners separately (e.g., male and female), while others used a life history calendar approach. There were explicit differences in the sample design and implementation, question sequence, and response categories. These differences required adjustments to permit comparability. In some cases, it was possible to find a lowest common denominator; in other cases, it was not. When the differences proved insurmountable, we conducted separate analyses utilizing subsets of comparable studies. Here, we provide a brief description of these data sets along with a detailed description of the adjustments we made to each (Appendix A provides the specific wording of each question and a general overview of the primary adjustments). In general, we used a simple rule to guide decisions regarding data adjustment and variable construction: for all surveys, we sought to capture the maximum number of distinct partners reported by participants.

Table 1 Overview of the seven population based surveys

Survey	Years	Age	Sex	Interview method	Survey Resp. Rate (%)	Eligible sample	Partners in last year		Partners in lifetime	
							N (coding)	Item Resp. Rate	N (coding)	Item Resp. Rate
BRFS	1996–2000	18+	M/F	Phone	49–63	62,884	59,927	95.3	NA	
GSS[a]	1988–2000	18+	M/F	SAQ	70–82	10,387	9,151 (T)	99.0	8,735	97.2
NCHRBS	1995	18+	M/F	SAQ	60	4,393	NA		4,328 (T)	98.5
NHSLS	1992	18–59	M/F	FTFI and SAQ	79	2,560	2,554	99.8	2,559	100.0
NSFG	1995	15–44	F	FTFI	79	9,970	9,900	99.3	9,776	98.1
NSM	1991	19–41	M	FTFI	70	3,321	3,320	100.0	3,317	99.9
NSW	1991	19–38	F	FTFI	71	1,669	1,669	100.0	1,669	100.0

Notes: All continuous year data were topcoded at 76+ to match the BRFS. For other measures, the (T) for (coding) indicates the original response was recorded with a topcode. Eligible sample size was based on the number of participants who were asked the sexual behavior questions, were in the target age range, and were not missing their demographic information. Item response rates based on refusals and "no answers" in direct and filter questions where appropriate

[a] The GSS collected data on partners since age 18, in 1988, 1991, 1993, 1994, 1996, 1998, and 2000. It is analyzed separately below. See Appendix A for details

General Social Survey

The GSS is conducted by the National Opinion Research Center (NORC) and was designed as part of a program of social indicator research to gather repeated measures on a broad range of data. The GSS used the NORC national probability sample, which includes all non-institutionalized English-speaking persons 18 years of age or older living in the United States. The samples were designed to give each household in the United States an equal probability of inclusion. Participants reported estimates of sexual partners via SAQ. The GSS asked questions about the number of sexual partners in the last year and since age 18 in 1989–1991, 1993, 1994, 1996, 1998, and 2000. Data on the number of partners the respondent had in the last year were also collected in 1988. There were a total of 16,159 participants who reported the number of sexual partners in the last year and 14,847 who reported the number of sexual partners since age 18 (Davis, Smith, & Marsden, 2003). GSS response codes for the number of sex partners in the last year were categorical and topcoded (1, 2, 3, 4, 5–10, 11–21, 21–100, 100+). As a result, when making comparisons between the GSS and other data sources for partners in the last year, we topcoded all studies at the highest common cutoff, 5+. GSS did not collect data on the number of partners in the lifetime, only partners since age 18, but one of the other data sets (NHSLS) collected data on partners since age 18 and we used this for comparison.

National College Health Risk Behavior Survey

The NCHRBS is a section of the Youth Risk Behavior Surveillance Survey conducted by the CDC in 1995 to monitor health-risk behavior among young college students. The NCHRBS used a two stage cluster sample design. The first-stage sampling frame contained 2,919 two and 4-year colleges and universities and the second stage was a random sample of individuals within the selected institutions. Of those eligible, 4,838 completed the questionnaire. Using a mailed SAQ, the NCHRBS asked about the number of male sexual partners and the number of female sexual partners over the lifetime. Each of these questions was top coded at 6. In order to get an estimate of the total number of sexual partners, we summed the responses to these two questions, but retained the topcode of six partners. The NCHRBS did not collect data on partners in the last year (CDC, 1997).

National Health and Social Life Survey

The NHSLS is a survey conducted in 1992 by the NORC. It was designed to be a comprehensive survey of the sexual behavior of adults 18–59 in the United States (Laumann, Gagnon, Michael, & Michaels, 1994). Participants were selected using a multistage area probability sample designed to give each household an equal probability of inclusion. A crossectional sample of 3,159 participants was collected as well as an over-sample of 273 black and Hispanic participants. The study used face-to-face interviews (FTFI) as well as SAQ to collect data on sexual experiences. The number of partners in the last year was asked multiple times in the survey using both modes of data collection. Laumann et al. constructed a categorical aggregate measure for partners in the last year that was based on both the FTFI and SAQ data. For our comparative analysis of partners in the last year, we instead used the data exclusively from the FTFI in order to isolate the effects of data collection method and preserve the continuously coded responses. The number of lifetime partners for the NHSLS participants was not asked directly; instead, there was a set of questions on same sex and opposite

sex partners before age 18, and a detailed set of life history calendar based questions on relationships after age 18. We constructed a lifetime measure following the strategy outlined by Laumann et al. in Appendix 5.2A, though again we excluded data from the SAQ to ensure a clean FTFI based measure. Data on partners since age 18 can be drawn from both the SAQ and FTFI sections of the survey independently allowing us to compare estimates from an SAQ and FTFI within the NHSLS as well as make a cross-survey comparison to the GSS.

National Survey of Family Growth

The NSFG is a multipurpose survey of a national sample of non-institutionalized women 15–44 years-old residing in the United States sponsored by the National Center for Health Statistics (U.S. Department of Health and Human Services, 1997). This analysis utilized data from cycle V of the survey, which was carried out in 1995 using FTFI. The sample for cycle V was a national probability sample of 10,847 women from households that had participated in the National Health Interview Survey (U.S. Department of Health and Human Services, 1997). The survey over-sampled both black and Hispanic women. The NSFG provides data on both the number of sexual partners in the last year and the number of sexual partners over the lifetime. For both questions, the instrument used by the NSFG allowed participants to give estimates in the form of a high and a low boundary if they could not recall an exact number. Only 0.4% (40) of participants could not recall an exact number of partners in the last year and 4.3% (468) of the participants could not recall an exact number for partners in their lifetime. Of the 468 participants reporting high and low estimates, 176 reported estimates that differed by only one partner. To reduce responses to a single variable, we took the mean from the high/low estimates and rounded to the nearest whole partner. There were also two cases reporting more sex partners in the last year then in their lifetime. To adjust for this discrepancy, lifetime partners were set equal to partners in the last year if partners in the last year were reported to be greater then partners in the lifetime.

National Survey of Men

The NSM was designed to examine sexual behavior and condom use among men. The study population consisted of 20–39 year old non-institutionalized men. The sample was based on a multi-stage, stratified, clustered, disproportionate-area probability sample of households within the contiguous United States and included an over-sample of Blacks. The data were collected in 1991 using FTFI, and the survey included questions for both partners in the last year and the lifetime (Tanfer, 1993). For both time frames, participants were asked to report the number of vaginal sex partners and anal sex partners. There is no way to ascertain how many partners were represented in both categories, so we defined the number of partners as the maximum of the two categories, which may be lower than the actual number of unique partners. A total of 586 (19%) of the men reported anal sex. Of these, 18 reported no vaginal sex partners and 35 reported more anal than vaginal sex partners. Finally, there were five cases where the number of partners reported in the last year was greater than the number of partners reported for the lifetime, and for these we coded the lifetime partners equal to the last year.

National Survey of Women

The NSW was also conducted in 1991 and was designed to examine sexual, contraceptive, and fertility behaviors and the factors associated with these behaviors. The sample included 1,669 cases from two sub-samples. The first sub-sample ($n = 929$) consisted of follow-up cases from the 1983 National Survey of Unmarried Women, which surveyed 1,314 never-married women between 20 and 29 years of age. The second sub-sample ($n = 740$) was from a different probability sample of 20–27 year old women of unspecified marital status selected in 1991. Data were collected using FTFI {Tanfer, 1994 #63}. The NSW used a very similar instrument to the NSM, so the same adjustment strategy was used. About 17% of the women surveyed reported having had anal sex. If the number of partners reported in the last year was greater than the number of partners reported for lifetime, lifetime was set equal to the last year. There were only 14 such cases.

Behavioral Risk Factor Survey

The BRFS is a part of the state-based Behavioral Risk Factor Surveillance System initiated in 1984 by the Centers for Disease Control (CDC) to collect data on risk behaviors and preventative health practices (National Center for Chronic Disease Prevention and Health Promotion, 2003). The BRFS used telephone surveys and the questions regarding sexual behavior were part of a supplement started in 1996. States make the decision whether to include the supplement in each year. We used data for the 5 years from 1996 to 2000. The number of states that elected to include the supplement during that period varied from a high of 25 in 1997 to a low of 2 in 1996. The variation made it impossible to aggregate these data into a true national probability sample. The BRFS was also the only telephone survey in our comparison. We therefore ran all of the analyses with and without the BRFS in order to mitigate the impact it may have. The BRFS only included a question about partners in the last year so it was only included in a handful of our analyses. We did not want to exclude the BRFS entirely, however, because of the amount of data it provides

($n = 72{,}280$). The variable for the number of sex partners in the last year was topcoded at 76+. There were three participants reporting the topcoded value. As the number was similarly small for other surveys with continuous response coding, we topcoded all data for sex partners in the last year to 76+ in our analyses of the continuous response data.

Sample Composition Indicators

To account for differences in sample demographic composition, we used four primary demographic attributes: race, age, sex, and marital status. The demographic variables were recoded into categories dictated by lowest common denominator. For comparisons, race was collapsed to White, Black, and Other; marital status was collapsed to Married, Divorced-Widowed-Separated, and Never Married; and age was collapsed to 18–24, 25–34, and 35–44. Some of the surveys did not include participants of every age within each bin. The sample compositions for each study are shown in Appendix B.

These recoded demographic variables created 27 unique categories within sex. These categories created a demographic index which was used to control for basic differences in sample composition of the surveys. Differences in reported numbers of partners by the primary demographic attributes (sex, age, race, and marital status) were also used as a comparison metric for evaluating the differences observed by study.

Statistical Analysis

The analytic strategy we employed had two steps. The first step used exploratory data analysis to obtain a general picture of the aggregate differences in reporting across surveys. Data weighted by their original survey weights were used for this part of the analysis. The results represent what researchers would obtain if each study were analyzed separately, and what a simple comparison of published findings from these studies might show. In the second step, we use ANOVA to determine if the study or interview method had an independent effect on the reported number of partners after controlling for sample demographic composition. The data used for the ANOVA were weighted using the same post-stratification weights used in the exploratory data analysis with one small difference. To adjust for changes in the demographic composition of the sample population at the time the surveys were administered all of the data sets were adjusted to have the same demographic composition as the 2000 U.S. census.

The ANOVA model has indexed terms for demographics and study:

$$Y_{ijk} = \mu + d_i + s_j + \varepsilon_{ijk}$$

$i = (1,\ldots,26)$ demographic index category within sex,
$j = (1,\ldots,6)$ adult study identifier,
$k = (1,\ldots,n_{ij})$ respondents in demographic category i of study j

Note that this is equivalent to a regression model with a set of dummy variables for demographic index and study.

The outcome variable was either the reported number of partners in the last year, the reported number of partners in the lifetime, or (for one specific analysis) the reported number of partners since age 18, and the analysis was performed separately by sex for each response coding of the outcome variable (continuous or top-coded). Each model was based on subsets of comparable data, and the comparability criteria are discussed below. Essentially, this analysis pools the datasets, cross-tabulates them by the demographic index (row) and study ID (column), and tests for study effects within demographic groups using the adjusted column sum of squares (SSQ), s_j in the equation above.

We focused on the SSQs and F-ratios from the ANOVA table because our analytic goal was to evaluate whether the variations in reporting between studies was "large." The traditional ANOVA table output, decomposing the total SSQ into the contributions of study effects and demographic variation, was well suited to this question. ANOVA provided metrics for evaluating both the statistical significance and the substantive importance of the study effects.

Substantive importance was assessed in several ways: by assessing the magnitude of the adjusted study mean differences in percentage terms, by comparing the variance associated with the studies to the variance associated with the demographic attributes, and by graphical assessment of systematic discrepancies. When functions of the SSQ were compared, the sequence of terms entered into the model was demographics first and study ID last.

Determining the statistical significance of the observed differences across studies required a different approach than the traditional F-tests used in ANOVA and regression for variance components. Traditional tests compare the F-statistic observed in the data to an F-distribution with appropriate degrees of freedom, and the validity of the tests depends on a number of assumptions. Validity is threatened in our case by both the right skewed distribution of our response variable, which leads to inflated estimates of significance, and the complications induced by multiple survey designs. Statistical significance was therefore assessed using a permutation test—a resampling method like the bootstrap or jackknife. Resampling methods are widely used in statistics when the distribution of the sample test statistic is unknown. The specifics of the test are discussed below, but in essence, it replaces the standard reference F-distribution used to assess the probability of an observed F-statistic, with a "permutation distribution" of F-statistics generated from the data by randomly reassigning participants across studies (Good, 1994).

The permutation tested the hypothesis that the observed *F*-statistic for the study effect was larger than one would expect by chance, given the sample sizes and compositions of the studies. The *F*-statistic was first computed for the observed data. To construct the permutation distribution, observations within demographic strata were randomly assigned a study ID (permuted), the *F*-statistic was recomputed, and this process was repeated 1,000 times until a distribution of *F*-statistics was obtained. The *p*-value for the observed *F*-statistic can be estimated from this permutation distribution; it is simply the rank of the observed *F* divided by 1,000. This *p*-value tells us how likely the observed study differences are to have happened by chance, given the data in our studies. If all possible permutations were calculated, this would be an exact probability, but a full permutation would require an excessive number of computations in this case. The test remains exact to 1 divided by the number of permutations.

When the individual observations were permuted across study ID certain constraints were imposed: observations remained within their demographic category, and the number of observations in each study x demographic category cell for each permutation remained fixed. As a result, the permutation left many things unchanged: the study N's, the sums of squares and *df* associated with the demographic index, and the *df* for the study effect and the residual variance. The permutation isolated and systematically varied only the sum of squares due to study ID and the residual sum of squares. The ratio of these mean squares in turn defined the *F*-statistic for study.

This permutation approach makes one assumption: the assumption of "exchangeability." Individual observations are treated as though they could come from any study that included their demographic group. Put another way, this assumes our observations are independent and identically distributed (*iid*). Due to differences in sampling designs across studies, we know these observations are not *iid*. Part of the difference is due to sample weights (due to both stratified sampling and post-stratification adjustment). We address this by creating self-weighting samples from each study. Self-weighted samples were generated by re-sampling observations with replacement from each study, with a probability defined by the study sample weights. The final self-weighted samples were constrained to have the same N, the same cell means for each demographic strata, and the same *F*-statistic for study ID as the original weighted samples. The other part of the difference is due to clustered sampling (used in some but not all of these studies). We did not control for that here, but the effect was to make our tests more conservative. By ignoring the clustering, our sample Ns overstated the effective Ns, and we were more likely to reject the null. In this case, accepting the null—that there were no significant differences between studies—was the finding of interest. So our test is conservative.

Several variations in study design made it necessary to restrict comparisons to subsets of similar studies. Three factors defined the comparable subsets: outcome measurement scale (continuous vs. topcoded responses), sample sex distribution (male only, female only), and data collection method (telephone, FTFI, SAQ). While only some of the studies were topcoded by design, continuous response data could be treated as topcoded, so we compared all surveys in the "topcoded" analysis, with the continuous responses topcoded to the lowest common denominator. For the subset of studies with continuous response coding for partners in the last year, the measure was actually topcoded at 76 for comparability with the BRFS. Some surveys were sex specific, so we conducted separate analyses for studies with males and studies with females. We also ran analyses excluding the BRFS, because it was the least likely to be representative and it had the largest sample (over 68,000 cases). The net result was 24 separate analyses across study subsets (3), outcomes (4), and sex (2).

Once the study effects in these comparable subsets were identified, we examined, where possible, whether the differences were associated with variations in interview method. For that analysis, the seven surveys were divided into FTFI, telephone, and SAQ groups. There were not enough replicates to provide a robust comparison of all three modes. The data did, however, permit a detailed within-study/between-method and within-method/between-study analysis of FTFI and SAQ for two surveys where the outcome response was partners since age 18.

Results

Comparisons of the unadjusted mean number of reported partners, and overall frequency distributions, showed clear but not large differences across the surveys. Figure 1 shows the results for partners in the last year and Fig. 2 shows the results for lifetime partners (with the exception of GSS, noted below). These figures represent what researchers would obtain if each study had been analyzed separately: that is, the data have been adjusted by their within-survey weights, but not adjusted for differences in sample composition across surveys.

The unadjusted frequency distributions shown in the figures were very similar, in some cases nearly identical. The subtle differences that did exist were enough to suggest statistically different overall means, as can be seen in the error bar plots. The nominal confidence intervals in these figures assume a normally distributed response variable, however, so they do not accurately represent statistically significant differences.

One of the differences evident in the figures was the heaping on round numbers for lifetime partners. The only survey that

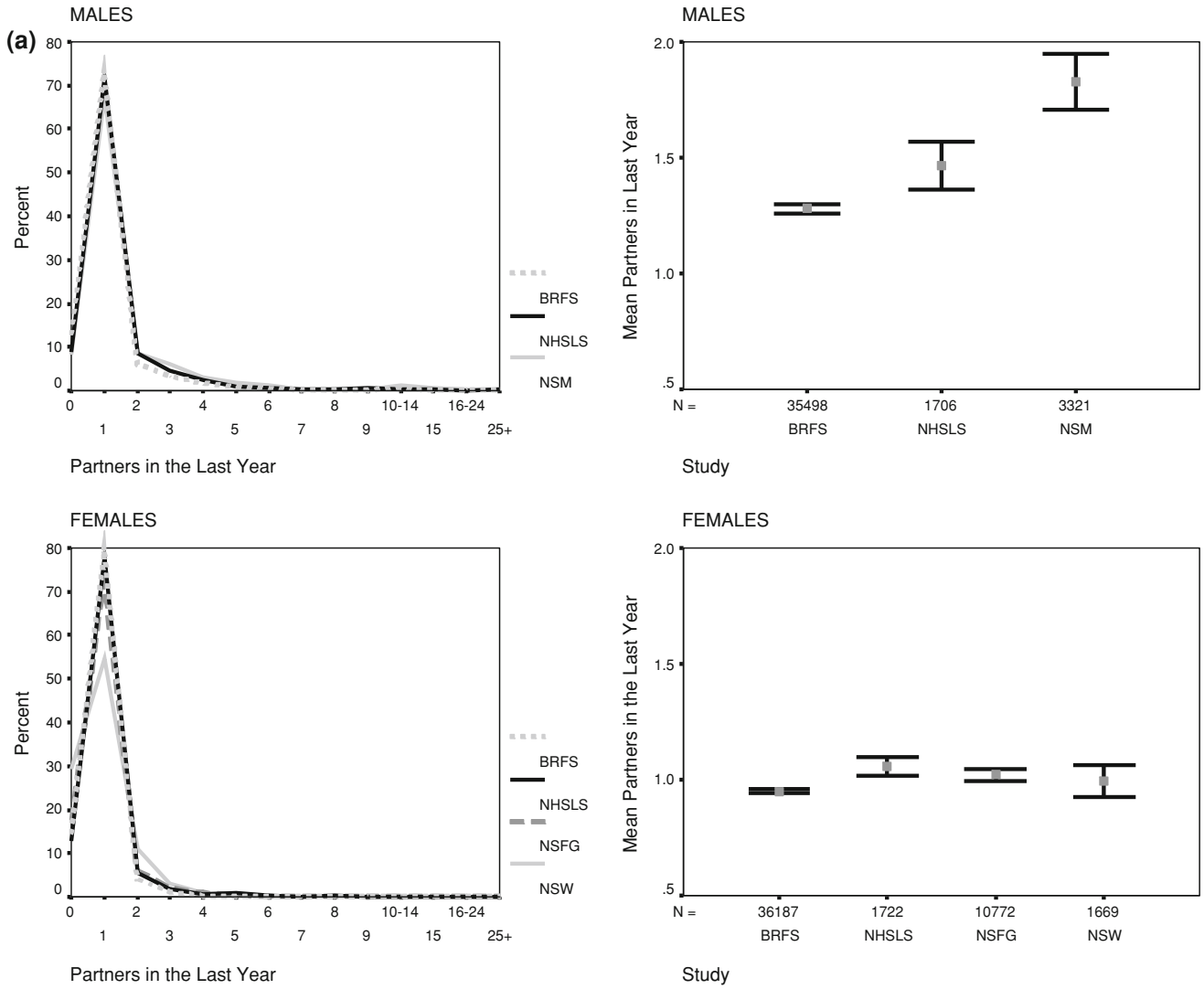

Fig. 1 Reporting number of partners last year by study, sex and response coding. **a** (continuous), **b** (topcoded). *Note*: Data weighted by original study weights, but not adjusted for differences in sample composition. Frequency distributions are shown on the left, means and nominal confidence intervals on the right

did not show this was the NHSLS, and that was because the measure from this survey was based on summing a set of detailed life history calendar based questions, rather than one or two summary questions. Interestingly, however, the NHSLS distribution appeared to be a smoothed version of the heaped data from the other surveys, suggesting the two approaches did not produce fundamentally different results. The detailed NHSLS questions did elicit a slightly higher number of partners overall, however, for both men and women. This can be seen in the error bar plots, and this remained true after adjusting for sample composition in Table 2.

The means for the GSS are shown in the panels for lifetime partners for convenience, but they are based on partners since age 18, not the lifetime. The GSS means were expected to be lower than the other studies, and this is what was found. For partners in the last year, which were comparable across surveys, GSS was on the low side for Fig. 2b, but was in the middle or higher range once adjusted for sample composition in Table 2.

The means from the BRFS, which only has the measure for partners in the last year, were also consistently below the other surveys. In this case, however, there was no a priori reason to expect lower means. As noted above, the BRFS was the least likely to be representative of the U.S. population, and the only survey to use a phone interview.

For the most part, the differences in Table 2 were moderate. The largest differences were on the order of 0.3 partners for the year measure, and 0.9 (but more variable) for the lifetime measure. The single largest difference was two partners (about 13%), for the lifetime continuous measure for males, though there were only two studies with this measure. The SDs were

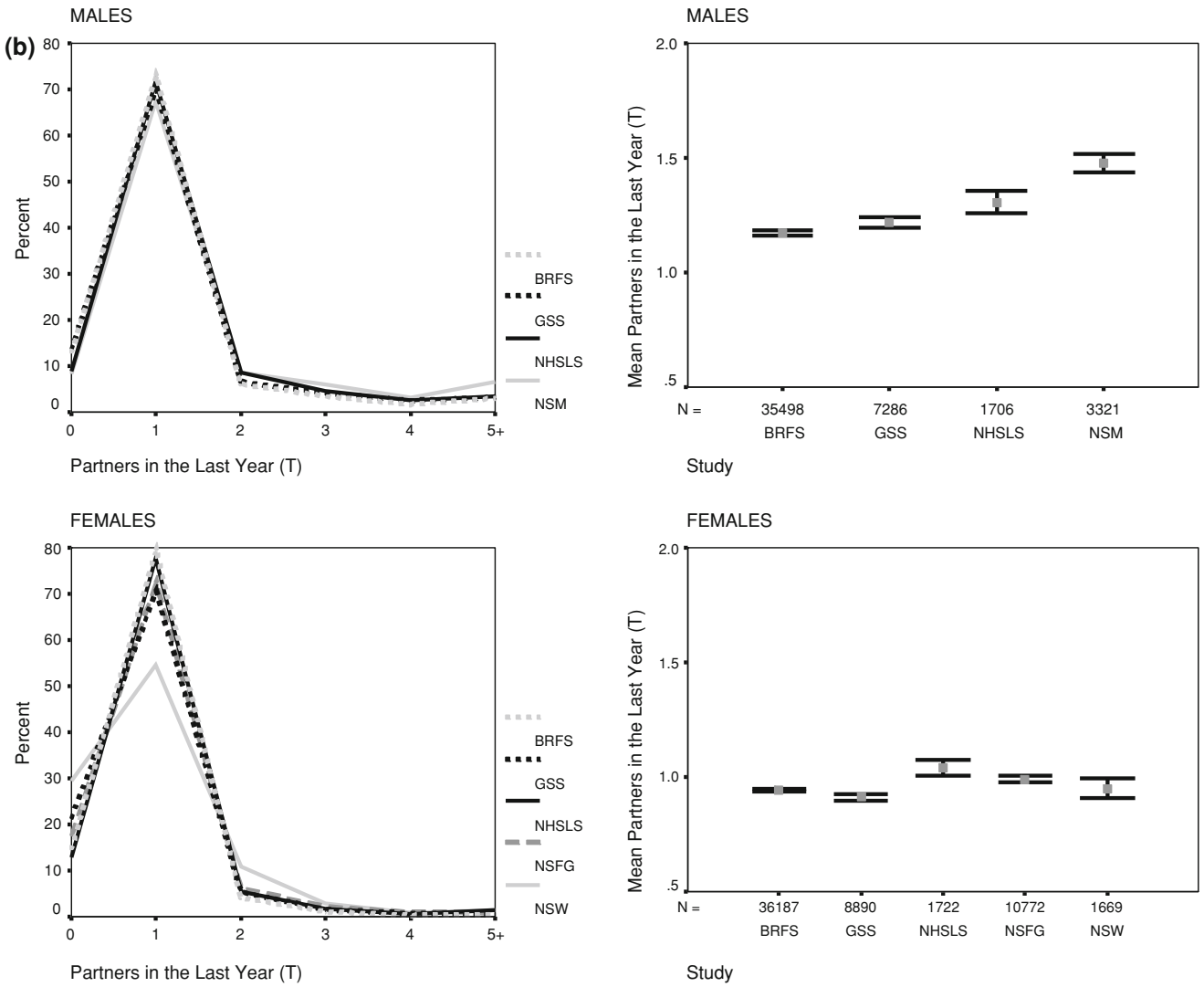

Fig. 1 continued

0.1 and 0.6 for the year and lifetime measures, respectively, and ranged from 3% to 15% of the overall averages.

After controlling for differences in sample composition, significant differences in reporting by study remained in six of the eight gender-by-outcome comparisons. These results are shown in Table 3. This table presents the results of the sequential progression through the data sources. In each step the data sets included were further restricted to surveys that had the most in common. We began by including all of the data, then the BRFS was excluded, and finally only studies that used FTFI were included.

Across all studies, there were no significant differences in the mean number of lifetime partners reported when the response was coded as a continuous variable, and this was true for both males and females. The observed F-statistic for these measures was in the center of the permutation distribution, the p-values were .58 and .31, respectively, so about what one would expect by chance.

For the remaining comparisons using all studies, the observed F-statistics were more than 40 times larger than the 5% threshold. When the BRFS was excluded, differences in male reports of partners in the last year were marginally significant for the remaining studies, with p-values of .05 for the continuous response and .09 for the topcoded response. Significant study differences for the female reports persisted, though they were also smaller. Restricting the analysis to surveys that used FTFI did not change the significance of the remaining differences, suggesting that survey administration mode was not responsible for these significant study effects. By this point, however, only four of the eight outcome measure by sex differences were statistically significant below the .05 level.

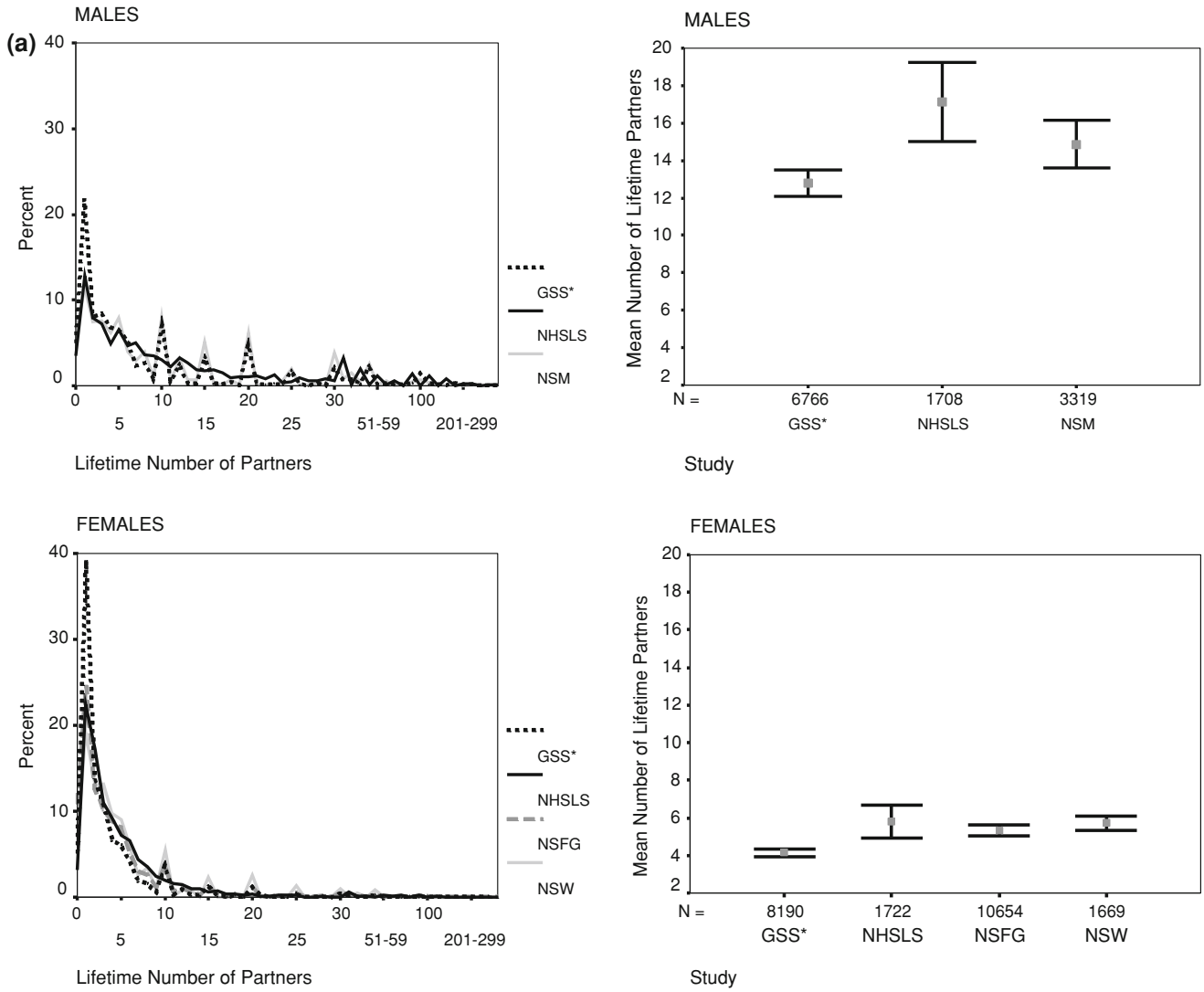

Fig. 2 Reported number of partners in the lifetime by study, sex and response coding. **a** (continuous), **b** (topcoded). *Note*: GSS reports partners since age 18, not lifetime. Data weighted by original study weights, but not adjusted for differences in sample composition. Frequency distributions are shown on the left, means and nominal confidence intervals on the right

The differences that remained after adjusting for sample composition were typically quite small, as suggested by Table 2. They were statistically significant because the amount of data in the studies used here gives the tests the power to detect even small differences in the means with a high certainty. It is worth considering other metrics, then, to evaluate whether the differences between studies are large or meaningful.

Table 4 compares the study effects to the main effects of age, race, and marital status, using the ratios of the MSE to adjust for differences in degrees of freedom. This ratio was well above 1 in 22 of the 24 comparisons. Across all the different outcome measures, comparison sets, and sex, the median effect of age was about 4 times larger than the study effect, the race effect was 3 times larger, and the marital status effect was 6 times larger. Excluding the BRFS strengthens the results: both instances of the study effect being larger than a demographic effect (marital status, for women) were reversed, and the relative sizes of the demographic effects were dramatically increased for men. In the FTFI-only comparison (which eliminates only GSS in the last year measure), the MSE ratios were all above 1 for both sexes. Note that, even though study differences remained statistically significant for women in this comparison, the median demographic effect was about 6 times larger. For men, the demographic effects were about 28 times larger than the residual study differences.

The study effects accounted for virtually none of the variance in partner reports. This can be seen at the end of the "All Studies" section at the top of Table 4. The fraction of the variance explained by study ranged from 0% to 1.3%, on the order of 10 times less than the variance associated with sample demographic composition. While the fraction was

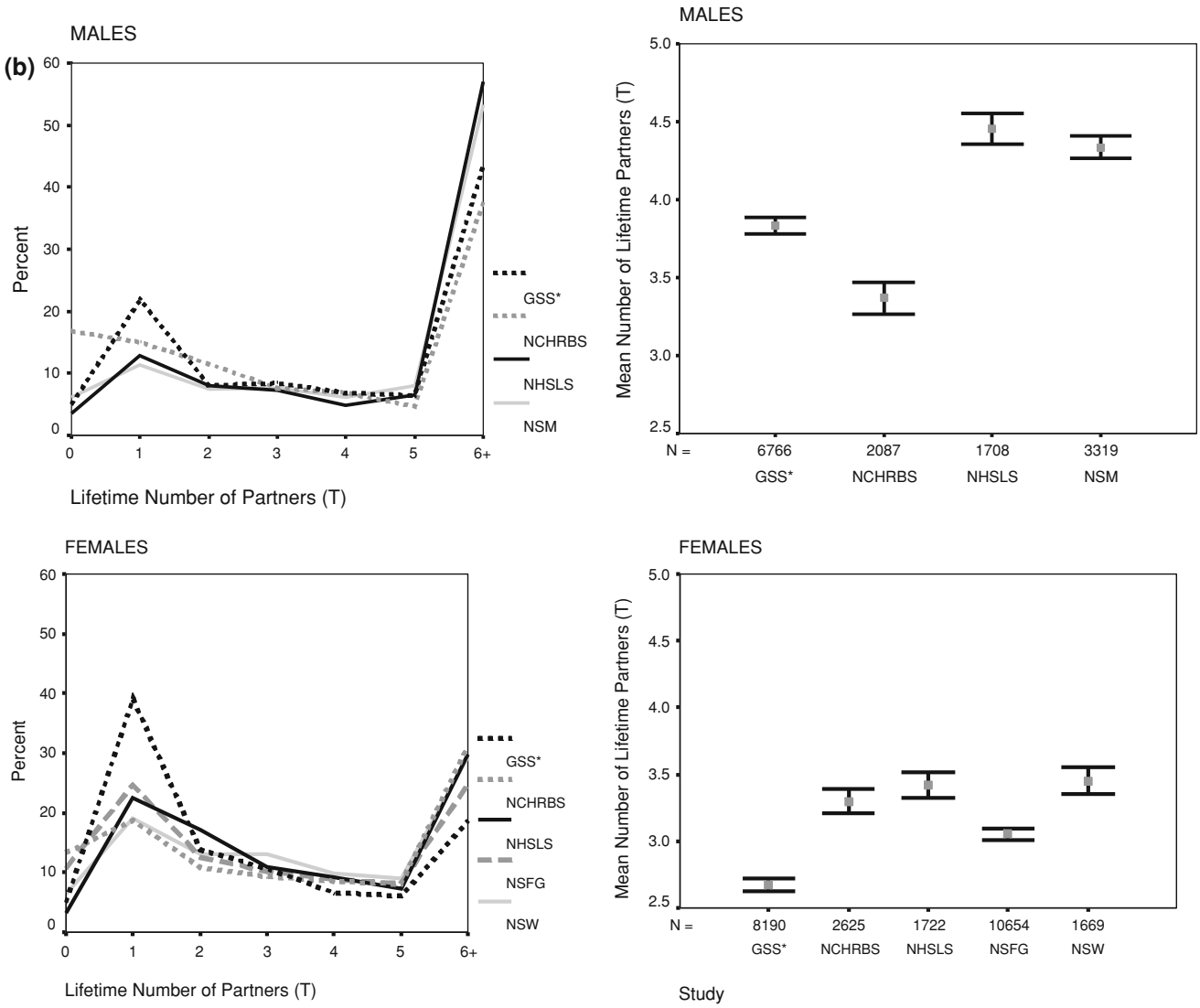

Fig. 2 continued

small for both, indicating substantial residual heterogeneity, demographics accounted for substantially more of the variance than study for all measures.

These results suggest a remarkable degree of consistency across studies and indicate that substantially more of the variance within and between studies was attributable to demographic characteristics.

Mode of Administration Effects

Adjusting for these demographic variations in sample composition helped to isolate the residual differences due to reporting, but the similarity in the results for the FTFI-only comparisons, and the comparisons with the other non-BRFS studies, suggested that the mode of survey administration may not account for much of this. This was somewhat unexpected, so we took a closer look to see if the finding was robust. The natural approach for testing the mode of administration effect would be to include a dummy variable in the ANOVA for mode and test it for significance, but there were not enough studies to provide sufficient replicates for a good test. Three studies used FTFI (NHSLS, NSM/NSW, NSFG), but one of these only had female participants. Of the two studies that used SAQ (GSS and NCHRBS), the former only had data on partners in the last year, and the latter only on lifetime partners, and both were topcoded. The BRFS was the only survey to use telephone interviewing, and it only has data on partners in the last year. Overall, then, there was no robust statistical test possible across all three modes. But the patterns we did observe in the limited three-way comparisons available are worth describing, because the differences were not in the expected direction. Table 5 shows how often, within the 27 demographic subgroups for each sex, the means for the number of partners reported in the FTFI studies were

Table 2 Study means for reported number of partners weighted to 2000 U.S. census demographics by sex and outcome measure

	Outcome measure	Females				Males			
		Last year		Lifetime		Last year		Lifetime	
		C	T	C	T	C	T	C	T
Survey	BRFS	0.96	0.95			1.33	1.20		
	GSS		1.10				1.40		
	NCHRBS				3.70				4.18
	NHSLS	1.13	1.10	5.96	3.63	1.63	1.40	17.24	4.46
	NSFG	1.04	1.02	5.61	3.20				
	NSW/NSM	0.86	0.84	6.49	3.51	1.82	1.47	15.15	4.31
Mean of study means		1.0	1.0	6.0	3.5	1.6	1.4	16.2	4.3
Largest difference		0.27	0.27	0.88	0.50	0.49	0.27	2.09	0.28
SD between studies		0.12	0.11	0.44	0.22	0.25	0.12	1.48	0.14
SD/mean		12%	11%	7%	6%	15%	8%	9%	3%

Note: Bottom row shows the standard deviation between studies divided by the mean of the study means

C Continuous response coding, *T* Topcoded responses

higher than in surveys using the comparison mode of administration.

While one might have expected to see higher numbers of partners reported in the SAQ studies, especially for women, instead we found the opposite: SAQ studies in general produced lower numbers of reported partners. The one exception was among women, for partners in the last year, but even here the FTFI means were higher for about 20% of the demographic subgroups of women, so the SAQ advantage was not universal. The FTFI studies also consistently produced higher means than the one phone survey. Again, these differences were confounded with the effects of specific studies, and, as with all the study differences we observed, they were not large.

We can make one other comparison for FTFI and SAQ, for the outcome measuring the reported number of partners since age 18. The GSS collected data on partners since age 18 with an SAQ, and the NHSLS also collected data on this measure, with both an FTFI and SAQ. The SAQ question wording was nearly identical for the two studies (the wording is shown in Appendix A). This allowed for two effects to be estimated: a method effect (within study, across method) and a study effect (across studies, within method). The method effect was not significant in the permutation test ($p = .33$ and $p = .08$ for females and males, respectively). The study effect was not significant for females ($p = .47$), but was significant for males ($p < .01$). The joint distribution of the subgroup mean reports is plotted in Fig. 3. Within the NHSLS, the consistency in SAQ and FTFI reports was very strong, net of a few outliers for the males. Given that these were the same participants reporting in both modes, it might be expected that the reports would be close. Still, if the SAQ provided an opportunity for greater disclosure, there was no evidence that this encouraged participants to report something different. The bottom panels of the figure show the differences between the two studies when both used SAQ. The significant difference found for males was likely driven by the two unusually high group means for the NHSLS.

Response Coding Effects

Turning to response coding, the topcoded responses were consistently significantly different across surveys, even when the continuously coded responses were not. In the comparisons after removing the BRFS, three of the four remaining significant differences were for topcoded responses. The topcoded analysis pooled all eligible studies: those in which the original responses were recorded with a topcode, and those for which we imposed a topcode post-facto (the different subsets of studies can be seen in Table 2). This may obscure a difference between original and post-facto topcoding. Topcoded response categories may influence the way people report partners, but we did not have enough replicates to test this. In each comparison, we had only one study with an original topcode: GSS for the last year, and NCHRBS for the lifetime.

It may seem counterintuitive that topcoded responses were more likely to be significant than continuously coded responses, since top-coding eliminates the upper tail outliers that would be expected to influence statistical tests. Such outliers have little impact here, however, since the permutation test randomly reassigned them across studies for the permutation distribution. As a result, anomalous variations in the upper tail of the reporting distribution were less likely to induce a significant study effect than systematic variation in

Table 3 Study effect *p*-values from the permutation tests

		Females				Males			
		Last year		Lifetime		Last year		Lifetime	
		C	T	C	T	C	T	C	T
All studies	*p*-value	<.001	<.001	.58	<.001	<.001	<.001	.31	<.001
	Studies compared	BRFS, NHSLS, NSFG, NSW	BRFS, GSS, NHSLS, NSFG, NSW	NHSLS, NSFG, NSW	NCHRBS, NHSLS, NSFG, NSW	BRFS, NHSLS, NSM,	BRFS, GSS, NHSLS, NSM	NHSLS, NSM,	NCHRBS, NHSLS, NSM
Excluding BRFS	*p*-value	<.001	<.001			.05	.09		
	Studies compared	NHSLS, NSFG, NSW	GSS, NHSLS, NSFG, NSW	As above	As above	NHSLS, NSM,	GSS, NHSLS, NSM	As above	As above
FTFI studies only	*p*-value		<.001		<.001		.14		.02
	Studies compared	As above	NHSLS, NSFG, NSW	As above	NHSLS, NSFG, NSW	As above	NHSLS, NSM	As above	NHSLS, NSM

C Continuous response coding, *T* Topcoded responses

the lower tail, where there were many observations. By collapsing variation in the upper tail, topcoding magnified the relative impact of the differences at the lower tail (0 vs. 1). The result can be seen in Appendix C, which shows the fraction of participants that reported 0 and the topcode value for each measure. In general, differences in the 0 fraction were greater for women than for men, while differences in the topcode fraction were smaller. This corresponds to the patterns of statistical significance in Table 3: both of the topcoded comparisons were significant for women, and the one topcoded comparison significant for men had a study with an abnormally high 17% of men reporting 0 partners (NCHRBS, for partners in the lifetime).

Discussion

The number of sexual partners reported in the seven studies examined here initially appeared to be quite different, judging by the unadjusted means plotted in Figs. 1 and 2. On closer inspection, however, few of these differences turned out to be statistically significant or substantively large. We have eight comparisons for these studies, defined by measure (lifetime, last year), coding (continuous, topcoded), and sex of respondent. Overall, across these eight comparisons, study differences accounted for less than 1% of the variation in partner reports. Controlling for sample demographic composition, there were no significant study differences in the reported number of lifetime partners for either men or women when the measure was continuous. Topcoded measures of lifetime partners, however, were significantly different across studies for both sexes. For partners in the last year, there were significant study differences in both the continuous and topcoded measures for both sexes. A single study accounted for most of the difference in men's reports: the BRFS. This was also the only telephone survey and its sampling frame was the least likely to be representative. When we excluded the BRFS, study differences in partners reported in the last year fell to borderline significance for men, but remained significant for women.

Are these remaining significant differences important? The sample sizes ranged from 1,600 to 62,000, so our statistical tests were quite powerful, and we could detect differences of 0.2 of a partner/year as statistically significant. In this context, statistical significance is an excellent guide for inference, but may not be the best guide to substantive importance. The typical differences we observed between study means were on the order of 2–15%. Is this a large difference? By comparison, age, race, and marital status each had much larger effects: together, they accounted for 10 times more variation in partner reports and individually they accounted for a median of 4 times more per degree of freedom used. Compared to demographic effects, then, the

Table 4 Relative effects of demographic attributes versus study effect using MSE ratios

Data sets	Comparison attribute	Females				Males			
		Year		Life		Year		Life	
		C	T	C	T	C	T	C	T
All studies	Age	4.8	3.0	68.4	6.6	1.6	3.3	12.3	3.8
	Race	1.2	1.2	16.3	3.2	1.4	3.2	9.9	3.0
	Marital status	0.7	0.9	313.5	10.3	3.8	7.5	40.4	1.2
Percent of variance due to:	*Sample composition*	*1.9%*	*3.3%*	*3.9%*	*8.9%*	*3.7%*	*7.8%*	*5.0%*	*12.9%*
	Study	*0.2%*	*0.7%*	*0%*	*0.6%*	*0.5%*	*0.8%*	*0%*	*1.3%*
Excluding BRFS	Age	6.4	2.7	As above	As above	4.2	56.9	As above	As above
	Race	3.7	1.5			9.6	33.0		
	Marital status	5.8	3.9			24.4	122.0		
FTFI studies only	Age	As above	2.7	As above	5.2	As above	46.5	As above	13.7
	Race		1.3		3.2		32.7		35.8
	Marital status		2.7		9.9		80.8		46.0

Note: Cells show ratio of demographic attribute MSE to study MSE for each attribute

C Continuous response coding, *T* Topcoded responses

Variance attributable to sample composition and study are shown in italics

Table 5 FTFI reports compared to other modes

Comparison mode	Comparison survey	Measure	How often FTFI study means are higher	
			Males (%)	Females (%)
SAQ	NCHRBS only	Life, topcoded	63	19
	GSS only	Year, topcoded	78	56
Phone	BRFS only	Year	89	70

Note: FTFI surveys include NHSLS, NSFG and NSM/W, as appropriate for each sex. Percentages based on comparing cell means across modes within each demographic index category

study differences were small. Another metric for defining substantive importance is the impact that these differences could have on predicted STI transmission. Here, the picture is less clear since the population level effects of average behavior differences can be highly nonlinear. Small differences in the mean can have a large impact on transmission dynamics, if these happen right at the reproductive threshold and raise R_0 above 1. An average difference of a single partner per year can do this (Morris & Dean, 1994), but recent simulation studies suggest that even differences as small as 0.2 of a partner can have this impact, especially in populations without the typical long right tailed partner distributions (Morris, Goodreau, & Moody, 2007). So, are the differences we find here important? The question should really be "important for what," and the answer to this is, "it depends." They are small in comparative magnitude, but the impact will depend on pathogen-specific transmission probabilities and how close the population level partnership network is to the reproductive threshold.

The factor most consistently associated with significant study differences was topcoding. This did not appear to be due to the influence a topcoded response category had on participants' reports. We know this because one of our comparisons, lifetime partners in FTFI studies, used the same subset of studies in both the continuous and topcoded comparison. The survey methods, question formats, and even participants were identical in this case—the only parameter that varied was the post hoc imposition of a topcode. Yet, the continuous measure showed no significant differences between studies, while the topcoded measure produced significant study differences. Since the topcoded measure was less informative, the fact that it differed significantly across studies may be somewhat less important. It does, however, reflect real differences in the fraction of participants reporting 0 partners, a difference that is lost in the larger variation of the continuous measure. We did not have enough replicates to identify whether there were differences between responses originally collected with a topcoded measure and responses

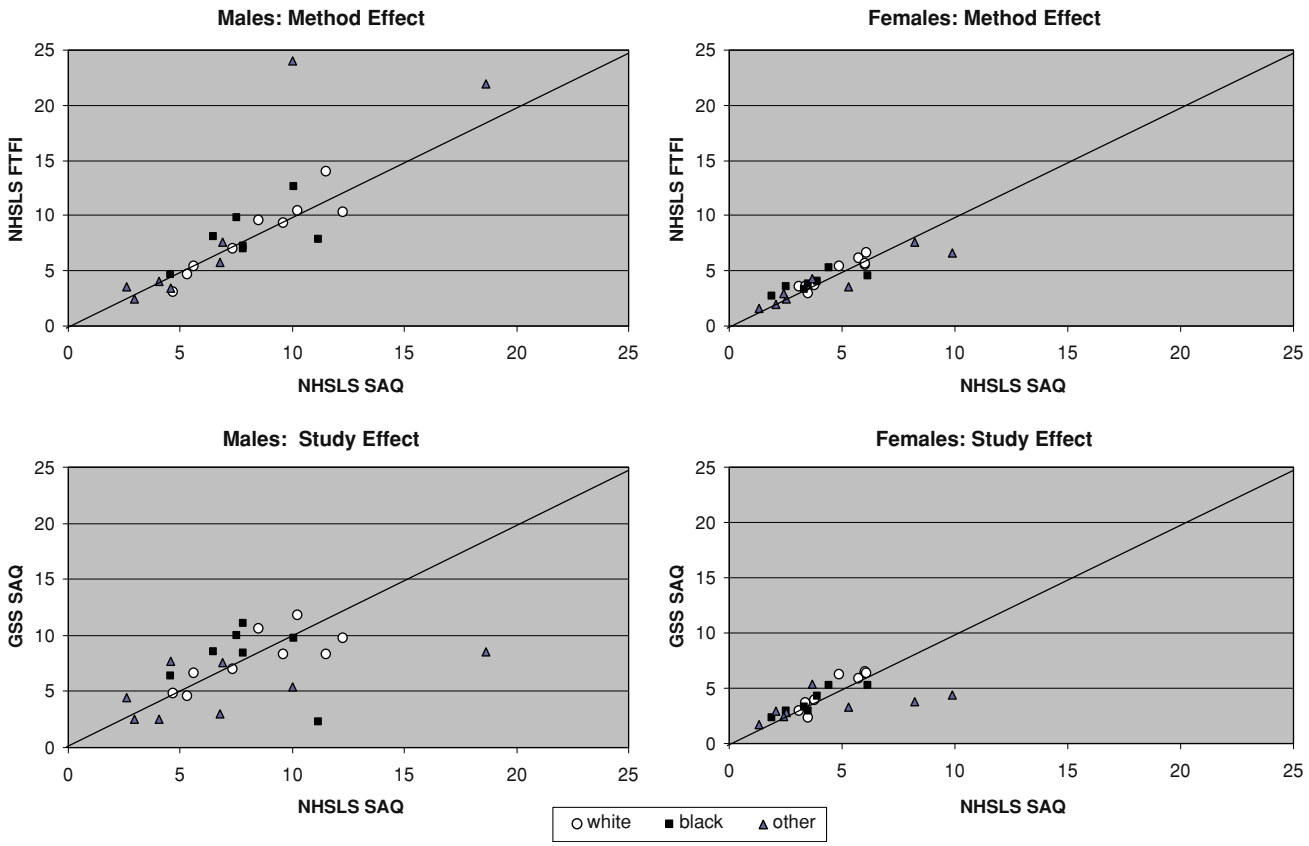

Fig. 3 Effect of method and study on reported number of partners since age 18. *Note*: Each point represents the mean for a demographic group defined by race, age, marital status and sex

topcoded post hoc. Still, we would conclude from this finding that data on the number of sexual partners should be collected with continuous response coding. Topcoding does have the benefit of making surveys easier to keypunch or scan. But both topcoding and categorical coding create problems at the data analysis stage, especially for comparative analyses when the topcodes and categories may vary widely across studies. Both topcodes and categories can be imposed post hoc, so there is much to be lost by topcoding response categories and little to be gained.

The evidence also suggests that mode of administration had little systematic impact on the number of partners that participants report, though we did not have enough studies to conduct a robust statistical test. We found minimal differences between the FTFI and SAQ reports, suggesting that participants may be more willing to disclose this information than previously thought, and that the number of sexual partners may be less sensitive than behaviors like drug use and abortion. A closer look at the existing empirical literature supports this conjecture. The few studies that explicitly considered questions on the self-reporting of sexual partners were consistent with what we found here: there was either no difference in reporting associated with mode of administration (Boekeloo et al., 1994; Durant & Carey, 2000; Scandell, Klinkenberg, Hawkes, & Spriggs, 2003) or higher reporting in the FTFI (Solstad & Davidsen, 1993). The implication would seem to be that both modes produce consistent estimates, so the decision should be based on other grounds.

Overall, these findings indicate a remarkable level of consistency in the reporting of number of sexual partners across different subgroups of the U.S. adult population. With seven population-based studies of U.S. adults reviewed here, this finding has general implications for other similar studies. The limitations that should still be kept in mind are that the detailed results for mode of administration and response coding relied on fewer studies, and all of our studies were from the U.S. It would be unwise to infer beyond the U.S., since cultural norms may vary, and the resources to train interviewers may vary. But our findings provide clear evidence that within the U.S. differences across surveys are small. Consistency is not validity, but if systematic biases do exist, they must be uncannily consistent across 54 demographic subgroups, seven surveys, and at least two interview methods.

Given the differences in target populations, response rates, question wording, study purpose, mode of data collection, and survey organizations, this finding was somewhat surprising. We did not undertake the analysis expecting to find this outcome, and we used several different approaches to see if the results were robust: simple graphics (that stay close to the data), multiple metrics to capture formal and substantive definitions of a "large" difference, and robust statistical methods that did not depend on untenable assumptions. All of the approaches told the same story: the differences across studies were small in magnitude and generally not significant.

This is the first systematic comparison of self-reported numbers of sexual partners across a large group of population-based surveys. The consistency we found adds to a growing set of findings that challenge long-held views about the feasibility and accuracy of self-reported sexual behavior data. That said, it is worth reviewing some of this evidence, as both the public perception of self-reported sexual behavior, and the perception among other scientific fields, tends to cling to the stereotypes.

It is generally believed that people will refuse to answer questions on sexual behavior in surveys (Kolata, 2007; Lewontin, 1995; Smith, 1992). In fact, item non-response rates for sexual behavior questions are often extremely low. As shown in Table 1, 2% was typical, and 5% was the highest non-response for partner reports in all of the studies here. By contrast, item non-response rates for income questions are on the order of 25–30% in the Current Population Survey, which is routinely used as the basis for empirical research and policy recommendations.

There is also a general assumption that biomarkers provide the truth about sexual behavior while self-reports cannot be trusted. This belief ignores the errors generated by imperfect sensitivity and specificity of all biological tests. In large population based surveys (like Add Health, or NHANES), where prevalence of the target condition is low (for example, STDs), even tests with high levels of specificity will generate a large number of false positives. For example, with a sample of 14,000, and a true prevalence of 1%, a test with sensitivity of 94% and specificity of 99.5% will have a positive predictive value of only 65% (that is, 35% of the observed cases will be false positives). This is well understood by the biostatisticians and epidemiologists who employ these tests, but is often ignored in popular discussion. Contrast 35% error to the 2–15% variation in study means for reported partners, and it is again puzzling why self-reported behavioral measures are regarded as more error prone.

Many continue to believe that there are large differences in men's and women's reports of the number of sexual partners. This too is a bit of a red herring. As shown in Morris (1993) using 3 years of the GSS data, almost all of the discrepancy in men's and women's means can be traced to reports in the top tail of the distribution. Among the 90% of participants reporting less than 20 lifetime partners, the ratio of male to female reports drops from 3.2:1 to 1.2:1. These differences may be statistically significant (large sample sizes ensure this), but they are much smaller than most people think.

Finally, it is often claimed that self-reports of sexual behavior are not concordant between partners. In fact, studies that enroll both partners find that reports for recent behaviors (frequency of coitus, types of sex, condom use) tend to be quite consistent, with rates of concordance 75% or higher (Bell, Montoya, & Atkinson, 2000; Harvey, Bird, Henderson, Beckman, & Huszti, 2004; James, Bignell, & Gillies, 1991; Lagarde, Enel, & Pison, 1995; Sison, Gillespie, & Foxman, 2004; Upchurch et al., 1991). With respect to reporting the existence of a sexual relationship, which was the focus of this article, the data suggest concordance may be higher still.

A recent paper shows concordance of over 90% in the reporting of sexual relationships among participants enrolled in a network study (Adams & Moody, 2007). In fact, sexual relationships were more likely to be reported by both partners than social, drug sharing, and needle sharing relations. Participants were also surprisingly accurate at reporting the existence of a sexual tie between two *other* people, with concordance rates of 95%. The participants in this study were a sample of drug injectors, prostitutes, and other persons at high risk, so not a group that one might expect to do well at a task like this.

This does not mean that there is no measurement error in self-reported sexual behavior, but it does suggest that the levels of error may be in the same range as many other survey measures. As is the case with all observational studies, the quality of the data depends on the quality of the study design, the training and performance of the field staff, and the care that has been taken in questionnaire development. It has been pointed out before that this is probably even more important for sexual behavior than for other self reported information (Cleland & Dare, 1994).

The results of this analysis are promising for research that relies on self-reported number of sexual partners. The small differences suggest that data on partner number can be collected effectively using a range of different survey methods and instruments. It also suggests that survey data on sexual behavior may be pooled across studies. Combining data from different sources provides powerful leverage for empirical research, providing larger samples for more detailed breakdowns, extending the range of sampled populations, and allowing detailed microdata to be linked to census or other aggregate population-based survey data (Handcock, Rendall, & Cheadle, 2005). Pooling may also provide a means by which we can efficiently investigate relatively rare events. Our findings suggest that the studies examined here can support a wide range of scientific inquiry in the future.

Appendix A

Table 6 Question wording and adjustments made to the data from seven surveys

Variable	Question for last year	Adjustments for last year	Question for lifetime	Adjustments for lifetime
BRFS	During the past 12 months, with how many people have you had sexual intercourse?	No adjustments. Responses topcoded at 76+. 3 participants reported 76+ partners	NA	NA
GSS	How many sex partners have you had in the last 12 months?	Responses were categorical for values greater then 4 so all responses greater then 4 were coded as 5. This study was treated as topcoded	Now thinking about the time since your 18th birthday (including the past 12 months), how many female partners have you had sex with? (same question asked for male partners)	Constructed by adding number of male partners since 18 and number of female partners since 18
NCHRBS	NA	NA	During your life, with how many females have you had sexual intercourse? (same question asked for male partners)	Constructed by adding the number of male partners in lifetime and number of female partners in lifetime
NHSLS	Thinking back over the past 12 months, how many people, including men and women, have you had sexual activity with, even if only one time?	NA	Detailed questions based on a life history calendar. See Laumann et al. (1994) Appendix C for calculation	For description, contact the corresponding author.
			NHSLS also includes explicit questions on partners since age 18:	
			Now thinking about the time since your 18th birthday (again, including the recent past that you have already told us about), how many female partners have you ever had sex with? (same question asked for male partners)	Constructed by adding number of male partners since 18 and number of female partners since 18
NSFG	During the last 12 months, that is, since (month/year), how many men, if any, have you had sexual intercourse with? Please count every male sexual partner, even those you had sex with only once. (probe for range if R is unable to recall exact number)	Constructed from high-low estimates	Counting all your male sexual partners, even those you had intercourse with only once, how many men have you had sexual intercourse with in your life? (probe for range if R is unable to recall exact number)	Constructed from high-low estimates
NSM	Since January 1990, how many different women have you had vaginal intercourse with? Since January 1990, how many different partners have you had anal sex with?	Constructed from vaginal sex partners in 1990 and anal sex partners in 1990	With how many different women have you ever had vaginal intercourse? With how many partners have you ever had anal intercourse?	Constructed from vaginal sex partners in lifetime and anal sex partners in lifetime
NSW	With how many different men did you have vaginal intercourse since January 1990? With how many different men did you have vaginal intercourse since January 1990?	Constructed as the greater of vaginal sex partners in 1990 or anal sex partners in 1990	With how many different men have you ever had vaginal intercourse? With how many different men have you ever had anal intercourse?	Constructed from the greater of vaginal sex partners in lifetime or anal sex partners in lifetime

BRFS Behavioral Risk Factor Survey, *GSS* General Social Survey, *NCHRBS* National College Health Risk Behavior Survey, *NHSLS* National Health and Social Life Survey, *NSFG* National Survey of Family Growth, *NSM* National Survey of Men, *NSW* National Survey of Women

Appendix B

Table 7 Sample composition for each study

Adult studies		BRFS	GSS	NCHRBS	NHSLS	NSFG	NSM	NSW	Overall	2000 U.S. census
Age	18–24	22.8	21.0	65.6	24.3	22.9	23.2	24.6	22.8	24.1
	25–34	36.8	38.7	21.9	39.2	38.0	50.5	66.1	37.3	35.1
	35–44	40.4	40.3	12.5	36.5	39.1	26.2	9.3	39.9	40.8
Race	White	81.0	79.6	71.8	78.2	79.8	78.4	76.5	80.6	72.3
	Black	11.4	13.4	10.2	11.8	13.7	11.6	16.4	12.3	12.8
	Other	7.6	7.0	18.0	10.0	6.5	9.9	7.1	7.2	14.8
Sex	Male	50.0	46.6	45.4	50.3	–	100.0	–	31.2	50.2
	Female	50.0	53.4	54.6	49.7	100.0	–	100.0	68.8	49.7
Marital status	Married	52.5	52.2	20.3	52.5	54.1	49.4	44.8	53.1	51.2
	Divorced, widowed, separated	11.3	13.3	7.2	11.8	14.3	10.9	10.1	12.4	11.3
	Never married	36.2	34.4	72.4	35.7	31.5	39.7	45.1	34.4	37.5
Total N		62,884	10,387	4,393	2,560	9,970	3,321	1,669	95,184	

Appendix C

Table 8 Proportion of observations reporting zero partners or the topcode value

Outcome:	Partners last year				Partners lifetime			
Sex:	Females		Males		Females		Males	
# of partners:	0	5+	0	5+	0	6+	0	6+
BRFS	15	0	13	3	NA	NA	NA	NA
GSS	21	1	13	3	5	19	5	43
NCHRBS	NA	NA	NA	NA	13	31	17	38
NHSLS	13	1	9	4	3	30	3	57
NSFG	18	1	NA	NA	11	25	NA	NA
NSW/NSM	29	1	8	7	7	29	6	53
Range	13–29	0–1	8–13	3–7	3–13	19–31	3–17	38–57

BRFS Behavioral Risk Factor Survey, *GSS* General Social Survey, *NCHRBS* National College Health Risk Behavior Survey, *NHSLS* National Health and Social Life Survey, *NSFG* National Survey of Family Growth, *NSM* National Survey of Men, *NSW* National Survey of Women

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ORIGINAL PAPER

An Evaluation of the Validity of Thermography as a Physiological Measure of Sexual Arousal in a Non-University Adult Sample

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Abstract Thermography is a promising technology for the physiological measurement of sexual arousal in both men and women. This study was designed to extend our previous college student thermography study findings to an older sample (*M* age = 37.05 years), add an anxiety control group to further examine the specificity of temperature change, and examine the relationship between genital temperature and a continuous measure of subjective sexual arousal. Healthy men ($n = 40$) and women ($n = 39$) viewed a neutral film clip after which they were randomly assigned to view one of four other videos: neutral ($n = 20$), humor ($n = 19$), anxiety provoking ($n = 20$) or sexually explicit ($n = 20$). Genital and thigh temperature were continuously recorded using a TSA ImagIR thermographic camera. Continuous and discrete reports of subjective sexual arousal were also obtained. Results supported the validity of thermography as a measure of sexual arousal: temperature change was specific to the genitals during the sexual arousal condition and was significantly correlated with subjective continuous and discrete reports of sexual arousal. Further development should assess the potential of thermography as a tool for the diagnosis and treatment evaluation of sexual arousal difficulties and for studying sex differences.

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Introduction

Thermography has been shown to be a promising technology for the physiological measurement of sexual arousal in both men and women (Kukkonen, Binik, Amsel, & Carrier, 2007). This technology works on the principle that all matter emits infrared radiation at a level proportional to its temperature. Current thermographic cameras can remotely detect this radiation and provide a continuous temperature reading of the object in focus with an accuracy of 0.07°C. As increased genital blood flow is a marker of sexual arousal, a thermographic camera can indirectly track vasocongestion by measuring changes in genital temperature.

Thermography provides numerous potential advantages over existing instrumentation (for a review of current instrument validity, see Janssen, 2001): (1) thermography does not require any genital manipulation or contact, which may result in either discomfort or in some cases arousal (Kukkonen et al., 2006; Prause, Cerny, & Janssen, 2005); (2) the same instrumentation can be used for both men and women; and (3) thermographic output, temperature, is measured on a known absolute scale, allowing for between group comparisons.

Thermographic cameras were used in the 1980s to measure sexual arousal; however, these cameras were technologically limited in that the temperature measurement had a large margin of error, the cameras could not provide continuous measurement, and were restricted to measuring temperature in one pre-determined area (Abramson & Pearsall, 1983; Abramson, Perry, Rothblatt, Seeley, & Seeley, 1981; Abramson, Perry, Seeley, Seeley, & Rothblatt, 1981; Seeley, Abramson, Perry, Rothblatt, & Seeley, 1980). Over the past

15 years, these problems have been solved and modern variants have been deployed in numerous medical diagnostic situations (Di Carlo, 1995; Ecker et al., 2002; Martini et al., 2002; Parisky et al., 2003; Szabo et al., 2000).

In a first study using modern thermographic cameras to record sexual arousal, we continuously monitored genital and thigh temperature in 58 healthy young men and women (*M* age = 21.16 years) who were randomly assigned to either a sexual arousal, a positive mood inducing arousal condition (humor) or a neutral control condition (Kukkonen et al., 2007). The results indicated that thermal imaging clearly differentiated the sexual arousal condition from the two control conditions, with the camera recording an average increase in genital temperature of 1.75°C during sexual arousal (increases of 3.3°C and 0.86°C for men and women, respectively). Furthermore, there were no significant changes in the non-genital control area, the thigh, indicating that temperature increases were specific to the genital region. Finally, increases in genital temperature were significantly and positively correlated with subjective ratings of sexual arousal (range $r = .51–.68$), and men and women showed similar patterns of temperature change overall, as measured through latency to maximal physiological arousal.

While the results from this first thermographic study were quite promising and provide initial support for the discriminant and convergent validity of thermography as a measure of sexual arousal, there were limitations: (1) our sample consisted of healthy undergraduate students and, as such, the results do not indicate the applicability of this instrument for older populations and clinical settings (external validity); (2) there was no anxiety control condition, which has been the most commonly used stimulus for evaluating the discriminant validity of instruments measuring sexual response (e.g., Both, Everaerd, & Laan, 2003; Laan, Everaerd, & Evers, 1995; Prause et al., 2005); and (3) there was no continuous monitoring of sexual arousal, which provides an indication of concurrent validity and is also one way to examine individual differences in arousal (Brody, 2007; Laan, Everaerd, & Evers, 1995; Laan, Everaerd, van der Velde, & Geer, 1995; Mitchell, DiBartolo, Brown, & Barlow, 1998; Rellini, McCall, Randall, & Meston, 2005; Wincze, Hoon, & Hoon, 1977; Wincze, Venditti, Barlow, & Mavissakalian, 1980).

To correct these problems and further examine the validity of thermography as a measure of sexual arousal, the present study assessed sexual arousal in 79 30–45 year old healthy men and women by remotely recording penile and labial temperature via thermography during a sexual arousal condition, a neutral control condition, a positive mood inducing arousal condition (humor), and an anxiety inducing arousal condition. In addition, a continuous measure of subjective arousal was used to examine the relationship between subjective and physiological sexual arousal. We hypothesized that, similar to the 18–28 year olds, the 30–45 year old participants would demonstrate increases in temperature that were specific to the sexual arousal condition and to the genital region. Furthermore, we predicted that genital temperature would be significantly correlated with both the continuous and discrete subjective measures of sexual arousal. Finally, we predicted that men and women would show similar patterns of overall temperature change.

Method

Participants

Potential participants were recruited through online and newspaper advertisements. Healthy males and pre-menopausal females between the ages of 30–45 years were eligible to participate. In total, 39 women and 40 men took part (*M* age = 37.05 years, *SD* = 4.20). The majority of our sample was of North American origin (59.5%), the remainder identified themselves as either European (15.2%) or from other areas of the world (25.3%; e.g., Asia, Middle East, South and Middle America, Caribbean, Africa). Participants were primarily English speaking (68.4%; French speaking 31.6%) and occupational status varied, with 36.7% of participants identifying as professionals, 27.8% as students, 20.3% working in the service industry, and 15.2% indicating other. The mean years of schooling was 17.08 (*SD* = 3.61) with men having significantly more schooling than women, $t(77) = 2.37$, $p < .05$; men $M = 18$ years, $SD = 3.93$; women $M = 16.13$, $SD = 3.01$. Forty-three percent of participants were cohabiting or married, 32.9% were dating one or more partners, 19% were single, and 5.1% indicated that they were divorced or separated. None of the women were taking oral contraceptives and 66.7% of them were nulliparous.

An additional 21 potential participants were excluded upon telephone screening based on the following criteria: absence of intercourse experience (0 participants), never having seen pornography (4 participants), a history of sexual arousal difficulties or sexual dysfunction of any kind (5 participants), any medication use that interfered with sexual arousal (6 participants), any current major medical and/or psychiatric illness (1 participant), or indication that the menopausal transition had begun (5 participants).

Participants were reimbursed $50 CDN to cover expenses related to their participation in this study.

Measures

Experimental Design and Manipulation

Participants were matched in groups of 8 (4 men and 4 women) for age (±3 years), as well as parity in women, and then randomly assigned to one of four experimental conditions

(neutral, humor, anxiety or sexual arousal), until there was a total of 10 men and 10 women in each film condition. All women were tested during the follicular phase of the menstrual cycle to control for the possible effects of the menstrual cycle on sexual arousal. The follicular phase was estimated by testing women within 12 days of the start day of their menstruation, but only once bleeding had ended (*M* cycle day during testing = day 9). Seven separate audiovisual 15-min film segments were used as stimuli. Two of these segments were shown to all participants and included the following: (1) a neutral video segment that consisted of still images of nature accompanied by calming music to allow for body temperature to stabilize (LaBarge, 2002); (2) a baseline video segment which consisted of a travelogue of the Yukon and Alaska (Glusic, 1994). The other video clips were viewed as part of the experimental manipulation and included the following: (1) a neutral control condition that consisted of a travelogue of the Amazon (Day, Cook, & Wolfe, 2001); (2) a humor control video which was comprised of three separate segments of *The Best Bits of Mr. Bean* (Vertue, Davies, Birkin, & Weiland, 1999); (3) an anxiety control video depicting a mother and her child being attacked by a rabid dog (Blatt & Singer, 1983); (4 and 5) separate male and female oriented erotic film clips depicting consenting adults engaging in a variety of sexual activities, such as manual and oral genital stimulation and penile vaginal intercourse (see Janssen, Carpenter, & Graham, 2003).

Equipment

A TSA ImagIR thermal imaging system provided by Seahorse Bioscience (North Billerica, MA) was used to monitor genital temperature. The sampling interval was set at eight frames per second. The sensitivity of this camera was 0.07°C and it had an operating range from 15°C to 40°C. For men, the camera was placed 1.0 m diagonally left from the participant, at a height of 1.09 m, angled at approximately 30 degrees. For women, the camera was situated directly facing the examination table at a distance of 0.5 m, at a height of 1.09 m and angled at approximately 20 degrees. The camera was not required to be at any specific distance from participants, though greater proximity allows for a more detailed image, and the slight differences in camera placement were necessary to have a clear image of the genital region for men and women. If the camera were to be placed directly facing the examination table for men as with women then, as erection occurred, the tip of the penis would obstruct the view of the rest of the penis.

I-O display systems *i-theater* goggles (Sacramento, CA), connected to a DVD player and laptop computer through a switchbox, were used to display the videos and subjective questionnaires privately to each participant. A standard intercom was used for communication between the participant and female investigator, who was in the adjoining room.

Physiological Measures

As with our previous study, a region of interest on the left labia majora for women and the shaft of the penis for men were used for all analyses. A non-genital control on the upper right thigh served to determine the specificity of temperature change during sexual arousal.

Discrete Subjective Measures

Discrete, Likert-style questions concerning subjective arousal were asked at the outset of the experiment and then following each film via the DVD goggles. Each question was pre-recorded and presented over the headphones with a corresponding scale shown on the screen for participants (see Appendix for list of questions).

Continuous Subjective Measure

In order to continuously record subjective sexual arousal, a Windows-based computer program was developed similar to that of Rellini et al. (2005). This program required participants to use a standard PC mouse to indicate subjective ratings of sexual arousal. Participants noted changes in sexual arousal by clicking on the right mouse button for increases and the left mouse button when they felt decreases in their subjective sexual arousal. Our rating scale was from 0 to 10, with 0 equaling no sexual arousal whatsoever and 10 denoting the most sexually aroused that participants could feel in the laboratory context. The numeric level of arousal was indicated using auditory stimuli presented through a speaker located next to the examination table; each click on the mouse was followed by an announcement of the number that participants had indicated. The computer program recorded the level of subjective arousal every second and an auditory reminder occurred if there was inactivity (no clicking) for a 60 s interval. The familiarity that most participants have with a computer mouse made this device relatively easy to use. Like Rellini et al., we believe that using non-visual stimuli was less likely to distract participants from the videos than previous continuous measures that relied on participants viewing both their continuous scales and their visual sexual stimuli. In addition, our program's ability to remind participants of their level of arousal after 60 s of inactivity encouraged participants to continue using the measure throughout testing.

Procedure

The experiment was reviewed and approved by the McGill University Faculty of Medicine Institutional Review Board; we obtained written informed consent from each participant.

Potential participants contacted the lab via telephone at which point study procedures were explained in detail and a telephone screening was conducted. Eligible participants were then scheduled for testing at our laboratory. When they arrived, the experimenter showed them the testing room as well as the adjoining data collection room. The thermal imaging equipment was demonstrated to them and participants were told that the experimenter would be monitoring their temperature and thermal image throughout testing. Participants were fully informed concerning the purpose of the study and the procedures; however, they were not informed about which experimental condition they were assigned to.

After informed consent was obtained, a brief semi-structured interview was conducted to collect sociodemographic and basic health and sexual health information (for list of questions, see Kukkonen et al., 2007). Once the demographic variables were collected, participants were left alone in the testing room for the duration of the experiment. All communication was conducted over an intercom system with the female research assistant in the adjoining room. Participants were instructed to get undressed from the waist down, and men were asked to sit on the examining table with their legs apart whereas women were asked to lie back and place their legs in knee supports, similar to a gynecological examination. All participants were instructed to put on the DVD goggles to view the videos and questionnaires. The thermal imaging camera recorded temperature for the duration of the experiment. Ambient room temperature was monitored for each participant and was maintained so that there was less than 1°C variation within each testing session (M room temperature = 22.51, SD = 1.67).

The first 15-min neutral video segment was used to allow for skin temperature to adjust and to stabilize (LaBarge, 2002). Following this 15-min period, participants answered questions on subjective arousal, which were presented over the DVD goggles. Subsequent to the questionnaire, all participants were shown another 15-min neutral travelogue, which served as the baseline measure of their temperature (Glusic, 1994). Subjective ratings of arousal were obtained once more through the questionnaire upon completion of the video. The final video sequence presented was either the sexually arousing video, the humorous film, the anxiety film or another neutral travelogue followed again by questions on subjective arousal (Blatt & Singer, 1983; Day et al., 2001; Janssen et al., 2003; Vertue et al., 1999).

Throughout all three videos (stabilization, baseline, and experimental), participants continuously reported their subjective sexual arousal using the mouse. Once all three videos were viewed, participants were instructed to remove the goggles and to get dressed at their convenience. The investigator then met with each participant to discuss the study and answer any additional questions.

Data Analysis

Data analyses were conducted to examine the following hypotheses:

1. genital temperature increases would be specific to the sexual arousal condition;
2. men and women would show no significant differences in temperature change;
3. thigh temperature would remain stable throughout testing for all conditions;
4. discrete and continuously measured subjective sexual arousal would increase only during the sexual arousal film;
5. there would be a significant and positive relationship between genital temperature and subjective sexual arousal for both men and women.

In order to examine temperature differences between assigned film conditions and genders, we averaged genital and thigh temperature separately into three time intervals: (1) temperature during the first 5 min (1–5 min); (2) mid 5 min (minutes 6–10); and (3) last 5 min (minutes 11–15) of each film. A three-way ANOVA with one repeated factor was then conducted on both genital and thigh temperature for each period of recording (baseline and experimental). The independent variables were sex, assigned film condition, and time of temperature recording as the repeated factor. Similarly, to examine differences in the continuous measure of subjective arousal by sexes and film condition, we averaged participants' continuous ratings into the same three time periods as their temperature and then conducted a three-way ANOVA with one repeated factor to determine the significance of these differences at baseline and during the experimental condition. To correct for violations in sphericity, the Greenhouse-Geisser procedure was applied to the repeated measures analyses; uncorrected degrees of freedom, but other corrected values are reported. Trend analyses were conducted following all significant interactions ($p < .05$) from the repeated measures ANOVAs. Trend analysis takes into consideration the shape of the response curves and determines whether there were significant differences between groups in how the dependent variables (i.e., genital temperature and subjective sexual arousal) increased or decreased over time.

To assess duration of responding, analyses were conducted on the latency to maximal genital temperature and latency to maximal continuous subjective sexual arousal. These variables were assessed using univariate ANOVAs with assigned film condition and sex as the independent variables.

To examine baseline levels of subjective arousal, a multivariate ANOVA was conducted on the discrete subjective arousal questionnaire. As it was expected that there would be

little variability in participant responses to each question during baseline, a principal components analysis could not be conducted for baseline levels of arousal. During the experimental condition, however, a principal components analysis with varimax rotation was conducted on the 13 arousal questions common to both sexes (excluding sex specific variables) to determine if a smaller number of stable factors could be used to assess subjective arousal. Using Kaiser's rule, only factors with eigenvalues over 1 were considered significant. Furthermore, a factor was considered reliable only if it had three or more variable loadings above .8. Group differences in stable factors were then assessed using ANOVAs. All significant interactions ($p < .05$) were followed by tests of simple main effects and Tukey HSD post-hoc analyses for ANOVAs. Finally, Pearson's method was used to conduct correlational analyses on the relationship between discrete and continuous subjective sexual arousal, and the relationships between the physiological and the subjective measures of sexual arousal.

Results

Baseline Parameters[1]

In examining genital and thigh temperature across the baseline, analyses indicated that there were no significant differences between sexes or experimental conditions. Furthermore, there was no sex × assigned film condition interaction. Similar to the physiological data, there were no significant differences between sexes or assigned film conditions for both continuous and discrete measures of subjective sexual arousal during the baseline film.

Physiological Measures of Sexual Arousal

Average Genital Temperature

To assess whether changes occurred in average genital temperature throughout testing, a three-way ANOVA with one repeated factor was conducted with sex and assigned film condition as the between subjects variables and time as the repeated measure. During the experimental condition, a significant interaction for Sex × Film Condition × Time, $F(6, 142) = 4.16, p < .01, \eta_p^2 = .15$, and Film Condition × Time, $F(6, 142) = 15.01, p < .001, \eta_p^2 = .39$ (see Fig. 1), was found.

In order to better understand the nature of the significant differences in average genital temperature over time, trend analyses were conducted via contrasts ($p < .05$). These

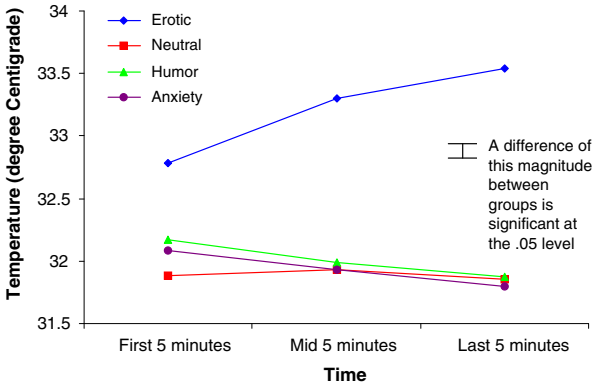

Fig. 1 Average genital temperature for all the participants in the sexual arousal ($n = 20$), neutral ($n = 20$), humor ($n = 19$) and anxiety ($n = 20$) conditions, averaged across the first 5 min, mid 5 min and last 5 min of the experimental condition

contrasts revealed a significant difference in the linear trend for genital temperature in the erotic condition as compared to the three control conditions. An examination of Fig. 1 clearly displays a difference in the shape of the response curves with participants in the erotic condition showing a sharp linear increase in their average genital temperature over time while the three control conditions exhibited little or no change.

To further examine the significant interaction between sex and film condition over time, separate post-hoc contrasts were conducted within sexes and within film conditions ($p < .05$). When examining male participants only, there was a significant difference in the linear trend for average genital temperature that separated the erotic condition from all three control conditions. This difference was accounted for by the increase in genital temperature over time for the participants in the erotic condition and the relatively stable temperatures for those in the control conditions. The same trend comparison for women revealed almost similar results: there was a significant difference in the linear trends for average genital temperature over time that separated the erotic condition from the humor and anxiety conditions, and a trend towards a significance between the erotic and neutral conditions ($p = .057$). Additionally, women in the anxiety condition had a decrease in genital temperature over time that created a significantly different linear trend from the three other film conditions. For both men and women, average genital temperature increased linearly throughout the erotic condition and remained stable or, in the case of the women in the anxiety condition, decreased, during the control films.

Contrasts within film conditions revealed no significant differences in average genital temperature over time between men and women within the neutral, humor or anxiety conditions. During the erotic condition, however, there was a significant linear trend that differentiated the men from the women. An examination of Fig. 2 shows clearly shows that this significant trend was accounted for by the greater

[1] Results from the various F tests at baseline are available from the corresponding author upon request.

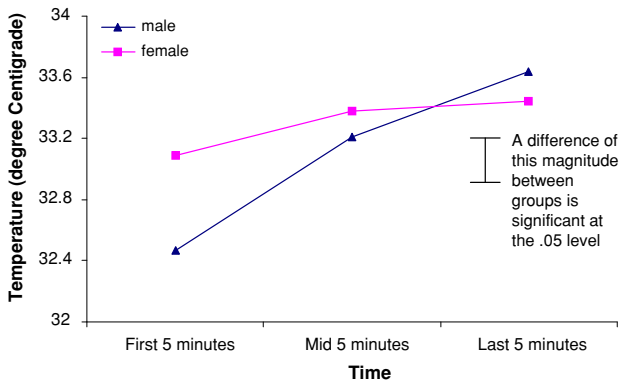

Fig. 2 Average genital temperature for men ($n = 10$) and women ($n = 10$) in the sexual arousal condition

intensity of average genital temperature responding over time for the men than women.

Latency to Maximal Temperature

Latency to maximal physiological arousal, or time to peak genital temperature, provides an indication of the duration of sexual responding. A two-way ANOVA was conducted on time to peak temperature with sex and assigned film condition serving as independent variables. During the experimental condition, there was a significant main effect for Film Condition, $F(3, 71) = 8.54$, $p < .001$, $\eta_p^2 = .27$.

A post-hoc analysis of time to peak temperature ($p < .05$) indicated that participants in the erotic condition took significantly longer time to reach peak temperature ($M = 469.65$ s, $SD = 303.73$) than those in the humor ($M = 150.05$ s, $SD = 188.85$) or anxiety conditions ($M = 149.37$ s, $SD = 199.96$). There were no significant differences between the erotic and neutral conditions ($M = 413.00$ s, $SD = 298.39$). In addition, participants in the neutral control condition took significantly longer to reach peak temperature than participants in the humor or anxiety conditions.

As there were no significant differences in the latency to maximal temperature for sex or sex × film, further analyses comparing men and women on this variable were not necessary.

Thigh Temperature

To determine whether temperature change during sexual arousal was specific to the genital region, thigh temperature was also recorded and analyzed. As with genital temperature, thigh temperature was averaged into three time periods. A three-way ANOVA on average thigh temperature, with sex and assigned film condition as the between-subjects variables and time as the repeated factor, did not reveal any significant interactions.

Subjective Measures of Arousal

Average Continuous Measure of Subjective Sexual Arousal

Throughout each film, participant self-reported sexual arousal was continuously recorded and these data were analyzed using a 2 (sex) × 4 (film condition) × 3 (time) repeated measures ANOVA. There was a significant Sex × Film Condition × Time interaction, $F(6, 142) = 2.87$, $p < .05$, $\eta_p^2 = .11$, and a Film Condition × Time interaction, $F(6, 142) = 12.91$, $p < .001$, $\eta_p^2 = .35$. Post-hoc contrast analyses ($p < .05$) revealed that the erotic group showed significant differences in the linear and quadratic trends of continuously reported subjective sexual arousal over time as compared to the humor and anxiety conditions. In addition, participants in the erotic condition showed significant linear trend differences from those in the neutral condition. An examination of Fig. 3 clearly displays these differences with participants in the erotic condition showing significant increases in their continuous subjective sexual arousal over time while the three control conditions exhibited little or no change. Tests of simple main effects to determine the Sex × Film Condition × Time interaction revealed no significant differences between men and women within each film condition.

Latency to Maximal Reported Subjective Sexual Arousal

To provide a comparison with latency to maximal physiological arousal, an examination of time to peak continuous rating of subjective sexual arousal was conducted. A two-way ANOVA with sex and assigned film condition as the independent variables revealed a significant main effect for Film condition, $F(3, 71) = 6.13$, $p < .001$, $\eta_p^2 = .21$. Post

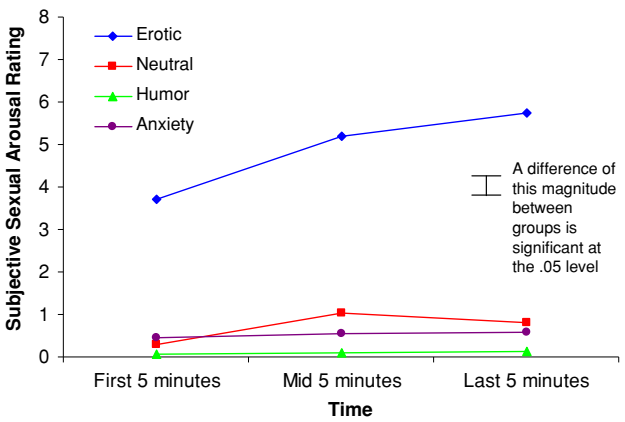

Fig. 3 Average continuous sexual arousal rating for all the participants in the sexual arousal ($n = 20$), neutral ($n = 20$), humor ($n = 19$) and anxiety ($n = 20$) conditions, averaged across the first 5 min, mid 5 min and last 5 min of the experimental condition

hoc analyses ($p < .05$) show that participants in the erotic condition had a significantly longer time to peak continuous sexual arousal rating ($M = 431.90$ s, $SD = 320.25$) than those in the humor ($M = 131.15$ s, $SD = 257.22$) or anxiety ($M = 87.32$ s, $SD = 214.69$) control conditions. There were no significant differences between the erotic and the neutral control condition ($M = 304.70$ s, $SD = 335.74$), and the three control conditions did not differ from each other.

Average Discrete Measures of Subjective Arousal

To assess discrete subjective arousal following the experimental condition, a principal components analysis with orthogonal varimax rotation was conducted on the 13 arousal questions common to both sexes (excluding sex specific variables) which resulted in two stable factors: Factor 1 accounted for 54.23% of the variance and consisted of all eight sexual arousal variables (eigenvalue of 7.21, rotated component loadings range from .76 to .98); Factor 2 (eigenvalue of 2.55) accounted for 16.95% of the variance and consisted of three variables: anxiety (loading of .89), fear (loading of .82), and relaxation (loading of −.77). A third factor was identified and related to humor, but with only two significant loadings, it was not considered reliable. A 2 (sex) × 4 (film) ANOVA analysis conducted on each of the two reliable factors during the experimental condition revealed a significant main effect for Film for the sexual arousal factor, $F(3, 71) = 103.54$, $p < .001$, $\eta_p^2 = .81$, and the anxiety factor, $F(3,71) = 30.30$, $p < .001$, $\eta_p^2 = .56$. Post hoc analyses ($p < .05$) revealed that participants in the erotic condition scored significantly higher on Factor 1 (sexual arousal) than those in the three control conditions. In addition, the participants in the humor group had a significantly lower score on this factor than those in the neutral condition. Regarding Factor 2 (anxiety), participants in the anxiety condition scored significantly higher on this variable than those in the three other conditions. Finally, there was one Sex × Film interaction for the sexual arousal factor, $F(3, 71) = 5.72$, $p = .001$, $\eta_p^2 = .20$, whereby women in the erotic condition had a significantly higher mean score than men.

Influence of Camera on Subjective Sexual Arousal

When asked if the process of recording their genitals affected their sexual arousal, 65% of the participants in the erotic condition responded that it did not affect their arousal; 15% said that it increased and 20% reported that it decreased their arousal (see Table 1). Participant reports of intrusiveness or sexually enhancing effects of the thermographic recording for each condition are shown in Table 1.

Table 1 Percentage of participants who indicated that having a camera film their genitals increased, decreased or did not affect their sexual arousal

Baseline	Increase 22.8% ($N = 18$)	Decrease 8.8% ($N = 7$)	No effect 68.4% ($N = 54$)
Experimental			
Neutral	10% ($n = 2$)	10% ($n = 2$)	80% ($n = 16$)
Humor	10% ($n = 2$)	5% ($n = 1$)	85% ($n = 17$)
Anxiety	10.5% ($n = 2$)	15.8% ($n = 3$)	73.7% ($n = 14$)
Erotic	15% ($n = 3$)	20% ($n = 4$)	65% ($n = 13$)

Relationship Between Discrete and Continuous Subjective Sexual Arousal Measures

To examine the relationship between the discrete subjective arousal questions and the continuous measure, correlational analyses were performed using Pearson's method. Results indicated a significant relationship between the sexual arousal factor from the principal components analysis and each of the three continuous measure of subjective sexual arousal averages (first 5 min, mid 5 min, and last 5 min) with an $r(77)$ of .78, .84, and .88 ($p < .001$) for the first 5 min, mid 5 min, and last 5 min, respectively. Using Fisher's transformation, we determined that there were no significant differences between the correlations for men and women for any of the time periods (first 5 min: $z = -.22$; mid 5 min: $z = 0$; last 5 min $z = .20$).

Relationship Between Subjective and Physiological Measures

Latency to Maximal Self-Reported and Physiological Sexual Arousal

To examine whether there was a significant difference between time to peak continuous subjective ratings of sexual arousal and time to peak genital temperature, a paired samples *t*-test was conducted for participants in the erotic condition. This analysis revealed no significant difference in the time to peak continuous subjective sexual arousal and time to peak temperature during the erotic film.

Correlation Between Genital Temperature and Continuous Subjective Sexual Arousal

To examine the relationship between genital temperature and continuous subjective ratings of arousal, correlational analysis was performed using Pearson's method on the average genital temperature for the first 5 min, middle 5 min, and last 5 min of recording and the average continuous rating for each of these time periods. Average genital temperature and

average continuous subjective sexual arousal were significantly positively correlated for all three time periods (first 5 min: $r(77) = .26$, $p < .05$; mid 5 min: $r(77) = .41$, $p < .001$; last 5 min: $r(77) = .46$, $p < .001$). Furthermore, using Fisher's transformation, we determined that there were no significant differences between the correlations for men and women during the mid 5 minutes ($z = .82$) or during the last 5 minutes ($z = .94$). During the first 5 minutes, however, women's genital temperature and average subjective rating was not significantly correlated whereas it was for the men, $r(40) = .39$, $p < .05$.

In addition to the between-subjects correlations, the continuous measure of subjective sexual arousal and continuous measure of genital temperature allow for within-subject correlations to be conducted for the participants in the erotic condition. By correlating the 900 temperatures (one reading per second for 15 min) with the continuous measure ratings, the correlations were significant for all 10 men in the erotic condition, $r(898)$ range .11–.94, $p < .05$, and for 8 out of the 10 women, $r(898)$ range .15–.94, with three of those correlations being in the negative direction (see Table 2). The two women without significant correlations had no variability in their subjective sexual arousal—one reported a 10/10 for the duration of the video and the other remained at 0/10 throughout testing. To determine whether significant differences exist between genders for these within-subject correlations, an independent samples *t*-test was conducted on the average within subject correlation for men and the average within subject correlation for women. These results showed a trend towards significance, $t(18) = 2.03$, $p = .06$.

Correlation Between Genital Temperature and Discrete Subjective Sexual Arousal Factor

To examine the relationship between genital temperature and subjective ratings of arousal, correlational analysis was performed using Pearson's method on the sexual arousal factor derived from the principal components analysis and the average genital temperature for the first 5 min, middle 5 min, and last 5 min of recording. Average genital temperature and the sexual arousal factor were significantly and positively correlated for the middle 5 min, $r(77) = .38$, $p < .001$, and last 5 min, $r(77) = .46$, $p < .001$, with a trend towards significance for the first 5 min, $r(77) = .20$, $p = .07$. Using Fisher's transformation, we determined that there were no significant differences between sexes for these correlations (mid 5 min: $z = .26$; last 5 min: $z = .75$). When examining within men and women separately, the sexual arousal factor was not correlated with genital temperature during the first 5 min.

Table 2 Within-subjects correlations for the continuous subjective sexual arousal and continuous genital temperature recordings for each participant in the sexual arousal condition ($n = 10$ per sex)

	r									
Male	.11[a]	.46[a]	.51[a]	.65[a]	.70[a]	.72[a]	.81[a]	.84[a]	.93[a]	.94[a]
Female	.00	.05	−.36[a]	−.32[a]	−.20[a]	.15[a]	.84[a]	.85[a]	.89[a]	.95[a]

[a] $p < .001$

Discussion

Results from this study indicated that thermal imaging could clearly detect and differentiate sexual arousal from neutral, humor, and anxiety control conditions in healthy 30–45 year old men and women. Participants in the sexually arousing condition experienced an average increase of 0.74°C in genital temperature from baseline to the erotic condition, as compared to decreases of 0.26°C, 0.44°C, and 0.57°C for participants in the neutral, humor, and anxiety conditions, respectively. In addition, the recorded temperature change was specific to the genitals as evidenced by the stable temperature maintained in the thigh region throughout testing for all participants. Finally, for both male and female participants, discrete and continuous ratings of subjective sexual arousal increased during the sexual arousal condition and demonstrated significant positive correlations with genital temperature.

Overall, these data strongly support the validity of thermography as a measure of physiological sexual arousal for both men and women. Thermography provides an advantage to most previously used measures in that it is not anatomy specific and can, therefore, be used for both sexes. This limits instrumentation artifacts in comparing men and women and enhances the applicability of the methodology. The use of both positive and anxiety arousal control groups in our study also provided strong discriminant validity for genital temperature as a measure of sexual arousal and was in line with previous research using such control groups (Both et al., 2003; Kukkonen et al., 2007; Laan, Everaerd, & Evers, 1995; Prause et al., 2005). Furthermore, the data collected from a non-college age sample allowed us to generalize the methodology to a broader population and supported the results from our previous research (Kukkonen et al., 2007).

While there was likely self-selection bias in terms of the participants that volunteer for such research, this bias is problematic for all studies of sexuality (Janssen, 2001) and we have no reason to believe that our sample was any different from others doing similar research. The significant correlations with subjective measures of sexual arousal provided support for the convergent validity of genital temperature as a measure of sexual arousal. Finally, the inclusion of a measure of instrument intrusiveness provided valuable information on the perceived effect of the camera on sexual arousal and supported the ecological validity of the technique. Very few

studies have examined the effects of instrument intrusiveness on sexual arousal. Prause et al. (2005) found a highly significant correlation between perceived discomfort of both the vaginal and labial photoplethysmographs and their level of interference in attending to films, which suggests that having an instrument that requires no contact would circumvent this distraction. It could be argued, however, that in the case of thermography, having a camera record genital temperature can differentially affect participants with varying levels of dispositional self-consciousness, something that was not measured in this study but should be examined in future research (Meston, 2006; van Lankveld, van den Hout, & Schouten, 2004).

Additional support for the ecological validity of this study was the relatively long presentation of continuous audiovisual sexual stimuli via videos. Recent research comparing subjective sexual arousal during different time intervals and different length video clips have demonstrated that subjective sexual arousal increased with length of film stimuli (Pfaus, 2008; Youn, 2006) and that genital response increased with stimulus intensity (Laan, Everaerd, van der Velde et al., 1995). The continuous 15 min period of explicit audiovisual sexual stimuli used in this study may have allowed for higher levels of sexual arousal that are more akin to the natural pattern of sexual response than shorter time periods. Indeed, visual inspection of the raw temperature graphs demonstrated a leveling off of genital temperature following latency to peak in the erotic condition.

The results from this study were remarkably similar to those of our first thermography study with healthy 18–28 year olds (Kukkonen et al., 2007). Men and women in both studies showed clear increases in temperature during sexual arousal that significantly correlated with their subjective report. Furthermore, there were no significant differences in the time it took men and women to reach peak temperature in either study, suggesting similarity in the pattern of sexual response between the sexes, which is also supported by early work from Rubinsky, Eckerman, Rubinsky, and Hoover (1987). While these overall results replicated our first thermography study, interesting differences did exist. One such difference was the magnitude of temperature change. The 30–45 year old participants had an average increase of 0.74°C during sexual arousal, whereas the 18–29 year olds had an average increase of 1.75°C. This difference in the degree of temperature change supports previous research by Solnick and Birren (1977), who found significant decreases in the magnitude and rate of penile temperature change during sexual arousal between younger and older populations, and could indicate a change in physiological functioning with age, especially considering the similar levels of reported subjective sexual arousal between our age groups. There are numerous reports in the literature of changes in the mechanical and structural properties of human vasculature with aging, and this difference in the magnitude of temperature change during sexual arousal could reflect both the alterations within the endothelium with age whereby nitric oxide production decreases and endothelin production increases, as well as the changes in vessel properties, including vascular smooth muscle hypertrophy and reduction in capillary density that accompany aging (Holowatz, Thompson-Torgerson, & Kenney, 2007; Jani & Rajkumar, 2006; Martin, Loomis, & Kenney, 1995; Schrage, Eisenach, & Joyner, 2007).

Men in the erotic condition showed a significant difference in the intensity of temperature change than the women. The sharper increase in temperature was possibly accounted for by the camera being focused close to the dorsal artery of the penis, which runs through the shaft, and likely increases temperature at a faster rate than the capillaries located throughout the labia majora. Of note is that while men had an initial sharper increase in temperature, women still reached peak temperature at a similar time point, between minutes 7 and 9. This is suggestive of similarities in the overall process of sexual responding. It is possible that the similarities in time to peak temperature were an artifact of differing visual stimuli; however, these results were in line with our previous study whereby men and women both reached peak temperature between minutes 11 and 13. Furthermore, research suggests that showing the same video for men and women may not be ecologically valid (Janssen et al., 2003). It is also possible that the lack of significant differences was due to small sample size; however, a priori power calculations to determine sample size suggest that this was likely not the case.

An examination of subjective sexual arousal revealed that both men and women in the sexual arousal condition reported significantly greater subjective sexual arousal than those in the neutral, humor, or anxiety conditions. Of interest was that the women viewing the sexual arousal film reported significantly greater sexual arousal than the men. Although this difference may be accounted for by differing video stimuli, it is also possible that the men were less comfortable reporting their subjective arousal to the female research assistant. Future research using the same video for men and women, in addition to have same-sex research assistants, would help clarify the source of these differences.

The relationship between women's physiological and subjective sexual arousal has been controversial (Brotto & Gorzalka, 2002; Laan & Janssen, 2007; Rellini et al., 2005). Our study on younger participants, however, demonstrated a significant relationship for both men and women, though not during the first 5 min of testing for women (Kukkonen et al., 2007). Similarly, this sample of 30–45 year olds revealed a significant relationship between genital temperature and the discrete report of subjective sexual arousal for the mid and last 5 min of testing but neither men nor the women showed concordance between these measures during the first 5 min.

Additionally, the magnitude of the correlations appeared to differ between age groups with the younger participants having correlations of .50, .67, and .71 for the first 5, mid 5, and last 5 min of testing, whereas the older group had significant correlations of .38 and .46 for the mid 5 and last 5 min of testing only. This apparent difference in correlation may reflect the differences in temperature change, since the range of temperature increases during sexual arousal for the 30–45 year olds was less than that of the 18–28 year olds. It may also be that experiential generational differences, such as pornography usage, could account for these differences; however, this seems unlikely since rates of subjective sexual arousal were comparable between the different age groups.

When examining the relationship between the average continuous subjective sexual arousal and average genital temperature for the first 5, mid 5, and last 5 min of testing, there was a significant relationship for the men at all three time points but only for the last two time points for the women. It is possible that the initial increase in genital temperature in women did not match their increase in subjective sexual arousal; however, examining the change in average continuous sexual arousal showed that the difference between baseline and the first 5 min of the sexual arousal film was negligible. This discrepancy during the first 5 min of the stimuli may very well represent a natural process whereby a participant's motivation for sexual response was increased gradually through exposure to an explicit sexual stimulus and the first minutes of testing did not provide an adequate time frame for the physiological and subjective responses to correspond. Another possibility is that reducing the continuous subjective and physiological data to one average time point during the first 5 min masked the initial changes that are occurring. Rellini et al. (2005) have suggested that more sensitive data analyses, such as hierarchical linear modeling, are required to properly understand the relationship between physiological and subjective arousal.

In conducting a within-subjects correlation for all 901 continuous subjective arousal and temperature points, we found that all men in the erotic condition demonstrated a significant inter-relationship; only eight out of the 10 female participants had such a relationship. The two women without significant correlations showed no variability in their ratings of subjective sexual arousal with one reporting a 0/10 and the other reporting a 10/10 for the duration of the video. This lack of variability did not allow for correlations to be calculated. In addition, three women had significant negative correlations, which can be attributed to three genital temperature non-responders. For the women who did respond with increases in genital temperature during the sexual arousal film, the correlations were significant, with one having a low correlation ($r = .15$) and the other four having correlations above 0.80. These results were similar to previous research with continuous measures (e.g., Brody, 2007; Rellini et al., 2005). Brody suggested that the variability can be accounted for by intercourse orgasm consistency. Unfortunately, we did not collect this data.

The existence of genital temperature non-responders is an interesting one and merits further investigation. It is certainly not uncommon in the literature to come across non-responders in sexual psychophysiology studies and there in an ongoing debate on what to do with their data (Janssen, 2006). In this sample, we had four female participants and one male participant who did not show increases in genital temperature during the sexually arousing film. Two of the women reported being highly sexually aroused subjectively throughout the presentation of all three video stimuli and thus may have already been at their maximal temperature from the outset, whereas the other two women reported increases in subjective sexual arousal but did not have corresponding changes in genital temperature during the sexual arousal film. In contrast, the only male without increases in genital temperature during the sexually arousing film also had no increases in his subjective sexual arousal. Of interest is that there were no non-responders in our initial study, which provides further support for the idea that there may be an age-related change in vascular functioning accounting for the diminished physiological response during sexual arousal. It is possible that a lack of physiological response in the presence of subjective reports of sexual arousal could be a marker of future sexual arousal difficulties or even general vascular disorders. Indeed, there is a literature linking decreased genital vascular response in men with a higher risk for more generalized vascular disorders, such as coronary arterial disease (Jackson, Rosen, Kloner, & Kostis, 2006; Vlachopoulos, Rokkas, Ioakeimidis, & Stefanadis, 2007). Further examination of genital non-responders is necessary to determine if there is any association with decreased genital response, age, and future vascular difficulties.

Although this study clearly provided additional support for the use of thermography in the physiological measurement of sexual arousal, there were methodological limitations. At present, there is no standardized method for examining the data, which means that the experimenter must visually inspect that the region of interest remains fixed on the same location throughout testing and manually move the region to correspond to movement by the participant. While it is impossible to ensure that the precise location remains unchanged, it is unlikely that minor errors in adjustment would significantly change the results. Another limitation was that while temperature is easily comparable between individuals, it is not clear that a similar numeric change in temperature is directly equivalent in men and women or even in different age groups. It is also not clear how long genital temperature takes to return to baseline after the cessation of a sexual stimulus or how reliable it is between separate testing sessions (Payne & Binik, 2006).

A new study examining labial temperature using a thermistor, however, provided initial support for genital temperature returning to baseline within a 10 min period, making the use of within-subjects designs possible (Prause & Heiman, 2008).

Understanding all of these parameters better would allow for the use of thermography in within and between subjects group designs. Future research on the concurrent validity of thermography, by comparing it to instruments that have been established as measures of sexual arousal, would also be useful. While previous research on penile temperature and penile plethysmography have shown high correlations, there are mixed results for the research on labial temperature and vaginal photoplethysmography (Fisher, Gross, & Zuch, 1965; Henson & Rubin, 1978; Henson, Rubin, & Henson, 1979; Prause & Heiman, 2008; Rubinsky, Hoon, Eckerman & Amberson, 1985; Solnick & Birren, 1977; Webster & Hammer, 1983). Finally, an examination of varying sexual film stimuli and detailed assessment of participant characteristics would provide insight into individual differences in genital temperature responding, in addition to further examining the similarities and differences between men and women.

We believe that thermography has great potential as a clinical diagnostic tool for the assessment and evaluation of sexual dysfunctions, such as erectile dysfunction, female sexual arousal disorder, and persistent genital arousal disorder. In addition, further examination of non-responders may provide useful information in determining markers of reduced vascular functioning. Finally, the ability to directly compare men and women makes this technology an ideal tool for the exploration of gender-specific theories of sexual arousal (Chivers, 2005).

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Appendix

Questions on subjective arousal (scale from 0 to 10 unless otherwise indicated):

Relaxation

1. Overall, how relaxed did you feel during this film?

Enjoyment

1. Overall, how much did you enjoy the film?

Humor

1. Overall, how funny did you find the film?

Anxiety

1. Overall, how anxious did you become during this film?
2. Overall, how frightening was this film?

Sexual Arousal

1. Overall, how sexually aroused did you become during this film?
2. How would you rate your peak sexual arousal?
3. Overall, how sexually aroused were you mentally during this film?
4. Did watching the video make you feel like having sex with a partner?
5. Did watching the video make you feel like masturbating?
6. Overall, how sexually aroused were you physically during this film?
7. How much genital change did you feel during this film?
8. Women only: how much lubrication did you feel during this film?
9. Women only: how much genital tingling or fullness did you feel during this film?
10. Men only: How would you rate your erection in response to this film?
11. At what point during the film would you say that you were most sexually aroused (1) *was not at all sexually aroused;* (2) *within the first 5 min;* (3) *between 5 and 10 min;* (4) *during the last 5 min;* (5) *varied throughout;* (6) *other*)?
12. How sexually aroused did you feel during the film as compared to how sexually aroused you typically are with a partner (*−5 much less sexually aroused* to *+5 much more sexually aroused*)?

Influence of camera on arousal

1. Did the process of having your genitals filmed affect you in any way (Yes/No)?
2. If yes,
   (a) Did it increase or decrease sexual arousal?
   (b) To what extent (*0 not at all-10 the most possible*).

3. If yes,
   (a) Did it increase or decrease how funny you thought the film was?
   (b) To what extent (*0 not at all-10 the most possible*).
4. If yes,
   (a) Did it increase or decrease how relaxed you felt during the film?
   (b) To what extent (*0 not at all-10 the most possible*).

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ORIGINAL PAPER

Category-Specificity in Sexual Interest in Gay Men and Lesbians

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Abstract The present study assessed the category-specificity of sexual interest of gay men and lesbians toward an understanding of the possible interaction of sex and sexual orientation that may exist in this phenomenon. Utilizing viewing time as a measure of sexual interest, we had participants ($N = 99$) rate the sexual appeal of sexually provocative pictures while the amount of time spent viewing each picture was inconspicuously measured. As hypothesized, same-sex oriented individuals demonstrated a category-specific pattern of sexual interest. That is, gay men and lesbians (1) viewed preferred sex pictures (i.e., of same sex) significantly longer than nonpreferred sex pictures (i.e., of opposite sex) and (2) rated preferred sex pictures as significantly more sexually appealing than nonpreferred sex pictures. Additionally, the difference in viewing times between preferred and nonpreferred sexual stimuli was not significantly different for gay men and lesbians, suggesting that lesbians are as category-specific as gay men. The implications of these findings are discussed.

Keywords Category-specificity · Sexual orientation · Sexual interest · Viewing time

Introduction

Sexual arousal and interest are constructs that have long been the focus of research attention (e.g., Chivers, Rieger, Latty, & Bailey, 2004; Kinsey, Pomeroy, & Martin, 1948; Laumann, Gagnon, Michael, & Michaels, 1994). Sexual interest can be defined as the predisposition to respond sexually to a preferred category (e.g., adult females), while sexual arousal generally refers to the psychological, physiological, and behavioral responses to an internal or external target of sexual interest (Chivers, 2005; Geer, Lapour, & Jackson, 1992; Singer, 1984). Sexual arousal is generally considered an indicator of sexual interest (Chivers, 2005).

Sex differences in sexual expression have been a major focus of research (e.g., Baumeister, 2000; Laan & Everaerd, 1995; Laumann et al., 1994; Savin-Williams & Diamond, 2000). Much of the previous research in this area has tended to conclude that sexual arousal and interest of men and women are, at a very basic level, quite different. Examples include the declaration that women's sexuality is flexible, while men's sexuality is static, and that women, but not men, have a bisexual pattern of sexual attraction (e.g., Baumeister, 2000; Lippa, 2006, 2007; Pattatucci, 1998). However, little attention has been paid to investigating how sexual orientation (gay, heterosexual, bisexual) might interact with sex differences (men vs. women) in affecting sexual interest and arousal.

In contrast, research on category-specificity, a newly identified quality of sexual attraction, has recently focused on examining the generalizability of sex differences in sexual interest and arousal across sexual orientations (e.g., Chivers, 2005; Chivers & Bailey, 2005; Chivers, Seto, & Blanchard, 2007; Chivers et al., 2004; Lawrence, Latty, Chivers, & Bailey, 2005; Rieger, Chivers, & Bailey, 2005). Category-specificity is defined as the degree to which sexual arousal/interest is dependent on characteristics of sexual targets portrayed in a category of stimuli (Chivers, 2005).

Heterosexual Sexual Arousal Patterns

Heterosexual men's sexual arousal has been found to be quite category-specific. That is, they demonstrate far greater

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arousal to females than they do to males (e.g., Chivers & Bailey, 2005; Chivers et al., 2004, 2007; Lawrence et al., 2005; Rieger et al., 2005). This holds true whether men's arousal is assessed objectively (e.g., physiologically) or subjectively (e.g., via self-report). Most recently, Israel and Strassberg (2008), using viewing time (VT) as an objective index of sexual interest, found that heterosexual men evidenced much longer viewing times to sexually provocative pictures of women than of men and rated the former much higher in sexual appeal.

In contrast, the findings for heterosexual women are somewhat more complicated. When assessed via vaginal plethysmography (e.g., Chivers & Bailey, 2005; Chivers et al., 2004, 2007; Steinman, Wincze, Sakheim, Barlow, & Mavissakalian, 1981; Wilson & Lawson, 1978), heterosexual women have demonstrated a generally nonspecific pattern of sexual arousal (i.e., no significant difference in their arousal to heterosexual or gay/lesbian stimuli). However, the self-reports of heterosexual women's sexual interest or arousal, as well as their viewing times, have demonstrated at least some degree of category-specificity consistent with their sexual orientation (e.g., Chivers & Bailey, 2005; Chivers et al., 2004, 2007; Israel & Strassberg, 2008; Steinman et al., 1981).

Overall, research indicates that, no matter how assessed, heterosexual men display a much more category-specific pattern of sexual arousal than do heterosexual women. However, we lack a clear theoretical understanding of the sex differences in category specificity.

Non-Heterosexual Sexual Arousal Patterns

Identical to heterosexual men, gay men show a strong category-specific pattern of sexual arousal (e.g., Chivers et al., 2004, 2007; Freund, 1963; Freund, Watson, & Rienzo, 1989; Lippa, 2006, 2007; Sakheim, Barlow, Beck, & Abrahamson, 1985; Wincze & Qualls, 1984). Same-sex oriented women also appear to show a pattern of sexual arousal that is relatively category-specific (i.e., more so than that of heterosexual women) (Blackford, Doty, & Pollack, 1996; Chivers et al., 2004, 2007; Lippa, 2006, 2007; Wincze & Qualls, 1984; Wright & Adams, 1999). For example, Chivers et al. (2007) presented women with a variety of erotic stimuli and assessed physiological and subjective sexual arousal. When presented with stimuli depicting only one person (i.e., masturbating, exercising in the nude), women who reported a predominantly or exclusively homosexual orientation demonstrated a category-specific pattern of sexual arousal (when assessed either through self-report or physiological measurement). However, despite such data, researchers have generally emphasized the main effect of participant sex, rather than its interaction with sexual orientation, in discussing category specificity (i.e., men are category specific, women are not) (e.g., Bailey, 2009; Chivers et al., 2004; Lippa, 2006).

Measures of Sexual Arousal/Interest

Most research on sexual interest or arousal has relied on genital plethysmography and/or self-reports. However, not only do both techniques have well-documented limitations (e.g., Laan, Everaerd, Van Der Velde, & Geer, 1995; Mahoney & Strassberg, 1991), but the different techniques also often appear to yield different degrees of category-specificity for women (e.g., Chivers & Bailey, 2005; Chivers et al., 2004). Researchers have recently begun to examine possible alternative objective measures of sexual interest, including viewing time. Viewing time, a measure of continuous visual attention to an erotic stimulus (Fischer, 2000), has been demonstrated to be a reliable and valid objective measure of sexual arousal. That is, studies have supported that individuals will look longer at their preferred sex than their non-preferred sex, both for heterosexuals and non-heterosexuals (Israel & Strassberg, 2008; Quinsey, Rice, Harris, & Reid, 1993; Wright & Adams, 1994, 1999; Zamansky, 1956).

Viewing time, for both men and women, has several advantages over genital plethysmography as an objective measure of sexual interest. It is less invasive, less susceptible to volunteer bias (Morokoff, 1985; Strassberg & Lowe, 1995; Wolchik, Braver, & Jensen, 1985; Wolchik, Spencer, & Iris, 1983), and it may be less vulnerable to participants' conscious misrepresentation of their sexual interest pattern (Fischer, 2000; Golde, Strassberg, & Turner, 2000; Gress, 2005; Harris, Rice, Quinsey, & Chaplin, 1996; Quinsey, Ketsetzis, Earls, & Karamanoukian, 1996). Most importantly, it allows for direct comparisons of men's and women's sexual interest.

The Present Study

As described above, results from several studies suggest that sex differences in the specificity of sexual interest and arousal routinely evidenced among heterosexuals may not be generalizable to those with a same-sex orientation. The present study examined this possible interaction further. Utilizing a different (perhaps preferable) measure of sexual interest (i.e., viewing time) than previous work in this area, the present study tested the hypothesis that gay men and lesbians will both demonstrate a category-specific pattern of sexual interest.

Specifically, it was predicted that, when presented with sexually provocative (i.e., partially clothed) same-sex and opposite-sex pictures, both gay men and lesbians (H1a) would view same sex pictures significantly longer than opposite sex pictures and (H1b) would rate same sex pictures significantly more sexually appealing than opposite sex pictures.

Method

Participants

Participants, age 18 years and older (men's M age = 24, SD = 4.14, range = 18–33 years; women's M age = 25, SD = 4.40, range = 18–35) were recruited through college campus and city-wide flyers, newspaper advertisements, local online classifieds (e.g., Craigslist), online communities (e.g., MySpace), a local Pride Festival, and from a university psychology department participant pool. Only individuals who considered themselves a 5 (predominantly homosexual, only incidentally heterosexual) or a 6 (exclusively homosexual) on the 0–6 Kinsey Scale (Kinsey et al., 1948) were accepted for this study. A total of 99 individuals were included: 52 self-identified gay men and 47 self-identified lesbians. Participants were compensated $10 for their participation. The measures, stimulus material, and procedures of this study were identical to those of Israel and Strassberg (2008) to which the reader is referred for more detail.

Measures

Participants completed a brief sexual orientation questionnaire via the computer. The questionnaire included items related to current and recent sexual fantasies, behaviors, and romantic attractions (Kinnish, Strassberg, & Turner, 2005). The primary dependent measures consisted of participants' sexual appeal ratings and viewing times for each picture viewed.

Stimulus Material

Stimulus materials consisted of 25 pictures of adult men and 25 pictures of adult women, all chosen from popular magazines, websites, and catalogues. Ten neutral pictures (e.g., lakes and mountains) were also included. For more detail, see Israel and Strassberg (2008).[1]

Procedure

After providing informed consent, participants completed the sexual orientation questionnaire. They then viewed the 60 pictures (25 men, 25 women, 10 neutral), presented in random order, via a computer program that allowed the viewer to forward through the pictures, but not return to previously viewed pictures. Participants were instructed as follows: "We would like you to rate each of the following pictures in terms of how sexually appealing you find the picture to be. Please make your ratings on a scale of 1–7, where 1 is 'not at all sexually appealing' and 7 is 'extremely sexually appealing.' We are interested in your rating of each picture, not how you believe others might rate the picture." Participants were informed that they would be viewing the pictures more than once. The rationale (not shared with participants) for showing each picture twice was to evaluate the reliability of any significant effects found. The second block of 60 pictures was identical to the first block, but was presented in a different, random order.

A computer program (DirectRT v 2004; www.empirisoft.com) tracked participants' viewing times without their knowledge by recording the time required to make their sexual appeal ratings once the picture appeared on the computer screen. The procedure took approximately 25 min to complete.

Results

Viewing Time

Figure 1 shows the mean viewing time as a function of sex and picture type. A 2 (Sex) × 3 (Picture Type: Male, Female, Neutral) × 2 (Trial) mixed-model analysis of variance (ANOVA) revealed a significant Sex by Picture Type interaction, $F(2, 97) = 45.29$, $p < .001$, $\eta p^2 = .32$. The significant interaction was examined further through univariate ANOVAs comparing viewing times for the three picture types separately by sex. Consistent with Hypothesis 1a, gay and lesbian participants viewed same sex pictures significantly longer than opposite sex pictures. For gay men, there was a significant effect for picture type, $F(2, 51) = 40.33$, $p < .001$, $\eta p^2 = .44$: Gay men's viewing times were longest for the pictures of men followed by the pictures of women and the neutral pictures. Post hoc testing (LSD) revealed that the contrast between pictures of men and pictures of women and the contrast between pictures of men and neutral pictures were significant (both ps $< .001$). The contrast between pictures of women and neutral pictures did not reach significance ($p > .05$). For lesbians, there was also a significant effect for picture type, $F(2, 46) = 19.5$, $p < .001$, $\eta p^2 = .30$. Lesbian's viewing times were longest to the pictures of women, followed by the neutral pictures and the pictures of men, with post hoc testing (LSD) showing that the contrast between pictures of women and pictures of men and the contrast between pictures of women and neutral pictures were significant (both ps $< .001$). The contrast between pictures of men and neutral pictures was not significant (see Fig. 1). Of note, a t-test comparing the difference in viewing times between preferred and nonpreferred sexual stimuli was not significantly different for gay men and lesbians ($t = 1.36$, $df = 97$, $p > .17$).

[1] The stimuli are available from the corresponding author upon request.

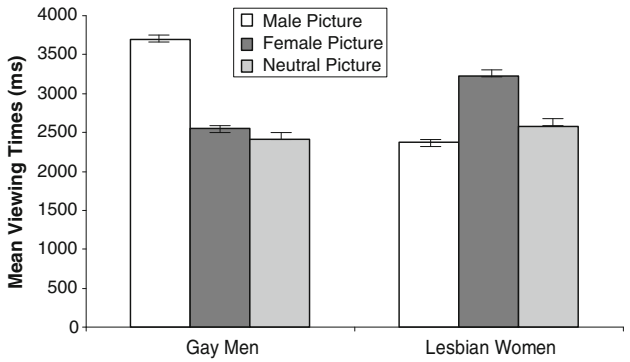

Fig. 1 Mean viewing time (±SE) by participant sex and picture type for gay/lesbian participants

Sexual Appeal Ratings

Figure 2 shows the mean sexual appeal ratings as a function of sex and picture type. A 2 (Sex) × 3 (Picture Type: Male, Female, Neutral) × 2 (Trial) mixed-model analysis of variance (ANOVA) revealed a significant effect for the Sex by Picture Type interaction, $F(2, 97) = 233.64, p < .001, \eta p^2 = .71$. The significant interaction was examined further through univariate ANOVAs comparing ratings of the three picture types separately by sex. For gay men, there was a significant effect for picture type, $F(2, 51) = 217.53\ p < .001$, $\eta p^2 = .84$. Consistent with Hypothesis 1b, gay men's sexual appeal ratings were highest to the pictures of men, followed by the neutral pictures and the pictures of women. Post hoc testing (LSD) revealed that the contrast between pictures of men and those of women and the contrast between pictures of men and the neutral pictures were significant (both $ps < .001$). The contrast between pictures of women and neutral pictures was not significant. For lesbians, there was also a significant effect for picture type, $F(2, 46) = 73.07\ p < .001, \eta p^2 = .61$. Lesbian's sexual appeal ratings were highest to the pictures of women, followed by the neutral pictures and the pictures of men. Post hoc testing (LSD) revealed appeal ratings to all three groups of pictures to be significantly different from each other: Pairwise comparisons of ratings of pictures of women to those of men or to the neutral pictures yielded $ps < .001$, while the comparison of the pictures of men to the neutral pictures yielded a $p < .05$ (see Fig. 2).

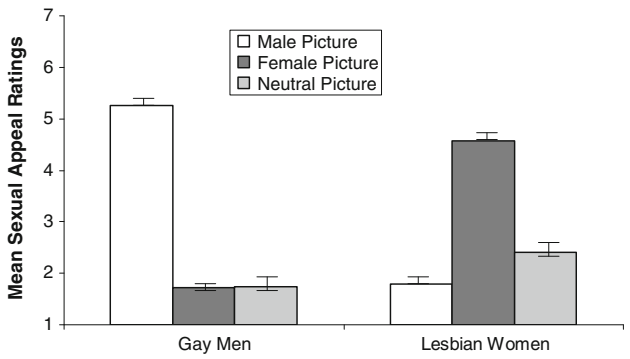

Fig. 2 Mean sexual appeal rating (±SE) by participant sex and picture type for gay/lesbian participants (absolute range, 1–7)

Classification Analysis

Finally, to identify more precisely the extent to which viewing time could distinguish gay men and lesbians, a discriminant analysis procedure was performed. The viewing times for the pictures of men and women in both trials served as the independent variable while participant sex served as the grouping variable. Overall, the viewing time patterns shown by gay men and lesbians in response to pictures of men and women were sufficiently different that participant sex could be correctly identified from viewing times for 88% of the cases. Further, there were fewer women misclassified as men (6.4%) than men misclassified as women (15.4%). These findings were almost identical to those reported by Israel and Strassberg (2008) for heterosexual participants.

Discussion

Prior studies on sexual interest and arousal consistently revealed a strongly category specific pattern for men (gay and heterosexual) and a non-specific pattern for heterosexual women (Chivers & Bailey, 2005; Chivers et al., 2004, 2007; Israel & Strassberg, 2008). Our results add to this picture by demonstrating that both gay men's and lesbian's sexual interest were strongly dependent upon target sex, supporting the importance of an interaction and suggesting that conceptualizing category-specificity as a main effect of sex (i.e., men are category specific, women are not) (e.g., Bailey, 2009; Chivers et al., 2004; Lippa, 2006) is inaccurate, or at least incomplete.

In speculating about possible reasons for our findings, we will concentrate on the results for the lesbians because, unlike for gay men, the lesbians' strongly category specific pattern of interest stands in sharp contrast to that of their female heterosexual counterparts.

When considering the possibility that all women might demonstrate a non-specific pattern of sexual interest or arousal (e.g., Chivers & Bailey, 2005), one explanation offered was that perhaps women's bodies evolved so as to be sexually responsive to almost any sexual stimulus to automatically prepare women for sexual intercourse (e.g., via vaginal lubrication) in order to protect the vaginal environment from injury and infection (e.g., associated with rape). Recent results (Chivers et al., 2004, 2007) and those of the present study suggest at least some women (i.e., lesbians) demonstrate clear category-specificity; therefore, the self-protective explanation for non-specificity in women needs to be amended to account for this.

What if it is only a masculinized brain that exhibits category-specific sexual interest or arousal? It is known that gay men and heterosexual men are prenatally exposed to relatively high (if not necessarily equal) levels of androgens (Wilson & Rahman, 2005). It has been hypothesized that many females who go on to identify as lesbians have also been exposed to higher than normal (for women) levels of prenatal androgens. According to this hypothesis, such exposure may overmasculinize their brains during early development, affecting brain structures and processes that influence sexual behavior (Ellis & Ames, 1987; Wilson & Rahman, 2005). While the evidence supporting this theory is indirect (i.e., based largely on women with congenital adrenal hyperplasia) and far from completely supportive (e.g., Dancey, 1990; Lippa, 2003), it is possible that such prenatal hormone exposure, should it exist, could result in lesbians (compared to heterosexual women) appearing more like men in their discriminating pattern of sexual interest or arousal (i.e., category-specific).

Alternatively (or additionally), it is possible that social influences may help account for the specificity in lesbian's sexual interest or arousal compared to that of heterosexual women. Relative to heterosexual women, lesbians may experience greater pressure from their subculture to (1) express their interest in their preferred sex (Newton, 1984) and (2) suppress any sexual interest to their nonpreferred sex (Golden, 1996; Hoagland & Penelope, 1991; Whisman, 1993) in order to legitimatize their self-identified sexual orientation. While lesbians self-identify as such for many reasons, a primary commonality among these may be a rejection of men, whether political, social, or sexual (e.g., Blumstein & Schwartz, 1977; Bower, Gurevich, & Mathieson, 2002; Golden, 1996; Hoagland & Penelope, 1991; Rust, 2002, 2003; Stein, 1999; Whisman, 1993). As described by Golden (1996), "The critical issue in determining the 'legitimacy' of a woman's claim to a lesbian identity is not whether she is sleeping with women, but whether she is sleeping with men" (p. 232). Perhaps these social pressures manifest as a sexual aversion to their nonpreferred sex. Consistent with this hypothesis was the finding in the present study that lesbians (unlike the heterosexual women in Israel & Strassberg, 2008) demonstrated less sexual interest (significantly so for self-report) in pictures of their nonpreferred sex than to the neutral pictures. Assuming that neutral pictures provided an index of baseline (i.e., absent) sexual interest, these findings suggest that lesbians (but not heterosexual women) have an aversion to sexualized pictures of their nonpreferred sex, rather than simply a lack of sexual interest in them.

While the generalizability of our results may be limited by the particular pictures of men and women used and a predominantly European-American participant population, our findings have potentially important implications for how women's sexuality is conceptualized. Specifically, much of the category-specificity research suggests that women's sexual arousal may be insignificant in the development of their sexual orientation (Chivers et al., 2004). The present study suggests otherwise. That is, the lesbians in the present study demonstrated a very clear preference for viewing their preferred sex (i.e., women), as opposed to their nonpreferred sex (i.e., men), and rated pictures of women substantially and significantly more sexually appealing than they did pictures of men. Thus, the present study argues that for lesbians, their pattern of sexual interest is substantially related to their sexual orientation. This finding highlights the need for not only separate models of sexual expression for men and women (Chivers et al., 2004), but also distinct models for lesbians and heterosexual women.

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ORIGINAL PAPER

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.

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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

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 videos[2]; 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) × 2 (Film Type) × 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 and lesbian film combined with vibration yielded greater genital responses than film alone.

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	
	M	*SD*	*M*	*SD*	*M*	*SD*
Heterosexual Film condition						
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
Lesbian Film condition						
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
Heterosexual Plus Vibrotactile condition						
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
Lesbian Plus Vibrotactile condition						
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

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 × 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 × 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 × 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 (*n*)	% of hetero women (*n*)	% of lesbian women (*n*)	% of lesbian women (*n*)
Genital response pattern				
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)**
Subjective arousal pattern				
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
Film-Only conditions				
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
Film-Plus-Vibrotactile conditions				
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	*B*	*SE*	*t*	*p*
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	*B*	*SE*	*t*	*p*
Step 1				
Age	−.05	.02	−2.32	.03
Step 2				
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

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	*B*	*SE*	*t*	*p*
Step 1				
Age	−.06	.03	−2.20	.04
Step 2				
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

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.

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) × 2 (Film Type) × 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 × 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	
	M	*SD*	*M*	*SD*	*M*	*SD*
Heterosexual Film condition						
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
Lesbian Film condition						
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
Heterosexual Plus Vibrotactile condition						
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
Lesbian Plus Vibrotactile condition						
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 × 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 (*n*)	% of hetero women (*n*)	% of lesbian women (*n*)	% of lesbian women (*n*)
Genital response pattern				
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)**
Subjective arousal pattern				
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	2	3	4
	Hetero[a]/lesbian[b]	Hetero/lesbian	Hetero/lesbian	Hetero/lesbian
Film-Only conditions				
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**
Film-Plus-Vibrotactile conditions				
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	*B*	*SE*	*t*	*p*
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 nonspecific 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	*B*	*SE*	*t*	*p*
Film-Only conditions				
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
Film-Plus-Vibrotactile conditions				
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 exclusively 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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ORIGINAL PAPER

Sexual Abuse History, Alcohol Intoxication, and Women's Sexual Risk Behavior

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Abstract We examined potential differences in women's likelihood of sexual risk taking in a laboratory setting based on alcohol intoxication and sexual abuse history. Participants ($n = 64$) were classified as non-sexually abused (NSA) or as having experienced sexual abuse in childhood only (CSA) or adulthood only (ASA) and randomly assigned to consume alcoholic (.06, .08, or .10% target blood alcohol content) or non-alcoholic drinks, after which participants read and responded to a risky sex vignette. Dependent measures included vaginal pulse amplitude, self-reported sexual arousal, likelihood of engaging in condom use and risky sexual behaviors described in the vignette, and mood. NSA and ASA women did not differ significantly on any dependent measures. CSA women reported significantly lower likelihood of condom use and unprotected intercourse relative to NSA and ASA women. Intoxicated women reported significantly greater sexual arousal, positive mood, and likelihood of risky sex relative to sober women. Intoxicated CSA women reported significantly more likelihood of unprotected oral sex and less likelihood of condom use relative to intoxicated NSA and ASA and sober CSA women. CSA women's increased risk of sexually transmitted infections (STIs) may be driven by non-condom use and behavioral changes while intoxicated. These findings provide preliminary insight into situational influences affecting CSA women's increased STI risk.

Keywords Sexual abuse · Sexual arousal · Alcohol intoxication · Sexual risk · Condom use · Vaginal pulse amplitude

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Introduction

Correlational studies have established that sexually abused (SA) women, particularly women abused in childhood, are at higher risk of contracting HIV/STIs than are non-SA women (e.g., Koenig & Clark, 2003). Alcohol intoxication and risky sexual behavior have been globally implicated in this association, but laboratory experiments designed to examine possible causal streams underlying these relationships are lacking (George & Stoner, 2000). Without such reports, understanding SA women's behavior in risky sexual contexts remains limited. We conducted a laboratory experiment in which we compared the influence of alcohol intoxication on the sexual risk intentions of women who had experienced child SA, adult SA, or no SA.

STI/HIV Risk and Sexual Abuse History

Women's risk of HIV/AIDS infection from heterosexual contact with high-risk partners (e.g., injection drug users, men who have sex with men) is increasing (Karon, Fleming,

Steketee, & De Cock, 2001). The proportion of AIDS cases in the U.S. attributed to heterosexual contact increased from 3% in 1985 to 32% in 2005 (CDC, 2005a), and about 80% of new HIV cases in U.S. women are due to heterosexual transmission (CDC, 2007). In sub-Saharan Africa, heterosexual transmission is the primary mode of HIV infection (e.g., Mills, Singh, Nelson, & Nachega, 2006).

An extensive literature has linked SA history with higher rates of HIV/STI diagnoses (Arriola, Louden, Doldren, & Fortenberry, 2005; Koenig & Clark, 2003). CSA women are more likely than non-CSA women to have risky sex and be HIV positive while being less likely than their non-abused peers to report using condoms and less confident about refusing unprotected sex (Greenberg et al., 1999; Hamburger et al., 2004; Koenig & Clark, 2003; Petrak, Byrne, & Baker, 2000; Senn, Carey, Vanable, Coury-Doniger, & Urban, 2006; Testa, VanZile-Tamsen, & Livingston, 2005; Whitmire, Harlow, Quina, & Morokoff, 1999). Findings of increased sexual risk-taking behavior following assault also exist for ASA women, but published reports are limited and less consistent than they are for CSA women (Brener, McMahon, Warren, & Douglas, 1999; Campbell, Sefl, & Ahrens, 2004). In a review, Gorey and Leslie (1997) reported that about 22% of U.S. women have experienced child sexual abuse. Sexual behaviors included in CSA definitions ranged from non-contact behaviors (e.g., sexual invitations from an adult to a child) to penile penetration. In a stratified random population sample ($N = 472$), Elliott, Mok, and Briere (2004) found that 22% of women reported adult sexual abuse (ASA) involving physical contact. These findings suggest that the SA-STI link affects a broad population of women, has serious sexual health implications, is not well understood, and necessitates further scientific scrutiny.

Alcohol Consumption, Sexual Abuse History, and STI/HIV Risk

Experiments have shown that acute alcohol intoxication increases sexual risk-taking (for reviews, see George & Stoner, 2000; Hendershot & George, 2007). In experimental studies, alcohol intoxication increased intentions of engaging in sexual risk behavior (e.g., Maisto, Carey, Carey, & Gordon, 2002; Maisto, Carey, Carey, Gordon, & Schum, 2004) and salience of impelling cues (Davis, Hendershot, George, Norris, & Heiman, 2007; MacDonald, MacDonald, Zanna, & Fong, 2000), while decreasing perception of sexual risk (Fromme, D'Amico, & Katz, 1999; Fromme, Katz, & Rivet, 1997). Also, in sexual risk-taking contexts, alcohol has been shown to increase self-reported sexual arousal but not genital sexual arousal (George et al., 2009). In addition to increasing the likelihood of high-risk sex while diminishing risk perception, alcohol intoxication appears to compromise women's ability to protect themselves from sexual risk because intoxication reduces condom use (Maisto et al., 2002, 2004; National Institute of Allergy and Infectious Diseases, 2004). SA history is linked to higher rates of alcohol use in women, and SA women are more likely than their non-abused peers to use alcohol before sex (Wilsnack, Wilsnack, Kristjanson, Vogeltanz-Holm, & Harris, 2003). Thus, alcohol intoxication and SA history may work in tandem to increase SA women's sexual risk-taking.

Without laboratory examinations of in-the-moment processes that influence the relations among SA history, alcohol intoxication, and likelihood of STI risk behavior, it is difficult to pinpoint loci that may be appropriate for prevention interventions. For example, it is unknown whether targeting SA women's risk awareness or condom non-use–or both–would be most effective in addressing increased STI risk in situations involving alcohol. Such knowledge will allow interventions aimed at teaching SA women to minimize sexual risk by interceding at specific points on the risk pathway.

We sought to examine influences of abuse history and alcohol intoxication on sexual risk-taking and sexual arousal by placing women in a context analogous to a real-life risky sexual encounter–a hypothetical sexual risk vignette. We hypothesized that SA women would report greater likelihood of risky behavior than would their non-SA counterparts in that they would report less likelihood of condom use and greater likelihood of sexual activity with their partner in the vignette. Because CSA occurs earlier in life and may have a broader effect on psychosexual developmental processes than ASA (for a review, see Trickett & Putnam, 1993) and CSA women exhibit higher rates of sexual risk than NSA women (e.g., Petrak et al., 2000; Senn et al., 2006; Testa et al., 2005), we hypothesized that CSA women would report greater likelihood of risky sexual behavior in the response to the vignette than would NSA and ASA women. We also hypothesized that intoxicated women would report greater likelihood of risky behavior and stronger self-reported sexual arousal than would their sober counterparts. Given research indicating global associations between sexual abuse history, alcohol use, and sexual risk (e.g., Koenig & Clark, 2003; Wilsnack et al., 2003), a second aim was to evaluate whether alcohol intoxication and abuse history would interact depending on type of abuse history (CSA vs. ASA). Because of the dearth of prior research in this area, we did not specify SA group hypotheses for this interaction; however, we hypothesized that SA women who received alcohol would report greater likelihood of risky behavior than would sober and NSA women. A third aim was to continue building on findings regarding SA history and genital arousal. Three studies have indicated that SA women's genital arousal to erotic film stimuli was dampened relative to their non-SA peers (Laan & Everaerd, 1995; Rellini & Meston, 2006; Schacht et al., 2007), and we hypothesized that SA women would exhibit smaller increases in genital arousal relative to their NSA counterparts. Because no published work has compared SA groups' genital response to erotic stimuli, we did not make hypotheses regarding SA-group differences.

Method

Participants

This study was part of a larger study designed to evaluate the influence of alcohol intoxication and sexual arousal on risky sexual decision-making. Participants ($N = 64$) were recruited from a western urban community and university with flyers, newspaper advertisements, and letters to university students, which stated that the study involved "social drinking and decision-making." Potential participants were told via telephone that procedures included genital measures of sexual arousal and were screened for eligibility. To be eligible, women had to be (1) between the ages of 21 and 35 years, (2) interested in dating opposite-sex partners, (3) not currently in an exclusive dating relationship, (4) a social drinker, (5) have no current or past problem drinking, and (6) not currently taking medications or have a current health condition that contraindicated alcohol consumption. Single, heterosexual women were sampled to increase the external validity of the story, which asked participants to consider engaging in sexual activities with a novel male partner. All procedures were conducted with approval by the University of Washington's Institutional Review Board. Participants received $15 per hour.

Participants' mean age was 27.0 years ($SD = 4.0$). Age did not significantly differ based on abuse group. Most were European-American (81%). The remainder were multi-racial or other (8%), Asian-American (5%), African-American (3%), or Latina (3%). Sixty-nine percent were employed, with 65% reporting an annual income of less than $31,000. Thirty-six percent were college students. Employment and student status did not vary based on abuse group.

Measures

Abuse Groups

Participants were classified as having no history of SA (NSA), CSA only, or ASA only. Classification was based on Finkelhor's (1979) interview questions and Koss and Oros' (1982) Sexual Experiences Survey (SES). Both measures consisted of items that behaviorally assess abuse experiences. CSA participants reported no ASA events and at least one sexual contact event (touching, sexual fondling, oral sex, and/or intercourse) before their 14th birthday with someone five or more years older. ASA participants reported no CSA events and at least one unwanted sexual contact event (forced oral sex and/or attempted or completed rape) after their 15th birthday. Thirty-nine percent ($n = 25$) reported no abuse experiences, whereas 48% ($n = 31$) reported ASA only and 13% ($n = 8$) reported CSA only.

Sexual Behavior

Seventy-seven percent ($n = 49$) reported current use of condoms for birth control and 42% ($n = 27$) reported current use of hormonal contraception. There were no significant differences on these variables based on abuse history. Reported mean age of first consensual sexual intercourse was 17.5 years ($SD = 2.4$), with CSA women reporting the earliest age (16.4 years; $SD = 2.9$), followed by ASA women (17.0 years; $SD = 2.1$) and NSA women (18.3 years; $SD = 2.3$), though these differences were not significant. The reported mean number of opposite-sex partners with whom participants had vaginal sex was 11.4 ($SD = 9.0$), with a median of nine. One woman reported having 200 lifetime partners and was excluded from analyses using mean number of partners. CSA women reported the smallest number of lifetime vaginal sex partners (7.3; $SD = 5.5$). NSA women reported a larger number of partners than did CSA women (8.7; $SD = 6.3$), but this difference was not significant. ASA women reported significantly more partners than did both NSA and CSA women (14.5; $SD = 10.5; p = .02$). Twenty-seven percent ($n = 17$) reported ever having been pregnant. Most of the sample (97%) reported that their sexual orientation was primarily heterosexual. The remaining 3% reported equal amounts of homo- and heterosexual experiences. There were no significant group differences for these variables.

Sexual Functioning

Non-partner items from the Modified Brief Index of Sexual Functioning for Women (adapted from Taylor, Rosen, & Leiblum, 1994) were used to measure sexual function, including four desire items, two sexual health items, and two sexual activity items ($\alpha = .74$). Mean levels of sexual functioning (NSA $= 2.9, SD = .72$; ASA $= 3.1, SD = .80$; CSA $= 2.8, SD = .54$) did not significantly differ between groups.

Drinking Habits (Collins, Parks, & Marlatt, 1985)

Participants were determined to be "social drinkers" at the phone screen if they reported drinking between one and 40 alcoholic beverages per week and denied ever being significantly concerned about their drinking, being treated for problem drinking, or being told by friends, family, or a professional that they were problem drinkers. Given evidence linking SA history with higher rates of alcohol consumption, these criteria were intended to be inclusive of a wide range of drinking habits while excluding problem drinkers. Participants' mean reported number of drinks per week was 10.1 ($SD = 7.2$) with a range of 0–39. Nearly all (95%) participants reported drinking 20 or fewer drinks per week. CSA women reported drinking

the fewest drinks per week ($M = 8.4$; $SD = 6.0$), followed by NSA women ($M = 9.8$; $SD = 7.2$). ASA women reported drinking the most drinks per week ($M = 10.7$; $SD = 7.6$), although none of these differences were significant.

Mood

Items from the Positive (alert, excited, proud, inspired, enthusiastic, and interested) and Negative (upset, jittery, guilty, distressed, nervous, hostile, and ashamed) Affect Scales (Watson, Clark, & Tellegen, 1988) were administered to measure mood state after the sexual risk-taking assessment (see description below). Eleven items were added: horny, satisfied, happy, and amused (positive); and lonely, embarrassed, shocked, depressed, apathetic, angry, and disgusted (negative). Participants responded to items on 5-point Likert scales (1 = very slightly or not at all; 5 = extremely). The positive affect scale had acceptable inter-item reliability ($\alpha = .86$), whereas the negative affect scale had low reliability ($\alpha = .54$).

Arousal Induction

Immediately before reading the sexual risk story, participants underwent a sexual arousal induction that consisted of a sexually neutral film followed by two brief erotic films. Pilot-testing established that participants found the films arousing. The neutral film was a 2.5-min bird documentary. The erotic films were each 3 min long and depicted explicit sexual activities between a man and woman, including kissing, oral sex, and vaginal intercourse. The purpose of the erotic films was to create a sexually charged atmosphere to prime exposure to the eroticized vignette. Data on responses to the film are reported elsewhere (Schacht et al., 2007).

Sexual Risk-Taking Assessment

Participants read and responded to an erotic second-person vignette in which the participant was the protagonist.[1] She was introduced to a man by a mutual friend, described as being sexually attracted to him, and placed in a sexual situation with him where condoms were unavailable. The protagonist was depicted as taking oral hormonal contraceptives. Alcohol consumption of the person representing the participant in the story was matched to the participant's alcohol condition in the experiment (alcohol vs. no alcohol), whereas the opposite sex partner was always portrayed as drinking two alcoholic beverages. Participants rated their likelihood of engaging in unprotected sexual behavior on 5-point Likert scales (1 = "not at all"; 5 = "very much") for each of 10 items. These items were collapsed to form the following four dependent variables, likelihood of condom use (2 items; "How much do you wish you had a condom?" and "How likely are you to ask Dan if he has a condom?"), oral sex (4 items; "How much do you desire Dan to perform oral sex on you/to perform oral sex on Dan, regardless of whether you actually will?" and "How likely are you to allow Dan to perform oral sex on you/perform oral sex on Dan?"), genital contact (2 items; "How much do you desire to rub your clitoris against Dan's penis, regardless of whether you actually will?" and "How likely are you to rub your clitoris against Dan's penis?"), and unprotected intercourse (2 items; "How much do you desire Dan's penis inside of you?" and "How likely are you to allow Dan to put his penis inside of you?"). The vignette was pilot-tested through interviews with a separate sample of pilot participants, and pilot participants' feedback was incorporated to maximize the vignette's external validity. Participants found the vignette realistic (1 = "not at all"; 5 = "very much") for the typical woman ($M = 4.6$; $SD = .6$), and for themselves ($M = 4.3$; $SD = 1.1$).

[1] The story may be obtained from the corresponding author upon request.

Genital Arousal

Genital arousal was measured using vaginal photoplethysmography (Geer, Morokoff, & Greenwood, 1974; BioPac Systems, Inc., Santa Barbara, CA, model MP 150; Behavioral Technology, Inc., Salt Lake City, UT). Vaginal pulse amplitude (VPA) was continuously sampled at a rate of 62.5 samples per second and recorded using Acqknowledge software, version 3.7.2 (BioPac Systems, Inc.).

Self-Reported Ratings of Sexual Arousal

Participants reported their arousal on four Likert scale questions (1 = "no sexual arousal at all"; 7 = "extremely sexually aroused"): (1) "Overall, how much sexual arousal did you feel during the film clips/the story?" (Heiman, 1977); (2) "To what extent did you feel sensation in your genitals during the film clips/the story?" (Heiman & Rowland, 1983); (3) "How much sexual warmth (in your genitals, breasts, and body) did you feel during the film clips/the story?" (Meston, Heiman, Trapnell, & Paulhus, 1998); (4) "To what extent did you feel sexually absorbed in the sensory components of the film clips/the story?" (Koukounas & McCabe, 2001). These items formed a scale with good inter-item reliability ($\alpha = .94$).

Procedure

Participants were instructed not to drive to the laboratory, not to eat or consume caloric drinks for 3 h before their appointments, and not to drink alcohol or use recreational or over-the-counter drugs for 24 h before their appointments. A female experimenter administered an initial breath test with an Intoxilyzer 5000 (CMI Inc., Owensboro, KY) to ascertain a zero reading and obtained informed consent. All participants were given a

pregnancy test (Osom hCG-Urine Test, Genzyme General Diagnostics, San Diego, CA) and then left alone to complete background questionnaires.

Alcohol Procedures and Administration

Each participant was randomly assigned to one of four beverage conditions: expect and receive a nonalcoholic beverage or to expect an alcoholic beverage and receive one of three alcohol doses (target BAC of .06, .08, or .10%). Participants were weighed to determine the amount of alcohol needed to achieve the assigned target BAC. Drinks were consumed in 9 min and consisted of alcohol and fruit juice. BAC was tested every 3 min until participants reached criterion and then they began the sexual arousal induction and risky sex assessment. No-alcohol participants drank a volume of juice equivalent to the total volume of liquid that they would have received in the alcohol condition.

Arousal Induction and Risky Sex Assessment Story

After participants reached the criterion BAC, they were instructed via intercom to maximize their arousal. The instructions were "We would like to ask you to try as much as possible to relax and maximize your arousal during the remainder of the experiment. We would like you to try and become as aroused as possible." They were then instructed to insert the probe. The experimenter monitored the VPA signal via computer in a separate room while the participant viewed the films and read the story. Following the story, participants rated their mood and arousal and were then instructed by intercom to remove the probe.

Detoxification and Debriefing

Sober participants were debriefed, paid, and released upon completion of the experiment. Alcohol participants remained in the laboratory until their BAC dropped to .03, when they were debriefed, paid, and released.

VPA Data Cleaning and Reduction

VPA data were reduced to 25 samples per second. Visually apparent movement artifacts were removed from waveform data, which were then reduced to 30-s means and digitally transformed. Remaining movement artifacts, defined as a 100% increase or decrease in VPA relative to either adjacent 30-s interval, were imputed using the mean values of the adjacent intervals (Schacht et al., 2007). The dependent measure for VPA was a difference score of maximum response during the story minus minimum response during the neutral film. One ASA-alcohol subject's VPA data were not interpretable because of movement artifacts and she was excluded from VPA analyses.

Results

There were no significant differences on dependent variables based on alcohol dose. Therefore, to increase statistical power, alcohol conditions were collapsed to form two conditions: alcohol and no alcohol. Alcohol participants' BAC immediately before the story did not significantly vary based on abuse condition. A series of 3 (non-abused vs. CSA-only vs. ASA-only) × 2 (intoxicated vs. sober) univariate ANOVAs were conducted on four story variables (condom use, likelihood of oral sex, likelihood of genital contact, and likelihood of intercourse), two arousal variables (self-reported arousal and VPA), positive mood, and negative mood. Bonferroni corrections were used to control for familywise error rate associated with conducting multiple statistical tests. See Table 1 for correlations among dependent variables.

Sexual Risk-Taking Assessment

Table 2 shows the means of all dependent variables by abuse group and alcohol condition. We found a main effect of abuse group for likelihood of condom use with the partner in the vignette, $F(2, 63) = 5.4$, $p = .007$, partial $\eta^2 = .16$. CSA women reported significantly less likelihood of condom use

Table 1 Bivariate correlations among dependent variables for all subjects

Variable	1	2	3	4	5	6	7	8
1. Condom use	–	.02	.08	−.12	−.30*	−.13	.02	−.29*
2. Oral sex		–	.44**	.50**	.11	.40**	.36**	−.03
3. Intercourse			–	.52**	.05	.18	.17	.07
4. Genital contact				–	.12	.19	.23	.15
5. Genital arousal (VPA)					–	.17	.11	.33**
6. Self-reported arousal						–	.73**	.11
7. Positive mood							–	−.06
8. Negative mood								–

Note: * $p < .05$; ** $p < .01$; $N = 64$; $df = 62$

Table 2 Mean scores on dependent variables by condition

Condition	Dependent variable							
	Condom use *M* (*SD*)	Oral sex *M* (*SD*)	Genital contact *M* (*SD*)	Intercourse *M* (*SD*)	Positive mood *M* (*SD*)	Negative mood *M* (*SD*)	Genital arousal *M* (*SD*)	Reported arousal *M* (*SD*)
All subjects	4.5 (.9)	3.9 (.9)	4.0 (1.0)	4.5 (.8)	2.6 (.8)	1.1 (.2)	.04 (.04)	4.8 (1.5)
Sober ($n = 29$)	4.7 (.7)	3.6 (.9)	3.8 (.8)	4.5 (.8)	2.4 (.8)	1.1 (.1)	.03 (.03)	4.2 (1.5)
Intoxicated ($n = 35$)	4.3 (1.0)	4.1 (.9)	4.1 (1.1)	4.5 (.8)	2.9 (.8)	1.1 (.2)	.04 (.05)	5.2 (1.2)
NSA	4.7 (.5)	4.0 (1.0)	4.1 (.9)	4.6 (.7)	2.6 (.8)	1.1 (.2)	.03 (.03)	4.8 (1.4)
Sober ($n = 11$)	4.9 (.2)	3.8 (.9)	3.9 (.8)	4.7 (.6)	2.4 (.6)	1.1 (.1)	.04 (.04)	4.6 (1.6)
Intoxicated ($n = 14$)	4.5 (.6)	4.1 (1.1)	4.3 (1.0)	4.5 (.8)	2.8 (.9)	1.1 (.2)	.02 (.01)	5.0 (1.3)
ASA	4.5 (.8)	4.0 (.8)	4.1 (1.0)	4.6 (.4)	2.7 (.9)	1.1 (.2)	.04 (.03)	5.0 (1.5)
Sober ($n = 14$)	4.7 (.8)	3.7 (.8)	3.9 (1.0)	4.6 (.5)	2.4 (1.0)	1.1 (.2)	.03 (.03)	4.2 (1.5)
Intoxicated ($n = 17$)	4.4 (.7)	4.1 (.8)	4.2 (1.0)	4.6 (.4)	2.9 (.8)	1.2 (.2)	.04 (.03)	5.6 (1.2)
CSA	3.7 (1.5)	3.7 (1.0)	3.4 (1.0)	3.8 (1.4)	2.4 (.7)	1.2 (.2)	.07 (.09)	4.1 (1.4)
Sober ($n = 4$)	4.4 (1.0)	2.9 (.9)	3.5 (.4)	3.6 (1.6)	1.9 (.3)	1.1 (.1)	.04 (.02)	3.1 (.8)
Intoxicated ($n = 4$)	3.0 (1.8)	4.6 (.4)	3.3 (1.5)	4.0 (1.4)	2.9 (.7)	1.2 (.3)	.1 (.13)	5.1 (1.1)

Note: Values range from 1 to 5 except reported arousal (1–7) and genital arousal (in mV, unrestricted range)

than did NSA ($p = .005$) and ASA women ($p = .028$), whereas NSA and ASA women did not significantly differ. We also found a main effect of alcohol group for condom use, $F(1, 63) = 9.0$, $p = .004$, partial $\eta^2 = .13$, such that alcohol participants reported significantly less likelihood of condom use than did no-alcohol participants. We found a main effect of alcohol group for likelihood of oral sex with the partner in the vignette, such that alcohol participants reported significantly greater likelihood of engaging in oral sex than did no-alcohol participants, $F(1, 63) = 9.0$, $p = .004$, partial $\eta^2 = .14$. We found a main effect of abuse group for likelihood of unprotected intercourse with the partner in the story, $F(2, 63) = 4.0$, $p = .024$, partial $\eta^2 = .12$. Contrary to our hypothesis, CSA women reported significantly less likelihood of unprotected intercourse than did NSA ($p = .041$) and ASA women ($p = .024$). There were no other significant main effects or interactions for abuse or alcohol group.

Self-Reported and Genital Arousal

We found a main effect of alcohol group for self-reported sexual arousal immediately following the vignette, such that alcohol participants reported significantly greater sexual arousal than did no-alcohol participants, $F(1, 63) = 9.7$, $p = .003$, partial $\eta^2 = .14$. There were no other significant findings relating to self-reported arousal. We found no significant main or interaction effects of abuse or alcohol group for VPA.

Mood

We found a main effect of alcohol group for positive mood immediately following the vignette, such that alcohol participants reported significantly greater positive mood than did no-alcohol participants, $F(1, 63) = 6.6$, $p = .013$, partial $\eta^2 = .10$. There were no other significant effects or interactions based on abuse or alcohol group for positive or negative mood.

Discussion

The hypothesis that SA women would report greater likelihood of risky sexual behavior was partially supported. CSA women reported significantly less likelihood of condom use with their partner in the vignette than did NSA and ASA women, but also reported less likelihood of intercourse. ASA and NSA women did not significantly differ in regards to sexual risk likelihood. We also found support for the hypothesis that alcohol would increase the likelihood of risky sexual behavior: Intoxicated women reported significantly less likelihood of condom use and significantly greater likelihood of oral sex and unprotected intercourse than did sober women. Also as hypothesized, intoxicated women reported significantly greater sexual arousal than did sober women. We did not find support for our hypothesis that abuse history and alcohol intoxication would interact to increase sexual risk-taking. Also, in contrast to past reports, we found no significant differences in genital arousal based on abuse history

(Laan & Everaerd, 1995; Rellini & Meston, 2006; Schacht et al., 2007).

The finding that CSA women reported significantly less likelihood of condom use relative to NSA women was consistent with other evidence that CSA women are less likely to use condoms than are non-abused women (Greenberg et al., 1999) and have higher rates of STIs than do non-CSA women (Arriola et al., 2005; Koenig & Clark, 2003). Partner communication and women's perception of their partners' attitudes towards condoms are the strongest psychosocial predictors of condom use (Sheeran, Abraham, & Orbell, 1999), and CSA women are less confident about refusing unprotected sex than are non-abused women (Greenberg et al., 1999; Hamburger et al., 2004). This finding may suggest that CSA women's increased sexual risk is driven in part by condom negotiation reticence. It is also possible that CSA women reported less likelihood of condom use than did NSA and ASA women because they were less interested in intercourse with their partner in the vignette. However, we found no significant difference based on abuse history for another risky behavior—likelihood of genital contact—which implies that CSA women may be as likely as ASA and NSA women to engage in some STI risk behaviors without condoms.

We replicated findings indicating that alcohol intoxication increases sexual risk behavior (Davis et al., 2007; MacDonald et al., 2000; Maisto et al., 2002, 2004). Also congruent with past work (e.g., George et al., 2009) was the finding that alcohol intoxication increased self-reported, but not genital, sexual arousal. Condom negotiation while under the influence of alcohol, including psychoeducation regarding alcohol's deleterious influence on condom negotiation, may be worthy targets for sexual risk prevention programs. Null findings regarding the interaction between abuse history and alcohol intoxication on sexual risk behavior may have been due to lack of power. However, it is also possible that the influence of alcohol intoxication and SA history have opposite effects (i.e., one may disinhibit whereas the other inhibits), thereby cancelling each other out.

CSA and ASA have both been linked to subsequent psychopathology (e.g., Briere & Jordan, 2004; Finkelhor & Browne, 1988; Paolucci, Genuis, & Violato, 2001; Trickett & Putnam, 1993), but same-sample comparisons of individuals reporting histories of CSA and ASA are rare. Therefore, the extent to which CSA and ASA have overlapping sequelae is unclear. We found that CSA women significantly differed from NSA and ASA women on some variables, but found no significant differences between ASA and NSA women. Our CSA sample was small, but these findings are consistent with the notion that the timing of abuse is an important consideration when predicting subsequent behavior changes. Noll, Trickett, and Putnam (2003) described behavior patterns of "sexual preoccupation" (e.g., increased sexual activity and partners) and "sexual aversion" (e.g., increased rates of sexual dysfunction) in CSA women, an idea proposed by Finkelhor and Browne (1988). The finding that CSA women reported less likelihood of intercourse relative to NSA and ASA women could be interpreted to indicate sexual aversion, although other interpretations are possible (e.g., social desirability). Furthermore, it is possible that situational factors (e.g., alcohol intoxication or the sexual activity in question) can affect whether sexually preoccupied or sexually aversive behavior is elicited from CSA women.

Limitations, Strengths, and Future Directions

Conclusions regarding these results should be made cautiously due to sampling issues. Our sample was small; thus, these findings may be limited in generalizability. In addition, our null finding for VPA differences, which contradicts past findings with CSA women (Laan & Everaerd, 1995; Rellini & Meston, 2006; Schacht et al., 2007), may be due to lack of power because of sample size or to a weaker VPA response to textual (the vignette) relative to visual (films) erotic stimuli. Future work should re-evaluate the possibility that abuse history and alcohol intoxication interact to influence sexual risk behavior. Other issues that may limit generalizability of results are volunteer and sampling biases. As is typical of participants willing to participate in studies using genital measures of sexual response (Strassberg & Lowe, 1995), our sample appeared to be more sexually experienced than other U.S. women in their age group, reporting a median of nine lifetime heterosexual partners. In a recent national survey, women aged 25–29 years reported a median of four lifetime heterosexual partners (including vaginal, oral, and anal sex; CDC, 2005b). In addition, we recruited only single women who reported that they were social, non-problem drinkers. The extent to which the women in our sample, particularly CSA-only women, were representative of larger samples, is unknown. Finally, the vignette paradigm used in this study may be limited in its external validity.

We did not evaluate partner interactions and condom negotiation, which influence in-the-moment decisions regarding condom use, nor did we evaluate alcohol's expectancy effects, which could account in part for our findings. Our work may be oversimplified relative to real-life situations, but represents an initial snapshot of SA women's responses to a sexual risk situation, which can provide a starting point for more complex evaluations of these processes. More work is needed to understand the partner interactions relevant to condom use.

These findings are important because of the lack of published reports comparing CSA-only and ASA-only women on any outcome variables. These findings also speak to the extensive literature linking alcohol consumption, sexual assault, and HIV/STI risk (e.g., Abbey, Zawacki, Buck, Clinton, & McAuslan, 2004; Senn et al., 2006).We found differences in likelihood of risky sex between abuse groups, which may indicate that CSA-only women's experience and

behavior in sexual situations diverges from that of other SA women's experiences. Further research in this area with a larger, more varied sample is warranted.

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ORIGINAL PAPER

Analysis of First Coitus

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Abstract The analysis of age of coital debut is central to a description of sexual behavior. Age of coital debut data typically shares some characteristics that make analysis difficult. For one, age is reported in whole years and, furthermore, some subjects do not report debut. We aimed to find a regression model that fits this type of data well and gives simple and interpretable results. We studied age of debut in four cross-sectional surveys (1987–2002) for a total of 18,000 subjects from the adult Norwegian population. We compared a Cox-model with a linear parametric survival model. Survival methods are natural tools for analyzing age of coital debut. The debut ages did not follow the proportional hazard model well and an additive parametric survival model was the better regression model for the Norwegian data set. Furthermore, the additive model was easier to interpret. The analysis showed a substantial change in age of debut in the cohorts born 1927–1984, with a drop of 1 year for men and 2.3 years for women. Women in the oldest cohorts reported their debut 0.8 years later and in the youngest cohorts 0.5 years earlier than did men. A parametric survival model gives results that are easier to interpret and fits the Norwegian data better than the Cox-model.

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Introduction

The analysis of age of coital debut is central to a description of sexual behavior in a population. It marks the start of the sexual career and an early age of debut is also strongly associated with risk behavior for sexually transmitted diseases. The age at coital debut has been shown to vary over time and between and within different societies and cultures (Bozon & Kontula, 1998; Edgarth, Lewin, & Nilsson, 1999; Johnson, Wadsworth, Wellings, & Field, 1994; Kontula, 2003; Kontula & Haavio-Mannila, 1995; Kontula, Rimpela, & Ojanlatva, 1992; Lewin, 1990; Pedersen, Samuelsen, & Wichstrom, 2003; Schmidt, Klusman, Dekker, & Matthiesen, 1998; Sundet, Magnus, Kvalem, Samuelsen, & Bakketeig, 1992; Teitler, 2002; Wielandt & Boldsen, 1989). Age of coital debut data shares some characteristics that make it somewhat difficult to analyze; the age distributions are usually skewed, age of debut is usually reported in whole years, and there will generally be a proportion of subjects without debut. The sexual debut generally takes place over a short age span; therefore, group differences as small as a quarter of a year are important. The choice of an improper method may easily bias the results more than this. The subjects without debut in the data point towards survival methods, yet very few of the published analyses use these methods, although there are exceptions (Kraft, 1991; Pedersen et al., 2003; Sundet et al., 1992).

The aims of this study were to elucidate the problems related to the estimation of coital debut ages, and to find a regression model that captures the information in debut age, fits the data well, and gives easy interpretable results.

Method

The data consist of four cross-sectional surveys of sexual behavior conducted in 1987, 1992, 1997, and 2002. In 1987, a random sample of 10,000 Norwegians, aged 18–60 years, was drawn from the population register by the Central Bureau of Statistics to participate in the sex survey. The data collection was carried out by means of mailed, self-administered questionnaires, followed by two reminders during the ensuing 6 weeks. All participants were anonymous to the researchers. The study was repeated in 1992 on a new sample of 10,000 persons within the same age span, and in 1997 and 2002 with an age span of 18–49 years.

The overall response rate to the four Norwegian surveys was 63% in 1987, 48% in 1992, 38% in 1997, and 36% in 2002. In all surveys, the response was higher among women than among men, higher among younger than older persons, and higher among individuals with higher levels of education than among those with lower educational level.

In total, 18,062 persons participated in the questionnaire surveys. Of the subjects with complete information on the covariates sex, birth year, education, and part of country, 15,620 gave an age of debut (observed), 856 subjects had not (yet) had their first intercourse (right censored), and 567 subjects had debut without giving the age of debut (left censored). This left 17,043 subjects for analysis. The question on population density was not included in the 1997 survey, so 13,506 subjects had information also including this covariate.

Age at first intercourse was reported in units of years in the surveys. A value of 17 means that the first intercourse took place somewhere in the interval 17–18 years. To account for this, a random value drawn from a uniform distribution between 0 and 1 was added to the debut age before the analysis. The same was applied to the age of censoring (Samuelsen, Wisløff, & Skrondal, 2005).

Birth cohort was grouped into 11 categories: a group of 8 cohorts born 1927–1934, and then groups of five cohorts born from 1935 to 1939, up to 1980 to 1984.

Educational level was coded in three categories according to the number of years of schooling: 1 = *lower* (<10 years), 2 = *medium* (10–12 years), and 3 = *higher* (>12 years).

Part of country was grouped from 20 counties into five geographical parts: East-Norway, Southwest-Norway, West-Norway, Middle-Norway, and North-Norway.

Population density was coded 1 = *sparse*, 2 = *small town, 200–1999 inhabitants*, 3 = *town, 2000–19999 inhabitants*, 4 = *city, 20000–100000 inhabitants*, and 5 = *large city, >100000 inhabitants*.

Survey was also included as a covariate (values 1–4).

All covariates were used as categorical in the models.

Statistical Analysis

Survival Data and Censoring

Coital debut is clearly an event in a life history and studies of the timing of this event naturally rely on life history analysis (Hosmer & Lemeshow, 1999). This term is used when several different types of events are studied at the same time. When only one type of event is considered, one often applies the term survival analysis (Kleinbaum, 1997).

A main feature both of life-time data and of data of time for coital debut is that the event is not observed for all at the end of the study. When we have either exactly observed event times or event times that exceed the observational time, we speak of right censored data. This is the most common type of censoring and it is also that type of censored data that can be analyzed most flexibly.

In the present data, there was also another type of censoring which ideally should be taken into account, called left censoring. There are some subjects who report having a debut, but the debut age is not given. For these subjects, all that is known is that the debut age was smaller than the age at follow up. Ideally, such information should be used in the analysis, but the most common methods do not allow for this. In the present data, however, most subjects were left censored in adulthood (after the major proportions of debuts have occurred) and ignoring them will likely not change results much. However, we will, when possible, also include the left censored subjects in the analysis.

Correction for Age Reported in Whole Years

The age of coital debut is reported in whole years in this and almost all other studies. There are two problems with this. Firstly, the stated debut ages will, on average, be approximately one half year smaller than the actual debut ages. With respect to the variation in sexual debut age, one half year is a quite substantial difference and failure to take this difference into account may artificially distort results. Secondly, the data were severely tied, that is, a large number of subjects will report the same debut age. Many methods for time to event (or survival) data are constructed for untied data and some kind of adjustment is then required. For Cox-regression, several tie correction methods have been developed (for a review, see Samuelsen et al., 2005), but this problem has received little attention with regards to other survival analysis methods. Here, we adopted a very simple approach, shown to work well for most censoring schemes (Samuelsen et al., 2005), consisting of adding uniform (0,1) noise to the debut ages (and to the censored ages). This automatically increased the medians by an average of 0.5 years, and also removed problems with ties in the regression models.

Kaplan–Meier and Crude Median Estimates

On the right censored data, the proportion with a debut before a given time is estimated by (one minus) the Kaplan–Meier curve (Kaplan & Meier, 1958). From this, we may estimate the median debut age as the time when the Kaplan–Meier curve crosses the value 0.5 and, similarly, other percentiles can be obtained. A confidence interval for the median (and percentiles) can further be calculated from confidence limits for the Kaplan–Meier curve (Hosmer & Lemeshow, 1999). Crude estimates of medians within subgroups are thus calculated from the Kaplan–Meier curves in the subgroups.

Proportional Hazards Model and Cox-Regression

Adjustment for confounders is usually carried out with regression techniques. The most common regression model for survival data is the Cox proportional hazards mode. The hazard is the "tendency" to have a debut, the same as the incidence rate of debut. The Cox model (Cox, 1972) states that the hazard of debut at age t is equal to a baseline hazard times the exponential function of a linear predictor of covariates:

$$h(t) = h_0(t)\exp(x\beta)$$

where $x\beta = \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p$ is a linear predictor in the p covariates $x_1, x_2, \ldots, x_p$. The estimates of the β_js are usually obtained without estimating the baseline hazard; thus, a flexible semi-parametric model is used.

The proportional hazards assumption, $h(t)/h_0(t) = \exp(x\beta)$, may well be invalid. In such cases, it is not appropriate to speak of a constant relative risk $\exp(x\beta)$ over all ages t. Since we study an adult population up to ages where the main proportion of the population have had their coital debut, this may be an even more serious problem than for many other survival data. The proportional assumption can be tested in the statistical package Splus based on Schoenfeld residuals (Grambsch & Therneau, 1995). Both a test and a plot of smoothed residuals are done for each covariate (Schoenfeld, 1982; S-Plus, 2001).

Parametric Survival Model

A further problem with the proportional hazards model is that the results are presented as relative risks $\exp(\beta_j)$ and there is no direct correspondence between relative risks and median ages. A model that is more comparable with and as easily interpretable as the median ages from the crude analysis may thus be preferable.

Furthermore, the crude Kaplan–Meier curves indicate that the essential effect of covariates is to shift the distribution of debuts along the time axis. This would suggest that a linear model where time to debut t satisfies $t = \beta_0 + x\beta + \varepsilon$, where $x\beta$ is again a linear predictor, where β_0 is an intercept, and where ε is an error term, could be adequate. Note that with this model, β_j has the interpretation as the change in median value when covariate x_j is changed one unit. Without censoring, this model would be fitted by the least squares regression without specifying the distribution for the error term. Regression methods for right censored data under similar weak assumptions for the error term have been developed (Buckley & James, 1979; Tsiatis, 1990), but have not been implemented in standard software packages. However, the software packages S-Plus allows for this model under the assumption that $\varepsilon = \sigma W$, where W follows some specified distribution and σ is an unspecified scale factor or dispersion term. The implementation of such models in S-Plus also allows for left-censoring. S-Plus offers such models with either normal, logistic or extreme value error distributions.

To choose a good regression model, it then seems sensible to apply an error distribution that has features similar to the crude Kaplan–Meier curves. These indicate light tails to the left (very few subjects with debut before 12 years) and fairly heavy tails toward the right (some subjects with debut at quite high age). None of the error distributions implemented in S-Plus have exactly this feature, but the extreme value distribution with density $f(t) = \exp(t - \exp(-t))$ has the opposite feature. In order to fit this model, we therefore reversed the time axis by multiplying all ages by –1, noting that such a reversal transforms right censorings to left censoring and vice versa.

Separate models were fitted for males and females using the full data set with birth year, education, and part of country as covariates. Then, the same models were fitted on the reduced data set also including population density as covariate. A survey variable was also included in all models to account for possible differences between the surveys. Since the model was additive, the results were easy to interpret, we predict the median age of debut with confidence intervals when all covariates were at their reference value, and then list the terms that were added when the covariates vary.

Comparisons of the Regression Models

To compare the results of the two models directly is difficult since the Cox model is multiplicative with relative hazards as association measures, whereas the parametric model is additive with differences in median debut as measures. To investigate the fit of the models, we therefore compared survival from the two models, with Kaplan–Meier survival curves estimated for many small subsets of data. The estimated survival function from the additive model follows directly from the specified parametric form and for the Cox models from the Breslow estimator of the cumulative hazard function.

For the comparison, we choose the 1., 5. and 11. cohort combined with the 1., 2. and 4. survey, respectively (otherwise the groups would be too small). These three groups were then combined with high and low education and two parts of the country (East and North) to form $3 \times 2 \times 2 = 12$ subsets. Three of these subsets have less that 5 subjects, so 9 subsets were used in the comparisons. For each of these subsets, a Kaplan–Meier survival curve was plotted with confidence intervals, as well as the survival from each model at the corresponding combination of covariates. The curve that was visually closest to the Kaplan–Meier was considered the best fit. The process was done separately for each sex.

Results

Censoring

Figure 1 shows a box plot of the age/age-of-debut distributions for the left-censored, observed, and right-censored groups. Since most of the observed debuts occurred before age 20, the left censored group probably does not add much information.

Kaplan–Meier

A total of 93.6% of the men and 96.0% of the women reported coital experience. The Kaplan–Meier survival curves are shown in Fig. 2.

There was a slight tendency for more debuts before age 16 among the males; after 16 years, the female failure curve was higher; the median was 17.8 years for females and 18.3 years for males. It should also be noted that that a large proportion (16.4%) of the debuts was reported to occur below the legal age of consent (16 years).

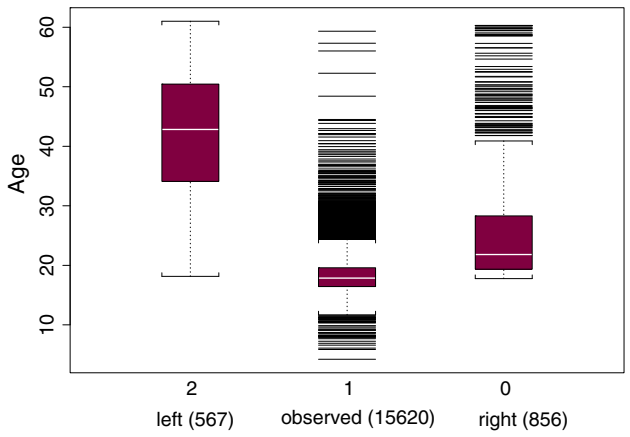

Fig. 1 Box plot of age distribution for subjects who are left or right censored, and debut age distribution for subjects observed. Left censored subjects state a debut without giving a debut age, right censored subjects state no debut. Observed subjects state a debut and a debut age

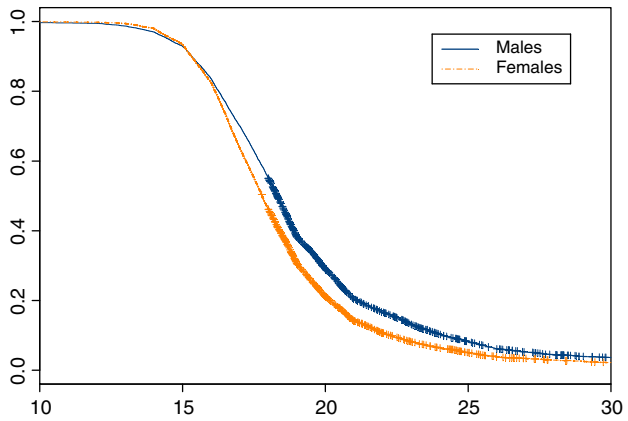

Fig. 2 Kaplan–Meier survival curves of age of coital debut by sex. The x-axis shows the age. The y-axis shows the proportion without debut

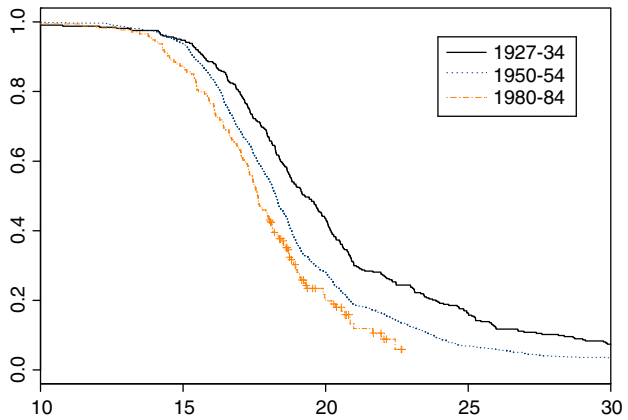

Fig. 3 Kaplan–Meier survival curve of age at coital debut by three selected cohorts (first, middle and last) for males

Figures 3 and 4 show the proportion without debut by age by cohort for males and females. To avoid clutter, only first, middle, and last cohort groups (1927–1934, 1950–1954, 1980–1984) are shown. We see a large change in debut over cohorts. For males the median debut dropped from 19.3 to 17.6 over the period; for females, the change was even larger, from 19.8 to 17.2 years.

Cox Model

We fit a separate Cox model for each sex, using survey, birth year, education, and part of country as covariates. The proportional hazard assumption was tested based on Schoenfeld residuals and they showed significant deviations from proportionality for many of the covariates. The deviations were stronger for the females than for the males. It appears that the Cox model may not be the best choice for this data. Also counting against the Cox-model is that it cannot use the left censored subjects.

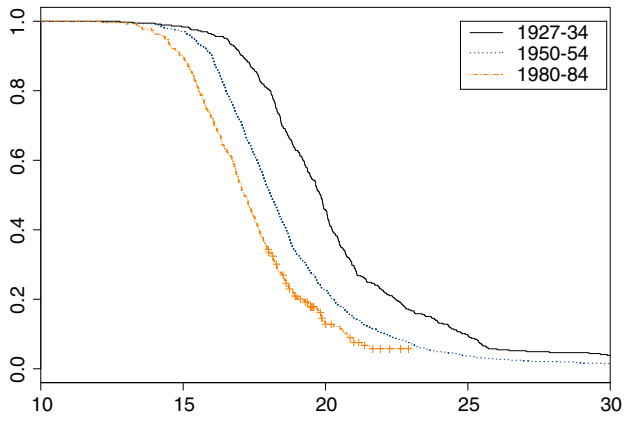

Fig. 4 Kaplan–Meier survival curve of age at coital debut by three selected cohorts (first, middle and last) for females

Parametric Survival Model

We fit an additive parametric survival model to the data using survey, birth year, education, and part of country as covariates. A separate model was fitted for each sex.

Table 1 shows the adjusted associations between age at coital debut and the covariates. To find the median debut for a given covariate combination, we took the reference value and added the adjusted differences for the corresponding covariate values. For example, the median debut for men born 1980–1984 with 10–12 years of education living in east Norway in a sparsely populated area equals $18.7 - 1.0 + 0.3 + 0 + 0 = 18.0$ years.

From the table, we see a clear change in coital debut over time. For men, there was a fairly steady decrease in median

Table 1 Median age of debut and adjusted differences in age of debut for males and females

	N	Males		N	Females	
		Adjusted difference	95% confidence interval		Adjusted difference	95% confidence interval
Reference	7696	18.7	(18.4, 19.1)	9545	19.5	(19.3, 19.8)
Birth year						
1927–1934	328	0.0		377	0.0	
1935–1939	328	0.2	(−0.3, 0.7)	365	−0.7	(−1.1, −0.4)
1940–1944	421	−0.5	(−1, 0)	456	−1.1	(−1.4, −0.8)
1945–1949	662	−0.3	(−0.7, 0.2)	682	−0.7	(−1, −0.4)
1950–1954	908	−0.4	(−0.8, 0)	1040	−1.6	(−1.9, −1.3)
1955–1959	1068	−0.4	(−0.8, 0)	1416	−2.2	(−2.5, −1.9)
1960–1964	1192	−0.6	(−1, −0.2)	1425	−2.7	(−2.9, −2.4)
1965–1969	1283	−0.4	(−0.8, 0)	1644	−2.5	(−2.8, −2.2)
1970–1974	827	−0.6	(−1.1, −0.2)	1153	−2.4	(−2.7, −2.1)
1975–1979	392	−0.7	(−1.2, −0.2)	626	−2.4	(−2.7, −2.1)
1980–1984	177	−1.0	(−1.6, −0.4)	276	−2.3	(−2.7, −1.9)
Education						
≤9	2641	0.0		3060	0.0	
10–12	1719	0.3	(0.1, 0.6)	2314	0.5	(0.3, 0.6)
13+	3247	1.0	(0.9, 1.2)	4033	1.1	(0.9, 1.2)
Part of country						
East	3792	0.0		4819	0.0	
South-west	998	0.1	(−0.2, 0.3)	1246	0.4	(0.3, 0.5)
West	1308	0.1	(−0.1, 0.3)	1579	0.3	(0.2, 0.5)
Middle	700	−0.1	(−0.4, 0.1)	825	0.1	(−0.1, 0.3)
North	783	−0.8	(−1, −0.5)	879	−0.3	(−0.5, −0.1)
Population density[a]						
Sparse	895	0.0		872	0.0	
Small place	1065	−0.7	(−1, −0.4)	1347	−0.4	(−0.5, −0.2)
Small city	1681	−0.7	(−1, −0.5)	2109	−0.2	(−0.4, 0)
City	1064	−0.6	(−0.9, −0.3)	1363	0.0	(−0.3, 0.2)
Large city	1401	−0.9	(−1.2, −0.6)	1667	−0.2	(−0.3, 0)

The columns contain variable names with categories, number of subjects and estimated difference in age of debut with 95% confidence interval based a parametric survival model. Separate models for males and females

[a] Fitted on a smaller data set

age at first coitus from the cohorts born 1927–1934, to the cohorts born in 1980–1984. The total drop over the period was 1 year for men. For women, the lowest age at first coitus was reported in the 1960 to 1964-cohort (2.7 years below the oldest cohort). Although not statistically significant, there was an indication of a following increase in coital debut age of 0.4 years up to the 1980–1984 cohort.

Women in the oldest cohorts reported that they had their first sexual intercourse 0.8 years later than did men. In the birth cohort 1955–1959, women dropped below men in coital debut age. In the latest cohorts, women had their first sexual intercourse 0.5 years earlier than did men. Note also that the confidence intervals for the female estimates were narrower than for the male estimates: there was more variation in male debut ages. This was also reflected in the estimated scale parameters in the models: the SD for the male residuals was 1.4 times larger than the female residuals.

Level of education (acquired for a large part after debut) was associated with coital debut both for men and for women. Those in the high education groups reported their coital debut approximately one year later than those in the low education group.

Age of coital debut varied geographically. Women in the Southwestern parts of Norway had their coital debut at a relatively high age. The coital debut age in the three northern countries was lower, particularly among males. Age of debut also varied according to population density. Respondents, particularly male respondents, living in sparely populated areas reported a higher age at first coitus than those living in more urbanized areas.

Cox and Parametric Survival Models Compared

We compared predicted survival from the two regression models with Kaplan–Meier survival curves for several small subsets of data. The model that stayed closest to the Kaplan–Meier curve for many different subsets was considered to have the best fit. For the males, the two model curves were both close to the Kaplan–Meier; of the nine subsets plots examined, the parametric model performed better in five plots, the Cox model better in four (Fig. 5 shows one example). For the females, the two models were more different, and the parametric model clearly performed better in all nine plots (Fig. 6 shows one example). This ties in with the more severe deviations from proportional hazards for the women.

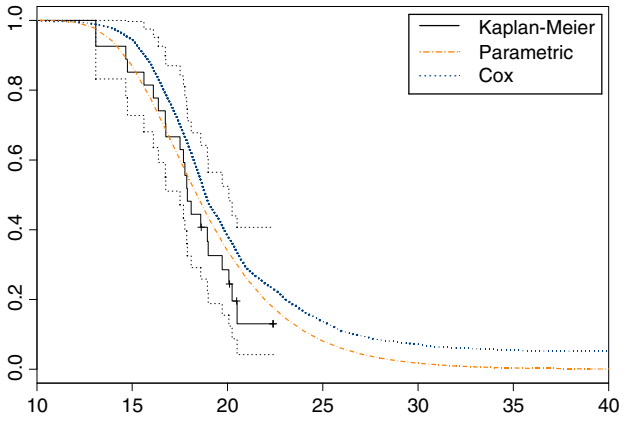

Fig. 5 Proportion of males without debut by age (survival plot). The solid line step curve is Kaplan–Meier with dotted confidence interval, the dash–dotted curve shows the parametric model, and the dotted curve shows the Cox model. The plot compares the predictions from the two models with the Kaplan–Meier curve estimated on a subset of 28 males from 4 survey, born 1980–1984, with high education, living in east Norway. The parametric model is closest to the Kaplan–Meier curve, i.e., shows the best fit

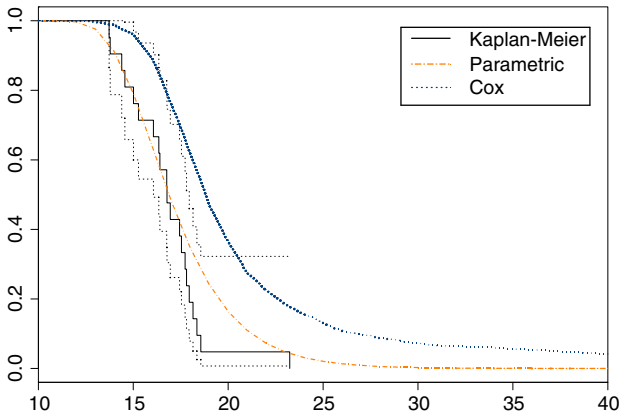

Fig. 6 Proportion of females without debut by age (survival plot). The solid line step curve is Kaplan–Meier with confidence interval, the dash–dotted curve shows the parametric model, and the dotted curve shows the Cox model. The plot compares the predictions from the two models with the Kaplan–Meier curve estimated on a subset of 23 females from 2 survey, born 1955–1959, with low education, living in north Norway. The parametric model is closest to the Kaplan–Meier curve, i.e., shows the best fit

Discussion

Age of coital debut was best analyzed by survival methods. The debut ages did not follow the proportional hazard assumption of the Cox model, and an additive parametric survival model was the better regression model for the data, both in terms of model fit and ease of interpretation. The analysis showed a substantial change in age of first sexual intercourse in Norway in the twentieth century. Comparing median coital debut age in persons born between 1927 and 1984, there has been a drop of 1 year for men and 2.3 years for women. Women in the oldest cohorts reported that they made their debut 0.8 years later than did men, whereas in the youngest cohorts reported their debut 0.5 years earlier than did men. Early coital debut was independently associated with low level of education, living in the north of Norway, and not living in a sparsely populated area.

The debut age data were not fully observed, for subjects without a debut we only know that the debut has not yet occurred, at the time of the study. If the analysis was not based on survival methods, then these subjects would be excluded from the analysis. Overall in our data, only around 5% were without debut; excluding these reduced the medians around 0.15 years. But for data or subgroups of young people, the error may be substantial.

The age of debut was reported in whole years and it is important to correct for this, for instance by adding noise from a uniform (0,1) distribution. This increases the medians by an average of 0.5 years, and also removes problems with ties in the regression models. Adding uniform noise gives the same effect as the Efron ties correction in Splus (Samuelsen et al., 2005). Information about the method is important when comparing to other results; the differences caused by the method may be larger than the difference in age at first intercourse between men and women. Some subjects may round their debut age up; if so, our method will slightly overestimate the debut age.

We hold that the main advantage of the additive parametric model is the easy interpretable output. Whether it will, in general, give a better fit to debut data than the Cox model is uncertain. The Cox model is a flexible model with a non-parametric baseline hazard, whereas the parametric model is more rigid: the error distribution has only one parameter that sets the scale (σ) and the shape is fixed (or can be chosen from among a few fixed shapes depending on the program used). Both models make strong assumptions about the data. The Cox model assumes proportional hazards inside all covariates. For data that follow subjects over the "full lifespan" where debut might take place, rather than a restricted age range, the proportionality may be less likely to hold. The additive parametric model makes an equally strict assumption of parallel debut ages inside all covariates; again, this assumption must hold over all debut ages. But in the Norwegian data, particularly for the females, the latter assumption is the better one. The models we have looked at are limited to the options available in Splus (v 6.1). SAS offers the same models. SPSS (v 14.0) does not have parametric survival models; Stata (v 9.0) does have parametric survival only for accelerated failure time models where the logarithm of the event times is linear.

We also fit a model with birth cohort as the only covariate, allowing a separate scale parameter (σ) for each cohort. The resulting scale parameters were different, showing higher variance in debut age in the first cohorts. We believe that such separate scales would have given us the best fit in the full model; unfortunately, Splus does not allow such models with more than one covariate.

The conclusions about model fit are based on comparing predictions from the regression models with Kaplan–Meier curves on small subsets of data. To our knowledge, no formal goodness of fits test exists for the parametric models. The parametric model also includes the left censored subjects (576 subjects, 3.4% of the data); the Kaplan–Meier and Cox analyses do not. The comparisons of the fit of the models are, therefore, not exactly correct, but removing the few left censored subjects makes little difference for the resulting parametric model.

Since the focus of this paper is on the method of analysis, the discussion on the effect of response rate and interpretation of the debut results is brief. The response rates in the four surveys were: 63%, 48%, 38%, and 36%. This raises two problems: the low overall response gives ample possibility for response bias and the change in response may mean a change in the response population structure over survey, which may invalidate time trends. To the former: The information on response bias is based on (1) comparing covariates in the samples with known covariates in the target population (sex, age, county, and education), (2) an additional survey of response bias, and on (3) comparing early and late responders (before and after reminders) (Stigum, Magnus, & Bakketeig, 1997; Stigum, Magnus, Veierød, & Bakketeig, 1995). Neither of these sources indicates any serious selection bias, but their power was low. Also, comparison with other studies on sexual behavior in Norway, Sweden, and Finland suggest that the non-response was close to random (Kontula & Haavio-Mannila, 1995; Stigum et al., 1997). To the latter: The time trend problem was reduced in our analysis since it was based on birth cohorts that were (partly) overlapping in the surveys. We also controlled for survey in the regressions; the trend in debut over cohorts was the same with and without survey in the model, indicating no confounding.

Furthermore, the figures from the youngest cohort matched those of another representative, population-based longitudinal study in Norway (Pedersen et al., 2003). Also, the regional differences in coital debut age in Norway found in this study corresponded well to the findings from Pedersen et al.'s (2003) study. These differences are likely to reflect differences in sexual culture within Norway.

That women since the beginning of the 1970s have had their first sexual intercourse at an earlier age than men is a finding specific for the Nordic, and a few other countries in northern Europe (Bozon & Kontula, 1998; Kontula & Haavio-Mannila, 1995; Sundet et al., 1992; Teitler, 2002). An important explanation for this is likely to be connected to women's access to oral contraception. When the prevention pill was introduced on the market and became available to women, the fear of unwanted pregnancy no longer functioned as a means of controlling and repressing female sexuality. However, that women make their coital debut prior to men is also likely to be related to sexual culture. The social acceptance of adolescent and female sexuality is significantly greater in the Nordic countries than in most other Western cultures (Helmius, 1990; Traeen, 1993).

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ORIGINAL PAPER

Sexual Identity and Sexual Well-Being in Female Heterosexual University Students

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Abstract Sexual identity has generally been studied with a focus on sexual orientation and has not incorporated a general identity framework. Low levels of identity exploration and commitment have been shown to predict poor well-being in adolescents, but the relationship between sexual identity and sexual well-being has not been examined. The current cross-sectional survey was administered to 293 heterosexual female undergraduate students from a mid-sized university in Ontario, Canada. Participants completed the Measure of Sexual Identity Exploration and Commitment (Worthington, Navarro, Savoy, & Hampton, 2008), as well as several measures to assess sexual well-being. These included the Sexuality Scale (Snell & Papini, 1989), the Sexual Awareness Questionnaire (Snell, Fisher, & Miller, 1991), the Body Esteem Scale for Adolescents and Adults (Mendelson, Mendelson, & White, 2001; Mendelson, White, & Mendelson, 1997), and four individual items assessing sexual satisfaction (Laumann et al., 2006). Confirmatory factor analysis was used to test the measurement models of sexual identity and sexual well-being, and structural equation modeling was used to examine the relationship between sexual identity and sexual well-being. Results indicated that higher levels of sexual identity exploration and commitment predicted sexual well-being. However, other aspects of sexual identity, such as synthesis and sexual orientation identity, were not predictive of sexual well-being. The implications of using an identity framework for measuring sexual identity are discussed.

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Keywords Sexual identity · Sexual well-being · Heterosexual women

Introduction

The process of adolescent identity construction has been well documented in the literature; however, the domain of sexual identity has been largely overlooked. The majority of previous research on sexual identity has focused exclusively on sexual orientation (e.g., Konik & Stewart, 2004; Tasker & McCann, 1999) and all prominent models of sexual identity (Cass, 1979, 1984; Fassinger & Miller, 1996; McCarn & Fassinger, 1996) have focused on the identity development or coming out process of non-heterosexuals. In the present research, sexual identity will be considered more broadly as a process of defining oneself as a sexual being, and will not be limited to sexual orientation.

Erikson (1956, 1968) was the first to suggest that forming a clear and stable sense of self-identity is the primary developmental task of adolescence. According to his theory of psychosocial development, an established and well-integrated identity structure provides a sense of purpose on the path to adulthood, and serves as the basis for coping with problems and making decisions. To create an empirical measurement of identity, Marcia (1966) drew on two dimensions of Erikson's theory of identity formation: crisis and commitment. Under this paradigm, commitment refers to a sustained personal investment and dedication to a set of goals, values, and ideals. Crisis, or exploration, is a period of examining alternatives and searching for appropriate goals, values, and ideals, with the intention of making a commitment. Based on levels of identity exploration and commitment, Marcia (1966) identified four types of identity to create the Identity Status Paradigm. The lowest order status in this

paradigm is *identity diffusion*, which refers to an adolescent who is uncommitted to and currently not exploring an identity. *Foreclosure* represents an individual who is committed to an identity without exploration. Generally, this is associated with a normative processing style which involves adopting the norms and values of important others, such as parents or guardians, without self-exploration of alternatives (Berzonsky, 1992). Adolescents in the *moratorium* phase are actively exploring options and alternatives, but have not yet committed to an identity. *Identity achievement* is realized when an adolescent has committed to an individual identity (i.e., a set of goals, values, and beliefs) based on active exploration of alternatives. Marcia's status conceptualization of identity has been well documented in the literature, but has only recently been applied to sexual identity development.

Identity and Well-Being

Many psychosocial correlates of identity statuses and processing styles have been demonstrated in research on adolescents. A predictive relationship has been shown between identity processing styles and maladjustment in youth. In general, diffuse-avoidant processing, which is characteristic of low levels of exploration and commitment, has been associated with conduct disorder, hyperactivity, and increased self-reported delinquency in high-school aged adolescents (Adams et al., 2001; Adams, Munro, Munro, Doherty-Poirer, & Edwards, 2005). The association of diffuse-avoidance with an external locus of control and the tendency to allow situational rewards to determine behavior may connect diffuse-avoidant processing to crime and deviance in adolescence. Additionally, the lack of direction and self-discipline associated with diffusion seems to place these youth at increased risk for academic problems and poor adjustment to university life (Berzonsky & Kuk, 2000). Vleioras and Bosma (2005) suggested that avoidance of identity issues (i.e., low levels of exploration) among university students was related to poor psychological well-being. One potential benefit of investigating identity exploration and commitment includes identifying students who may be at risk for behavioral and psychological problems (Berzonsky & Adams, 1999). However, while the utility of studying adolescent identity has been demonstrated, little research attention has been devoted to studying adolescent sexual identity development and its relationship to sexual well-being.

Sexual Identity

Sexual identity can be distinguished from sexual orientation as a process of defining oneself more broadly as a sexual being and includes dimensions beyond sexual orientation. In addition to sexual orientation, the dimensions of a sexual identity might include sexual values and needs, preferred forms of sexual expression and sexual activities, and desired characteristics of sexual partners (Worthington, 2004). Worthington, Savoy, Dillon, and Vernaglia (2002) added sexual orientation identity to the concept of sexual identity, noting that the recognition and acceptance of a person's sexual orientation is an additional component of his or her general sexual identity.

Eliason (1995) studied heterosexual identity using an identity framework. Eliason examined university students' essays in terms of Marcia's (1966) Identity Status Paradigm and found that heterosexual students present different levels of exploration and commitment to a sexual identity. Research of this nature is important in breaking down the myth that heterosexuality is a monolithic identity that requires limited identity processing, but the major weakness of this research was the primary focus on sexual orientation as the sole component of sexual identity (Worthington et al., 2002).

Worthington et al. used their model of heterosexual identity to create a measurement tool that assessed four aspects of sexual identity (commitment, exploration, synthesis, and sexual orientation identity moratorium) across sexual orientations. The Measure of Sexual Identity Exploration and Commitment (MoSIEC, Worthington, Navarro, Savoy, & Hampton, 2008) is comprised of four distinct sub-scales. *Exploration* reflects the identity construct first operationalized by Marcia (1966) and refers to the level of consideration an individual has personally and actively given to aspects of their sexual identity. This consideration can be cognitive, behavioral, or both, but is not limited to behavioral exploration. *Commitment* was also derived from an identity status framework (Marcia, 1966) and reflects levels of clarity and devotion to aspects of a sexual identity. Commitment may be demonstrated as a sustained personal investment to a set of goals, values, and ideals. Specifically, exploration is characterized by the active pursuit of a refined identity whereas commitment is characterized by the choice to adopt a specific identity based on a set of goals, values, and ideals. *Synthesis* refers to the consistency between an individual's sexual identity and other aspects of their lives. A high score on the synthesis sub-scale is indicative of a sexual identity that is well integrated into all areas of an individual's life. The final sub-scale, *sexual orientation identity moratorium*, measures the extent to which an individual has considered their sexual orientation and the clarity and consistency of this aspect of their sexual identity.

Worthington et al.'s model considers an individual's development along multiple dimensions of sexual identity and it is emphasized that many individuals will have different levels of commitment to different aspects of their sexual identity. Worthington et al. (2008) tested this four-factor model of sexual identity in four samples using exploratory

and confirmatory factor analysis (CFA). In the current study, CFA was used to test this model in a sample of female university students. Structural equation modeling (SEM) was then used to explore the relationship between sexual identity and sexual well-being.

Sexual Well-Being

Subjective well-being has been defined as a person's cognitive and affective evaluation of their life, and positive well-being has consisted of life satisfaction, including satisfaction with specific important domains (e.g., work, relationships), positive affect, and low levels of negative affect, self-acceptance, and autonomy (Clark, Marshall, Ryff, & Wheaton, 2001; Diener, 2000). Despite the multidimensional approach used to study general well-being, a multi-faceted model of sexual well-being does not exist. Sexual well-being has generally been thought of as one's level of satisfaction with their sex life. Oberg, Fugl-Meyer, and Fugl-Meyer (2002) have assessed sexual well-being simply by asking participants to rate how satisfied or dissatisfied they are with their sexual lives. Sexual well-being can be seen as an analog to subjective well-being and, therefore, in defining sexual well-being for the current study, multiple dimensions were considered.

Sexual well-being has been associated with an increased satisfaction with personal sexuality, which includes sexual awareness, clarity of sexual values, and comfort with sexual communication (Gustafson, 1998), as well as sexual satisfaction in terms of the emotional and physical relationship, sexual functioning, and importance of sexuality (Laumann et al., 2006). Sexual esteem refers to the value a person places on him or herself as a sexual being and the general evaluation of one's potential to relate sexually to another person (Snell, Fisher, & Walters, 1989). Esteem related to body image refers to the subjective positive or negative evaluation of one's physical appearance and level of attractiveness. Body esteem has been evaluated in three areas: body esteem related to one's general appearance, body esteem related to weight satisfaction, and body esteem based on the perceived attributions of others (Mendelson, Mendelson, & White, 2001; Mendelson, White, & Mendelson, 1997). It has been shown to be an important component of women's sexual self-schema, which refers to cognitions regarding the sexual self (Wiederman & Hurst, 1997), a construct conceptually similar to sexual well-being. In the current study, subjective sexual well-being was defined as the cognitive and affective evaluation of oneself as a sexual being. Operationally, this included satisfaction with sexual relationships and functioning, sexual awareness, sexual self-esteem, body image esteem related to appearance, weight, and the attributions of others.

Proposed Model and Hypotheses

With our model, we aimed to test if the relationship between sexual identity and sexual well-being was similar to the relationship between identity and well-being. The current study was based on a sample of heterosexual women as there is limited research on heterosexual identity, and the construction of sexual identity and sexual well-being may be different across genders. Specifically, it has been found that women generally demonstrate higher levels of commitment and exploration earlier and more often than men, especially when the investigation included the identity domains of sexuality and interpersonal relationships (Kroger, 1997). Factors such as body esteem have also be shown to have a stronger impact on women's sexuality than men's (Haavio-Mannila & Purhonen, 2001), as such the indicators of sexual well-being for women may not be applicable for men. Therefore, the current study focuses exclusively on sexual identity and sexual well-being in women.

The general identity literature demonstrates how different levels of identity exploration and commitment contribute to well-being and adjustment in several areas of life. For example, low levels of identity exploration and commitment (i.e., diffuse identity status) have been commonly related to maladjustment and lower levels of psychological well-being (Adams et al., 2001, 2005; Vleioras & Bosma, 2005). However, as previously stated, the relationship between sexual identity development and sexual well-being is not known. It was hypothesized, based on the previous identity literature, that higher levels of sexual identity exploration and commitment would be related to greater sexual well-being. We also predicted that greater sexual identity synthesis would be related to greater sexual well-being and higher levels of sexual identity orientation moratorium would be related to lower levels of well-being (Fig. 1).

Method

Participants

Participants were 293 heterosexual female undergraduate students recruited from the University of Guelph. Participants ranged in age from 17 to 27 years ($M = 19.55$, $SD = 1.46$). The majority (92%) of the participants identified as white/Caucasian. A total of 224 (76.5%) participants reported previously engaging in sexual intercourse. Nearly half (46%) of the participants were seriously dating one person, and the majority (58%) of these participants had been in this relationship between 1 and 5 years.

Students were recruited through classroom visits by the researcher and provided with a copy of the link for the online

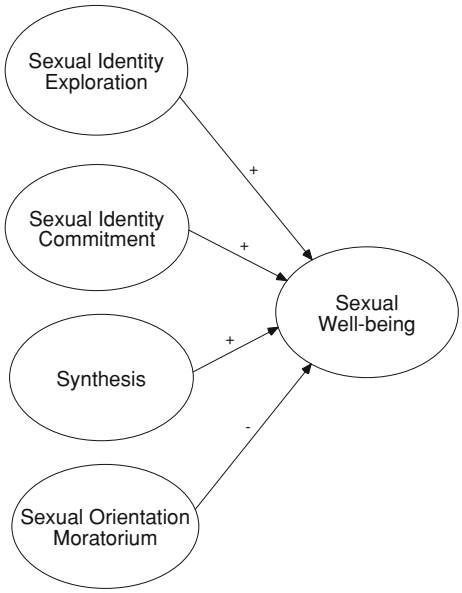

Fig. 1 Hypothesized model of the relationship between sexual identity and sexual well-being

survey. The researcher visited 14 undergraduate classes in multiple disciplines including family relations and applied nutrition, political science, geography, psychology, sociology, and biology. Approximately 3,200 students in total were enrolled in the classes visited. However, a portion of these students were likely enrolled in more than one of these classes or were absent on the day of recruitment, and recruitment efforts may not have reach all enrolled students. A total of 477 students responded to the online survey, which based on classroom enrollment is a 15% response rate. Of these, 87 (18.5%) participants were removed from the analysis because they did not complete the online survey; the sample was further reduced to meet age and gender requirements. Participants were not required to be sexually active to be eligible for participation in this research and were provided with this information during recruitment. For survey questions pertaining to sexual activity, participants could either respond to these questions based on sexual activity other than sexual intercourse or could choose a "not applicable" option. Additionally, potential participants were informed that an incentive would be offered for involvement in the study. This study received ethics approval from the Research Ethics Board at the University of Guelph.

Measures

Sexual Identity Measure

Sexual identity was measured using Worthington et al.'s (2008) MoSIEC. The MoSIEC is a 28-item questionnaire (see Appendix—Table 2 for a complete list of items) that measures four aspects of sexual identity: *exploration* (10 items), *commitment* (7 items), *synthesis* (4 items), and *sexual orientation identity moratorium* (4 items). The items were rated on a 5-point Likert-type scale from 1 (very uncharacteristic of me) to 5 (very characteristic of me). Two initial studies conducted by Worthington et al. (2008) using this measure have demonstrated high internal consistency across *commitment* ($\alpha = .83$ and .80), *exploration* ($\alpha = .85$ and .87), *sexual orientation moratorium* ($\alpha = .78$ and .73), and *synthesis* ($\alpha = .79$ and .72). Two-week test–retest reliability was also good, ranging from .71 to .91 in a sub-sample of 61 participants.

Sexual Well-Being Measures

Sexual Self-Esteem Sexual self-esteem was measured using the subscale of sexual esteem from the Sexuality Scale (SS; Snell & Papini, 1989). The SS is a 30-item scale that is rated on a 5-point Likert-type scale for agreement with each item: −2 (disagree), −1 (slightly disagree), 0 (neither agree nor disagree), +1 (slightly agree), +2 (agree). Ten items in this scale reflected *sexual esteem*, a positive regard for and confidence in the capacity to experience one's sexuality in a satisfying and enjoyable way (e.g., I am confident about myself as a sexual partner). This subscale was used with a sample of 296 undergraduate males and females at a small midwestern university and demonstrated good reliability ($\alpha = .92$) and validity (Snell & Papini, 1989), which has been subsequently supported by Snell, Fisher, and Schuh (1992). Good reliability was also demonstrated in the current sample ($\alpha = .94$).

Sexual Satisfaction Sexual satisfaction referred to satisfaction with one's sexual relationships, satisfaction with one's sexual functioning, and the importance of sex in one's life. To assess sexual satisfaction across these domains, four questions were adapted from Laumann et al. (2006). Participants were asked: "During the past 12 months, how physically pleasurable did you find your relationship with your partner to be?" and "During the past 12 months, how emotionally satisfying did you find your relationship with your partner to be?" Response options for both questions were on a 5-point scale, ranging from "not at all satisfying" to "extremely satisfying" with an additional "not applicable" option for participants who were not in a relationship in the last year. Participants were informed that they may consider either their current sexual partner or most recent sexual partner. Satisfaction with sexual functioning was assessed by the following question: "If you were able to spend the rest of your life with your sexual functioning the way it is today, how would you feel about this?" Response options were on a 5-point scale from "very dissatisfied" to "very satisfied." And finally, participants were asked: "How important a part of your overall life would you say that sex is?" Response

options ranged from "not important at all" to "extremely important." Adequate reliability was demonstrated in the current sample ($\alpha = .74$).

Sexual Awareness Sexual awareness was measured using two subscales from the Sexual Awareness Questionnaire (SAQ; Snell, Fisher, & Miller, 1991): *sexual consciousness*, a tendency to think and reflect on the nature of one's own sexuality, and *sexual assertiveness*, a tendency to be assertive about the sexual aspects of one's life. Each item was rated on a 5-point Likert scale from 0 (not at all characteristic of me) to 4 (very characteristic of me). Items included: I am very aware of my sexual feelings (sexual consciousness), If I were to have sex with someone, I'd tell my partner what I like (sexual assertiveness). Snell et al. (1991) provided evidence for acceptable reliability (alphas ranging from .80 to .89) and validity of these two subscales in two samples of 386 undergraduate students. The scale yielded good reliability in the current sample as well ($\alpha = .81$).

Body Esteem Body esteem referred to an individual's self-evaluations of their body or appearance. Body esteem was measured using the *Body Esteem Scale for Adolescents and Adults* (BESAA; Mendelson et al. 1997, 2001). This measure was rated on a 5-point Likert scale and consisted of three subscales: BE-Appearance (10 items reflecting general feelings about appearance), BE-Weight (8 items reflecting weight satisfaction), and BE-Attribution (5 items reflecting one's attribution about how others are evaluating their body or appearance). Strong test–retest reliability ($r = .83$ to .89) and convergent validity with two measures of self-esteem have been demonstrated in a sample of 1,334 high school, college, and university students (Mendelson et al., 1997). In the current sample, all three subscales of the BESAA demonstrated good reliability ($\alpha = .90$, $\alpha = .92$, $\alpha = .92$, for weight, appearance, and attribution, respectively).

Data Analysis

Confirmatory factor analysis was used to test a measurement model of both sexual identity and sexual well-being. The most important components of sexual well-being were determined based on the six indicator variables (sexual satisfaction, sexual esteem, sexual awareness, and body esteem related to weight, appearance, and the attributions of others) and a four-factor model of sexual identity was tested based on the four subscales of the MoSIEC (commitment, exploration, synthesis, and sexual orientation identity moratorium). CFA was also used to test a second-order model of sexual identity using the four factors as indicators of one general latent factor. All responses were coded in the affirmative direction and scale scores were then calculated according to the individual scale's coding instructions.

Once the best-fitting models were established for each construct, SEM was used to explore the relationship between these constructs. All models were estimated using maximum likelihood estimation in the Analysis of Moment Structures Program (AMOS 6.0, Arbuckle, 2005). As suggested by Hu and Bentler (1998), multiple fit indexes were used to determine how well the model fit the data. Goodness of fit measures across various categories were used, including chi-square and chi-square minimum difference, Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). The chi-square index assesses the discrepancy between the estimated and the observed covariance matrices and should have a small value. However, due to its sensitivity to sample size, the chi-square statistic is often significant despite reasonable fit to the data (Byrne, 2001). Therefore, other fit indexes and squared multiple correlations (SMCs) were used to compensate for potential biases in the chi-square test. The amount of variance accounted for by a particular variable in the model was indicated by the SMC value. The goal was to retain variables that accounted for the greatest amount of variance in the model. Based on previously established guidelines (Browne & Cudeck, 1993; Byrne, 2001; Hu & Bentler, 1999), GFI, AGFI, CFI, and TLI values of .90 and greater were considered a good fit and values of .80 and greater a fair fit. RMSEA values of less than .05 were considered a good fit and values of up to .08 were accepted considering the other fit indexes were reasonable.

Results

Measurement Models

Sexual Identity

The first measurement model tested Worthington et al.'s (2008) four-factor model of sexual identity and included the four identity factors: exploration (10 items), commitment (7 items), synthesis (5 items), and sexual orientation moratorium (4 items). The initial four-factor measurement model of sexual identity (Model 1) was tested and the fit indexes suggested a less than adequate fit to the data, $\chi^2(299) = 988.02$, $p < .001$, GFI = .79, AGFI = .75, CFI = .75, TLI = .73, RMSEA = .09. Fit indexes for all models are reported in Table 1. Critical ratios indicated that all the paths in the model were statistically significant. Factor correlations were significant at the .001 level, except between exploration and sexual orientation moratorium.

The factor loadings ranged from .38 to .85. Only one standardized factor loading was below .40 (*sexid15* on the Exploration factor). The SMCs ranged from .12 to .74, with

Table 1 Goodness of fit indicators for sexual identity and sexual well-being measurement models and the structural model

Model	χ^2	*df*	CMIN/DF	GFI	AGFI	CFI	TLI	RMSEA	$\Delta\chi^2$ (Δdf)
Sexual identity									
Model 1	988.02	299	3.30	.79	.75	.75	.73	.09	
Model 2	886.52	275	3.22	.80	.77	.77	.75	.09	M1–M2 (24) = 101.68*
Model 3	826.70	252	3.28	.81	.77	.77	.75	.08	M2–M3 (23) = 59.82*
Model 4	770.25	230	3.35	.81	.78	.78	.76	.09	M3–M4 (22) = 56.45*
Model 5	682.09	209	3.26	.82	.79	.80	.77	.08	M4–M5 (21) = 88.16*
Model 6	624.21	189	3.30	.83	.80	.81	.78	.08	M5–M6 (20) = 57.88*
Model 7	**484.51**	**188**	**2.58**	**.87**	**.84**	**.87**	**.85**	**.07**	M6–M7 (1) = 139.70*
Model 8	1323.28	189	7.00	.57	.48	.49	.44	.14	
Sexual well-being									
Model 9	55.97	5	11.20	.93	.80	.84	.67	.19	
Model 10	**3.82**	**2**	**1.91**	**.99**	**.97**	**.99**	**.98**	**.05**	M9–M10 (3) = 52.15*
Structural model									
Model 11	**673.44**	**292**	**2.31**	**.85**	**.82**	**.87**	**.85**	**.07**	

Bold items indicate final best-fitting model, * $p < .001$

the variables *sexid15*, *sexid10*, and *sexid21_r* having values below .20 (.12, .16, and .19, respectively). The ultimate goal of the analyses was to test the relationship between sexual identity and sexual well-being; therefore, modifications were made to the measurement model of sexual identity to improve model fit before testing that structural relationship.

The largest MI was between the error terms for *sexid15* and *sexid10* (MI = 35.14), suggesting that the addition of a path between the error terms of these items may be appropriate. Both of these items measure the degree to which one has explored or attempted to understand their sexual orientation. It makes theoretical sense that these items share some degree of nonrandom measurement error. The highest MI for covariances was the error term for *sexid15* and the sexual orientation moratorium factor, indicating that this item may be cross-loading on both the exploration and sexual orientation moratorium factors. However, because the item *sexid15* considers the exploration of sexual orientation, it makes theoretical sense that this item would cross load on both factors. Also, *sexid15* had the lowest factor loading (.35). Based on this information, *sexid15* was removed from the model.

Removing *sexid15* resulted in a slight improvement in overall fit indexes (Model 2). Four more items were removed from the model in a stepwise fashion based on low SMCs and factor loadings, and model fit indexes were calculated for each individual change or adjustment to the model (Models 3–6). The weakest items were removed in sequence and fit indexes were calculated after each change to determine whether the deletion of the item improved the overall fit of the model to the data. In total, five items were removed from the model, two from the exploration factor, one from commitment, one from synthesis, and one from sexual orientation moratorium. After removing the five items, the highest remaining MI for covariances was between the commitment and synthesis factors (MI = 108.50), suggesting that these variables should be allowed to correlate. A path was added between commitment and synthesis, which significantly improved the fit of the model.[1] No further improvements were indicated and Model 7 was retained as the best-fitting model of sexual identity, $\chi^2(188) = 484.51, p < .001$, GFI = .87, AGFI = .84, CFI = .87, TLI = .85 RMSEA = .07 (see Table 1).

A second-order factor model was also tested using the same 15 variables, and specified the four latent sexual identity factors from Worthington et al.'s model of sexual identity, and a higher-order sexual identity factor. There was a clear decrement in fit indexes for the second-order model (Model 8) as compared to the best fitting first-order model, $\chi^2(189) = 1323.28$, $p < .001$, GFI = .57, AGFI = .48, CFI = .49, TLI = .44, RMSEA = .14. Overall, the four-factor Sexual Identity model demonstrated significantly better fit to the data than the second-order model, as indicated by the chi-square values and comparison of fit indexes, and was thus used to test the structural relationships between sexual identity and sexual well-being.

Sexual Well-Being

The second measurement model tested was a one-factor model of sexual well-being and included the latent construct

[1] Given the strong correlation between the commitment and synthesis factors ($r = .82$), an alternate model was tested collapsing these two factors into a single factor. However, there was a decrement in fit values for the three-factor model and Worthington et al.'s (2008) four-factor model of sexual identity was retained.

of sexual well-being measured by six indicators: sexual esteem (*sexesteem*), sexual awareness (*sexaware*), sexual satisfaction (*sexsatis*), body weight esteem (*bewt*), body appearance esteem (*beapp*), and body esteem attribution (*beatt*). Total scale scores were used for each of the indicator variables instead of individual items because the Cronbach's alphas were in the acceptable range for all scales. One reference item was selected (*sexsatis*) and its path coefficient was fixed to a value of 1.0 to appropriately scale each factor. The remaining parameters were freely estimated.

The first attempt at testing the measurement model of sexual well-being revealed a negative error term for the variable *beapp*. This variable was removed from the model. The one-factor measurement model (Model 9) suggested a poor fit to the data, $\chi^2(5) = 55.97$, $p < .001$, GFI = .93, AGFI = .80, CFI = .84, TLI = .67, RMSEA = .19. Fit indexes for the measurement and structural models are reported in Table 1. Critical ratios indicated that all paths in the model were statistically significant at the .001 level. The standardized regression weights (or factor loadings) ranged between .24 and .89. The SMCs ranged between .06 and .70. *Bewt* had an SMC of .06, meaning that 6% of the variable's variance was accounted for by the factor, and a factor loading of .24. The analysis focused on removing the weakest indicators, while monitoring the influence on the other variables. The weakest indicators were identified by weak factor loadings and low SMCs; therefore, the variable with the lowest factor loading and SMC (*bewt*) was removed from the model.

Removing *bewt* from the model decreased the chi-square value to a desirable range. Fit values indicated that Model 10 was a good fit to the data, $\chi^2(2) = 3.82, p = .15$, GFI = .99, AGFI = .97, CFI = .99, TLI = 98, RMSEA = .05. Factor loadings for the remaining variables were above .40 and SMCs were all above .20. Modification indexes were also examined and did not suggest any further improvements to the model. Therefore, Model 10 was the final one-factor model of sexual well-being and included body esteem attribution, sexual esteem, sexual awareness, and sexual satisfaction.

Structural Model of Sexual Identity and Sexual Well-Being

The structural relationships between sexual identity and sexual well-being were tested using the best-fitting models of sexual identity (Model 7) and sexual well-being (Model 10). Based on previous identity research, it was expected that exploration and commitment would be positively correlated with sexual well-being. Results indicated that two of the four structural paths were statistically significant. Commitment and exploration were significant, whereas synthesis and sexual orientation moratorium were not. Fit indexes revealed that the structural model (Model 11) had a slight decrement in fit values compared to the measurement models, $\chi^2(271) = 673.44$, GFI = .85, AGFI = .82, CFI = .87, TLI = .85, RMSEA = .07, but was an adequate fit to the data. Structural regressions indicated that the commitment (.76) and exploration (.39) factors had a positive relationship to sexual well-being, which is consistent with identity theory. Inconsistent with the current hypotheses, sexual orientation moratorium and synthesis had weak and non-significant relationships to sexual well-being. MIs indicated further improvements to the model, but the improvements involved further changes to the measurement model and were not made as the interest in this analysis was testing the structural relationship between sexual identity and sexual well-being. Therefore, Model 11 was the final structural model and demonstrated adequate fit to the data (see Fig. 2).

Discussion

Based on findings from the general identity literature, it was hypothesized that levels of sexual identity exploration and commitment would be related to sexual well-being. This hypothesis was supported as commitment and exploration had a strong, positive relationship with sexual well-being, meaning that greater personal consideration and clarity of sexual identity was related to higher levels of sexual well-being. This finding is theoretically aligned with the general identity research findings that levels of identity exploration and commitment are related to subjective well-being and adjustment (Adams et al., 2001, 2005; Berzonsky & Adams, 1999; Berzonsky & Kuk, 2000), and indicates that sexual identity development has some of the same features of identity development.

Although the relationships of synthesis and sexual orientation identity moratorium to sexual well-being were in the expected direction (i.e., a positive relationship between synthesis and sexual well-being and a negative relationship between sexual orientation identity moratorium), the results were not statistically significant. Perhaps synthesis or consistency across aspects of the sexual self is not always desirable, especially for young undergraduate students who may be exploring certain facets of their sexuality for the first time. For example, if an individual's values around sex are that sexual activity is limited to committed relationships, there may be times when their sexual needs include a desire to have sex when thy are not in a relationship, which conflicts with their values. Inconsistencies between values, which can be a product of upbringing, religion or parental values, and sexual needs or desires may explain why synthesis does not significantly contribute to sexual well-being.

Additionally, all participants in the current sample identified as heterosexual and were not in a state of moratorium about their sexual orientation. Three of the five items

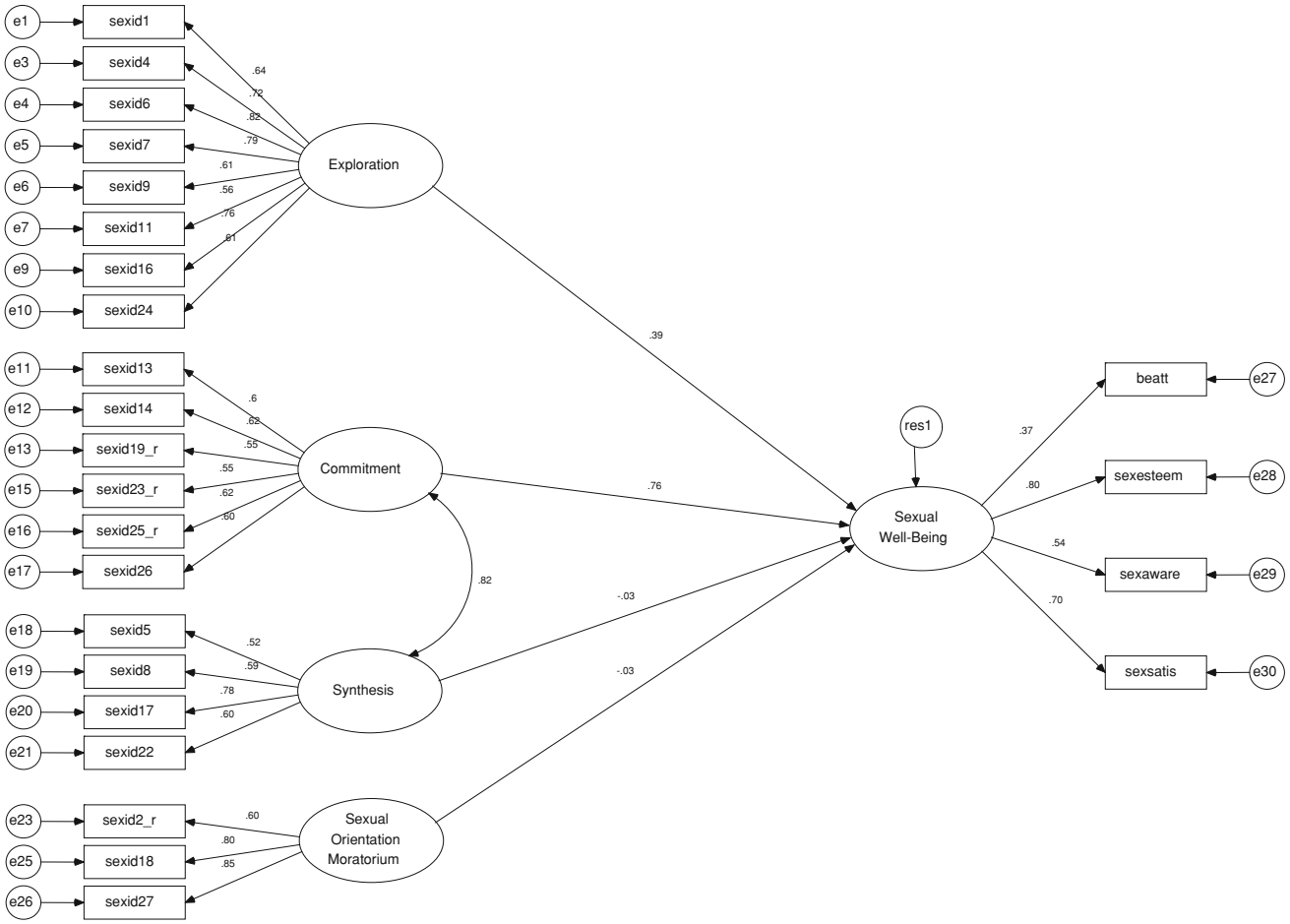

Fig. 2 The structural relationship between sexual identity and sexual well-being

removed (*sexid10*, *sexid15*, and *sexid28*) from the sexual identity measurement model were related to sexual orientation. Therefore, consideration of sexual orientation was not a salient factor for sexual well-being in the current heterosexual sample. Worthington et al. argued that their model holds across six sexual orientation groups (heterosexual men, heterosexual women, gay men, lesbians, bisexual men, and bisexual women); however, tests of measurement invariance have not been conducted to determine if the MoSIEC is equivalent across sexual orientation groups. Multi-group invariance refers to the items in a particular measure operating equivalently across different populations and comparisons across groups should only occur once the measurement model is deemed invariant (Byrne, 2001).

Worthington et al. reported reasonable fit for their four-factor model of sexual identity (i.e., CFI = .94, TLI = .93, SRMR = .06, RMSEA = .06); however, a second-order model of sexual identity was not tested. In the current study, a second-order model was tested but results did not support it. Considering sexual identity as a general overarching factor may obscure the multidimensional nature of this construct and the information that each subscale provides about sexual identity formation. In fact, the MoSIEC is not currently used as a single-score and our results advocate against such use in the future. A four-factor model has the benefit of providing more specific information about sexual identity exploration and commitment, two key factors in identity formation. Additionally, it provides information about sexual orientation moratorium, which may be differentially meaningful across sexual orientations. Marcia's (1966) Identity Status Paradigm, the identity model influencing the MoSIEC, is grouped by status and provides information across four levels of identity formation. Similarly, in previous models of gay and lesbian identity development, sexual identity is not conceptualized as an overarching construct, but as a series of phases toward greater identity synthesis (Fassinger & Miller, 1996; McCarn & Fassinger, 1996). Therefore, both empirical and theoretical support exists for the four-factor model of sexual identity, but future replication is needed to further establish this model.

Worthington et al. (2008) conceptualized their model as a "theoretically-based, multidimensional measure of the processes of sexual identity development" (p. 32). Therefore, sexual identity development is not characterized by a series

of hierarchical stages, but by the multiple processes involved in sexual identity development. The main contribution of the current research is demonstrating that levels of sexual identity commitment and exploration are significantly related to levels of sexual well-being. Women who choose a set of sexual goals, values, and ideals based on personal consideration are more likely to experience greater sexual satisfaction, sexual awareness, sexual esteem, and body esteem. Further, Berzonsky and Adams (1999) suggested that one implication of investigating identity exploration and commitment is to identify students who may be at risk for psychological and behavioral problems. The MoSIEC may be useful for counselors and sex educators to identify adolescents and young adults who are vulnerable for low levels of sexual well-being.

Limitations

The current investigation is cross-sectional and uni-directional, providing information about how levels of sexual identity are related to sexual well-being at one point in time. Future research examining the bi-directional relationship of sexual identity and sexual well-being over time is needed. Further, the current sample consisted of undergraduate university students from one Canadian university who were predominately Caucasian and the results may not be generalizable across other populations, age groups or ethnicities. Dunne (2002) reported that sex research participants tend to have more liberal sexual attitudes and greater sexual experience than their counterparts of the same age and gender. Therefore, participants in this sample may have been more sexually experienced and more comfortable talking about sex than the general population. Additionally, the current study only explored the sexual identity of women and the model should be examined across genders to determine if the constructs of sexual identity and sexual well-being are defined similarly in males. Men have demonstrated lower levels of identity exploration and commitment in terms of sexuality and interpersonal relationships (Kroger, 1997), thus these components of sexual identity may be less salient predictors of men's sexual well-being than women's. Further, a model of male sexual well-being may include different indicators than have been demonstrated in the current sample of women. For example, body esteem has been shown to have less influence on men's sexuality (Haavio-Mannila & Purhonen, 2001) and may not be a significant indicator of men's sexual well-being.

Conclusions and Future Directions

In conclusion, the current study provided support for a four-factor model of sexual identity as proposed by Worthington et al., 2002, 2008) over a second-order model. Bieschke (2002) suggested that Worthington et al.'s model is a useful integration of existing identity frameworks and sexual identity research that is inclusive across sexual orientations. Although it was proposed that the MoSIEC applies to individuals of all sexual orientations, the model may need to be adapted based on sexual orientation. Whereas an inclusive model has its utility (Bieschke, 2002), aspects of sexuality may be differentially conceptualized and salient across sexual orientations. In the current study, the majority of the items that were removed from the model to improve the fit were related to sexual orientation. Past research suggested that there is greater personal consideration given to non-heterosexual identities (Ellis, 2000; Konik & Stewart, 2004). This paralleled findings from research on Caucasian identity development (Fouad & Brown, 2000; Helms & Piper, 1994), indicating that members of a majority group often do not consider their position of privilege. Since heterosexuals may not consider their sexual orientation to the same extent as an individual with a non-heterosexual identity, the items asking them to consider their exploration and commitment of sexual orientation created some degree of misfit in the model. Hoffman (2004) suggested that it is necessary to consider diverse models of sexual identity development across sexual orientations to account for the unique experiences of those with a sexual minority identity. Future analyses using CFA to test multi-group models to examine measurement invariance can address the utility of the MoSIEC across sexual orientations.

The present research also provided an initial framework for a multidimensional conceptualization of sexual well-being. The results support sexual esteem, sexual satisfaction, sexual awareness, and body esteem attribution as the most important components of sexual well-being found in this study. This preliminary model is the first step to creating a multidimensional measure of sexual well-being. Future efforts in this direction may include the use of EFA to determine specific items related to these constructs that would be most useful in measuring sexual well-being, and investigating other components of sexual well-being. Further, the broader well-being literature indicated that variables such as affect and mood influence general well-being (Diener, 2000; Eid & Diener, 2004). Sexual affect and current mood were not included in the current model of sexual well-being. Additionally, behavioral aspects of sexuality were not explored in the current study. Future research on sexual well-being may explore its influence on sexual risk-taking and sexual behaviors, as well as the role of sexual abuse and psychological factors on sexual well-being. Further work in this area may serve to strengthen the bridge among sexual identity theory, measurement, and application.

Appendix

See Appendix—Table 2.

Table 2 Measure of Sexual Identity Exploration and Commitment (MoSIEC) items for each subscale prior to model trimming

Exploration	
sexid1:	I remember a time when I was trying different kinds of sexual activities.
sexid3:	I went through a period in my life when I was trying to determine my sexual needs.
sexid4:	I am actively trying to learn more about my own sexual needs.
sexid6:	I am open to experiment with new types of sexual activities in the future.
sexid7:	I am actively trying new ways to express myself sexually.
sexid9:	I went through a period in my life when I was trying different forms of sexual expression.
sexid11:	My sexual values will always be open to exploration.
sexid15:	I will always try to achieve a deeper understanding of my sexual orientation.
sexid16:	I am actively experimenting with sexual activities that are new to me.
sexid24:	I can see myself trying new ways of expressing myself sexually in the future.
Commitment	
sexid13:	I know what my preferences are for expressing myself sexually.
sexid14:	I have a clear sense of the types of sexual activities I prefer.
sexid19_r:	I do not know how to express myself sexually.
sexod21_r:	I have never clearly identified what my sexual values are.
sexid23_r:	I have never clearly identified what my sexual needs are.
sexid25_r:	I am uncertain about my preferences for different modes of sexual expression.
sexid26:	I have a firm sense of what my sexual needs are.
Synthesis	
sexid5:	My sexual values are consistent with all of the other aspects of my sexuality.
sexid8:	My understanding of my sexual needs coincides with my overall sense of sexual self.
sexid17:	The ways I express myself sexually are consistent with all of the other aspects of my sexuality.
sexid22:	The sexual activities I prefer are compatible with all the other aspects of my sexuality.
sexid28:	My sexual orientation is compatible with all other aspects of my sexuality.
Sexual orientation identity moratorium	
sexid2_r:	My sexual orientation is clear to me.
sexid10:	I am actively trying to understand my sexual orientation.
sexid18:	I sometimes feel uncertain about my sexual orientation.
sexid27:	My sexual orientation is not clear to me.

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ORIGINAL PAPER

Sexual Narcissism and the Perpetration of Sexual Aggression

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Abstract Despite indirect evidence linking narcissism to sexual aggression, studies directly examining this relationship have yielded inconsistent results. Likely contributing to such inconsistencies, prior research has used global measures of narcissism not sensitive to whether the components of narcissism are activated in sexual versus non-sexual domains. The current research avoided such problems by using a measure of sexual narcissism to predict sexual aggression. In a sample of 299 men and women, Study 1 validated the Sexual Narcissism Scale, a new sexuality research instrument with four subscales—Sexual Exploitation, Sexual Entitlement, Low Sexual Empathy, and Sexual Skill. Then, in a sample of 378 men, Study 2 demonstrated that sexual narcissism was associated with reports of the frequency of sexual aggression, three specific types of sexual aggression (unwanted sexual contact, sexual coercion, and attempted/completed rape), and the likelihood of future sexual aggression. Notably, global narcissism was unrelated to all indices of sexual aggression when sexual narcissism was controlled. That sexual narcissism outperformed global assessments of narcissism to account for variance in sexual aggression suggests that future research may benefit by examining whether sexual narcissism and other sexual-situation-specific measurements of personality can similarly provide a more valid test of the association between personality and other sexual behaviors and outcomes (e.g., contraceptive use, infidelity, sexual satisfaction).

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Introduction

The regularity with which men perpetrate rape and other forms of sexual aggression against women is alarming. Nearly 15% of men admit to having engaged in behavior that meets the legal definition of rape or attempted rape, and approximately one third of men admit to physically or verbally coercing a woman into unwanted sexual acts, such as forced sexual touching and coerced intercourse (e.g., Abbey, McAuslan, & Ross, 1998; Koss, Gidycz, & Wisniewski, 1987; Loh, Gidycz, Lobo, & Luthra, 2005; White & Smith, 2004). Further, if assured they would not be caught, between 20 and 30% of men indicate some likelihood of forcing sexual activity on a woman in the future (e.g., Briere & Malamuth, 1983; Greendlinger & Byrne, 1987; Osland, Fitch, & Willis, 1996; Smith, Martin, & Kerwin, 2001).

Narcissism and Sexual Aggression

Although numerous attitudinal, situational, and personality factors likely converge to predict sexual aggression (for reviews, see Chesire, 2004; Koss et al., 1994; Lalumière, Harris, Quinsey, & Rice, 2005; Lonsway & Fitzgerald, 1994; Marx, Van Wie, & Gross, 1996; Murnen, Wright, & Kaluzny, 2002), several theories of sexual aggression convincingly implicate narcissism as one particularly important dispositional risk factor (e.g., Baumeister, Catanese, & Wallace, 2002; Malamuth, 2003; Malamuth, Heavey, & Linz, 1993). Narcissism is a personality style characterized by tendencies toward exploiting others, a general lack of empathy for others, a pervasive pattern of grandiosity, and an excessive need

for admiration (American Psychiatric Association, 2000). Indeed, a connection between narcissism and sexual aggression makes sense for several reasons. First, narcissists respond more aggressively than non-narcissists to interpersonal rejections across a variety of domains (e.g., Baumeister, Bushman, & Campbell, 2000; Baumeister, Smart, & Boden, 1996; Bushman & Baumeister, 1998; Bushman, Bonacci, van Dijk, & Baumeister, 2003; Konrath, Bushman, & Campbell, 2006; Rhodewalt & Morf, 1998; Twenge & Campbell, 2003), a response that may generalize to any rejections they experience in the sexual domain. Second, possibly due to their especially high need for positive regard and admiration (Morf & Rhodewalt, 2001; Raskin, Novacek, & Hogan, 1991), narcissists appear particularly oriented toward sexual relationships (Hurlbert, Apt, Gasar, Wilson, & Murphy, 1994; Wryobeck & Wiederman, 1999), an orientation that provides greater opportunities to experience the types of rejections that could lead to sexual aggression. Third, narcissists demonstrate inflated, but often distorted, views of their abilities (Campbell, Bosson, Goheen, Lakey, & Kernis, 2007; Morf & Rhodewalt, 2001), views that may lead them to believe victims desire or even benefit from their sexual advances, despite those victim's rejections or protests against such advances (cf. Baumeister et al., 2002). Finally, narcissists are characterized by low levels of empathy (e.g., Watson, Grisham, Trotter, & Biderman, 1984) and high levels of hostility and exploitativeness (e.g., Raskin et al., 1991), a combination of traits that may prompt them to forcefully take the sexual relations they desire even if they realize sexual aggression may harm their victims.

Despite such strong theoretical links, only a handful of empirical studies have directly examined whether men high in narcissism are more likely than men low in narcissism to perpetrate sexual aggression, and the results of such studies have been inconsistent. Providing support for the link between narcissism and sexual aggression, Bushman et al. (2003) demonstrated that men who were high in narcissism held more rape-supportive attitudes and behaved more aggressively toward a female confederate who refused to read aloud a sexually explicit passage than men who were low in narcissism. Further, Kosson, Kelly, and White (1997) found that men high in narcissism were more likely to use arguments, pressure, or positions of authority to force a woman into unwanted sexual activity than men low in narcissism. However, raising doubts about the link between narcissism and sexual aggression, Kosson et al. (1997) also reported that men high in narcissism were *not* more likely to commit other forms of sexual aggression, including verbal threats, exploitation of an intoxicated woman, and physical force. Likewise, two other studies (Chantry & Craig, 1994; Pospiszyl, 2002) found that global measures of narcissism did not clearly differentiate men incarcerated for sexual aggression from those incarcerated for non-sexual aggression.

Sexual Narcissism and Sexual Aggression

Though these inconsistencies are surprising given the strong theoretical rationale that narcissism should predict sexual aggression, they are not surprising in light of a robust literature documenting similar cross-situational inconsistencies between personality and behavior (for reviews, see Bem & Allen, 1974; Epstein, 1979; Mischel & Peake, 1982). Explaining such inconsistencies, Mischel and Shoda (1995) argued that personality only influences behavior in situations that activate the cognitive components of that personality system. Accordingly, narcissistic men should only exhibit sexual aggression when sexual situations activate the cognitive components of their narcissism (e.g., entitled sexual desires, a lack of empathy for sexual partners). But because global assessments of narcissism, such as the frequently used Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988), are insensitive to whether the components of narcissism are activated in sexual situations versus non-sexual situations, they conflate sexual and non-sexual narcissists and thus cannot consistently distinguish narcissists likely to sexually aggress from narcissists unlikely to sexually aggress. Indeed, Baumeister et al. (2002) noted that although trait measures of narcissism predict behaviors with some success, "The behaviors seem highly circumstantial, and in many situations narcissists respond the same as anyone else" (p. 94; see also Bushman & Baumeister, 1998; Rhodewalt & Morf, 1998).

How can research overcome these challenges and demonstrate more consistent links between narcissism and sexually aggressive behavior? When similar inconsistencies emerged in research on the relationship between attitudes and behaviors (see Wicker, 1969), researchers were able to overcome them by measuring both constructs with regard to the same specific domains (e.g., Ajzen & Fishbein, 1977; Davidson & Jaccard, 1979). For example, Davidson and Jaccard (1979) demonstrated that attitudes toward using oral contraception were a more consistent predictor of actual use of oral contraception compared to attitudes toward contraception measured more globally. A similar strategy may resolve the inconsistencies observed thus far between narcissism and sexually aggressive behavior. Specifically, a domain-specific measure of *sexual* narcissism that assesses whether the cognitive components of narcissism are activated in sexual situations may predict sexually aggressive behavior with more precision than a global measure of narcissism. Though others have made similar suggestions (Ryan, 2004; Wryobeck & Wiederman, 1999), we are aware of no empirical studies that directly test for such a relationship.

Overview of the Current Research

The overarching goal of the current research was to demonstrate more consistent links between narcissism and sexual

aggression by investigating the extent to which a measure of sexual narcissism could account for significant variance in sexual aggression that was not accounted for by global narcissism. To this end, we conducted two independent studies. In Study 1, we developed and examined the psychometric properties of a new domain-specific measure of sexual narcissism, the Sexual Narcissism Scale (SNS). In Study 2, we used the SNS to account for variance in sexual aggression above and beyond the variance accounted for by a global assessment of narcissism, the NPI. To determine whether the SNS consistently outperformed the NPI, we examined the incremental validity of the SNS in predicting five indices of sexual aggression: total frequency of sexual aggression (Abbey, Parkhill, & Koss, 2005), type of sexual aggression (i.e., unwanted sexual contact, sexual coercion, and attempted/completed rape; Koss et al., 1987), and the likelihood of perpetrating sexual aggression in the future (Malamuth, 1981).

Study 1

The absence of a psychometrically sound measure of sexual narcissism may be one reason researchers have yet to explore the connection between sexual narcissism and sexual aggression. One measure of sexual narcissism does exist, the Index of Sexual Narcissism (ISN; Hurlbert et al., 1994), but that scale was developed for clinical purposes using a sample of abusive military husbands (see also Hurlbert & Apt, 1991) and has been criticized for having conceptual and psychometric limitations (Wryobeck & Wiederman, 1999). Specifically, using a principal components analysis, Wryobeck and Wiederman (1999) reported that as many as 9 of the 25 items on the ISN did not load onto any of the primary factors, and those primary factors did not capture important components of narcissism, such as sexual exploitation and lack of sexual empathy. Further, the ISN conflates participants' own sexual narcissism with their perceptions of others' sexual narcissism, as some items require participants to report their own beliefs (e.g., "I think I am better at sex than most people my age"), whereas other items require participants to report their perceptions of others' beliefs (e.g., "In general, most people take sex too seriously"). Because these limitations could restrict the ability to detect an association between sexual narcissism and sexual aggression, the goal of Study 1 was to establish a new, psychometrically sound measure of sexual narcissism. In this study, we first describe the process of item and subscale development for the new SNS, and then report relevant psychometric properties and descriptive statistics.

Method

Participants

Participants in Study 1 were 363 college students enrolled in psychology courses at a large southeastern university. We excluded two participants prior to analyses because they failed to follow survey instructions. Additionally, because complete data were required to conduct confirmatory factor analyses (Kline, 2005), we excluded 62 participants who skipped one or more SNS items, leaving 299 participants in the final sample (152 men, 147 women). All participants were between 18 and 29 years of age ($M = 19.2$, $SD = 1.5$) and were predominantly Caucasian (82%). Further, 96% of the sample reported their sexual orientation was heterosexual, and a total of 69% participants reported having engaged in sexual intercourse on at least one occasion.

Procedure

After approval from the university Institutional Review Board, groups of 30 or fewer students completed a battery of paper-pencil questionnaires ($n = 281$) or computer-based questionnaires ($n = 82$) in a classroom setting. The survey instructions remained the same for both administration types and no significant differences in scores on the SNS emerged across the two methods of administration. All data were collected anonymously.

Measures

Demographic Form

A demographic form was included to gather basic information about participant sex, age, and race. Additionally, four items were included to gather information about participants' sexual history, including whether or not they had ever had sexual intercourse, their lifetime number of sexual intercourse partners, their number of sexual intercourse partners in the past year, and their age of first intercourse.

Sexual Narcissism Scale (SNS)

Our goal was to develop a conceptually clear, reliable, and brief measure of sexual narcissism that could be used easily in research settings. Based on systematic item pilot testing ($N = 137$, 62 males, 75 females, M age $= 18.9$), we began the current study with a pool of 40 sexual narcissism items from which we planned to choose the strongest subset for the final scale. All items were written to represent one of four

components of narcissism hypothesized to be active in the sexual domain and shape sexual outcomes: (1) sexual exploitation, (2) sexual entitlement, (3) low sexual empathy, and (4) grandiose sense of sexual skill. Items on the Sexual Exploitation subscale assessed the ability and willingness to manipulate a person to gain sexual access (e.g., "One way to get a person in bed with me is to tell them what they want to hear"). Items on the Sexual Entitlement subscale assessed a sense of sexual entitlement and belief that the fulfillment of one's sexual desires was a personal right (e.g., "I am entitled to sex on a regular basis"). Items on the Low Sexual Empathy subscale assessed a general lack of empathy and devaluation of sexual partners (e.g., "The feelings of my sexual partners don't usually concern me"). Finally, items on the Sexual Skill subscale assessed a tendency to hold a grandiose sense of sexual skill or an exaggerated sense of sexual success (e.g., "I am an exceptional sexual partner"). Participants responded to all items on a 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree). Four reverse-scored items were included to control response sets, and then recoded for inclusion in the total scale score. Accordingly, higher scores indicated greater levels of sexual narcissism.

Results

Psychometric Properties of the 40-Item Sexual Narcissism Scale

Preliminary scale statistics were computed for the 40-item SNS and each subscale. Initial reliability statistics indicated high internal consistency among the items overall (Cronbach's $\alpha = .91$), and within each subscale (Sexual Exploitation $\alpha = .87$, Sexual Entitlement $\alpha = .81$, Low Sexual Empathy $\alpha = .77$, and Sexual Skill $\alpha = .76$). Nevertheless, item-total correlations ranged from $-.14$ to .68, indicating some items were more strongly representative of the construct than others.

Confirmatory Factor Analysis

In order to identify and remove poor fitting items, the 40 items were submitted to a confirmatory factor analysis (CFA) using Lisrel version 8.72 (Joreskog & Sorbom, 2005) with the C3 independence model (Joreskog, 2004). Based on Kline's (2005) recommendations, four fit indices were used to determine the best fitting four-factor model: the Minimum Fit Function (MFF) χ^2, which should demonstrate a ratio to degrees of freedom (df) of approximately 3 or less (Kline, 2005), the Comparative Fit Index (CFI; Bentler, 1990), which should be at least .90, the Standardized Root Mean Square Residual (SRMR), which should be less than .10 (Kline, 2005), and the Root Mean Square Error of Approximation (RMSEA), which should be less than .08 (Browne & Cudeck, 1993). Results demonstrated that the 40-item SNS had an adequate CFI of .92 and an adequate MFF $\chi^2(734)$ of 2092.94, $p < .001$, that yielded a χ^2/df ratio of 2.85. However, the SRMR of .12 suggested higher than ideal differences between predicted and observed inter-item covariances and the RMSEA of .09 suggested more error in the model than desired.

Psychometric Properties of the Final 20-Item Sexual Narcissism Scale

As planned, we identified and dropped poor-fitting items according to modification indices and fitted residuals, ensuring that the fit of the model was improved each time we dropped an item. This procedure yielded a final four-factor model consisting of 20 items, with five items per subscale, and much stronger fit, $\chi^2_{\text{difference}}(570) = 1659.47, p < .001$, MFF $\chi^2(164) = 433.47$, $p < .01$, χ^2/df ratio = 2.64, CFI = .95, SRMR = .077, RMSEA = .077. Additionally, this 20-item, four-factor model provided adequate fit for men [$N = 152$, MFF $\chi^2(164) = 282.29$, $p < .01$, χ^2/df ratio = 1.76, CFI = .94, SRMR = .09, RMSEA = .07], women [$N = 147$, MFF $\chi^2(164) = 323.39$, $p < .01$, χ^2/df ratio = 1.97, CFI = .93, SRMR = .09, RMSEA = .08], and non-virgins [$N = 206$, MFF $\chi^2(164) = 377.90$, $p < .01$, χ^2/df ratio = 2.30, CFI = .93, SRMR = .073, RMSEA = .082], but demonstrated slightly more error than is ideal among virgins [$N = 93$, MFF $\chi^2(164) = 310.63$, $p < .01$, χ^2/df ratio = 1.89, CFI = .90, SRMR = .11, RMSEA = .095].

The final 20 items, along with factor loadings, means, *SD*s, and observed ranges for each item, are presented in Table 1. As the table shows, all items loaded well onto their corresponding factors, with all factor loadings above .50, and demonstrated substantial variability, with all *SD*s near or above 1 and participants using most or all of the scale on all items. Further, reliabilities for the 20-item scale and each 5-item subscale were acceptable (Full Scale $\alpha = .85$; Sexual Exploitation $\alpha = .76$; Sexual Entitlement $\alpha = .80$; Low Sexual Empathy $\alpha = .79$; Sexual Skill $\alpha = .86$). These psychometric characteristics were similar when computed separately for men (Full Scale $\alpha = .85$; Sexual Exploitation $\alpha = .72$; Sexual Entitlement $\alpha = .82$; Low Sexual Empathy $\alpha = .77$; Sexual Skill $\alpha = .87$), women (Full Scale $\alpha = .81$; Sexual Exploitation $\alpha = .73$; Sexual Entitlement $\alpha = .76$; Low Sexual Empathy $\alpha = .79$; Sexual Skill $\alpha = .86$), non-virgins (Full Scale $\alpha = .86$; Sexual Exploitation $\alpha = .76$; Sexual Entitlement $\alpha = .79$; Low Sexual Empathy $\alpha = .70$; Sexual Skill $\alpha = .80$), and virgins (Full Scale $\alpha = .86$; Sexual Exploitation $\alpha = .75$; Sexual Entitlement $\alpha = .80$; Low Sexual Empathy $\alpha = .77$; Sexual Skill $\alpha = .87$).

Subscale correlations appear in Table 2. As the table shows, each subscale of the SNS correlated well with the

Table 1 Final 20-Item Sexual Narcissism Scale

Item wording	Subscale	Factor loading	*M*	*SD*	Range
If I ruled the world for one day, I would have sex with anyone I choose	Exp	0.63	2.48	1.48	1–5
One way to get a person in bed with me is to tell them what they want to hear	Exp	0.73	2.29	1.15	1–5
When I want to have sex, I will do whatever it takes	Exp	0.62	2.27	.94	1–5
I could easily convince an unwilling person to have sex with me	Exp	0.55	2.09	1.01	1–5
I would be willing to trick a person to get them to have sex with me	Exp	0.63	1.55	.84	1–5
I feel I deserve sexual activity when I am in the mood for it	Ent	0.66	2.62	.98	1–5
I am entitled to sex on a regular basis	Ent	0.65	2.50	1.08	1–5
I should be permitted to have sex whenever I want it	Ent	0.70	2.28	1.00	1–5
I would be irritated if a dating partner said no to sex	Ent	0.64	2.05	1.07	1–5
I expect sexual activity if I go out with someone on an expensive date	Ent	0.66	1.73	.85	1–4
When I sleep with someone, I rarely know what they are thinking or feeling	Emp	0.54	2.23	.88	1–5
It is important for me to know what my sexual partner is feeling when we make love[a]	Emp	0.63	2.17	.90	1–5
I enjoy sex more when I feel I really know a person[a]	Emp	0.56	1.92	1.00	1–5
The feelings of my sexual partners don't usually concern me	Emp	0.80	1.75	.89	1–5
I do not usually care how my sexual partner feels after sex	Emp	0.77	1.72	.86	1–5
I am an exceptional sexual partner	Skill	0.82	3.68	.83	1–5
My sexual partners think I am fantastic in bed	Skill	0.81	3.64	.80	1–5
I really know how to please a partner sexually	Skill	0.73	3.54	.86	1–5
I have been very successful in my sexual relationships	Skill	0.66	3.33	.92	1–5
Others have told me I am very sexually skilled	Skill	0.73	3.31	.98	1–5

Note: Items were randomized for survey administration. Exp = Sexual Exploitation, Ent = Sexual Entitlement, Emp = Low Sexual Empathy, Skill = Sexual Skill

[a] Reverse scored item

Table 2 Intercorrelations between Sexual Narcissism Scale and each subscale

		1	2	3	4	5
1	Total SNS	–				
2	Sexual Exploitation	.89***	–			
3	Sexual Entitlement	.84***	.72***	–		
4	Low Sexual Empathy	.49***	.42***	.24***	–	
5	Sexual Skill	.45***	.23***	.27***	−.30***	–

*** $p < .001$

overall scale. The strongest correlation among subscales was between Sexual Exploitation and Sexual Entitlement. Accordingly, the fit of a three-factor model was estimated in which the items from these two subscales were loaded onto the same factor. That model provided significantly poorer fit, $\chi^2_{\text{difference}}(3) = 39.50$, $p < .001$, indicating important empirical independence between the Exploitation and Entitlement subscales. Thus, the four factor structure was retained.

Descriptive Statistics by Sex and Virginity Status

Means and *SD*s for the total scale and each subscale by sex and virginity status are shown in Table 3. To determine whether scores on the SNS differed across men and women and across virgins and non-virgins, we conducted a series of 2 (Sex) x 2 (Virginity Status) ANOVAs for the full scale and each subscale. Three significant interactions emerged. First, sex and virginity status interacted to account for scores on the full scale, $F(1, 295) = 7.14, p < .01, d = .32$.[1] Specifically, contrasts revealed that male non-virgins reported higher SNS scores than male virgins, $F(1, 295) = 5.88$, $p < .05$, $d = .31$, whereas female non-virgins did not differ significantly from female virgins, $F(1, 295) = 1.89$, $p = .18$, $d = .17$. Also, male non-virgins reported higher SNS than female non-virgins, $F(1, 295) = 46.78$, $p < .001$, $d = .80$, whereas male virgins did not differ significantly from female virgins, $F(1, 295) = 1.89, p = .17, d = .16$.

Second, sex and virginity status interacted to account for scores on the Sexual Exploitation subscale, $F(1, 295) = 8.17$, $p < .01$, $d = .34$. Specifically, contrasts revealed that male non-virgins did not significantly differ on Exploitation from male virgins, $F(1, 295) = 2.47$, $p = .12$, $d = .20$, whereas female non-virgins reported significantly less Exploitation than female virgins, $F(1, 295) = 6.14, p < .05$,

[1] A Cohen's *d* statistic was calculated from each *F* using the formula: $d = t(n_1 + n_2)/[\sqrt{(df)}\sqrt{(n_1 n_2)}]$, where $t = \sqrt{F}$ (Dunst, Hamby, & Trivette, 2004). The magnitude of the effect was interpreted using the guidelines by Cohen (1998), where the effect was either small ($d = .2$), medium ($d = .5$), or large ($d = .8$).

Table 3 Descriptive statistics for the Sexual Narcissism Scale and each subscale

	Total SNS		Exploitation		Entitlement		Low empathy		Skill	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Men										
All men	2.63	.50	2.46	.75	2.38	.76	2.12	.65	3.55	.74
Non-virgins	2.68	.48	2.53	.75	2.46	.74	1.93	.57	3.82	.63
Virgins	2.49	.51	2.27	.74	2.16	.77	2.61	.57	2.90	.56
Women										
All women	2.28	.43	1.81	.68	2.10	.69	1.78	.65	3.44	.67
Non-virgins	2.25	.42	1.70	.65	2.11	.72	1.52	.43	3.65	.61
Virgins	2.35	.42	2.02	.69	2.06	.64	2.31	.69	3.02	.61

$d = .31$. Also, male non-virgins reported higher Exploitation than female non-virgins, $F(1, 295) = 78.49$, $p < .001$, $d = 1.03$, and male virgins reported higher Exploitation than female virgins, $F(1, 295) = 6.30$, $p < .05$, $d = .29$.

Third, sex and virginity status interacted to account for scores on the Sexual Skill subscale, $F(1, 295) = 6.95$, $p < .01$, $d = .31$. Specifically, contrasts revealed that male non-virgins reported higher Skill than male virgins, $F(1, 295) = 77.62$, $p < .001$, $d = 1.13$, and female non-virgins reported significantly higher Skill than female virgins, $F(1, 295) = 27.44$, $p < .001$, $d = .65$. Also, male non-virgins reported higher Skill than female non-virgins, $F(1, 295) = 12.39$, $p < .001$, $d = .41$, whereas male virgins did not differ significantly from female virgins, $F(1, 295) = .66$, $p = .42$, $d = .09$.

Although the sex by virginity interactions for Sexual Entitlement and Low Sexual Empathy were not significant, three significant main effects emerged. Specifically, men reported higher levels of Sexual Entitlement than women, $F(1, 295) = 20.12$, $p < .001$, $d = .52$; men reported less Sexual Empathy than women, $F(1, 295) = 76.52$, $p < .001$, $d = 1.02$; and non-virgins reported higher Sexual Empathy than virgins, $F(1, 295) = 47.09$, $p < .001$, $d = .86$.

Sexual Narcissism and Sexual Behavior

Finally, we conducted analyses to determine the extent to which sexual narcissism was related to three sexual behaviors: (1) the lifetime number of sexual intercourse partners, (2) the number of intercourse partners in the prior year, and (3) the age of first intercourse. Results revealed significant positive correlations between sexual narcissism and lifetime number of intercourse partners, $r = .25$, $p < .001$; $M = 3.35$ ($SD = 5.06$), and between sexual narcissism and number of intercourse partners in the prior year, $r = .18$, $p < .01$; $M = 1.40$ ($SD = 2.06$), indicating sexual narcissists engage in intercourse with more partners. Further, a significant negative correlation emerged between sexual narcissism and age of first intercourse, $r = -.15$, $p < .05$; $M = 16.47$ ($SD = 1.81$), suggesting participants high in sexual narcissism began having sex at younger ages than participants low in sexual narcissism.

Discussion

Results of Study 1 provided evidence for the sound psychometric properties of the new 20-item SNS with four distinct subscales: Sexual Exploitation, Sexual Entitlement, Low Sexual Empathy, and Sexual Skill. Specifically, the total scale and each of the four subscales demonstrated adequate reliability, and a confirmatory factor analysis confirmed the scale's four factor structure. Further, indicating the psychometric properties were quite robust, these properties were strong among men, women, and non-virgins, although the factor structure demonstrated slightly more error among virgins—possible because there were fewer virgins in the sample. Further still, the total scale and each of the subscales differentiated levels of sexual narcissism between men and women and between virgins and non-virgins in predictable ways. Specifically, consistent with a robust body of research showing that women are often socialized to be less sexually assertive than men (see Morokoff, 2000) and differ from men in their motivations for sexual interactions (e.g., Browning, Hatfield, Kessler, & Levine, 2000), and consistent with gender differences obtained in research on global narcissism (e.g., Tschanz, Morf, & Turner, 1998), men reported higher levels of sexual narcissism than women on all four factors. Likewise, consistent with their different levels of sexual experience, non-virgins, particularly male non-virgins, tended to report higher levels of sexual narcissism, with the exception that both male and female non-virgins reported higher levels of sexual empathy. Finally, as found in prior research (Wryobeck & Wiederman, 1999), sexual narcissism was associated with more sexual experiences that began at an earlier age.

Study 2

The purpose of Study 2 was to use the brief and reliable SNS developed in Study 1 to explore the relationships among narcissism, sexual narcissism, and sexual aggression. Though we were interested in the bivariate relationships among narcissism, sexual narcissism, and sexual aggression, we were particularly interested in the ability of sexual narcissism to account for variance in sexual aggression beyond that accounted for by the NPI (i.e., the incremental predicative validity of the SNS). Specifically, in line with our premise that a measure of sexual narcissism should better assess whether the cognitive components of narcissism are activated in sexual situations, we expected the SNS would demonstrate stronger associations with sexual aggression than the NPI, and that the NPI would account for no additional variance in sexual aggression once its association with the SNS was controlled.

Method

Participants

Participants were 415 undergraduate men enrolled in psychology courses at a large southeastern university. We excluded one participant who failed to follow survey instructions. Further, because we planned to calculate a total sexual aggression score and could not artificially compute missing sexual aggression data, we eliminated 29 participants missing data on the dependent sexual aggression measure (see also Malamuth, Sockloskie, Koss, & Tanaka, 1991). Finally, we dropped 7 participants missing more than 10% of data on the SNS. Thus, our final sample included 378 men. Participants were between the ages of 18 and 45 ($M = 19.5$, $SD = 2.6$), and primarily Caucasian (86%). Further, 97% of the sample reported their sexual orientation was heterosexual, and a total of 69% participants had engaged in sexual intercourse on at least one occasion.

Procedure

After receiving approval from the university Institutional Review Board, data were gathered through the use of an anonymous computer-based survey. Participants completed the survey in groups of 20 or less. Data were collected over two academic semesters. No significant differences emerged between data collection periods on sexual narcissism, narcissism, or sexual aggression.

Measures

Sexual Narcissism Scale

The 20-item SNS described in Study 1 was used to assess participants' endorsement of narcissistic personality traits in the sexual domain. As in Study 1, we conducted a CFA on men with complete SNS data ($n = 370$). The CFA revealed an adequate fit to the four factor model, MFF $\chi^2(164) = 367.89$, $p < .01$, χ^2/df ratio = 2.24, CFI = .97, SRMR = .06, RMSEA = .06. Further, all items loaded well onto their corresponding factors, with factor loadings ranging from .57 to .97 for Sexual Exploitation, from .66 to .89 for Sexual Entitlement, from .47 to .70 for Low Sexual Empathy, and from .61 to .73 for Sexual Skill. Finally, internal consistency for the full scale and each subscale was acceptable (Full Scale $\alpha = .84$; Sexual Exploitation $\alpha = .78$; Sexual Entitlement $\alpha = .84$; Low Sexual Empathy $\alpha = .79$; Sexual Skill $\alpha = .89$).

Narcissistic Personality Inventory

The 40-item NPI (Raskin & Terry, 1988) was used to assess narcissistic personality styles. Items such as "If I ruled the world, it would be a much better place," and "I find it easy to manipulate people" were rated in a yes-no response format. A total score was calculated for each participant with higher scores indicating a more narcissistic personality style (Cronbach's $\alpha = .81$).

Sexual Aggression Frequency and Type

Sexual aggression perpetrated by men against women was assessed with a recently updated Sexual Experiences Scale (SES; Abbey et al., 2005) that captures behaviorally specific forms of sexual aggression perpetrated since the age of 14 (Koss & Gidycz, 1985; Koss & Oros, 1982; Koss et al., 1987). The updated SES includes 35 items; however, in line with the suggestion by Abbey et al. (2005), we combined the five items that inquire about sexual aggression perpetrated through the use of alcohol with the five items that inquire about sexual aggression perpetrated through use of drugs into alcohol *or* drug items. Thus, the SES scale used for this study contained 30 items. Specifically, participants reported whether or not they used six different tactics: arguments/pressure, lies/promises, guilt/anger, giving alcohol/drugs, taking advantage of an intoxicated woman, and using physical force to engage in five different types of sexual behavior that was unwanted by the woman: fondling/kissing, attempted sex, oral sex, sexual intercourse, and anal sex/insertion of objects. Three items were not used in forming total scores because

they did not clearly involve sexual contact: sex that was attempted, but not completed, through use of arguments/pressure, lies/promises, or guilt/anger. Thus, there were a total of 27 sexual aggression items included in the present analyses from which we created a continuous sexual aggression frequency score by summing the total number of items endorsed (possible range = 0–27).

Additionally, we used the SES items to calculate conceptually distinct but not mutually exclusive indices of three types of sexual aggression: unwanted sexual contact, sexual coercion, and attempted or completed rape (see Koss et al., 1987). Specifically, for sexual contact, 0 = no sexual contact and 1 = any verbally pressured or physically forced kissing or sexual touching, but not sexual penetration. For sexual coercion, 0 = no sexual coercion and 1 = verbally pressured sexual penetration (i.e., oral, anal, or vaginal). For attempted or completed rape, 0 = no attempted or completed rape and 1 = sex that was attempted, but not completed, through means of physical force, giving drugs/alcohol, or taking advantage of a victim who was too incapacitated to consent *or* completed sexual penetration (i.e., oral, anal, or vaginal) through means of physical force, giving alcohol/drugs, or taking advantage of a victim who was too incapacitated to consent.

Future Likelihood of Sexual Aggression

We assessed the propensity toward future sexual aggression with the likelihood of forced sex item developed by Malamuth (1981). Specifically, participants were asked to rate the likelihood that they would engage in "forced sex" in the future if assured they would not be caught or punished using a 5-point scale from 1 (Not at All Likely) to 5 (Extremely Likely).

Results

Descriptive Statistics

A total of 32% of men ($n = 121$) reported committing at least one act of sexual aggression since the age of 14, with the number of sexually aggressive acts ranging from 0–15. A total of 14% of men ($n = 67$) reported perpetrating more than one act of sexual aggression, and 4% ($n = 19$) reported perpetrating five or more acts. A breakdown by the type of sexual aggression indicated that 30% ($n = 114$) had perpetrated a form of sexual contact against a woman's will, 21% ($n = 80$) had perpetrated an act of sexual coercion, and 4% ($n = 14$) had perpetrated an act of attempted or completed rape. Additionally, 20% of men ($n = 76$) indicated some likelihood of perpetrating forced sexual activity in the future if assured they would not be caught, including 18% ($n = 69$) who indicated mild to moderate likelihood (score of 2 or 3 on the 5-point scale) and 2% ($n = 7$) who indicated a strong likelihood (score of 4 or 5 on the 5-point scale).

Finally, acceptable variability was observed on each of the predictor variables. Specifically, the mean SNS score was 2.55 ($SD = .51$) with an observed range of scores from 1.20 to 4.15 (possible range = 1–5), and the mean NPI score was .55 ($SD = .15$) with an observed range of scores from .15 to .93 (possible range = 0–1).

Does Sexual Narcissism Predict Sexual Aggression?

We first estimated bivariate correlations among sexual narcissism, narcissism, and sexual aggression. As can be seen in Table 4, although global narcissism and sexual narcissism were moderately related to one another, they shared less than 20% of variance, which is consistent with our premise that global narcissism is not always activated in the sexual domain. Additionally, significant positive correlations emerged between each index of sexual aggression and both narcissism and sexual narcissism. Further, analyses revealed that every SNS subscale was associated with the frequency of sexual aggression and the likelihood of future sexual aggression, indicating the association between the SNS and sexual aggression was not driven by merely one component of sexual narcissism. However, these bivariate associations did not control for the shared variance between global narcissism and sexual narcissism. Our prediction was that sexual narcissism would account for variance above and beyond the variance accounted for by global narcissism, and that global narcissism would not account for variance in sexual aggression once its association with sexual narcissism was controlled. Addressing that prediction was the goal of our next set of analyses.

Does Sexual Narcissism Predict Sexual Aggression Beyond Global Narcissism?

To estimate the incremental predictive validity of sexual narcissism, we conducted a series of regression analyses. Because the sexual aggression frequency data and likelihood of sexual aggression data were negatively skewed and thus violated assumptions of normality, we specified negative binomial distributions for analyses involving these variables (for a thorough discussion of non-normal distributions and corrective statistical techniques, see Atkins & Gallop, 2007). Because the sexual contact, sexual coercion, and rape variables were dichotomous, we used binary logistic regression analyses to account for variance in these variables.

First, we examined the unique variance in global and sexual narcissism that was associated with the frequency of sexual aggression by regressing the frequency of sexual

Table 4 Bivariate correlations: sexual narcissism, narcissism, and sexual aggression

		1	2	3	4	5	6	7	8	9	10
1	SNS	–									
2	Exploitation	.87***	–								
3	Entitlement	.86***	.70***	–							
4	Low Empathy	.40***	.33***	.20***	–						
5	Skill	.43***	.19***	.24***	−.37***	–					
6	NPI	.44***	.36***	.36***	.00	.38***	–				
7	SA	.40***	.39***	.32***	.19**	.13*	.23***	–			
8	Contact	.31***	.33**	.22***	.16**	.08	.17**	.54***	–		
9	Coercion	.36***	.35**	.28***	.10*	.19***	.18***	.70***	.42***	–	
10	Rape	.14**	.16**	.11*	.07	.02	.13*	.47***	.27***	.21***	–
11	LSA	.36***	.38***	.31***	.12*	.10*	.10*	.38***	.26***	.29***	.11*

Note: SNS = Sexual Narcissism Scale

Exploitation = Sexual Exploitation Subscale

Entitlement = Sexual Entitlement Subscale

Low Empathy = Low Sexual Empathy Subscale

Skill = Sexual Skill Subscale

NPI = Narcissistic Personality Inventory

SA = Total frequency of sexual aggression

Contact = Unwanted sexual contact

Coercion = Sexual coercion, Rape = Attempted/completed rape

LSA = Likelihood of sexual aggression

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

aggression onto the NPI in a first analysis and then onto the NPI and the SNS in a second analysis. As shown in Table 5, the NPI was significantly associated with sexual aggression in the first analysis. However, when the SNS was entered in the second analysis, thus controlling for the variance shared between the SNS and the NPI, sexual narcissism accounted for variance in the frequency of sexual aggression beyond that accounted for by global narcissism whereas global narcissism was no longer significantly related to frequency of sexual aggression.

Next, we examined the unique variance in global and sexual narcissism that was associated with whether or not men engaged in unwanted sexual contact, sexual coercion, and attempted/completed rape by separately regressing each type of sexual aggression onto the NPI in a first set of logistic regression analyses and onto the NPI and the SNS in a second set of analyses. As shown in Table 5, global narcissism was associated with each type of sexual aggression. However, when the SNS was entered in the second analysis, thus controlling for the variance shared between the SNS and the NPI, sexual narcissism accounted for variance in all three outcomes beyond that accounted for by global narcissism (although the association between the SNS and attempted/completed rape was only marginally significant), whereas global narcissism was no longer significantly related to any of the three specific types of sexual aggression.

Table 5 Hierarchical regressions: narcissism and sexual narcissism predicting sexual aggression

	NPI		SNS	
	B	Cohen's *d*	*B*	Cohen's *d*
Total frequency of sexual aggression[a]				
Step 1	0.32***	.71		
Step 2	0.75	.13	1.59***	.94
Sexual contact[b]				
Step 1	2.56**	.35		
Step 2	0.77	.09	1.36***	.52
Sexual coercion[b]				
Step 1	2.96**	.36		
Step 2	0.41	.04	1.97**	.62
Attempted or completed rape[b]				
Step 1	4.52*	.25		
Step 2	2.77	.14	1.07^{+}	.18
Likelihood of sexual aggression[a]				
Step 1	0.32	.07		
Step 2	−0.23	.05	0.37*	.26

Note: Unstandardized betas are reported. See Footnote 2 for Cohen's *d* formula

[a] Hierarchical regression with a negative binomial distribution

[b] Hierarchical logistic regression

*** $p < .001$; ** $p < .01$; * $p < .05$; $^{+}$ $p < .10$

Finally, we examined the unique variance in global and sexual narcissism that was associated with the extent to which men reported a propensity to perpetrate sexual aggression in the future if assured they would not be caught by regressing perceived likelihood of sexual aggression onto the NPI in a first analysis and then onto the NPI and the SNS in a second analysis. As shown in Table 5, global narcissism was not independently associated with the likelihood of sexual aggression in the first step of the model. However, as was the case with all the other measures of sexual aggression, the association between the SNS and likelihood of sexual aggression was significant, even when the NPI was controlled.

Does the Association Between Sexual Narcissism and Sexual Aggression Interact with Virginity Status?

Although virgins could have engaged in numerous types of sexual aggression (e.g., verbally pressured sexual touching, physically forced oral sex), they could not have engaged in other types of sexual aggression, such as verbally pressured intercourse, alcohol-induced intercourse, and physically forced intercourse. Thus, we examined whether the association between sexual narcissism and sexual aggression varied across virgins and non-virgins by replicating the analyses reported above with a dummy code of virginity status and an interaction term formed from the product of that dummy code and mean-centered SNS scores. Significant interactions emerged for sexual aggression frequency, $B = 1.30$ Wald $\chi^2(1, 378) = 8.08$, $p < .01$, $d = .30$, and sexual coercion, $B = 2.04$,Wald $\chi^2(1, 378) = 5.45$, $p < .05$, $d = .24$.[2] Specifically, sexual narcissism was significantly associated with sexual aggression frequency, $B = 1.76$,Wald $\chi^2(1, 378) = 62.24$, $p < .001$, $d = .89$, and sexual coercion, $B = 2.37$, Wald $(1, 378) = 34.48$, $p < .001$, $d = .63$, among non-virgins; however, sexual narcissism was not significantly associated with sexual aggression frequency, $B = .46$,Wald $\chi^2(1, 378) = 1.28$, $p = .26$, $d = .12$, or sexual coercion, $B = -.33$,Wald $(1, 378) = .17$, $p = .68$, $d = .04$, among virgins. The association between sexual narcissism and forced sexual touching, attempted/completed rape, and likelihood of future sexual aggression did not vary across virgins and non-virgins.

General Discussion

Given that global measures of narcissism have demonstrated inconsistent links with sexual aggression in past research, the goal of the current studies was to extend theories of sexual aggression (e.g., Baumeister et al., 2002) by examining the relationships between narcissism, sexual narcissism, and sexual aggression. In Study 1, we developed the domain-specific SNS, documented the psychometric strengths of the SNS, and demonstrated that the psychometric properties of the SNS replicated across men, women, and non-virgins, though they were slightly weaker among virgins—possibly because the number of virgins in the sample was relatively low. Then, in Study 2, we demonstrated that sexual narcissism was a more robust predictor of sexual aggression than global narcissism across several conceptually distinct measures. Specifically, although global narcissism, assessed with the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988), accounted for a statistically significant portion of variance in the frequency of sexual aggression when it was examined independently, sexual narcissism was positively associated with the frequency of sexual aggression whereas the NPI was unrelated to the frequency of sexual aggression when both the NPI and the SNS were examined simultaneously. Likewise, although global narcissism accounted for a statistically significant portion of variance in three specific types of sexual aggression—unwanted sexual contact, sexual coercion, and attempted/completed rape—when it was examined independently, sexual narcissism was positively associated with all three types of sexual aggression whereas the NPI was unrelated to all three when both the NPI and the SNS were examined simultaneously. Finally, consistent with previous research demonstrating inconsistencies in the link between globally assessed narcissism and sexual aggression, global narcissism was not significantly associated with the propensity to perpetrate sexual aggression in the future, whereas sexual narcissism was significantly related to future sexual aggression propensity. Taken together, these results indicate a robust relationship between sexual narcissism and sexual assault perpetration.

The current findings have important theoretical implications for research on sexual aggression, specifically, and for research on sexuality more generally. With respect to research on sexual aggression, the current findings provide support for several theoretical frameworks that posit a relationship between self-serving, narcissistic personality styles and sexual aggression (e.g., Baumeister et al., 2002; Malamuth, 2003; Malamuth et al., 1993). However, they also refine such frameworks by demonstrating that the components of narcissism are most predictive of sexual aggression when active in the sexual domain. Accordingly, theories may most accurately describe the dispositional qualities of sexual aggressors to the extent that they clarify the domain specific nature of those dispositions. Further, as it is likely that sexual narcissism may be strongly correlated with other measures that consistently predict reports of sexual aggression, such as impersonal sexual behaviors, hostile attitudes toward women, self-perceived mating success, psychopathy, and

[2] A Cohen's d statistic was calculated from each χ^2 using the formula: $d = \sqrt{[(4\chi^2)/(N - \chi^2)]}$ (Dunst et al., 2004).

situational risk factors (for reviews, see Koss et al., 1994; Lalumière et al., 2005; Malamuth, 2003), future research that situates sexual narcissism within comprehensive frameworks of sexual assault and considers the unique contribution of this construct in light of other known risk factors could significantly enhance theory in this area.

With respect to sexuality research more generally, the current findings demonstrate the importance of using measures of personality specific to the sexual domain to predict sexual behavior. It is now rather widely accepted that the extent to which personality predicts behavior varies substantially across situations (for reviews, see Bem & Allen, 1974; Epstein, 1979). This may be particularly true regarding the sexual domain where people engage in behaviors they do not display in other aspects of their lives. In line with the findings reported here, perhaps measuring the extent to which the cognitive components of other personality constructs (e.g., conscientiousness, extraversion) are active in sexual domains would provide stronger tests of the association between those personality constructs and sexual behavior.

By providing insight into the dispositional characteristics of sexual aggressors, the current findings also have important practical implications. Specifically, the finding that men were more likely to perpetrate sexual aggression when the components of narcissism were activated in sexual situations provides ways to identify and even treat sexual aggressors. Specifically, targeting the cognitive components of sexual narcissism (e.g., a lack of sexual empathy, a sense of sexual entitlement) may help attenuate sexual aggression risk. Consistent with this possibility, recent experimental research (Konrath et al., 2006) demonstrated that narcissists were more likely than non-narcissists to behave aggressively toward an experimental partner except when they were provided with false feedback that they shared a similarity with the partner, a manipulation that may have increased levels of empathy. Future sexual aggression prevention research may benefit by directly examining whether inducing sexual empathy among sexual narcissists can reduce sexual aggression in similar ways. More generally, though, future research may benefit by examining *how* interventions can successfully induce such empathy, as current sexual aggression interventions targeting empathy have provided mixed results (for review, see Schewe, 2002).

In addition to these theoretical and practical implications, the current research suggests several avenues for future research. Most relevant to the current research question, future research may benefit by examining the association between sexual narcissism and sexual aggression by women. Although women perpetrate sexual aggression much less frequently than men, they do perpetrate (e.g., Anderson & Aymami, 1993; Krahe, Scheinberger-Olwig, & Bieneck, 2003; Struckman-Johnson & Struckman-Johnson, 1994), and sexual narcissism may explain at least part of such perpetration. Recent research by Hines (2007) revealed that females were most likely to engage in sexually aggressive behavior in cultures that provide women greater possibilities of social power. Likewise, across a host of studies, narcissism has been associated with a quest for social power, admiration, and positive regard (for review, see Morf & Rhodewalt, 2001). This quest for power may explain why sexual narcissism is related to sexual offending and, considered in light of Hines' research, suggests an association between sexual narcissism and sexual offending may emerge among women. Future research may benefit by addressing this possibility directly.

More broadly, future research may benefit by examining the extent to which sexual narcissism predicts other sexual behaviors and outcomes. For example, though numerous studies have examined the role of personality in predicting risky sexual behaviors, such as the failure to use contraception (for a review, see Hoyle, Fejfar, & Miller, 2000), Pinkerton and Abramson (1995) argued that, "It appears that most existing measures are too general to accurately reflect the sexual component of risk-taking" (p. 720). Perhaps components of narcissism measured with specific regard to the sexual domain, such as an inflated sense of sexual skill or sexual entitlement, may predict high risk sexual behaviors. Sexual narcissism may also predict infidelity. Although several studies recently reported that measures of global narcissism accounted for variance in infidelity (Atkins, Yi, Baucom, & Christensen, 2005; Buss & Shackelford, 1997; Campbell, Foster, & Finkel, 2002), it remains unclear whether this association would remain once the variance shared between global narcissism and sexual narcissism is controlled. Addressing this issue would provide valuable information about the psychology of infidelity, particularly whether infidelity stems from sexual motivations, non-sexual motivations, or both. Finally, it is possible that aspects of sexual narcissism may predict positive sexual outcomes as well (cf. Campbell, 2001). For instance, the heightened sexual skill perceived by sexual narcissists may predict higher levels of sexual satisfaction in themselves and/or their partners. Indeed, more positive sexual expectancies, which skilled partners may be more likely to possess, have been shown to predict more positive changes in sexual satisfaction among married women (McNulty & Fisher, 2008). In sum, the newly-validated SNS provides a host of opportunities for future sexuality research.

Our confidence in the results reported here is enhanced by several strengths of the methodology and design of these studies. First, the psychometric properties of the SNS were demonstrated across two large, independent samples and across both men and women, providing confidence that it is a reliable research instrument. Second, the ability of sexual narcissism to outperform global measures of narcissism was replicated across five conceptually distinct measures of

sexual aggression (i.e., total frequency, three specific types, and future likelihood). In addition to increasing our confidence that the results were not idiosyncratic to a particular index, this nuanced approach demonstrated that sexual narcissism is consistently associated with numerous forms of sexual aggression, something previous research on global narcissism has been unable to show (Kosson et al., 1997). Finally, the current analyses were appropriate for the skewed data typical for research on sexual aggression. Specifically, rather than log transforming the sexual aggression variables, which typically remain skewed even after such transformation (Atkins & Gallop, 2007), we specified the appropriate negative binomial distribution in our regression analyses of the sexual aggression frequency and propensity toward future sexual aggression variables, eliminating the concern that the results were due to violations of the normality assumptions that must be met to properly interpret the results of OLS regressions. Future research on sexual aggression may benefit by adopting similar strategies (see Atkins & Gallop, 2007).

Despite these strengths, several qualities of this research limit the extent of our conclusions until the current findings can be replicated and expanded. First, all variables were assessed with explicit, self-report instruments. Though these assessment procedures are standard in the field, and though we attempted to increase the veracity of self-reports by making all survey procedures anonymous, it remains possible that the findings were influenced by socially desirable response biases. Future research may benefit by replicating the association between sexual narcissism and sexual aggression using lab-based observational measures (e.g., Mitchell, Angelone, Hirschman, Lilly, & Hall, 2002) or by comparing men convicted of sexually violent crimes to men convicted of non-sexually violent crimes or non-offenders. Second, all data were collected cross-sectionally which limits our ability to determine any potential causal direction of the associations that emerged here. Sexual narcissism may indeed predict sexual aggression, or sexual aggression may lead to sexually narcissistic beliefs through dissonance reduction (cf. Festinger, 1957). An interesting avenue for future research would be to use a prospective design that follows a sample of young men who have not previously been sexually aggressive and examines how specific and general measures of narcissism truly predict future sexual aggression. Likewise, it is unclear whether the associations between sexual narcissism and frequent and early sexual experiences observed in Study 1 emerged because sexual narcissism leads to these types of sexual experiences or because these sexual experiences lead to sexual narcissism. Future longitudinal research may benefit by attempting to tease apart these potential causal directions. Third, the current studies only examined the role of sexual narcissism in accounting for sexual aggression that was perpetrated by men against women. Although this is the most common type of sexual aggression (Tjaden & Thoennes, 2006), other types of sexual aggression, such as same-sex, woman to man, and child sexual abuse may also be explained, in part, by sexual narcissism. Exploring these possibilities may provide important insights into the role of sexual narcissism in all sexual offending.

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ORIGINAL PAPER

Sexual Compulsivity and Sexual Risk in Gay and Bisexual Men

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Abstract Much of our understanding of the association between the Sexual Compulsivity Scale (SCS) and sexual risk behavior among men who have sex with men (MSM) has been limited to samples of HIV positive MSM only. Using data from a community-based survey of gay and bisexual men ($n = 1214$), this analysis sought to further evaluate the association between the SCS and sexual risk behavior. The SCS was significantly associated with a variety of sexual risk behaviors, including having sex under the influence of club drugs, engaging in unprotected anal sex (receptive or insertive) with partners of the same and/or different HIV serostatus, identity as a barebacker, intentions to have bareback sex, number of recent sex partners, and temptation for unsafe sex. The SCS was also significantly associated with having engaged in a variety of specialized sexual behaviors (i.e., fetishes), many of which can increase HIV transmission risks. Finally, in multivariate analyses, the SCS significantly predicted unprotected sex with a non-main partner even when controlling for race, HIV serostatus, age, identity as a barebacker, and club drug use. These data indicate that the SCS may be able to serve as an indicator to detect HIV-associated sexual risk behavior in community-based samples of gay and bisexual men.

Keywords Sexual compulsivity · Gay and bisexual men · Sexual risk behavior · HIV · Club drugs · Fetishes

Introduction

Sexual compulsivity, also known as sexual addiction and compulsive sexual behavior (Coleman, 1992; Goodman, 1992), is characterized by increased levels of sexual fantasies and behaviors, both in frequency and intensity, that interfere with personal, interpersonal, or vocational pursuits (Bancroft, 2008; Black, 1998; Kafka & Prentky, 1994). Sexual compulsivity can result in: interpersonal conflict and distress; social and occupational problems resulting from lack of time spent participating in non-sexual activities; psychological distress, especially regarding self-esteem; and financial problems resulting from the costs of pornography, paying for sex, and loss of income from avoiding work responsibilities (Muench & Parsons, 2004). The prevalence of sexual compulsivity in the U.S. is estimated to be between 3% and 6% (Black, 1998; Carnes, 1991; Coleman, 1992), with a significantly higher incidence among men (Dodge, Reece, Cole, & Sandfort, 2004; Gullette & Lyons, 2005; Kuzma & Black, 2008).

Compared with heterosexuals, researchers have also suggested that rates of sexual compulsivity are higher among gay and bisexual men (Baum & Fishman, 1994; Cooper, Delmonico, & Burg, 2000; Missildine, Feldstein, Punzalan,

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& Parsons, 2005). Parsons et al. (2008) proposed explanations for this phenomenon and emphasized that gay and bisexual men report more lifetime sex partners compared to other social groups (Quadland, 1985; Saghir & Robins, 1973), and have access to a greater variety of sexual "outlets" (e.g., bathhouses, Internet, sex parties; Parsons, 2005). As a result, these factors may make it easier for gay and bisexual men at risk for sexual compulsivity to actually develop the problem and/or to trigger sexually compulsive episodes (Parsons, Kelly, Bimbi, Muench, & Morgenstern, 2007).

Sexual Risk Behavior and Men who have Sex with Men

Despite recent declines in HIV transmission in the U.S. overall (CDC, 2008a) men who have sex with men (MSM) continue to comprise a disproportionate number of HIV/AIDS cases, 48.1% in 2006 (CDC, 2008b). In addition, the number of HIV/AIDS diagnoses among MSM from 2001 to 2006 has increased 8.6% (CDC, 2008c, d). Meanwhile, researchers investigating sexual compulsivity among MSM have consistently identified a link between this phenomenon and negative sexual outcomes (Benotsch, Kalichman, & Kelly, 1999; Kalichman et al., 1994; Kalichman, Greenberg, & Abel, 1997; Kalichman & Rompa, 1995, 2001; O'Leary et al., 2005; Parsons, Bimbi, & Halkitis, 2001; Reece, Plate, & Daughtry, 2001). For example, Reece (2003) reported that sexually compulsive men were less likely to disclose their HIV serostatus to sexual partners, O'Leary et al. (2005) found men with sexually compulsive symptoms reported lower condom use self-efficacy, and Semple, Zians, Strathdee, and Patterson (2008) reported that higher scores on sexual compulsivity were found among men who engage in sexual marathons. Nevertheless, many of these studies have drawn from samples of HIV positive MSM, thus limiting our knowledge of the possible association among sexual compulsivity and sexual risk behavior among more generalized samples of MSM.

Though the exact mechanism by which SC increases HIV risk is unknown, Bancroft et al. (2003) proposed that rational decision-making can become impaired during a state of sexual arousal. In essence, when one is not sexually aroused, they can recognize that specific sexual behaviors may be risky and thus should be avoided. In contrast, during sexual arousal, there is less concern about sexual risks. Applying these ideas, it may be possible that because SC MSM maintain protracted states of sexual arousal, their longer term ability to avoid sexual risk is diminished.

Similarly, among gay and bisexual men, sexual risk behavior has been related to drug use, and specifically "club drugs," a category name typically given to ketamine, MDMA/ecstasy, cocaine, GHB, and methamphetamine (Nanín & Parsons, 2006). Engaging in sex under the influence of club drugs can decrease inhibitions, particularly around condom use (Carey et al., 2008). Parsons et al. (2007) study of 180 sexually compulsive gay and bisexual men reported that substance use, particularly methamphetamine, was a major trigger for episodes of compulsive sexual behavior. Decreased inhibitions and a reduced locus of control during sexual activity may be associated with sexual compulsivity which, by definition, involves reduced self-control over one's sexual behavior.

Specialized sexual behaviors and extreme sexual behaviors (i.e., fetishes) may also be related both to sexual compulsivity and HIV risk. Moskowitz and Roloff's (2007) analysis of 300 Internet profiles found that men who wanted to transmit HIV (either by becoming infected or giving the virus to others) were significantly higher on a range of fetish-like behaviors, and were more likely to exhibit symptoms consistent with sexual compulsivity (both on behavior and psychological measures). Though not all of the specialized sexual behaviors assessed by Moskowitz and Roloff necessarily increased risk for HIV transmission (e.g., foot play), their data identified an association between specialized sexual behaviors, sexual compulsivity, and HIV transmission risks. Their data suggest specialized sexual behaviors may be an important variable in understanding a potential association between sexual compulsivity and HIV transmission risks.

The Sexual Compulsivity Scale

Select groups of health professionals, researchers, and academics have spent the better part of the last 50 years professionalizing and constructing a discourse of sexual compulsivity (e.g., www.sash.net). While the third addition of the *Diagnostic and Statistical Manual of Mental Disorders* listed sexual compulsivity as a "sexual disorder not otherwise specified," the four edition makes no mention of sexual compulsivity (American Psychiatric Association, 1994). As a result, researchers and clinicians have been challenged with developing and adopting generally agreed upon classifications and indicators of sexual compulsivity that are culturally sensitive and morally/politically neutral (Levine & Troiden, 1988). For example, having multiple sexual partners or frequent masturbation (in addition to other socially unsanctioned or non-normative sexual behavior) are not sufficient criteria to diagnose sexual compulsivity. Instead, these thoughts or behaviors must somehow create a sense of personal, occupational, or social distress (Muench & Parsons, 2004). Furthermore, this distress must not be in response to an individual's perceptions of society's expectations of sexual behavior (e.g., a gay man feeling guilt about having sex with other men based on societal homophobia), but rather real negative consequences, such as sexual behaviors/thoughts that interfere with a person's ability to function on a daily basis (SASH, 2003). While formal diagnostic criteria for

sexual compulsivity have yet to be outlined, the Sexual Compulsivity Scale (SCS) (Kalichman et al., 1994) has been one of the most widely tested, cited, and used empirical measures believed to capture out of control sexual thoughts and behaviors (McBride, Reece, & Sanders, 2008).

The SCS is a 10-item self-administered questionnaire that assesses the impact of sexual thoughts on daily functioning and the inability to control sexual thoughts or behaviors. Items for the SCS were derived from a self-help guide for persons with sexual control problems who have difficulty managing their sexual thoughts and behaviors or who believe that they have a sexual addiction (Comp Care, 1987; Kalichman & Rompa, 2001). Items on the SCS are scripted in a Likert-type fashion with response choices ranging from 1 to 4 (e.g., "My sexual thoughts and behaviors are causing problems in my life," "I struggle to control my sexual thoughts and behavior," 1 = not like me, 4 = very much like me) and summation scores can range from 10 to 40. As developed, this measure was originally tested in a sample of 106 "homosexually active men" who were recruited through advertisements in newspapers and community outreach to STD clinics serving gay communities (Kalichman et al., 1994). The measure demonstrated strong reliability ($\alpha = .89$) and temporal stability. Meanwhile, other researchers have also found the SCS to be internally consistent (α ranging from .86 to .89), reliable (three month test-retest coefficient = .80), and to possess convergent criterion-related validity (Benotsch et al., 1999; Kalichman & Cain, 2004; Kalichman & Rompa, 1995).

In their original study, Kalichman et al. (1994) tested correlations of the SCS with a battery of continuous measures (e.g., loneliness, sensation seeking, sexual behaviors). No significant correlations were found between the SCS and unprotected anal sex or number of sex partners. However, the SCS was correlated with sexual risk (measured in a variety of ways) in follow-up studies (Kalichman & Cain, 2004; Kalichman & Rompa, 1995, 2001), and a number of other researchers have also identified a strong correlation between sexual compulsivity and sexual risk behavior. This association has been identified in samples of college students (Dodge et al., 2004; Gullette & Lyons, 2005; McBride et al., 2008), HIV positive men and women (Benotsch, Kalichman, & Pinkerton, 2001; Kalichman et al., 1997; Kalichman & Rompa, 2001) low-income heterosexuals (Kalichman & Rompa, 1995), and MSM (Kalichman & Rompa, 1995; Parsons et al., 2001).

Current Focus

Though there has been a growing interest in sexual compulsivity among MSM, there has been little published research specifically evaluating the SCS's ability to predict sexual risk behaviors within community-based samples of gay and bisexual men. Given SC's link to HIV-associated risk behavior overall, MSM who are experiencing SC symptomatology might be an important group to target HIV education and prevention. Though not all men who engage in sexual risk behavior are necessarily sexually compulsive, identifying and treating SC may be an effective means to dualistically prevent risky sexual behavior and the spread of HIV for some MSM (McBride et al., 2008). Thus, it is necessary to fully evaluate the association between measures of sexual compulsivity and sexual risk behavior in order to tailor formal interventions and educational or prevention campaigns to high risk populations.

Method

Participants

A cross-sectional, street-intercept method (Miller, Wilder, Stillman, & Becker, 1997) was adapted to survey 1,214 gay and bisexual men at a series of gay, lesbian, and bisexual (GLB) community events in New York City in the fall of 2004 through the Sex and Love Study, version 3.0. This approach to collecting data has been used in numerous studies (Carey, Braaten, Jaworski, Durant, & Forsyth, 1999; Chen, Callahan, & Kerndt, 2002; Kalichman & Simbaya, 2004a, b; Rotheram-Borus et al., 2001), including those focused on GLB persons (Benotsch, Kalichman, & Cage, 2002; Kalichman et al., 2001) and has been shown to provide data that are comparable to those obtained from other more methodologically rigorous approaches, such as random-digit dialing (Halkitis & Parsons, 2002).

Procedure

At both two-day long community events, the research team hosted a booth, and a member of the research team actively approached each person who passed the booth. Potential participants were provided with information about the project and offered the opportunity to participate. The response rate was high, with 87.0% of those approached consenting. In order to be eligible for the project, participants had to report being at least age 18 and identified as gay, lesbian, or bisexual (only men's surveys were used for the present analyses). Those who were not at least age 18 or identified as heterosexual (and reported no sexual behavior with members of the same sex) were ineligible to participate. The survey required 15–20 min to complete, and—to promote confidentiality—participants were given the survey on a clipboard so that they could step away from others to complete the questionnaire privately. Upon completion, participants deposited their own survey into a secure box at the booth. As an incentive, those who completed the survey were given a voucher for free

admission to a moviXe. Data were entered into an SPSS database and verified by project staff for accuracy. Hunter College's Instutitional Review Board approved this project.

Measures

Demographics

Men completed a variety of demographic measures, including age, race and ethnicity, and HIV serostatus.

Sexual Compulsivity

Participants completed the Kalichman et al. (1994) 10-item SCS as described in the Introduction. As indicated, summation scores can range from 10 to 40, with higher values indicating greater likelihood of sexual compulsivity. Though no value has been established as a "cut-point" to designate sexual compulsivity, previous researchers have identified that values ≥24 on the SCS may indicate severe SC-like symptoms (Parsons et al., 2001).

Drug Use and Sex Under the Influence of Drugs

Men indicated if they had recently used a range of club drugs, including ketamine, MDMA/ecstasy, GHB, cocaine, and methamphetamine. These responses were dichotomized yes/no. Additionally, men also indicated if they had experienced a recent (≤90 days) episode of sex while under the influence of drugs.

Identity as a Barebacker and Intentions to Bareback

Barebacking (i.e., intentional unprotected sex) factors were assessed in the same manner as previous years' versions of the Sex and Love Study (Parsons & Bimbi, 2007). Men indicated if they identified as a barebacker (i.e., person who seeks out unprotected sex; yes/no) and completed measures of intentions for unsafe sex assessed by asking, "I purposely seek out bareback sex as a top" and "I purposely seek out bareback sex as a bottom" (with response choices 1 = strongly disagree to 4 = strongly agree). For this analysis, men having indicated "agree" or "strongly agree" were collapsed into "agree = 1," and others were collapsed into "disagree = 0." Participants also estimated the number of recent (≤90 days) sex partners who were HIV serodiscordant and HIV seroconcordant, and reported if they had engaged in unprotected sex (receptive or insertive) with these partners.

Specialized Sexual Behaviors

Participants also completed a series of questions assessing if they had participated in a range of 10 different specialized sexual behaviors (i.e., fetishes) ever in their lives (Nanín, Bimbi, Brown, Severino, & Parsons, 2005; Nanín, Bimbi, & Parsons, 2006). These included water sports (i.e., urine exchange); fisting (hand/fist in anus); anal play; bondage and domination; sadism and/or masochism; exhibitionism, photography, or voyeurism; breath play/asphyxiation; snowballing (i.e., exchange semen between mouths); felching (i.e., using mouth to pull semen from partner's rectum); and group sex. Though not all of the aforementioned specialized sexual behaviors may increase the risk for HIV or STI transmission (e.g., exhibitionism, photography, or voyeurism), clearly some of them do (e.g., felching). Furthermore, all of them capture variant levels of sexual experimentation/adventurism (Nanín et al., 2005, 2006), which may be related to sexual compulsivity and HIV transmission risks (Moskowitz & Roloff, 2007).

Temptation for Unsafe Sex

Finally, participants also completed the Temptation of Unsafe Sex (TUS) scale (Parsons, Halkitis, Bimbi, & Borkowski, 2000; Parsons, Halkitis, Wolitski, & Gomez, 2003). The TUS scale is a 10-item four-point Likert-type scale that assesses temptations for unsafe sexual behavior. It presents different situations in which an individual may be tempted to engage in sex without a condom. Items include "I really want sex," "I really need affection," "I am with a really hot guy," "He says he wants to bareback," "I am angry," "I think the risk of STDs is low," "I think the risk for HIV (or re-infection) is low," "I feel depressed," "I think he wants to bareback," "I am drunk or high on drugs" (1 = "not at all," 4 = "very much"). Using principal component analysis with varimax rotation, the TUS demonstrated strong internal consistency, yielding only one factor for the scale (Cronbach's $\alpha = .89$).

Analytic Plan

Where appropriate, *t*-tests or Spearman's r_s were calculated to assess differences in and associations between the SCS and the variety of aforementioned measures of HIV risk and sexual behavior. Spearman's r_s is a non-probability test of the linear relation between non-normally distributed continuous variables (e.g., number of recent sex partners and the SCS) and can be interpreted much the same as a Pearson *r* correlation coefficient (Tabachnick & Fidell, 2001). Finally, a series of three logistic regressions were conducted in an effort to better control for the multivariate effects of sociodemographic characteristics (race, HIV serostatus, age), substance use, and identity as a barebacker on the association between the SCS and recent unprotected anal sex with a non-main partner (Menard, 2002).

Results

Table 1 displays sample characteristics. Mean age was 37.5 years ($SD = 11.4$; range, 18–78). The sample was diverse, with 37.8% being persons of color and was overall well educated. Most men (92.7%) were gay identified with the remainder identified as bisexual. HIV positive men comprised 12.1% of the sample, 17.1% of men reported having used at least one of the five club drugs recently (≤90 days), and 18.9% of men reported a recent episode of unprotected anal sex with a non-main partner. Cocaine (10.6%), MDMA/ecstasy (8.8%), and methamphetamine (8.4%) were the most common drugs men had recently used. Further, the full range of possible SCS scores was demonstrated among men sampled ($M = 19.9$, $SD = 6.92$, range, 10–40) with 30.5% ($n = 370$) of men having scored 24 or higher on the SCS.

Bivariate Comparisons of Sexual Risk and the SCS

Table 2 shows bivariate comparisons of the SCS and a variety of HIV-associated risks. In total, men who: were HIV positive, reported unprotected sex (insertive or receptive) with a HIV seroconcordant or serodiscordant partner, or reported intentions to seek out bareback sex (either as a top or a bottom) scored significantly higher on the SCS than men without these characteristics. Furthermore, the number of recent sex partners (HIV seroconcordant or serodiscordant) and scores on the TUS scale were positively correlated with scores on the SCS. In essence, the SCS was significantly related to all indicators of increased HIV risk.

Having recently used ketamine, MDMA/ecstasy, GHB, cocaine, or methamphetamine was not significantly related to total score on the SCS. Because these values were non-significant, they are not reported in Table 2. Nevertheless, men who had engaged in sex while under the influence of at least one of these drugs scored significantly higher on the SCS compared with men who had not.

Specialized Sexual Behaviors and the SCS

Table 3 shows the association between the SCS and a variety of specialized sexual behaviors. The prevalence of specialized sexual behaviors was as follows: group sex, 60.6% ($n = 672$); anal play, 56.1% ($n = 623$); exhibitionism, photography, voyeurism. 39.8% ($n = 441$); watersports (urine exchange), 32.8% ($n = 365$); bondage and domination, 29.8% ($n = 328$); fisting (hand/fist in anus), 20.9% ($n = 231$); sadism and/or masochism, 20.7% ($n = 228$); snowballing (semen exchange between mouths), 19.7% ($n = 218$); breath play/asphyxiation, 8.1% ($n = 89$); and felching (use mouth to pull semen from partner's rectum), 7.4% ($n = 81$). Men who had previously engaged in water sports, fisting, bondage and domination, exhibitionism, photography, or voyeurism, breath play/asphyxiation, snowballing, felching, or group sex reported significantly higher scores on the SCS. In contrast, the SCS was unrelated to whether men had engaged in sadism and/or masochism, or anal play.

Table 1 Demographic and substance use characteristics ($N = 1,214$)

	n	%
Age, in categories[a]		
18–30	356	29.3
31–40	424	34.9
41–50	271	22.3
51+	163	13.4
Race and ethnicity		
African American	111	9.1
Caucasian	755	62.2
Latino	202	16.6
Asian/Pacific Islander	82	6.8
Other	64	5.3
Education		
No answer provided	40	3.3
High school or less	107	8.8
Some college	301	24.8
College	354	29.2
Graduate school	412	33.9
Sexual identity		
Gay	1125	92.7
Bisexual	89	7.3
HIV status		
Positive	157	12.9
Negative/unknown	1057	87.1
Club drug use, ≤90 days		
Ketamine	57	4.7
MDMA/ecstasy	107	8.8
GHB	30	2.5
Cocaine	129	10.6
Methamphetamine	102	8.4
Any club drug use	207	17.1
Unprotected sex, ≤90 days (with a non-main partner)		
Insertive	194	16.0
Receptive	129	10.6
Any unprotected sex (insertive or receptive)	229	18.9

[a] Age is a continuous measure

Multivariate Logistic Regressions

A series of logistic regressions were conducted in an effort to control for the confounding effects of sociodemographic characteristics (race, HIV serostatus, age), substance use, and identity as a barebacker on the association between the SCS and sexual risk behavior (Table 4). In this instance, recent unprotected anal sex (insertive and/or receptive; 1 = yes,

Table 2 The sexual compulsivity scale and HIV-risk-associated outcomes

	n	Mean	*SD*	*t*	*df*	*p*	Cohen's *d*[a]
HIV status							
Positive	157	21.4	7.50	2.96	1209	.003	.24
Negative/unknown	1057	19.7	6.81				
Had sex while under the influence of drugs, ≤90 days[b]							
Yes	247	20.5	7.13	2.04	1029	.04	.14
No	784	19.5	6.86				
Unprotected sex with HIV seroconcordant partners, ≤90 days							
Insertive							
Yes	156	22.8	6.59	4.96	679	<.001	.44
No	525	19.9	6.57				
Receptive							
Yes	105	21.9	6.22	2.29	679	.02	.25
No	576	20.3	6.75				
Unprotected sex with HIV serodiscordant partners, ≤90 days							
Insertive							
Yes	79	23.0	6.63	3.59	671	<.001	.44
No	594	20.1	6.60				
Receptive							
Yes	59	23.3	5.83	3.43	669	<.001	.49
No	612	20.2	6.68				
Barebacker identified							
Yes	116	22.3	7.34	3.87	1165	<.001	.37
No	1051	19.7	6.85				
I purposely seeks bareback sex as a top							
Agree	130	22.8	7.26	5.21	1170	<.001	.47
Disagree	1042	19.5	6.77				
I purposely seeks bareback sex as a bottom							
Agree	106	22.6	6.95	4.21	1168	<.001	.43
Disagree	1064	19.6	6.85				

	n	Mean	*SD*	Spearman's r_s	*p*
Number HIV serodiscordant partners, ≤90 days	660	3.19	14.84	0.19	<.001
Number HIV seroconcordant partners, ≤90 days	635	4.79	13.78	0.14	<.001
Temptation for unsafe sex scale	1165	15.0	7.07	0.25	<.001

[a] Cohen's *d*: (Mean 1 − Mean 2)/SD_{pooled} SC scale

[b] Drugs include ketamine, ecstasy/MDMA, cocaine, methamphetamine, or GHB

0 = no) served as the dependent variable. The SCS alone was entered into the first step of the model; race (1 = Caucasian), HIV status (1 = HIV+), and age in years were entered into the second step; the third step additionally took into consideration the total number of club drugs participants had recently used (range 0–5) and barebacker identity.

As would be expected, in the first model, the SCS significantly predicted a recent episode of unsafe sex with a non-main partner. Adjusting for the effects of race (Caucasian versus not), HIV status, and age did little to otherwise better explain the SCS score's ability to predict unsafe sex (Model 2). Age and HIV serostatus, in and of themselves, both significantly predicted unsafe sex in Model 2, such that HIV positive men had a significantly higher likelihood than other men of reporting unprotected sex with a non-main partner. In contrast, increases in age reduced the odds of unprotected sex with a non-main partner (values are reported in Table 4). Furthermore, this pattern was consistent, even when additionally controlling for identity as a barebacker and the total number of club drugs recently used (Model 3). Net the effects

Table 3 The sexual compulsivity scale and specialized sexual behavior, ever in one's life

	n	Mean	*SD*	*t*	*df*	*p*	Cohen's *d*[a]
Water sports (urine exchange)							
Yes	365	20.7	7.37	2.60	1110	<.001	.16
No	747	19.6	6.58				
Fisting (hand/fist in anus)							
Yes	231	21.6	7.20	4.15	1104	<.001	.30
No	875	19.5	6.71				
Anal play							
Yes	623	20.1	6.96	1.30	1109	ns	.07
No	488	19.6	6.74				
Bondage and domination							
Yes	328	20.7	6.91	2.58	1100	.01	.16
No	774	19.6	6.83				
Sadism and/or masochism							
Yes	228	20.4	7.15	1.07	1102	ns	.09
No	876	19.8	6.81				
Exhibitionism, photography, voyeurism							
Yes	441	20.6	7.06	2.67	1106	.01	.16
No	667	19.5	6.73				
Breath play/asphyxiation							
Yes	89	22.6	7.22	3.89	1099	<.001	.41
No	1012	19.7	6.77				
Snowballing (exchange semen between mouths)							
Yes	218	20.8	7.08	2.13	1103	.03	.16
No	887	19.7	6.83				
Felching (use mouth to pull semen from partner's rectum)							
Yes	81	22.6	6.65	3.72	1099	<.001	.43
No	1020	19.7	6.86				
Group sex							
Yes	672	20.6	6.88	4.16	1106	<.001	.25
No	436	18.9	6.75				

[a] Cohen's *d*: (Mean 1 − Mean 2)/SD_{pooled} SC scale

of the other variables in the model, for every one unit increase in the SCS, the odds of having recently engaged in unprotected sex increased by 4%. Considering the possible range of scores in the SCS, the magnitude of these increased odds for unprotected sex was quite high. For example, scoring 28 on the SCS versus 18 on the SCS (a 10 unit different) would result in a 1.54 higher predicted odds of engaging in unprotected sex (i.e., an odds increase of 54%). Similarly, scoring 38 versus 18 (a 20 unit increase) would result in a 237% increased odds for unprotected sex.

Discussion

Although the SCS was not designed to perform as an indicator of sexual risk behavior, its association with sexual risk has been identified in a diverse range of samples, including MSM (Kalichman et al., 1997; Kalichman & Rompa, 1995, 2001). Though there has been increasing interest in the association between sexual compulsivity and HIV-associated risk behavior among MSM, much of this research has focused on samples of HIV positive MSM. As MSM comprise a considerable proportion of both HIV incidence and HIV/AIDS prevalence in the U.S. (CDC, 2008b) and SC has been linked to sexual risk behavior specifically among this population, MSM who are experiencing sexual behaviors perceived to be "out of control" or sexually compulsive might be an important group in which to investigate the association between sexual compulsivity and HIV-associated risk behavior (Muench & Parsons, 2004). Such findings and implications have begged the question, "Can we effectively reduce unsafe sexual behavior, by identifying/treating sexual compulsivity?" Thus, it is essential to better evaluate the association between measures of sexual compulsivity and sexual risk behavior, as misidentifying this relation could result in inappropriately designed and poorly targeted research interventions or health educational programs.

These analyses investigated the extent to which the SCS might correlate/predict HIV-associated risk outcomes in a community-based sample of gay and bisexual men. Sexual risk behavior was operationalized in a variety of ways and the SCS was significantly related to all indicators of sexual risk. Thus, within this large community-based sample, it seemed the SCS was an effective tool to identify individuals who had engaged in sexual risk, and these findings support those of previous researchers. Furthermore, in multivariate logistic regression, the SCS still acted as a significant predictor of unprotected sex even when controlling for participant's HIV status. Thus, these findings indicate that the SCS may be an effective measure to globally distinguish sexual risk among a wide variety of gay and bisexual men in community-based samples, not just among HIV positive MSM. Though these analyses found a significant association between the SCS and sexual risk behavior, it is worth mentioning that not all men who engage in HIV-associated risk are essentially sexually compulsive, and that a variety of factors are associated with sexual risk behavior. But, given the link between SC and HIV risk, these data imply that treatments for SC could dualistically assess for sexual risk behavior while also providing HIV/STI prevention and education.

As part of this study, participants indicated if they had participated in 10 different specialized sexual behaviors (i.e., fetishes) ever in their lives. Though, in and of themselves, not all of the behaviors assessed increase HIV transmission risk, some of them could serve as proxies for HIV transmission risk (e.g., fisting may increase potential for rectal tearing and thus spreading HIV or other blood born pathogens), or are direct indictors of HIV risk (e.g., felching requires ejaculation into the partner's rectum). Taken together, these

Table 4 Logistic regressions predicting unprotected anal sex with a non-main partner, ≤90 days

	Model 1			Model 2			Model 3		
Modeχ^2	15***			39.6***			103.5***		
df	1			4			6		
Nagelkerke R^2	0.04			0.09			0.23		
Constant, β	−1.78			−0.09			−0.87		
	β	Exp. β	95%CI	β	Exp. β	95%CI	β	Exp. β	95%CI
SCS score	0.05	1.05	1.02–1.08***	0.05	1.05	1.02–1.07***	0.04	1.04	1.01–1.07**
Caucasian (1 = yes)				0.20	1.22	0.82–1.82	0.23	1.26	0.82–1.93
HIV+ (1 = yes)				1.22	3.39	2.05–5.61***	0.68	1.98	1.11–3.53*
Age				−0.02	0.98	0.97–1.00*	−0.02	0.98	0.96–1.00*
Barebacker (1 = yes)							2.37	10.72	5.12–22.46***
Total number of club drugs used, <90 days							0.28	1.33	1.10–1.60**

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

specialized sexual behaviors capture variant levels of sexual experimentation and sexual adventurism (Nanín et al., 2005, 2006), and may serve as mechanisms by which HIV transmission risks are increased (Moskowitz & Roloff, 2007). It warrants mentioning that some of the specialized sexual behaviors assessed in this analysis, if used in place of unprotected anal sex, could reduce the potential for HIV transmission (e.g., water sports). However, the contexts of how such behavior is enacted will moderate any risks. For example, although HIV is not present in urine (CDC, 2006), any blood present in urine (e.g., due to a urinary tract infection) could transmit HIV in addition to other pathogens.

With the exception of anal play and sadism/masochism, all the specialized sexual behaviors assessed were significantly related to the SCS. Researchers and health service providers seeking to dually address HIV transmission risks and sexual compulsivity among MSM might also consider addressing the continuum of specialized sexual behaviors men may engage in. This would also include educating men about the potential risks that are uniquely associated with different types of specialized sexual behaviors. Further, although this analysis assessed 10 different behaviors, it did not capture the full range of specialized sexual behaviors in which individuals may engage (e.g., foot play).

As a word of caution, these results cannot be widely extrapolated, as all data were gathered from gay and bisexual men living in New York City. Needless to say, this analysis complements previous researcher's findings by further contributing to our knowledge of sexual risk behavior and measures of sexual compulsivity. Furthermore, because this analysis drew from a sample of men recruited at large-scale community-based GLBT events, we believe these data may be particularly useful for researchers and health providers seeking to reach visible and accessible members of the GLBT community. That being said, MSM who are not well connected to the GLBT community might have been less inclined to attend the events where data were collected and are thus not represented in these analyses.

The goal of this study was not to identify the best predictor of sexual risk. Instead, this analysis evaluated the ability of the SCS to correlate with/predict sexual risk behavior in a community-based sample of gay and bisexual men. HIV-associated risks were operationalized in a multitude of ways and, in bivariate analyses, the SCS was consistently and significantly associated with these outcomes. Using multivariate logistic regression to adjust for the effects of age, race, HIV status, identity as a barebacker, and the number of club drugs a person may have recently used, the SCS continued to significantly predict unprotected sex. Understandably, with the exception of race, these "control" variables also significantly predicted unprotected sex in and of themselves. Thus, these data highlight the need for multidimensional models in understanding unprotected sex among gay and bisexual men, while also exploring the unique role that sexual compulsivity may be contributing in this association.

In conclusion, although this analysis found a significant and consistent association between the SCS and measures of sexual risk behavior, this does not preclude the potential for other variables that may mediate or moderate this association. Although it is beyond the scope of the present study, other factors could include variables, such as sensation seeking or "risk-taking" personality types (Bancroft, 2000; Zuckerman, Eysenck, & Eysenck, 1978), and this might be an arena for researchers and community/health service providers to further consider. Finally, it is equally important to also consider larger sociostructural variables (e.g., racial inequality, homophobia, class structures) and their impact both on sexual compulsivity and HIV transmission risk. These factors were beyond the scope of the present analysis, but are arenas for further consideration.

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ORIGINAL PAPER

Moderators of Sexual Behavior in Gay Men

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Abstract We investigated factors that might moderate the association between sexual behavior desires and sexual behavior enactments in gay men. Condom eschewal, number of STIs, HIV serostatus, age, and relationship status were each hypothesized to moderate this association. An Internet survey collected data from 219 self-identifying gay men. Results indicated that sexual behavior desires and enactments were highly correlated, and of the five moderators tested, four varied this association. Condom eschewers had a stronger association between desires and enactments than condom users. Gay men with fewer STIs/STDs (excluding HIV) also had a stronger association between the two variables. HIV serostatus did not exclusively moderate the association. Rather, a three-way interaction was produced such that HIV-positive men with STIs had a stronger association between sexual behavior desires and enactments than HIV-negative men with STIs. Finally, gay men in monogamous relationships were least likely to have their desires associated with enactments. Age was not found to be a significant moderator. Overall, we concluded the moderators representing sexual health and sexual health behaviors were most influential over the enactment of sexual behavior desires.

Keywords Gay men · Sexual enactment · Sexual desire · HIV · STIs/STDs · Condom use

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Introduction

Gay men are diverse with respect to the sexual behaviors they both desire and enact (Sanderson, 1994). Moreover, gay men differ from other groups in their sexual behavior. Research shows that, on average, gay men have more partners, engage in more risky sexual behavior, and are more likely to seek sexual sensation than other groups, such as heterosexual men and women and lesbians (Bailey, Gaulin, Agyei, & Gladue, 1994; Ekstrand, Stall, Paul, Osmond, & Coates, 1999; Thompson, Yager, & Martin, 1993). Considering that gay men differ from other groups with regard to many sexual activities, one might also expect gay men to be more likely to enact their sexual behavioral desires. Aside from studies on gay male paraphilic behaviors (e.g., Alison, Santtila, Sandnabba, & Nordling, 2001; Sandnabba, Santtila, & Nordling, 1999; Weinberg, Williams, & Calhan, 1994), few studies have examined the relationship between gay male sexual behavior desires and enactments and virtually none have examined moderators of the association between sexual behavior desire and sexual behavior enactment. Little is understood about gay men's sexual inhibition or disinhibition of behaviors when faced with problems such as sexually transmitted infections (STIs), the human immunodeficiency virus (HIV), and sustaining safer sex practices. Thus, we explored possible moderators of the relationship between sexual behavior desires and enactments among gay men. Specifically, we focused on the impact of five potential moderators identified in previous research with gay men: condom eschewal, STIs, HIV, age, and relationship status.

Before the introduction of HIV into the gay community in the 1980s, condom use was extremely low—sharply increasing only after the connection between HIV infection and anal intercourse was conclusively shown (Catania et al., 1991). Many gay men adopted the reinforced ethic of "a condom every time" during these years (Kippax & Race, 2003). However, it has

been argued that the introduction of highly active antiretroviral therapies (HAART; DiClemente et al., 2002; Race, 2003), the popularization of "effective" techniques (e.g., *coitus interruptus*) to prevent HIV transmission (Van de Ven et al., 2002; Wegesin & Meyer-Bahlburg, 2000), and HIV prophylaxis fatigue and rebellion (Crossley, 2004; Gauthier & Forsyth, 1999; Halkitis, Wilton, & Galatowitsch, 2005; Wolitski, 2005) have all contributed to the decrease in condom use. Regardless of explanation, condom eschewal—the voluntary disuse of condoms during anal intercourse—has been associated with a higher valued or more pleasurable sexual experience, drug use before or during sex, and anal intercourse with an increased number of partners (Crosby, Stall, Paul, Barrett, & Midanik, 1996; Ekstrand et al., 1999; Kelly & Kalichman, 1998).

As suggested, gay men are encouraged to wear condoms because they enact behaviors highly associated with STI and HIV infection (Lama & Planelles, 2007; Royce, Sena, Cates, & Cohen, 1997). However, recent research has suggested antithetical responses to the gay male population's high prevalence of STIs and HIV—the bareback movement (Crossley, 2004; Gauthier & Forsyth, 1999; Halkitis et al., 2005; Mansergh et al., 2002; Moskowitz & Roloff, 2007a; Tewksbury, 2003; Wolitski, 2005). In this subculture of gay men, condoms are actively eschewed. For barebackers, this is performed in spite of possible STI/HIV infection and to feel more "sexually liberated" (Crossley, 2004; Halkitis et al., 2005). Additionally, many barebackers believe that becoming HIV-positive is an effective way to increase sexual liberation and reach a "sexual nirvana" because the fear of seroconverting from the enactment of unsafe sexual behaviors is removed from the sexual experience (Gauthier & Forsyth, 1999; Moskowitz & Roloff, 2007a, b). Whether HIV-positive men actually enjoy a sort of "sexual nirvana" remains hotly debated (see Halkitis et al., 2005; Moskowitz & Roloff, 2007b; Parsons & Bimbi, 2007; Wolitski, 2005). It becomes difficult to assess if being HIV-positive allows for the greater enactment of sexual behavior desires; or, alternatively, if being HIV-positive is merely incidental, and it is the factors that contribute to becoming HIV-positive (e.g., condom eschewal) that increase the likelihood for greater sexual behavior enactments. Thus, more research into the association among sexual behavior desires, enactments, and STIs/HIV is needed.

Age has significant social and sexual meaning for gay men (Berger, 1996). Gay men highly value physical attractiveness, and thus younger, fitter, and more attractive individuals become prime choices for sexual selection (Berger, 1996; Grube, 1990). In short, availability exists for young men to have more sex than older men. Research suggests that younger men indeed have more unprotected sex or engage in otherwise risky behaviors than older men and are at a higher risk for STI/HIV contraction (Mansergh & Marks, 1998; McAuliffe et al., 1999; Valleroy et al., 2000; Vincke, Bolton, & Miller, 1997). Research is vague concerning the other sexual behaviors younger versus older men enact. Yet, if a differentiation has been noted between the groups with respect to cautiousness regarding sexual intercourse, it is plausible that younger and older gay men differ with respect to sexual behavior desires and their potential enactments.

Individuals in short and long-term gay relationships sometimes open their relationships either temporarily or indefinitely (Blasband & Peplau, 1985). The literature suggests partners in monogamous relationships report stronger dependency on their partners, more favorable attitudes towards the relationship itself, and lower tension than those in non-monogamous relationships (Kurdek & Schmitt, 1985). However, more recent research suggests that though monogamy may provide those previously mentioned benefits, over time, partner distrust, jealousy, sexual ennui, and anxiety push virtually all homosexual male, romantic relationships towards non-monogamy (Worth, Reid, & McMillan, 2002). The sexual variety, prevention of possessiveness, and the promotion of freedom and egalitarianism all overwhelm the need for exclusivity in many gay male couples (Shernoff, 2006; Yip, 1997). With respect to our current research, if the tendency to open a relationship stems from sexual desire for other partners, then, it may be likely that the association between sexual behavior desires and enactments varies between single, monogamously partnered and non-monogamously partnered gay men.

Hypotheses

H1. We posit that gay men who eschew condoms will have a stronger association between their sexual behavior desires and enactments. That is, men who actively increase the sensation of their sexual experience by condom eschewal may be oriented towards fulfilling more of their desires in general; they are pleasure seekers. If, as previous research suggests, they also tend towards having more partners, then pleasure seeking may be compounded by available and willing partners who will engage in the desired behaviors.

H2. We posit that gay men who have been diagnosed with more STIs over the past year (excluding HIV) will have a weaker association between sexual behavior desires and enactments than men who have been diagnosed with fewer STIs. Despite the barebacking trend described in the previous section associated with increased HIV infection, gay men may become more sexually cautious as the number of infections increases. Such men may report decreased behavioral enactments as a corollary.

H3. With respect to HIV, we posit that HIV-positive gay men will have a stronger association between sexual behavior desires and enactments than HIV-negative men. It may be likely that removing the possibility of seroconverting from the enactment of sexual behaviors encourages enactment within already HIV-positive men. Conversely, HIV-negative men

may be reluctant to act on certain sexual behaviors that may endanger them for HIV transmission.

H4. We posit that younger gay men will have a stronger association between sexual behavior desires and enactments than older gay men. With a higher availability of sexual partners, young men may have more opportunities to enact sexual behaviors. Older gay men, as Berger (1996) suggests, may have to settle for whomever they can attract, regardless of whether the partner is willing to partake in the enactment of a particular desire.

H5. With regard to relationship status, we posit that single gay men will have the strongest association between sexual behavior desires and enactments, followed by partnered men in non-monogamous relationships, and then partnered men in monogamous relationships. Single men have the active option to pursue anyone willing to satisfy their desires. Similarly, men in partnered, non-monogamous relationships have the options to both pursue anyone outside of the relationship and/or pursue their primary partners. Yet, research suggests partners tenaciously maintain codes of conduct during their encounters with third parties (Kippax et al., 1997) and condoms may be reintroduced to prevent STI/HIV infection of the primary partner (LaSala, 2005). So though partner availability may exist, the non-monogamous partner may not be able to enact some of his desires due to these constraints. Finally, men in monogamous relationships may find that some desires are unfulfilled due to their partner not wanting to enact the behavior.

Method

Participants

Participants were solicited to fill out an Internet-based survey. Advertisements with links to the survey were strategically placed around the web. Notices were put on a gay blog page (e.g., www.Gay-Torrents.net) to gain participation. Free advertisements were placed on Craigslist, in the "etcetera jobs" section of its employment opportunities pages. These Craigslist ads were placed in Atlanta, Baltimore, Chicago, Ft. Lauderdale, Palm Springs, Toronto, and Vancouver. Advertisements were placed in AOL "m4m" chat rooms, (e.g., "phoenixm4m," or "southcarolinam4m"). A classified ad was also placed in the weekly publication, *Gay Chicago Magazine*. Finally, free advertisements were placed on two gay listservs for graduate schools, University of Illinois, Chicago, and University of Michigan. At the end of the survey, participants were invited to click a link in order to receive a $10.00 gift card to a popular coffee chain.

The sample consisted of 219 self-identified gay men who completed the questionnaire. As shown in Table 1, the sample was largely white and tended to live in urban areas. About half the men were single, about a third were in a monogamous relationship, and about a fifth were in a non-monogamous relationship. HIV-positive and HIV-negative men were equally represented in the sample. Though the distributions of some of the demographic variables were unequal, and in some cases skewed, the variables were not significantly related to either the independent or dependent variables. With regard to the moderators, income was correlated with age. This variable was controlled for when testing age as a moderator.

Measures

Sexual Behavior Desires and Enactments

To assess sexual behavior desires, participants were presented a list of sexual behaviors and asked to check the behaviors they desired to enact (no = 0, yes = 1). Assessed behaviors included: oral intercourse, anal intercourse, vaginal intercourse, anilingus, fisting, urination, defecation, erotic asphyxiation, domination, submission, voyeurism, exhibitionism, and sexual assault. When applicable, both receptive and insertive forms of the behavior were assessed. A follow-up question was asked that measured which of those same behaviors the participant had actually enacted over the past year (no = 0, yes = 1). We summed the desired sexual acts with good reliability, $\alpha = .85$, and the enacted sexual acts with similarly good reliability, $\alpha = .83$. Thus, we created the sexual behavior desires and the sexual behavior enactments scales.

Condom Eschewal

Condom eschewal was measured using a continuum from 0 to 100% of the time using 10% increments. Participants were asked the percent of time they used condoms during receptive and insertive anal intercourse as individual measures. These two scales (for receptive and insertive) were averaged with excellent reliability, $\alpha = .93$.

STIs

Participants were asked to check only STIs they had been diagnosed with in the past year (no = 0, yes = 1): Chlamydia, gonorrhea, pubic crabs or lice, herpes, genital warts or asymptomatic HPV, sexually contracted hepatitis, syphilis, protozoa or fungal infection, and other (from Cates, 1999). The number of reported STIs was summed for each participant.

HIV Serostatus

Individuals self reported either being seronegative, seropositive, or sero-unknown. Sero-unknown men were omitted from

Table 1 Description of the variables

Demographic variables	*n*	*% of N*
City size (in people)		
<50K	25	11.4
50–250K	38	17.4
251–750K	36	16.4
>750K	120	54.8
Race/ethnicity		
White	176	80.4
Black	3	1.4
Latino	18	8.2
Asian	13	5.9
Middle/Eastern	5	2.3
Other	2	1.8
Income (USD)		
<$10K	31	14.2
$10–30K	49	22.4
$31–50K	64	29.2
$51–75K	38	17.4
$76–100K	23	10.5
>$100K	14	6.4
Education		
Some high school	6	2.7
Finished high school	23	10.5
Some undergraduate	34	15.5
Finished undergraduate	62	28.3
Some graduate	31	14.2
Finished graduate	63	28.8

Independent and dependent variables	*M*	*SD*
Sexual behavior desires (IV)[a]	8.10	3.97
Sexual behavior enactments (DV)[b]	5.71	3.37

Moderator variables	*n*	*% of N*	*M*	*SD*
Condom eschewal[c]			47.22	41.07
STIs[d]			.51	.83
HIV serostatus				
Seronegative	102	46.6		
Seropositive	106	48.4		
Sero-unknown	11	5.0		
Age[e]			35.34	10.33
Relationship status				
Single	116	53.0		
Monogamous relationship	64	29.2		
Non-monogamous relationship	39	17.8		

Note: Absolute ranges for the continuous variables: [a] 1–21, [b] 1–17, [c] 0–100, [d] 1–4, [e] 20–62

the HIV-oriented analyses because of their low representation ($n = 11$).

Relationship Type

Individuals could report being single, in a monogamous relationship, or in a non-monogamous or open relationship.

Statistical Analysis

The data were analyzed using multivariate analysis of variance (MANOVA), bivariate correlations, and moderated and multiple regression. SPSS 11.0 was used for carrying out the analyses of variance (ANOVA), the bivariate correlations, and for breaking down and interpreting the significant interactions (as defined by Aiken & West, 1991). JMP 5.1 was used for all higher-level analyses (i.e., the moderated regression). Missing data were not found to be a significant problem. However, since the participants had the option to skip questions that did not pertain to them, the sample size varied across some of the analyses. For example, participants could skip questions on condom eschewal during anal intercourse if they had not participated in either the receptive or insertive versions of that behavior.

We used moderated regression in which an interaction term was created by multiplying the given moderator with the independent variable, sexual behavior desires (Aiken & West, 1991). Where the moderators or independent variable were inter-correlated, we controlled for those variables. Variables were all entered on different steps of the regression, with controlled variables entered before the independent variable and moderator variable. The interaction term was always entered last.

When an interaction term proved to be significant, we deconstructed the relationship between behavior desires and enactments to measure the strength of this association at the different intervals of the moderator. For HIV and relationships status, each was broken down into its nominal variations (e.g., for HIV serostatus: seronegative and seropositive; for relationship status: single, monogamous, and non-monogramous). Dichotomizing continuous variables contributes to the loss of statistical power (Aiken & West, 1991). Thus, to interpret the interaction of continuous moderators, the relationship between behavior desire and enactment was shifted up and down by one *SD* rather than dichotomizing the variable. That is, all the data were transformed into high and low variations by adding or subtracting one *SD* to each participant's response. As a result of this transformation, we could calculate the strength of the relationship at different intervals on the continuous variable without losing power or excluding cases. High responses represented falling

one *SD* above the mean, and low represented falling one *SD* below the mean (as per Aiken & West, 1991). For example, using these statistical methods on age ($M = 35.34$, $SD = 10.33$): high age (older men) would test the strength of the relationship between desires and enactments if the mean of the moderator age was shifted up by one *SD* to 45.67 years old and low age (younger men) would test the strength of the relationship if the mean were shifted down by one *SD* to 25.01 years old.

Results

Correlations of Key Variables

Regression analysis confirmed a strong and significant association between sexual behavior desires and behavior enactments, $F(1, 217) = 170.68, R^2 = .44, p < .001$. The following will report on whether this association was moderated by condom eschewal, STIs, HIV, age, and relationship status.

As shown in Table 2, both condom eschewal and number of STIs were positively related to an HIV-positive serostatus and age. HIV serostatus and age were related such that an HIV-positive serostatus was associated with increased age. MANOVA revealed that relationship status was associated with age [$F(2, 121) = 3.70, R^2 = .06, p = .02$], and HIV serostatus [$F(2, 121) = 7.52, R^2 = .11, p < .01$]—a Bonferroni-Holm correction showed that younger men were more likely to be in monogamous relationships ($p < .02$) and HIV-positive men were more likely to be single ($p < .01$).

H1. To test the hypothesis that gay men who eschewed condoms would have a stronger association between sexual behavior desires and enactments than men who more readily used them, a model was created using sexual behavior desire, condom eschewal, and the interaction term of sexual behavior desire multiplied by condom eschewal. The model controlled for HIV serostatus and age. The overall model was significant, $F(5, 118) = 45.71, R^2 = .66, p < .001$, and the interaction term added significantly to the fit of the model, $t(118) = -3.16, \Delta R^2 = .03, p < .01, \beta = -.18$.

Table 2 Correlation matrix of variables

	Condom eschewal	STIs	HIV	Age
Condom eschewal	–	.13	.18*	.23**
STIs		–	.30**	.15*
HIV			–	.55**
Age				–

Note: For condom eschewal, a positive association signifies propensities towards low or no condom use. HIV should be interpreted as seronegative = 0, seropositive = 1. * $p < .05$, ** $p < .01$

To interpret the interaction, we broke it into those who often used condoms (shifting the mean to one *SD* above, or 93.88% of the time) and those who eschewed them (shifting the mean to one *SD* below, or using them only 11.68% of the time). As Fig. 1 shows, controlling for age and HIV serostatus, condom users showed a weaker association between the variables than condom eschewers, $t(118) = 6.93, p < .001, \beta = .54$. Condom eschewers showed a stronger association than condom users, $t(118) = 11.13, p < .001, \beta = .89$. The first hypothesis was thus confirmed by this ordinal interaction. Desires and enactments were significantly correlated for both groups, but stronger for condom eschewers.

H2. To test the hypothesis that STIs (excluding HIV) would reduce the association between behavior desires and enactments, while H3 (that HIV would increase this association), we simultaneously tested a model with both interaction terms included (HIV × desires and STIs × desires). If it were true that HIV serostatus moderated the relationship between desires and enactments, then the interaction should contribute significant variance independent of all the other variables—including the interaction term comprised of STIs and desires. Controlling for age, condom eschewal, and relationship status, we created a model that included number of STIs, HIV serostatus, sexual behavior desires, the interaction term of number of STIs multiplied by desires, and the interaction term of HIV serostatus multiplied by desires. All were entered on different steps of the regression with the HIV interaction term on the last step.

The model was highly significant, $F(9, 114) = 28.36, R^2 = .69, p < .001$. The interaction term containing STIs and

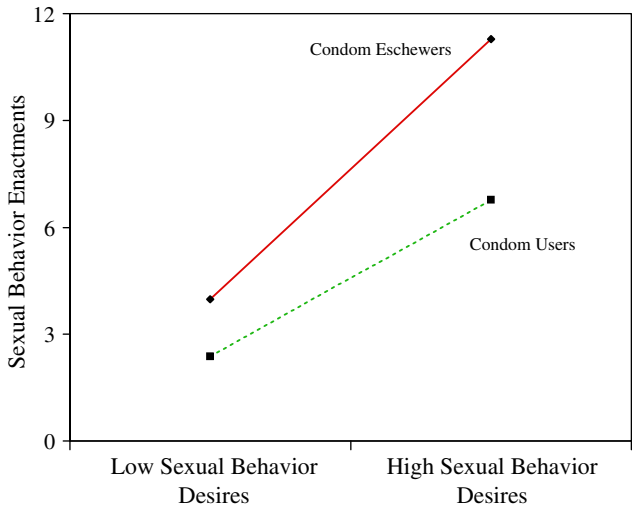

Fig. 1 Low and high sexual behavior desires predicting sexual behavior enactments by condom eschewers and users. Note, the x-axis represents generalized low (one *SD* below) and high behavior desires (one *SD* above the mean), and the y-axis represents the actual count of behaviors. They are not codes for the behaviors themselves. Condom eschewers are those who fall one *SD* below the mean, and condom users are those who fall one *SD* above the mean

desires added significantly to the fit of the model, $t(114) = -3.14$, $\Delta R^2 = .03$, $p < .01$, $\beta = -.18$. However, the interaction term containing HIV and desires was not significant, $t(114) = 1.61$, $\Delta R^2 < .01$, $p = .11$, $\beta = -.09$. Thus, these tests confirmed the second but not the third hypothesis.

To interpret the interaction, we shifted the statistical relationship between desires and enactments by those who had not been affected by STIs (shifting the mean to one *SD* below, or 0), and those who had been affected by STIs (shifting the mean to one *SD* above, or 1.34). Though individuals could not have fractions of STIs, for the sake of creating low versus high STI incidence, we merely used the one *SD* above, 1.34, as a population marker representing the part of the population affected more by STIs. Figure 2 represents this deconstruction. Controlling for age, condom eschewal, monogamy, and HIV, individuals who had contracted fewer or no STIs had a stronger association between the variables, $t(115) = 10.61$, $p < .001$, $\beta = .89$. Individuals who had developed more STIs had a weaker association than those who had fewer or none, $t(115) = 9.21$, $p < .001$, $\beta = .60$.

Next, we explored whether it was possible that the association between STIs and behavior enactments was moderated by HIV serostatus (i.e., HIV-positive men with and without STIs compared to HIV-negative men with and without STIs). We created a three-way interaction by multiplying HIV serostatus, STIs, and sexual behavior desires and entered it on the last step of the moderated regression analysis. This term accounted for a statistically significant increment of variance, $t(112) = 3.31$, $\Delta R^2 = .03$, $p < .01$, $\beta = .23$. As shown in Fig. 3, among men who were HIV positive, $t(27) = 8.00$, $p < .001$, $\beta = .78$, or HIV-negative, $t(33) = 8.31$, $p < .001$, $\beta = .84$, the magnitude of the association between desires and enactments was similar *as long as they had no or fewer STIs*. However, when STIs affected the health of individuals, HIV serostatus became a significant moderator. No statistically significant association existed between sexual behavior desires and enactments in HIV-negative men infected with more STIs, $t(9) < 1$, $\beta = .21$, but among HIV-positive men infected with more STIs, there remained a statistically significant association between their sexual desires and their sexual enactments, $t(33) = 6.23$, $p < .001$, $\beta = .70$.

H4. To test whether younger men had a stronger association between desires and enactments relative to older men, a model containing HIV serostatus, relationship status, condom eschewal, STIs, income, age, sexual behavior desires, and the interaction term of age multiplied by sexual behavior desires was created. Though the model was significant, we were only interested in the β and ΔR^2 of the interaction term, which were not significant, $t(114) = -.24$, $\Delta R^2 < .01$, $p = .81$, $\beta = -.01$. Thus, age was not a moderator of the association between desires and enactments.

H5. To test whether relationships status moderated the association between behavior desires and enactments, a model was constructed of HIV serostatus, age, monogamy, sexual behavior desires, and the interaction term of sexual behavior desires multiplied by relationship status. The model was significant, $F(7, 211) = 31.25$, $R^2 = .51$, $p < .001$. However, of the three relationship statuses—single, monogamous, and

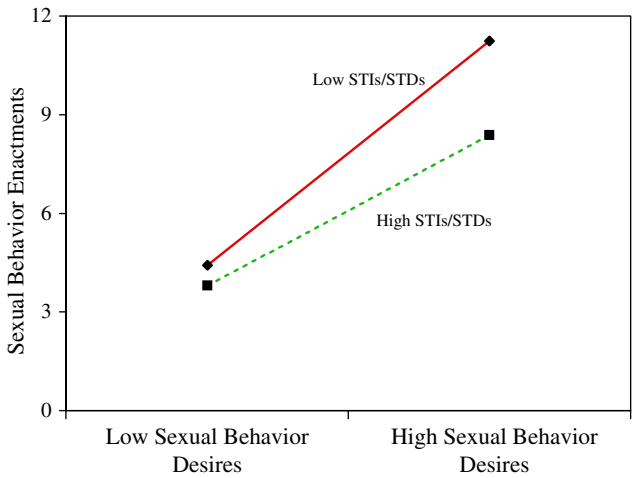

Fig. 2 Low and high sexual behavior desires predicting sexual behavior enactments by number of acquired STIs. Note, the x-axis represents generalized low (one *SD* below) and high behavior desires (one *SD* above the mean), and the y-axis represents the actual count of behaviors. They are not codes for the behaviors themselves. Low number of STIs/STDs are those who fall one *SD* below the mean, and high number of STIs/STDs are those who fall one *SD* above the mean

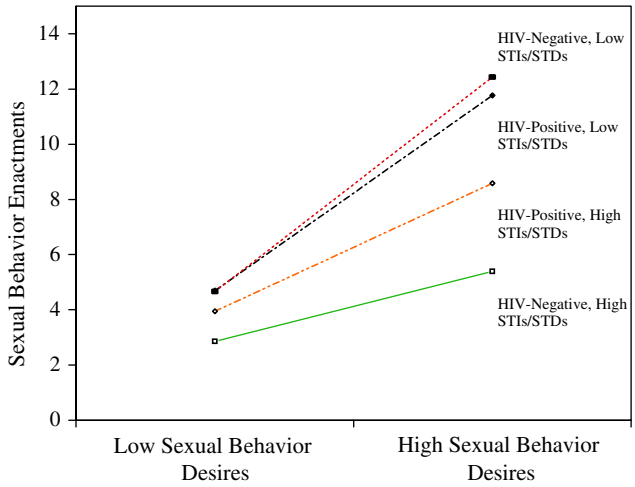

Fig. 3 Low and high sexual behavior desires predicting sexual behavior enactments by HIV serostatus and number of STIs/STDs. Note, the x-axis represents generalized low (one *SD* below) and high behavior desires (one *SD* above the mean), and the y-axis represents the actual count of behaviors. They are not codes for the behaviors themselves. HIV serostatus is explicitly marked. Low numbers of STIs/STDs are those who fall one *SD* below the mean, and high numbers of STIs/STDs are those who fall one *SD* above the mean

non-monogamous—only the interaction with desires and the monogamous group statistically differed from the other two, $t(211) = -2.64, \Delta R^2 = .03, p = .01, \beta = -.14$. Men in monogamous relationships were less likely to show an association between the variables, $t(59) = 5.73$, $p < .001$, $\beta = .59$, as compared to men in non-monogamous relationships, $t(34) = 10.27, p < .001, \beta = .88$, or men who were single, $t(103) = 8.60, p < .001, \beta = .62$. There was no significant difference between the standardized beta for the single men and the standardized beta for the non-monogamous men.

Discussion

A strong association was found between gay male sexual behavior desires and behavior enactments. Furthermore, this association was moderated by condom eschewal, STI contraction, and relationships status. HIV serostatus was an insufficient moderator on its own. However, it further defined STIs as a moderator. Age was not found to significantly moderate the association between behavior desires and behavior enactments. Each of these findings contributes to the general understanding of gay male sexual behavior and gives insight into the influential nature of sexual disease, safer sex choices, and relationship agreements.

Specifically, condom eschewers showed a stronger association between sexual behavior desires and enactments relative to condom users in our study. As mentioned in the introduction, some researchers have claimed that gay men who eschew condoms are in search of sexual liberation, exhibition, and freedom (Crossley, 2004; Gauthier & Forsyth, 1999). Our data lend some support to these claims. Men who consistently wear condoms show hesitancy towards risky sex. In our sample, this caution might have been transitive, affecting behavior enactments but not behavior desires. We suggest that a decreased association between one's desires and enactments might also indicate fewer feelings of sexual liberation and freedom, as desires are unfulfilled. Conversely, for condom eschewers, the data showed an extremely strong association between desires and enactments ($\beta \approx .90$). This increased association might suggest greater sexual liberation and freedom among condom eschewers as desires are fulfilled.

STIs and HIV were predicted to moderate the association between desires and enactments. Yet, the hypothesized weaker association was found only with respect to STIs. Ostensibly, it seemed that gay men who contracted STIs recoiled from some sexual behaviors they ultimately desired. Yet, our results showed that men who had STIs and were also HIV-positive continued to show a strong association between behavior desires and enactments. In contrast, that same relationship was non-significant for HIV-negative men. In men whose HIV-positive serostatus was compounded with one or more STIs, their unchanged enactment of desires might be explained by fatalism and apathy towards one's health (as described in previous research into unprotected anal intercourse, see Kalichman, Kelly, Morgan, & Rompa, 1997). For HIV-negative men with STIs, the non-significant association between desires and enactments might have been a reaction to the STI, in which sexual desires were not enacted due to physical infection or fears of contracting future STIs. Further research is needed to understand the role of concomitant HIV infection and other STIs on the enactment of desired sexual behaviors.

It may be that time since diagnosis, adherence to HAART, viral load, CD4 count, and all the rest of the variables endemic of being HIV-positive influence the association between desires and enactments. Yet, the perceptions that HIV-positive men enacted more of their desires and were ultimately sexually freer to behave as they wished were largely unsupported by our data. An argument was presented in the introduction as to whether being HIV-positive encouraged men to enact their desires more, or whether men who enacted their desires more were simply more likely to contract HIV. In the final analysis, the condom eschewal data, the phenomenon of STIs recoiling behavioral enactment, and the negligible effect of HIV itself on enactment all support the latter contention.

Relationship type was only partially shown to influence the strength of sexual behavior desires and enactments. Specifically, men in monogamous relationships were least likely to show an association between their desires and enactments, particularly relative to single men and men in non-monogamous relationships. As a possible explanation, it might have been that the self-imposed, low partner availability affected the enactment of sexual behaviors, where each monogamous partner was limited by his partner's willingness to perform the behaviors. More generally, behavioral enactment of desires does not definitively signify sexual or relationship satisfaction—two variables that have been reported to affect relationship continuity in heterosexuals and homosexuals alike (Kurdek, 1994, 1998). However, the data did show monogamy to stifle the enactment of some sexual behaviors while keeping the desire to perform those same behaviors intact. Reasonably, in such a psychological state, lessened desired behavior enactments might ultimately lead to lessened sexual satisfaction—forcing either a reevaluation of the sort of relationship the partners wish to have or its dissolution.

The strength of all of these conclusions were limited due to our small sample size, which may have restricted the ability to detect small effects (Cohen, 1988). Yet, finding statistically significant results using only 219 men increased the confidence in our hypotheses. Additionally, the sample was recruited using a variety of ways as to ensure an international, diverse, and heterogeneous group of participants. Recruitment for this study had no impact on any of the analyses, even though some of the demographic variables were skewed (e.g., city size, race). Further, the results cannot be generalized to bisexual or heterosexual men. Future studies still might recruit from a broader

range of Internet and non-Internet sites as a means to increase the number and diversity of participants.

In addition to these methodological concerns and as a function of using the online survey, it was possible that the measures of sexual behavior desires and enactments might have been affected by the anonymity provided by the Internet. Individuals may have inflated the number of sexual behaviors they actually enacted over the past year. Or alternatively, as suggested by previous research (Moskowitz, Rieger, & Roloff, 2008), by providing so many sexual behavior choices, we may have seeded or introduced sexual behavior desires that would have not been considered through using an open-ended response style. The strength of these behavior desires may thus be weakened. Future studies might correct this limitation by asking participants to self-generate sexual behavior desires.

The moderators of sexual behavior enactment were introduced as a concept under researched. In addition to this current study, there are several ways to increase the scientific understanding of sexual behavior enactments: through examining the enactment of behavior desires in other groups and through the assessment of further moderators. We used gay men exclusively for our study. The sexual behaviors of men who have sex with men aside from those who self-label as gay are only just being understood—that is, men on the "down low," closeted gay men, etc. (see Martinez & Hosek, 2005; Millett, Malebranche, Mason, & Spikes, 2005; Pathela et al., 2006). The same-sex sexual behaviors of bisexual men, though noted as being enacted less frequently than self-labeling gay men (Stokes, Vanable, & McKirnan, 1997), are usually only discussed as they pertain to STIs/HIV (Kelly et al., 2002; O'Leary & Jones, 2006). The degree to which bisexual men, men on the down low, or closeted men enact their sexual desires (aside from engaging in protected or unprotected anal intercourse) is, as of yet, unknown. Other demographic groups should be assessed as well in future studies. Heterosexual men and women, lesbians, and different ethnic and racial groups might all display different associations between their desires and enactments when compared to each other group and the gay men in our current study.

The five moderators that we examined in this study seemed particular germane to gay men. Future research might find additional moderators that ultimately vary the strength of sexual behavior desires on behavior enactments in this population. Studies might also endeavor to find moderators that affect lesbians, and heterosexual men and women and their respective levels of sexual behavior desires relative to enactments. For example, factors such as religiosity, having children or number of children, and/or marital status may all influence the degree to which heterosexual men and women act on their sexual desires. Finally, with respect to discovering future moderators for different populations, research should explore the compounding effects of moderators on each other, such as was the case with STIs and HIV in our study.

In the final analysis, the identification of factors that encourage or discourage individuals from the enactment of their desires ultimately becomes extremely important—and not merely from perspectives within health psychology or disease prevention. Performing such research, as it did in our study regarding HIV-positive men, may help to dispel commonly held misperceptions about how different individuals sexually behave. It may also help psychologists and relationship therapists to counsel individuals who may be sexually unsatisfied or frustrated, or in romantic partnerships affected by sexual dysfunction. As we show for gay men, the availability of a willing partner is merely the most obvious moderator of sexual behavior desires and their enactments. Psychological, physiological, and social constraints have commensurable influence over the decision and willingness to turn desired sexual behaviors into enacted realities.

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ORIGINAL PAPER

Correlates of Heterosexual Anal Intercourse Among Substance-Using Club-Goers

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Abstract Anal sexual intercourse represents the highest transmission risk for infection with the human immunodeficiency virus (HIV), yet much of what we know about anal sex is based on men who have sex with men (MSM). Less is known about heterosexual adults who practice anal sex, especially those who may be at risk for HIV such as substance users. The present study examined the demographic, sexual behaviors, substance use, and psychosocial correlates of recent anal intercourse among a heterosexual young adult sample of nightclub goers who also use substances. Data were drawn from an on-going natural history study of participants ($n = 597$) in Miami's club scene who use club drugs, use prescription medications for non-medical reasons, and were regular attendees of nightclubs. Participants who reported anal sex ($n = 118$) were more likely to be male, of moderate income, Latino, trade sex, have unprotected sex, and report victimization. Event-based and qualitative studies are needed to better understand the context in which anal sex occurs. Interventions that target heterosexual populations should include discussion about the risks of anal sex.

Keywords Anal sex · Drug use · Heterosexual · Mental health · Sexual risk

Introduction

Anal sexual intercourse represents the highest transmission risk for infection with the human immunodeficiency virus (HIV) (Centers for Disease Control and Prevention [CDC], 2005). CDC (2005) estimates that the risk of HIV transmission is five times greater for receptive anal intercourse compared to receptive vaginal intercourse, and 1.3 times greater for insertive anal compared to insertive vaginal intercourse. Anal sex is prevalent among heterosexual populations (Gorbach et al., 2009), yet much of what we know about anal sex and HIV risk is based mainly on men who have sex with men (MSM). Little is known about the characteristics of heterosexual adults who engage in anal sex, especially specific groups of heterosexual adults who report other risk behaviors such as substance abuse (CDC, 2006; Reynolds, Latimore, & Fisher, 2008). The present study attempted to address these gaps by describing the characteristics of heterosexual young adult participants in a large natural history study of club drug use, and who also reported engaging in anal intercourse in the past 90 days.

According to the 2002 National Survey of Family Growth data, 40% of men and 35% of women report ever having anal sex (Mosher, Chandra, & Jones, 2005). Among adolescents and young adults (15–19), the prevalence of lifetime anal sex ranges from 11 to 27% (Gates & Sonenstein, 2000; Houston, Fang, Husman, & Peralta, 2007; Ompad et al., 2006). Estimates of recent heterosexual anal intercourse are less available. The most comprehensive national data available documented past year anal sex as 9.6% of men and 8.6% of women (Laumann, Gagnon, Michael, & Michaels, 1994), with other studies finding similar rates (Reinisch, Hill, Sanders, & Ziemba-Davis, 1995; Reinisch, Sanders, Hill, & Ziemba-Davis, 1992). Most of these studies, however, have focused on general populations and are also not current.

Certain groups, such as substance users, report high rates of anal intercourse (Zule, Costenbader, Meyer, & Wechsberg, 2007). Among substance users, the prevalence of anal sex appears to be much higher, with approximately one out of three reporting recent anal sex (Gross et al., 2000; Powis, Griffiths,

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Gossop, & Strang, 1995). Substance users also tend to engage in HIV risk behaviors, including needle sharing, inconsistent condom use, and multiple sexual partners (Lorvick, Martinez, Gee, & Kral, 2006; McElrath, 2005). More alarming are the findings that suggest anal sex may be correlated with a range of sexual risk behaviors, including younger sexual debut, sex trading, more sexual partners, more sexually transmitted infections, and lower prevalence of condom use (Baldwin & Baldwin, 2000; Flannery, Ellingson, Votaw, & Schaefer, 2003; Gross et al., 2000; Houston et al., 2007; Karim & Ramjee, 1998; Lorvick et al., 2006; Misegades, Page-Shafer, Halperin, McFarland, & The YWS Study Investigators Group, 2001). Heterosexual adults who engage in anal sex are at high risk of HIV infection and transmission. Some HIV infections reported as heterosexually acquired were due to anal sex rather than vaginal sex (Halperin, 1999). In terms of absolute numbers, there are seven times more women than homosexual men who engage in unprotected anal sex (Halperin, 1999). One study estimated that 62% of female HIV infections were due to anal sex (Halperin, Shiboski, Palefsky, & Padian, 2002), and therefore it is important to understand the context in which anal sex may occur and contribute to heterosexual transmission of HIV.

The use of barrier protection during anal sex would reduce HIV transmission, yet studies report inconsistent and low prevalence of condom use for anal sex (Dixon, Peters, & Saul, 2003; Erickson et al., 1995). According to the HIV Testing Survey (CDC, 2004), less than 15% of heterosexual men and women report always using condoms during anal intercourse with their primary partner in the last 12 months and less than one out of three report always using condoms during anal intercourse with non-primary partners in the last 12 months.

Previous studies suggest that heterosexual, young poly-drug users are more likely than non-users to participate in recent anal intercourse, particularly users of club drugs (CDC, 2006). Miami is internationally known for its late night entertainment scene, which is attended by mainly young adults and where poly drug use is common. Miami's club drug-using scene is primarily located in an extensive network of large and small nightclubs that are of a few recognized general types: large dance clubs, smaller liquor-serving clubs with small dance floors, and after-hours bars that do not serve alcohol. South Beach, the lower 20 blocks of the city of Miami Beach, remains a center of nightclub activity in the county. Closing hours for nightclubs vary by municipality, but the city of Miami, just across the causeway from Miami Beach, has created a 24-h nightclub district that has attracted much of the club and prescription drug-using community. Miami is also a high HIV/AIDS prevalence and incidence community (Florida Department of Health, 2006). Therefore, the goal of this study was to examine the potential correlates of anal intercourse among a heterosexual young adult sample of poly-drug using club goers in South Florida.

Method

Participants

Data were drawn from an on-going natural history study of 597 participants in Miami's club scene who used club drugs and also used prescription medications for non-medical reasons. The major goals of the project were to examine the onset and progression of drug abuse, to assess changes in health and social consequences of this drug abuse over time, and to examine the mechanisms of access to prescription drugs (e.g., street sales, internet, trading with friends, doctor shopping, theft) among the sampled substance users. Participants were interviewed at baseline and at three successive six-month intervals; data reported here were from baseline interviews only.

To be eligible, participants had to be 18–49 years old, and (1) have used one or more club drugs at least three times during the past 90 days; and (2) have used one or more psychoactive prescription medications three times or more in the past 90 days for non-medical reasons; and (3) report attending recognized nightclubs at least twice per month. Club drugs, as defined in the study, included powder cocaine, ecstasy, GHB, ketamine and LSD. The 597 participants described in this report entered the study between May 2006 and May 2008. On average, participants reported a median number of 6 clubs attended in the last month.

The present study focused only on young substance using adults who reported engaging in heterosexual anal sex. Of the 597 participants, 33 male participants reported having sex with men. Subsequent analyses were based on the remaining sample ($N = 564$). Participants were mostly male (57%), Latino (54%), had at least a high school diploma (64%), and reported working either full-time (36%) or part-time (24%). Mean age was 25.68 years. Twenty-five percent ($n = 138$) of participants reported anal sex within the past year, with comparable prevalence of recent anal sex (within the past 90 days) also being reported (21%; $n = 118$). Data analyses were based on recent anal sex, that is, anal sex in the last 90 days.

Procedure

Participants were recruited through respondent-driven sampling (RDS; Heckathorn, 1997). This method is similar to snowball or chain referral sampling with two notable exceptions: (1) study participants were paid an incentive for each eligible respondent they recruited who completed the baseline interview, and (2) the person making the referral did not disclose the identity of the person recruited to the researchers. In this study, five coupons were given to each study participant, with the understanding that they would earn $50 for the recruitment of each additional

eligible respondent. A coupon identifying the recruiter was transmitted from the recruiter to the potential recruit, who then "validated" the incentive payment to the recruiter by presenting the coupon when he or she appeared at the field office to be interviewed. Each respondent/recruiter was limited to five coupons in order to prevent a few recruiters with large social networks from biasing the overall sample toward those with similar demographic and drug using profiles (homophily) and in order to lengthen the recruitment chains (Heckathorn, 1997). Theoretically, respondent-driven sampling has been shown to quickly reduce sources of respondent bias (such as ethnic and sexual identity, gender, and drug of choice) as successive branches or waves of respondent contacts were enrolled and then solicited for additional contacts (Heckathorn, 1997; Heckathorn, Semaan, Broadhead, & Hughes, 2002).

The study was conducted from the South Florida branch of the University of Delaware's Center for Drug and Alcohol Studies. The project was housed in a field office strategically located to facilitate access to a diverse population of club and prescription drug users. This site was central to the hubs of nightclub activity and was easily reachable by public transportation, automobile, bicycle or on foot by participants from throughout the county. Private offices were used for all interviews. All field staff completed the requirements for National Institutes of Health web-based certification for protection of human subjects. Human subject protections protocols were approved by the University of Delaware's Institutional Review Board.

At intake, the nature of the project was explained by the research staff, including its voluntary and confidential nature and the monetary stipends. Each client was screened for eligibility, followed by informed consent, and interview and locator data collection. Interview data were collected using laptop computer-assisted personal interviews. Clients received HIV education literature and condoms and a $50 stipend upon completion of these baseline activities. Baseline screening and interview procedures lasted about 2 h.

Measures

The Global Appraisal of Individual Needs (GAIN; Dennis, Titus, White, Unsicker, & Hodgkins, 2002) has eight core sections (background, substance use, physical health, risk behaviors, mental health, environment, legal, and vocational), with each containing questions on the recency of problems, breadth of symptoms, and recent prevalence in days or times. Cronbach alphas for all scales and subscales were over .7 (more detail on scale development can be found at http://www.chestnut.org/LI/gain/index.html). For this study, we examined items from the background, sexual risk behaviors, substance abuse, and mental health sections. Specific sections and items are presented below.

Demographics

Age, gender, ethnicity/race, income, education, homelessness history, and employment status were assessed. For ethnicity, first participants were asked whether they were Latino or not; followed by race, which was assessed with the categories of Black/African-American, White, Asian, and other. African-Americans were used as the reference group for subsequent analyses. Participants were also asked whether or not they had a current primary sexual partner.

Sexual Behaviors

Some sexual risk items were dichotomous (yes/no) and assessed various sexual risk behaviors in the past year. Item examples were: "In the past 12 months, have you had sex while high on alcohol/drugs?" "In the past 12 months, have you had sex with a MSM?" "In the past 12 months, have you had two or more sexual partners?" Participants were also asked to report frequency of vaginal sexual activity and condom use for the past 90 days. The condom use variable was later recoded as "never," "inconsistent," or "always." Participants were also asked, "When was the last time, if ever, a doctor or nurse told you that you had the following STI's: Chlamydia, gonorrhea, syphilis, HPV, herpes, any other STI, and HIV." Responses were coded as a binary variable: never diagnosed (0) and diagnosed (1).

Drug Use Behaviors

Substance use was assessed by asking participants how many times a particular substance was used before or during sex in the last 90 days. The drug use variable was recoded as a dichotomous variable (no/yes). Substances included a comprehensive list of both illicit drugs and prescription-type drugs such as the following: alcohol, marijuana, ecstasy, methamphetamine, cocaine, crack, heroin, prescription painkillers (hydrocodone, OxyContin, oxycodone), and sedatives (Valium, Klonopin, Xanax).

Psychosocial Correlates

The mental health component of the GAIN instrument includes subscales which assess different aspects of mental health within the past year: somatic symptoms, depressive symptoms, anxiety symptoms, and traumatic stress. Somatic symptoms was assessed by 4 items ("During the past 12 months, have you had significant problems with headaches, faintness, dizziness, tingling, numbness, sweating or hot or cold spells?" or "During the past 12 months, have you had significant problems with sleep trouble, such as bad dreams, sleeping restlessly or falling asleep during the day?"). Depressive symptoms were assessed by 9

items ("During the past 12 months, have you had significant problems with feeling very trapped, lonely, sad, blue, depressed, or hopeless about the future?"). Anxiety symptoms were assessed by 12 items ("During the past 12 months, have you had significant problems with feeling very anxious, nervous, tense, scared, panicked or like something bad was going to happen?"). Traumatic stress was assessed by 13 items ("During the past 12 months, have the following situations happened to you: when something reminds you of the past, you became very distressed and upset?"). The somatic, depressive, anxiety and traumatic stress symptoms measure are subscales of the general mental distress scale of the GAIN. General victimization scale was assessed by 15 items ("Has anyone ever done any of the following things to you: attacked you with a gun, knife, stick, bottle, or other weapon?"). All scale items used a dichotomous response format (yes/no). Total scores on each of the subscales were additive.

Recent Anal Sexual Intercourse

The outcome variable was a single item, "How many times have you had anal sex in the last 90 days?" Responses were recoded as a dichotomous variable (no/yes).

Results

Demographics

Table 1 reports the demographic differences between those who reported recent anal sex versus those who did not. Of the eight demographic variables examined, four variables were significantly related to recent anal sex. Cross-tabulations show that women were less likely to report recent anal sex and Latino participants were more likely to report anal sex than African-American. Participants with moderate income ($19,000–34,999) were over twice as likely to report recent anal sex as those who reported lower income. Lastly, those with a primary sexual partner were more likely to report recent anal sex than those who did not.

Sexual Risk Behaviors

Participants reported that they had vaginal sex an average of 38 times, and anal sex an average of 2.5 times in the last 90 days. Condom use was low for both vaginal and anal sex in the last 90 days. Thirty-six percent of participants who had vaginal sex in the last 90 days never used condoms and 33% used them inconsistently. Approximately half of those who reported anal sex in the last 90 days never used condoms, with another 9% using them inconsistently.

Table 2 reports the association of recent anal sex with sexual risk behaviors. Of the 10 variables examined, six variables were significantly related to recent anal sex. As shown in Table 2, condom use during recent vaginal sex was related to recent anal sex. Specifically, participants who reported recent anal sex were less likely to use condoms during vaginal sex during the past 90 days than those who did not and those who had a primary sexual partner were more likely to engage in recent anal sex. In addition, participants who reported recent anal sex were also more likely to trade sex to get money or drugs, use drugs or money to buy sex, have two or more sex partners, have unprotected sex in the past year, and use alcohol/drugs to make sex last longer in the past year. Finally, the prevalence of STI's among this sample included the following: Chlamydia (8%), gonorrhea (6%), syphilis (2%), HPV (4%), herpes (3%), any other STI's (4%), and HIV (1%).

Drug Use Behaviors

Table 2 also shows the substances used before or during sex in the last 90 days that correlated with recent anal sex. Of the six variables examined, three variables were significantly related to recent anal sex. Only the significant associations between substance use and recent anal sex are presented in the table. Recent anal sex was significantly related to alcohol, ecstasy, and cocaine use before or during sex in the last 90 days.

Psychosocial Correlates

In Table 3, psychosocial correlates of recent anal sex were examined. Of the five variables, four were significantly related to recent anal sex. Participants who reported recent anal sex also reported more depressive symptoms, anxiety symptoms, and traumatic stress symptoms in the past 12 months, as well as a history of general victimization.

Lastly, as shown in Table 4, a multivariate logistic regression analysis was conducted which included recent anal sex regressed on most significant bivariate predictors. We wanted to streamline the multivariate analyses in order to ensure enough power to determine a medium effect size. Therefore, the significant substance abuse correlates in the bivariate analyses were not included because other predictor variables also measured substance use (e.g., had sex while high, trading sex to get drugs, and used alcohol/drugs to make sex last longer). Also, mental health subscales used in the bivariate analyses (e.g., somatic, depressive, anxiety, and traumatic symptoms subscales) were combined to form the general mental distress scale, which is part of the standardized GAIN assessment tool. Therefore, the predictor variables in the multivariate analyses included the following: demographics (gender, race, income, and primary sexual partner), sexual risk behaviors (had sex while high, trading sex to get money/drugs, used drugs/money to buy sex, multiple partners, unprotected sex in past year, used alcohol/drugs to make sex last longer), and psychosocial correlates (general mental distress, and general victimization). Of the 12 variables that were included in

Table 1 Characteristics of substance-using heterosexual adults who engaged in recent anal sex ($N = 564$)

Variables	Had recent anal sex (%)[a]		Odds ratio (95% [CI])	*p*
	Yes ($n = 118$)	No ($n = 441$)		
Gender			0.60 [0.39, 0.93]	.020
Male ($n = 321$; ref)	24	76		
Female ($n = 235$)	16	84		
Race				
African-American ($n = 124$; ref)	13	87		
Hispanic ($n = 300$)	26	74	2.37 [1.32, 4.26]	.004
White ($n = 116$)	18	82	1.49 [0.74, 3.02]	ns
Other ($n = 17$)	18	82	1.45 [0.37, 5.60]	ns
Income				
$0–18,999 ($n = 323$; ref)	17	83		
$19,000–34,999 ($n = 139$)	31	69	2.23 [1.40, 3.55]	.001
$35,000+ ($n = 97$)	22	78	1.38 [0.78, 2.42]	ns
Education				
<High school ($n = 125$; ref)	25	75		
High school ($n = 232$)	21	79	0.79 [0.47, 1.32]	ns
Some college+ ($n = 201$)	19	81	0.73 [0.43, 1.25]	ns
Ever homeless in last 90 days			1.12 [0.58, 2.15]	ns
No ($n = 502$; ref)	21	79		
Yes ($n = 57$)	23	77		
Employment status				
Full-time ($n = 199$; ref)	24	76		
Part-time ($n = 132$)	21	79	0.87 [0.51, 1.48]	ns
Unemployed ($n = 92$)	21	79	0.84 [0.46, 1.54]	ns
In School ($n = 49$)	14	86	0.54 [0.23, 1.28]	ns
Other ($n = 87$; e.g., military)	20	80	0.79 [0.42, 1.46]	ns
	M (*SD*)	*M* (*SD*)	*F* test	
Age	25.14 (7.14)	25.83 (7.85)	0.73	.392

ref reference

[a] Data missing for 5 participants

the multivariate analyses, seven variables continued to be significant predictors of recent anal sex: gender, race, income, having a primary sex partner, trading sex for money/drugs in past 12 months, having unprotected sex in the past 12 months, and a history of victimization.

Discussion

The present study examined the demographic, sexual risk, drug use, and psychosocial correlates of recent anal sex among a heterosexual sample of substance using club goers. The prevalence of recent anal sex (21%), although higher than general population estimates in previous studies (Laumann et al., 1994), was comparable to those found in other drug using populations (Strang, Powis, Griffiths, & Gossop, 1994). Few studies have examined recent anal sex within a heterosexual population, and fewer still include psychosocial correlates using multivariate analyses.

Our findings suggest that there were important demographic correlates of anal sex including gender, race/ethnicity, income, and having a current primary sexual partner. Previous studies have also found demographic characteristics, such as race/ethnicity and income, related to anal sex (Misegades et al., 2001). For example, the present study found that Latinos were more likely to report recent anal sex than African-American participants. Previous studies have found high prevalence of anal sex among Latinos in the U.S. (Laumann et al., 1994; Quadagno, Sly, Harrison, Eberstein, & Soler, 1998) as well as samples from other Latin American countries (Dixon et al., 2003; Halperin, 1999). Reasons for this ethnic difference are unclear; however, anecdotal information suggests that anal sex may be high in the Latino community because of the perceived increased sexual pleasure for the male partner (Marin & Gomez, 1997). Latina women report engaging in anal sex because of their male partner's requests or demands (Davila & Brackley, 1999). The findings that gender, race/ethnicity, and partner status seem to be important correlates of recent anal sex, suggest that future research may benefit from examining relationship-level factors such as sexual communication and decision-making. Qualitative as well as longitudinal studies in particular may be beneficial in determining the interaction between socio-cultural and

Table 2 Percentage of sample that reported recent anal sex and other sexual risk behaviors ($N = 564$)

Variables	Had recent anal sex (%)[a]		OR [CI]	*p*
	Yes ($n = 118$)	No ($n = 441$)		
Has current primary sexual partner			1.69 [1.02, 2.81]	.042
No ($n = 145$; ref)	15	85		
Yes ($n = 414$)	23	77		
Used condom with recent vaginal sex				
Always ($n = 157$; ref)	15	85		
Inconsistent ($n = 166$)	24	76	2.18 [1.27, 3.75]	.049
Never ($n = 184$)	28	72	1.76 [1.00, 3.09]	.005
Used needles to use drugs			0.50 [0.15, 1.68]	ns
No ($n = 36$; ref)	25	75		
Yes ($n = 35$)	14	86		
Had sex while high on alcohol/drugs			3.52 [1.07, 11.62]	.028
No ($n = 40$; ref)	8	92		
Yes ($n = 518$)	22	78		
Had sex with IDU			1.19 [0.46, 3.04]	ns
No ($n = 533$; ref)	21	79		
Yes ($n = 25$)	24	76		
Had sex with MSM			1.62 [0.61, 4.32]	ns
No ($n = 536$; ref)	21	79		
Yes ($n = 20$)	30	70		
Traded sex to get money/drugs			2.82 [1.31, 6.08]	.006
No ($n = 529$; ref)	20	80		
Yes ($n = 29$)	41	59		
Used drugs/money to buy sex			2.27 [1.05, 4.92]	.033
No ($n = 527$; ref)	20	80		
Yes ($n = 30$)	37	63		
Had 2+ sex partners			1.62 [1.04, 2.51]	.032
No ($n = 208$; ref)	84	16		
Yes ($n = 350$)	24	76		
Had unprotected sex in last year			2.48 [1.46, 4.22]	.001
No ($n = 161$; ref)	12	88		
Yes ($n = 397$)	25	75		
Used alcohol/drugs to make sex last			1.58 [1.04, 2.39]	.032
No ($n = 368$; ref)	81	19		
Yes ($n = 190$)	26	74		
Used alcohol before/during sex			2.08 [1.09, 3.95]	.024
No ($n = 94$; ref)	13	87		
Yes ($n = 455$)	23	77		
Used ecstasy before/during sex			1.85 [1.11, 3.08]	.018
No ($n = 156$; ref)	15	85		
Yes ($n = 310$)	24	76		
Used cocaine before/during sex			1.85 [1.19, 2.86]	.006
No ($n = 235$; ref)	17	83		
Yes ($n = 268$)	73	27		

ref reference; *IDU* intravenous drug user; *MSM* men who have sex with men

[a] Data missing for 5 participants

intra-personal factors involved in anal sex. For Latinos living in the United States, this may also include the association between acculturation (i.e., the process of adapting to the U.S.) and sexual risk behaviors. Future studies should examine cultural level factors such as traditional gender role norms and acculturation.

At the bivariate level, alcohol, ecstasy, and cocaine use during sex were significant correlates of recent anal sex. Previous

Table 3 Bivariate analyses: recent anal intercourse regressed on psychosocial symptoms ($N = 564$)

Psychosocial symptoms	B	[95% CI]	*p*
Somatic symptoms	.05	[−0.11, 0.43]	ns
Depressive symptoms	.09	[0.08, 1.25]	.027
Anxiety/fear symptoms	.10	[0.14, 1.34]	.016
Traumatic stress	.09	[0.07, 1.57]	.033
General victimization scale	.17	[0.60, 1.76]	.001

Table 4 Multivariate analyses: recent anal sex regressed on demographic, sexual risk, drug use, and psychosocial correlates significant at the bivariate level ($N = 564$)

Variables	B	OR [95% CI]	*p*
Gender	−.62	0.54 [0.33, 0.89]	.020
Race			
African-American (ref)			
Hispanic	.94	2.55 [1.34, 4.87]	.005
Income			
$0–18,999 (ref)			
$19,000–34,999	.70	2.02 [1.22, 3.34]	.006
Current primary partner	.70	2.02 [1.15, 3.55]	.014
Traded sex in past year	1.16	3.18 [1.16, 8.72]	.025
Had unprotected sex in past year	.68	1.97 [1.13, 3.46]	.018
Victimization	.11	1.12 [1.02, 1.22]	.015

studies have found that cocaine use is linked to sexual risk behaviors in diverse populations (Parry et al., 2008; Sumnall, Beynon, Conchie, Riley, & Cole, 2007; Zule et al., 2007), and can promote a greater willingness to sexually experiment (Sumnall et al., 2007). However, in the present study, we assessed cocaine use before and during any sexual encounter in the last 90 days, not just anal sex. We were unable to determine whether cocaine use plays a role in facilitating anal sex specifically or simply risky behaviors in general. Further research, including event-based designs, could shed light on which substances may be more likely linked to anal sex. In addition to event-based studies, qualitative studies would be beneficial to determine what situational factors, decision-making processes, specific drug use, and psychosocial correlates may predict anal intercourse.

Our findings were congruent with the current literature, which suggest that those who engage in anal sex also engage in other sexual risk behaviors that may lead to sexually transmitted infections including HIV (Baldwin & Baldwin, 2000; Erickson et al., 1995). Those who reported engaging in anal sex were more likely to also report other behaviors that put them at risk for HIV infection: lower prevalence of condom use with recent vaginal sex, trading sex to get money/drugs, using drugs/money to buy sex, having multiple partners, having unprotected sex, and using alcohol/drugs to make sex last longer. However, once these predictors were entered into a multivariate model, only those who had traded sex for drugs or money, and had unprotected sex in the past year, were more likely to report recent anal sex. This finding suggests that those who engage in heterosexual anal sex are also engaging in multiple risk behaviors and are an important group to target for prevention intervention. Previous studies suggest that those who engage in anal intercourse are higher on certain personality characteristics such as erotophilia and sensation-seeking (Baldwin & Baldwin, 2000; Zuckerman, 1979). Sensation seeking and impulsivity are known to be related to sexual risk behaviors in other populations (Kalichman, Heckman, & Kelly, 1996). In addition, our qualitative work with this population suggests that those who engage in anal sex imply that this was the next step in their sexual lives and that they engaged in anal sex due in large part to add more novel stimulation. Future research should examine the association between sensation seeking and anal sex among heterosexual populations.

On the bivariate level, a substantial number of our psychosocial measures correlated with recent anal sex. Those who reported engaging in anal sex also reported more depressive and anxiety symptoms, traumatic stress, and general victimization. However, only victimization remained significant at the multivariate level. In general, research on the association between anal sex and psychosocial factors is scant. Previous studies suggest a correlation between anal sex and forced sex or sexual coercion (Ferguson & Morris, 2003; Stadler, Delany, & Mntambo, 2007), which may lead to conflict and feelings of victimization. It is unclear what role a history of victimization may play in sexual decision-making. Future studies are needed to shed light on the association between victimization, different types of abuse, and the decision to engage in anal sex.

The findings from the present study have several research and practical implications. It is one of the few studies that focus on recent anal sex among a heterosexual adult sample. It is also a sample of young substance users at risk for HIV. As mentioned earlier, in order to better understand the context in which anal sex occurs, future research must study the risks of anal sex at the event level and qualitatively. In terms of practical implications, HIV prevention and interventions need to include information specific to heterosexual anal sex such as the higher risk of infection.

The present study has the usual limitations that accompany a study that is cross-sectional and based on self-report. Although reliance on self-report behavioral measures is somewhat controversial, a variety of controlled studies have documented that when questioned about drug use and sexual activities in a non-threatening environment, drug users provide reliable information and are truthful to the best of their recollection (Needle, McCubbin, & Lorence, 1985; Sobell & Sobell, 1990; Stephens, 1972). We would suggest that these findings, combined with assurances of confidentiality and the use of specially trained staff in the present study, served to mitigate the potential deficiencies in reliance on self-report data. This study also has some notable strengths. First, it is one of the few studies to explore anal

sex practices among a heterosexual population. Third, the sample is a young substance using sample at risk for HIV/STI. Fourth, the use of respondent driven sampling reduces the sampling biases inherent in recruiting a hard to reach population: club-going substance users. Lastly, although causality cannot be determined from cross-sectional data, this study contributes to our knowledge of the psychosocial correlates of recent anal sex.

In conclusion, anal sexual intercourse continues to be a social taboo and a highly stigmatized behavior, yet it appears to be relatively common among young adult heterosexual poly drug users. HIV prevention efforts need to address the particular risk that anal sex represents for heterosexual populations. There is evidence that those who engage in anal sex also report other sexual risk behaviors. Interventions need to include a discussion on the specific risks of anal sex. Moreover, our study suggests that there may be important psychosocial correlates to anal sex that are not well-understood such as a history of victimization. Future studies need to delve deeper into the practice of anal sex through event-based studies, qualitative and longitudinal studies in order to understand the context and processes that lead to anal sex.

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ORIGINAL PAPER

Perceived "Out of Control" Sexual Behavior in a Cohort of Young Adults from the Dunedin Multidisciplinary Health and Development Study

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Abstract Out of control sexual behavior, also known as compulsive sexual behavior or sexual addiction, has not been studied in a representative sample of the general population. At age 32 years, 940 (93%) of 1,015 members of the birth cohort of the Dunedin Multidisciplinary Health and Development Study responded to a series of questions about sexual behavior, administered by computer. We enquired about sexual fantasies, urges or behavior that participants regarded as out of control during the previous year, and defined such experiences as out of control sexual experiences (OCSE). Nearly 13% of men and 7% of women reported OCSE in the past year. Women who reported such experiences were more likely than other women to have reported (elsewhere in the interview) having had high numbers of opposite sex partners, concurrent sexual relationships, or sex with a partner met on the internet, as well as a higher likelihood of same-sex attraction or behavior. Among men reporting OCSE, there was an association with having paid for heterosexual sex and with same-sex attraction and behavior. Few believed that OCSE had interfered with their lives (3.8% of all men and 1.7% of all women in the cohort). Only 0.8% of men and 0.6% of women reported that their actual sexual behavior had interfered with their lives. OCSE were also analyzed in relation to certain personality traits and to childhood sexual abuse (CSA). Some evidence of a link with impulsivity (women only) and negative affectivity was found. CSA was associated with OCSE among men. In conclusion, this population-based study has provided the first empirical estimations of the occurrence of OCSE and its relationship to a range of sexual behaviors in a representative sample.

Keywords Compulsive sexual behavior · Sexual addiction · Hypersexuality · Sexual behavior · Childhood sexual abuse · Sexual orientation

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Introduction

There has been much debate as to whether sexual behavior that is out of control is best regarded as a compulsive behavior, an addiction, a form of impulse control disorder, or as hypersexuality, a disorder of sexual desire (Black, 1998; Coleman, 2003; Gold & Heffner, 1998; Goodman, 2001; Grant, Levine, Kim, & Potenza, 2005; Kafka, 1997; Stein, Black, & Pienaar, 2000). Some years earlier, Levine and Troiden (1988) had challenged such labelling, believing that this was merely pathologizing behaviors that diverged from prevailing erotic standards. Goodman (2001) carefully reviewed the evidence for and against these different concepts and came to the conclusion that "driven sexual behavior with harmful consequences" was most appropriately designated as an addictive disorder. Coleman (1992), on the other hand, had defined it as "behavior driven by anxiety-reduction mechanisms rather than by sexual desire." He preferred the term compulsive sexual behavior, using this as an umbrella term for a behavior he regarded as having multiple causes (Coleman, 2003).

After conducting a study involving volunteers from Sex Addicts Anonymous and male patients with self-defined sexual addiction ($n = 31$ in total), Bancroft and Vukadinovic (2004) came to the conclusion that sexual behavior may be unregulated for a variety of reasons, and that the general descriptive term "out of control" was therefore preferable until the patterns and determinants of such behaviors are better understood. In their sample, for example, they had noted a tendency for experiencing increased sexual interest when depressed or anxious and had found few convincing descriptions of resistance. Gold and Heffner (1998) had also suggested there are often multiple functions of and reasons for out of control sexual behavior, and called for empirical research. Black, Kehrberg, Flumerfelt, and Schlosser (1997) reported on a small series of people with compulsive sexual behavior recruited via newspaper advertisements. They too concluded that compulsive sexual behavior was likely not to be a unitary phenomenon. In their sample, fantasies and urges that were out of control featured strongly as well as actual behavior. Most of the participants had tried to resist their fantasies and urges, and many described the behaviors as being associated with certain psychological states, predominantly negative moods. Raymond, Coleman, and Miner (2003) noted that a group of 25 they recruited via newspaper advertisements did not present with the pervasive preoccupation with sex seen in clinical samples. They commented on the heterogeneity of presentations, with a spectrum from very compulsive to more impulsive presentations. In view of this background, we have elected to use Bancroft and Vukadinovic's (2004) term "out of control" sexual behavior.

Despite current uncertainties about the nature and determinants of out of control sexual behavior, it is worth considering a theoretical framework proposed by Goodman (1997). Goodman attempted to integrate both biological and psychological understandings of the addictive process. His model involved impaired affect regulation, impaired behavioral inhibition, and an aberrant motivational-reward system. Hence, people vulnerable to out of control sexual behavior would likely be chronically prone to negative affect states and affective instability. They would also be more likely than others to be people in whom urges for short-term reinforcement tended to override long-term consequences. Bancroft and Vukadinovic (2004) raised the issue of how a person's standards might contribute to self-regulatory failure, in particular if the person was trying to cope with conflicting or incompatible standards. Not only could moral or religious beliefs undermine the process of self-regulation (e.g., they suggested it would be difficult to use masturbation to regulate one's sexual needs if one believed it was evil), but also the very belief that one's sexual behavior was out of control could develop because of the adoption of restrictive values (Coleman, 1992). According to Goodman, an essential process in the development of self-regulatory functions is "internalization." In this process, the regulatory functions provided by primary caregivers become integrated into the child's own system. Isay (1999) described developmental difficulties experienced during the boyhood of gay men he had worked with, particularly their use of repression and fantasy in order to accommodate parental expectations. Hence, it would be of interest to know whether a feeling that one's sexual behavior was out of control might be a particular issue for those with same-sex attraction.

Another element discussed by Goodman (1997) was that selection of sexual behavior as the "drug of choice" in an addictive process could result from sexual seduction. In further developing Goodman's model of impaired affect regulation in out of control sexual behavior, Bancroft and Vukadinovic (2004) described three potentially problematic ways in which affect and sexuality could be related. One was a paradoxical mood-sexuality relationship in which sexual interest would be increased rather than decreased in negative mood states. They suggested that such a paradoxical relationship could develop as a consequence of early experiences, such as childhood sexual abuse (CSA), which combine sexual response with negative mood. Gold and Heffner (1998) proposed a direct mechanism by which CSA might contribute to the development of out of control sexual behavior, in that, for victims of CSA, sex might be used as a means of controlling others or of taking back the control that had been lost in childhood. Although a link between out of control sexual behavior and CSA has been widely assumed, Chivers (2005) questioned the evidence base for it, since it has come from selected samples. For example, the report by Carnes and Delmonico (1996) that 78% of 290 participants had been sexually abused as children was based on a highly selected sample (Carnes, 1991).

A major limitation of most research so far on out of control sexual behavior is that studies have involved selected samples, such as small groups of patients asking for help (McConaghy, Armstrong, & Blaszczynski, 1985) or responders to newspaper advertisements (Black et al., 1997; Kafka & Prentky, 1992; Raymond et al., 2003). Carnes' (1991) study was based on a sample of 289 people, said to have been in recovery from sexual addiction for three or more years, who returned self-report questionnaires originally sent to 1,500 people sourced in various ways. The shortcomings of this approach were highlighted by Chivers (2005). The internet has offered possibilities for investigation of online sexual problems in large non-clinical samples, with about 6% of those engaging in online sexual activity reporting problems (Cooper, Griffin-Shelley, Delmonico, & Mathy, 2001) or scoring positive on a sexual compulsivity scale (Daneback, Ross, & Månsson, 2006). Miner, Coleman, Center, Ross, and Rosser (2007) used the internet to recruit a large sample of Latino men who had had sex with men, in order to assess the psychometric properties of their Compulsive Sexual

Behavior Inventory. Internet samples, however, may differ somewhat from randomly selected population-based samples (Ross, Mänsson, Daneback, Cooper, & Tikkanen, 2005).

We could find no empirical studies of the frequency of out of control sexual behavior in representative samples drawn from the general population. Coleman (1992) believed that about 5% might suffer from it, and Carnes was quoted by Black et al. (1997) and Schneider (2004) as saying it affects 6% of the population, although no published work was cited in support of these figures. Kalichman and Rompa's (1995) sexual compulsivity scale was used in a study of heterosexual introductory health science students at a U.S. university (Dodge, Reece, Cole, & Sandfort, 2004), but the proportion of students who scored highly was not assessed. Dodge et al. noted that student sexual behavior that might appear to be pathological to researchers might be experienced as normal sexual exploration by college students.

We had an opportunity to assess perceived out of control sexual fantasies, urges, and behavior in a birth cohort who had reached the age of 32 years, in whom a range of information had been recorded at regular intervals throughout their lives. We had three main aims. The first was to assess how commonly men and women in a population-based sample reported having experienced sexual fantasies, urges or behavior that they regarded as out of control. We coined the term "out of control sexual experiences" as an umbrella term that would encompass thoughts as well as actual behaviors that were perceived as out of control. Second, we aimed to establish to what extent this construct was correlated with specific sexual behaviors the participants had provided information about, particularly recent behaviors. This included a range of sexual partnerships, including same-sex partnerships. The third aim was to test certain features of the theoretical framework put forward by Goodman (1997) and further developed by Bancroft and Vukadinovic (2004). We were able to assess whether particular prospectively assessed personality traits were more common among people who later reported having had out of control sexual experiences compared with those who had not. In accordance with the model, we hypothesized that people with out of control sexual experiences would be more likely than others to be prone to negative affective states and to be impulsive. In view of the reported link among sensation-seeking in general, sexual sensation-seeking, and sexual compulsivity (Kalichman et al., 1994; Kalichman & Rompa, 1995), we examined whether out of control sexual experiences were associated with high scores for sensation-seeking in general. We also aimed to clarify whether people might have judged their sexual experiences to be out of control, not because of anything excessive or unusual about the experiences, but because they judged themselves harshly or over-scrupulously in the light of traditional moral standards, strong religious beliefs, or because they wished to avoid harm or danger at all costs. We also wished to test whether childhood sexual abuse was associated with out of control sexual experiences.

Method

Participants

The Dunedin Multidisciplinary Health and Development Study is a longitudinal study of a cohort of 1,037 people who were born in Dunedin, New Zealand between 1 April 1972 and 31 March 1973, and who were still living in the province of Otago at the age of 3 years (Silva & Stanton, 1996). The cohort was slightly socioeconomically advantaged compared with New Zealand as a whole, but the full range of socioeconomic strata was represented. The study members were seen at age 3 years, then every two years until 15 years, then at 18, 21, 26, and 32 years. This report is based on the 940 study members (92.6% of the surviving cohort of 1,015) who participated in a comprehensive assessment of sexual behavior at age 32 years and answered questions about out of control sexual behavior that were included in the assessment.

Measures and Procedure

Demographic Variables

Socioeconomic status was assessed at age 32 using the New Zealand Socioeconomic Index (NZSEI-99), an occupationally-derived indicator of socioeconomic status (Davis et al., 1999). Socioeconomic status was categorized as low, medium or high. Educational attainment was recorded and two categories formed according to whether or not there were qualifications higher than any examination passes in School Certificate, a national examination held at about 15 years of age.

Sexual Behavior

The participants who agreed to the sexual behavior assessment (92.6% of the cohort) responded to questions administered by computer (Dickson, Paul, & Herbison, 2003). The section about out of control sexual experiences, which was presented near the end of the questionnaire, began with the question "In the past 12 months, have you had sexual fantasies, urges or behavior that you felt were out of control?" If the answer was "yes," participants were then asked to specify which were out of control, with each being separately endorsable, and also to specify "Which of these have interfered with aspects of your life in the past 12 months, for example, your health (including injury), relationships, work, finances or the law?", with fantasies, urges, and behavior again being asked about separately. Participants were then asked about the

degree to which they needed some outside help, if any, and if they had received help, they were asked to specify which types of services had been used.

Most of the other questions about sexual behavior were based on those used in the 1990 British National Survey of Sexual Attitudes and Lifestyles (Johnson, Wadsworth, Wellings, & Field, 1994). The age at which the participant had first had heterosexual intercourse was asked only at age 21. For those for whom this was not available, the age was estimated based on the first assessment at which sexual intercourse was acknowledged. At age 32, a series of questions were asked about opposite sex relationships: the duration of the current or most recent relationship, sexual and emotional satisfaction with that relationship, and whether there had been any concurrent sexual partner either at the beginning or during the relationship. Participants were also asked about the number of opposite sex partners in the past 6 years. Following the example of Långström and Hanson (2006), we identified number of reported partners in the highest decile (which in our sample was 10 or more partners both for men and for women) as a measure of a high level of this behavior. Participants were asked whether they had had sex with a partner met on the internet in the past year and men only were asked whether they had paid for sex in the past year (gender of partner not specified for these questions).

Further questions inquired about same-sex attraction. With the question "What best describes who you have ever felt sexually attracted to?", six options were offered. Men, for example, chose from the following: "only to males, never to females; more often to males and at least once to a female; about equally often to males and females; more often to females and at least once to a male; only ever to females, never to males; never attracted to anyone at all." Some participants had described same-sex attraction at one or more of the earlier assessments but did not mention ever having experienced same-sex attraction at the age 32 assessment. Because of this variability of reporting, it was considered most accurate to include same-sex attraction reported at the ages 21 and 26 assessments as well. Same-sex attraction was categorized using two mutually exclusive categories: "Major" if the participant reported in at least one of the three assessments that their lifetime sexual attractions were equally or more to the same sex, and minor if they were more often attracted to the opposite sex but had been attracted at least once to someone of the same sex (Dickson et al., 2003).

Childhood Sexual Abuse

At the age 26 assessment, participants were asked a number of questions about unwanted sexual experiences up to the age of 16 years, including "Before you turned 16, did someone touch your genitals when you didn't want them to?" If the participant reported this, they were asked for further details. Similar questions were asked about being forced to touch someone else's genitals, attempted intercourse, completed intercourse, and any "other" unwanted sexual activity. When participants had been asked about their experience of first intercourse, at the age 21 assessment, they had been asked how willing they were compared with their partner (Dickson, Paul, Herbison, & Silva, 1998). If less willing, they were asked whether they had been forced. Those who reported a forced first intercourse before the age of 16 were also considered to have experienced childhood sexual abuse. A narrow definition of childhood sexual abuse (CSA) was used, with abuse included only if it involved genital contact (van Roode, Dickson, Herbison, & Paul, 2009).

Personality Traits and Religiosity

The assessment of personality traits was conducted at age 26, using a modified version of the Multidimensional Personality Questionnaire (MPQ). The MPQ is a self-report personality instrument designed by Tellegen et al. (1988) to assess a wide range of individual differences in affective and behavioral style. It was modified (Form NZ) to make it shorter (177 items instead of 300) and suitable for New Zealanders (Krueger et al., 1994). It was developed and standardized with nonclinical populations and its reliability and validity are well established (Krueger, Caspi, & Moffitt, 2000). The MPQ Form NZ did not include the Absorption scale. It produced 10 primary scales: Traditionalism, Harm Avoidance, Control, Aggression, Alienation, Stress Reaction, Achievement, Social Potency, Well-being, and Social Closeness. In the light of the theoretical framework put forward by Goodman (1997) and Bancroft and Vukadinovic (2004), we analyzed for possible correlations between certain personality traits and the reporting of out of control sexual experiences. To assess whether those reporting these were more likely to be sensation-seeking or impulsive, we compared the mean scores for the two groups for Control (low scores indicate impulsivity) and Harm Avoidance (low scores indicate sensation-seeking tendencies). Another possibility was that reporting sexual experiences to be out of control might reflect the participant's moral judgment rather than anything about the experience itself. The closest we could get to assessing this dimension was to compare the mean scores for Traditionalism (high scores would indicate endorsement of high moral standards and conservatism) and also take into account the mean scores for Control and Harm Avoidance, in case rather than being impulsive or sensation-seeking, the group with out of control sexual experiences might show cautiousness and preference for safe and dull activities. To test whether those reporting out of control sexual experiences were more readily prone to negative affective states, the scale used was Stress Reaction, which brought together responses about being nervous, sensitive and prone to worry, having changing moods, and

feeling miserable without reason. We compared between-group means of the distribution of scores for the above four scales using *t*-tests. To explore whether religiosity might have affected the participants' judgments about whether their sexual behavior had been out of control, we compared the proportions of those with and without out of control sexual experiences for whom religion was very important (when asked whether religion was not important, somewhat important or very important to them).

Results

Out of Control Sexual Fantasies, Urges, and Behavior

Responses to the questions about the above phenomena, collectively described as "out of control sexual experiences" (OCSE), are shown in Table 1. As can be seen, 60 (12.7%) men and 31 (6.7%) women reported having had such experiences in the past year, with the most common problems being sexual fantasies and urges that were out of control. Whereas men outnumbered women in experiencing out of control fantasies and urges, equal numbers of men and women (11 in each case) reported actual behavior that was out of control. They were not asked what behaviors were involved. Only 18 men and 8 women felt that their fantasies, urges or behavior had interfered with their lives and, in most cases, this was caused by problematic fantasies or urges rather than behavior. Only 4 of 59 men (0.8% of all men) and 3 of 30 women (0.6% of all women) said that actual behavior had interfered with their lives (one man and one woman did not answer some of the questions). Help-seeking was rare, especially among the men. The one man who had received help did not disclose details. Four women had received help, some from multiple sources. These included a psychiatrist, a psychologist, counselors, religious providers, and an unspecified source in one case. In subsequent analyses, the OCSE group comprised all who reported having out of control fantasies, urges, behavior or any combination thereof. Because of the small numbers reporting interference with life, we were not able to analyze for this group separately.

Out of Control Sexual Experiences in Relation to Demographic Variables

There were no significant differences in socioeconomic status (categorized as low, medium, or high based on the NZSEI-99) or educational attainment (using two categories of educational attainment), according to OCSE status (data not shown).

Out of Control Sexual Experiences in Relation to Other Questions about Sexuality

Age at first heterosexual intercourse was compared among men and women with and without OCSE across four age groupings: up to 15 years, 16–17 years, 18–20 years, and 21 years or over. There was no statistically significant difference in the patterns for either men or women according to OCSE status (data not shown).

Table 2 shows responses to a series of questions about opposite-sex and same-sex relationships. With regard to opposite sex relationships, it can be seen that, among the men, there were no significant differences according to whether or not they had had OCSE, except that those with OCSE were more likely to have paid for sex within the previous year (we ascertained that none of the four men with OCSE who had paid for sex had had a same-sex partner in the past 12 months, so these contacts must have involved opposite sex encounters). Women who had reported OCSE, however, differed from their female counterparts in a number of ways with regard to heterosexual behaviors. They had more than five times the odds of having had 10 or more opposite sex partners within the previous six years and of reporting having had more than one sexual partner concurrently, either at the start of or during a relationship. They were less satisfied with their

Table 1 Frequency and percentage reporting out of control sexual experiences in past 12 months

	Men ($n = 474$)		Women ($n = 466$)	
	N	%	*N*	%
Out of control sexual experiences in past 12 months[b]	60[a]	12.7	31[a]	6.7
Sexual fantasies	40	8.4	14	3.0
Sexual urges	34	7.2	16	3.4
Sexual behavior	11	2.3	11	2.4
Any out of control sexual experience interfering with life	18	3.8	8	1.7
Any out of control sexual experience for which help perceived to be needed	14	3.0	6	1.3
Any out of control sexual experience for which help was received	1	0.21	4	0.9

[a] 1 man and 1 woman did not answer all subsequent questions

[b] Some participants reported more than one type of sexual experience

Table 2 Patterns of sexual behavior among men and women reporting out of control sexual experiences at age 32

Feature of sexual behaviour	Men ($n = 474$)[a]					Women ($n = 466$)[a]				
	Men with out of control sexual experiences ($n = 60$)[a]		Other men ($n = 414$)[a]		Odds ratio (95% C.I.)[b]	Women with out of control sexual experiences ($n = 31$)[a]		Other women ($n = 435$)[a]		Odds ratio (95% C.I.)[b]
	%	N	%	N		%	N	%	N	
Total number of opposite sex partners in highest decile in past 6 years (≥10 partners)	20.0	12	17.2	71	1.2 (0.6–2.4)	25.8	8	5.8	25	5.7 (2.3–14.0)
Most recent opposite sex relationship was a single encounter	8.3	5	4.4	18	1.4 (0.4–4.6)	9.7	3	2.3	10	2.8 (0.6–12.8)
Concurrent opposite sex sexual relationship (start/during) reported at age 32	38.6	22	29.0	119	1.5 (0.9–2.7)	51.6	16	15.6	67	5.8 (2.7–12.2)
Duration of current or most recent opposite sex relationship 5 or more years	46.7	28	47.6	197	1.0 (0.6–1.7)	48.4	15	59.5	259	0.6 (0.3–1.3)
Satisfaction with current/most recent opposite sex relationship (extremely/very)										
Sexual	88.3	53	89.1	369	0.9 (0.4–2.2)	64.5	20	80.7	351	0.4 (0.2–0.9)
Emotional	70.0	42	77.3	320	0.7 (0.4–1.2)	58.1	18	78.9	343	0.4 (0.2–0.8)
Intercourse with partner met on internet in past year	5.0	3	4.1	17	1.2 (0.3–4.3)	9.7	3	1.4	6	7.7 (1.8–32.3)
Paid for sex in past year (men only)	16.7	10	7.3	30	2.6 (1.2–5.6)					
Same-sex partner in past year[c]	6.7	4	2.2	9	3.2 (1.0–10.8)	19.4	6	2.8	12	8.5 (2.9–24.4)
Five or more same-sex partners in past 6 years	5.0	3	1.0	4	5.4 (1.2–24.7)	–	–	1.2	5	–
Same-sex attraction ever (reported at any of ages 21, 26, 32, mutually exclusive categories)										
Major	8.3	5	1.7	7	6.7 (2.0–22.2)	16.1	5	3.9	17	6.1 (2.0–18.9)
Minor	26.7	16	9.4	39	3.9 (2.0–7.6)	38.7	12	29.4	128	1.9 (0.9–4.3)

[a] Denominators varied as some participants did not answer all questions

[b] Confidence Interval. Reference group: those not reporting this characteristic. For same-sex attraction variables, reference group is those reporting opposite-sex attraction only

[c] Involving genital contact

current or most recent relationship both sexually and emotionally. We also conducted this analysis among the smaller number of women ($n = 274$) whose current/most recent relationship was one of five years or longer, in case this association was explained by the somewhat lower percentage of people with OCSE in long-term relationships. For sexual satisfaction, the result was still statistically significant, but for emotional satisfaction the difference no longer reached statistical significance (data not shown). The odds for women with OCSE to have had sex with a partner they had met on the internet were more than seven times those of women not reporting OCSE (gender not specified, but in fact these must have been heterosexual encounters, because none of these three women had had a same-sex partner in the past year).

With regard to same-sex relationships, there were some similarities and some differences between the men and women who had reported OCSE, as can also be seen in Table 2. Higher proportions of both men and women with OCSE reported having had a same-sex partner within the previous year, but the difference was statistically significant only for women. The odds for the men with OCSE to have had five or more same-sex partners in the past 6 years were five times those of other men. Both men and women with OCSE were significantly more likely to have reported that half or more of their sexual attractions were to the same sex, compared with other participants. It is noteworthy that three of seven men who had had five or more same-sex partners in the past six years, and five of the 12 who reported ever having had a period of major same-sex attraction, were men who at age 32 felt that they had out of control sexual fantasies, urges or behavior. This was in contrast to the women: none of the five women who had five or more same-sex partners in the past six years had reported OCSE.

Relationship to Childhood Sexual Abuse (CSA)

Responses to the questions about having been sexually abused as a child, which had been enquired about six years earlier, did differ according to later reporting of OCSE. CSA had occurred among 23.2% (13) of men with OCSE, com-

pared with 6.1% (24) of the other men, and among 43.3% (13) of the women with OCSE, compared with 30.0% (127) of the other women. The difference between the two groups of men was statistically significant (Fisher's exact test, $p = .0002$) but for the women did not reach statistical significance.

Relationship to Personality Traits and Religiosity

We compared certain previously ascertained personality traits among men and women with and without OCSE. These results are shown in Table 3. The OCSE group of women had a significantly lower score on the Control scale, indicating more impulsivity than the non-OCSE group of women. There were no significant differences between groups, however, that would have indicated either sensation-seeking or a tendency to make scrupulous moral judgments, using the scales we had selected. The mean scores for both the male and the female OCSE groups for Stress Reaction (indicating tendencies towards nervousness, sensitivity, worrying, changing moods, and feeling miserable without reason) were higher than those of the non-OCSE groups.

When importance of religion was assessed, there were no significant differences according to OCSE status. Among men, 11.7% (7) with OCSE and 10.6% (44) of other men reported religion was "very important" to them ($\chi^2 = 1.40$, df = 2). The equivalent results for women were 19.4% (6) of women with OSCE and 13.6% (59) of other women ($\chi^2 = 1.89$, df = 2).

Discussion

In this representative population-based sample, nearly 13% of men and 7% of women reported having had sexual fantasies, urges or behaviors that they considered were out of control during the past year in response to a simple question. Only 2.8% of the total sample believed that these had interfered with their lives, with most of these cases involving fantasies or urges rather than actual behavior. Less than 1% of the total sample said that actual sexual behavior had interfered with their lives. Nevertheless, among those who reported OCSE, irrespective of whether or not they said it had interfered with their lives, certain differences in sexual behaviors were evident compared with the rest of the sample. Among women, higher proportions of the OCSE group reported having had high numbers of opposite-sex partners, concurrent sexual relationships or sex with a partner met on the internet, as well as a higher likelihood of having had a same-sex partner in the past year or a period of major same-sex attraction during their lives. Among men, on the other hand, heterosexual behaviors differed little (having paid for sex in the past year was the only heterosexual behavior that occurred significantly more in the OCSE group), but there was a link with same-sex attraction and behavior. Personality traits were of some relevance: Women with OCSE were more impulsive than other women and, for both sexes, there was an association with a tendency towards negative affect states. The other main finding was that CSA was associated with OCSE among men, with nearly a quarter of the men with OCSE having been sexually abused as children.

Despite the fact that the definition of OCSE we employed did not include a measure of persistence and did not require the participant to have acknowledged any interference with their life, the construct clearly had some meaning in terms of sexual behavior, and this meaning differed according to gender. Among women with OCSE, the heterosexual behaviors that occurred significantly more often than among those without OCSE may fall within the criteria for high levels of "impersonal" sex as defined by Långström and Hanson (2006) in a study of sexual behavior in the Swedish general population. Långström and Hanson distinguished high rates of intercourse from high rates of what they called "impersonal sex," by which they meant sex primarily concerned with the act itself. Among the behaviors they included in their "impersonal sex" category were having high numbers of partners or concurrent sexual relations. Of course, their study design, like ours, provided no way of knowing whether the sex in these instances (e.g., concurrent sexual relationships)

Table 3 Personality traits (assessed at age 26) among men and women, according to reporting out of control sexual experiences at age 32

Personality trait	Men ($n = 466$)					Women ($n = 465$)				
	Men with out of control sexual experiences ($n = 58$)		Other men ($n = 408$)			Women with out of control sexual experiences ($n = 30$)		Other women ($n = 435$)		
	M	*SD*	*M*	*SD*	*p*	*M*	*SD*	*M*	*SD*	*p*
Harm avoidance (vs. sensation-seeking)	47.5	22.0	51.9	22.6	ns	73.2	15.6	72.7	19.8	ns
Control (vs. impulsivity)	53.1	23.7	56.4	22.5	ns	59.0	17.0	67.6	21.1	<.05
Traditionalism	59.8	16.0	62.4	18.5	ns	65.5	20.0	65.3	18.0	ns
Stress reaction	49.9	31.0	36.8	28.4	<.01	63.7	26.7	48.5	29.5	<.01

was, in fact, impersonal, in the sense of being focused on the act rather than the relationship. In our case, the fact that the group of women with higher rates of these behaviors were more likely to describe themselves as having had sexual experiences that were "out of control" would be consistent with this possibility. In their study of American college students, Dodge et al. (2004) found that students who were high scorers on their sexual compulsivity measure were also more likely to report sexual behaviors that could be described as impersonal, including non-exclusive sexual activities. They did not analyze the association for men and women separately. Kalichman and Rompa (1995) found sexual compulsivity scores were associated with numbers of sexual partners among inner city lower-income men and women. Some of the sexual behaviors of the women with OCSE may have been engaged in impulsively, in view of their higher mean score for impulsivity. Raymond et al. (2003) noted higher mean scores for impulsivity compared with published means for males among their largely male group (23 men and two women) of responders to newspaper advertisements about out of control sexual behavior.

The responses of the women in the sample raise the question as to whether women who engage in heterosexual behaviors considered to be more normative for men might class their fantasies, urges or behaviors as out of control because they believe they are inappropriate for women. The women with same-sex partners or attractions might also have believed that these features indicated that they were in some way out of control. In both cases, it is possible that they were reflecting societal attitudes that they did not necessarily hold themselves. The personality traits considered and answers about religiosity did not lend support to any idea that women with OCSE might have been judging their behavior harshly because of their own traditional beliefs. The fact that women with OCSE were less satisfied with their heterosexual relationships could fit with either cause or effect: Their out of control fantasies, urges, and behaviors may have occurred because the relationship was less satisfying or, alternatively, their OCSE or factors associated with its origin may have undermined the relationship.

The picture for the OCSE men was quite different, in that only one of the measures of heterosexual behaviors differed significantly from those of the non-OCSE men. A possible explanation for this gender difference could be that some of the OCSE men did, in fact, have heterosexual behavioral problems of the sort that are more common in men, such as excessive use of pornography, but this was not revealed because we had not asked about pornography. The aspect of their sexuality that stood out, however, was their same-sex attractions and multiple same-sex partners. We have no way of knowing whether their feeling of being out of control related to same-sex fantasies, urges or behavior. They may have actually been troubled by other fantasies or by behaviors we did not enquire about, such as masturbation or online sexual problems, rather than by their same-sex behaviors. Masturbation was the predominant sexual outlet behavior in Kafka's (1997) group of predominantly married men with sexual addictions or paraphilias. Along with multiple brief sexual encounters and pornography dependence, compulsive masturbation was the most commonly reported sexual disorder in Kafka's sample. The belief of the men in our study that their sexual experiences were out of control could possibly be linked with their attitude to homosexuality or to their response to societal beliefs about homosexuality. In the Dunedin cohort generally, there was less acceptance of male homosexuality compared with female, among men as well as women (Dickson et al., 2003). But at age 26, none of the men who had been attracted to men or had sexual contact with a man in the previous year had thought sex between men was at all wrong (Dickson et al., 2003). There was no evidence from the personality assessment of a tendency to judge themselves according to traditional mores or of religion being particularly important to them. Another possibility is that men with same-sex experiences may have considered these out of control because of awareness of the risk of consequences of same-sex behavior such as acquiring human immunodeficiency virus infection or being "outed." Few studies have explored whether there is a relationship between same-sex attraction and behavior and reporting of out of control sexual behavior.

About one-third of the sample of recovering sexual addicts investigated by Carnes and Delmonico (1996) described themselves as other than heterosexual, but as described above, this was far from a representative sample. Dodge et al. (2004) could not throw light on this issue because they excluded students who described themselves as homosexual or bisexual. Cooper, Delmonico, and Burg (2000) reported that, in their internet survey, homosexual and bisexual participants were over-represented in their "cybersex compulsive" group, who by definition had scored highly on Kalichman's (1994) Sexual Compulsivity Scale. Although Daneback et al. (2006) had no homosexual responders among 82 people identified as sexually compulsive in their internet study (which was conducted on a mainstream "heterosexual" site), they did note that people who were bisexual were over-represented. In Längström and Hanson's (2006) study, there was no association between high rates of impersonal sex and sexual orientation, although this was associated with ever having had a same-sex partner.

This study has provided evidence from a representative sample of the general population that CSA is associated with OCSE among men. This finding could not have been affected by any beliefs held by the study members about CSA in relation to out of control sexual experiences, since enquiry about CSA had been made 6 years earlier, quite separately from the OCSE assessment. The overall percentage of men

and women with a history of CSA was similar to the 31% reported by Black et al. (1997), despite differences between the samples. Their sample consisted mainly of men, and was a more troubled group than ours, with all having experienced distress or impairment in an important life domain in relation to actual sexual behavior. A quarter of the OCSE men in our study had been victims of CSA. Although CSA has been linked with many adverse adult outcomes, evidence has accumulated that these are not necessarily directly due to CSA. Widom and Ames (1994), for example, assessed long-term criminal consequences among people whose abuse had been substantiated by the courts, and found that physical abuse and neglect as well as CSA increased the risk of adult sexual offending. Horwitz, Widom, McLaughlin, and White (2001) concluded that the "matrix of disadvantage" experienced by abused and neglected children explained much of the link with adult mental health problems. These truly prospective studies of documented cases of severe abuse involved a stronger measure of CSA than our own, which relied on self-report. Nevertheless, many cases of CSA never reach the courts, so there is also merit in exploring CSA via community-based studies.

Another approach that has helped in disentangling the connections between CSA and adult problems is the use of twin studies. Although Dinwiddie et al. (2000) found that differences in rates of psychiatric disorders between abused and non-abused co-twins were for the most part not significant, others (Kendler et al., 2000; Nelson et al., 2002) found evidence for some direct contribution. Kendler et al. (2000) also addressed the issue of possible genetic transmission of liability to psychiatric disorder. They found that the association between CSA and psychiatric disorders declined only slightly when they adjusted for parental psychopathology. Despite the evidence of a considerable contribution of family environment to adult psychopathology that follows CSA, Putnam (2003) concluded in a review of the topic that the overall findings were consistent with a significant causal relationship. He commented that, as a group, people who were sexually abused as children, irrespective of psychiatric diagnosis, tended to have problems with affect regulation and impulse control. Of relevance to OCSE are the results of a prospective study of the impact of CSA on sexual development. Noll, Trickett, and Putnam (2003) found more sexual preoccupation 10 years later among women who had been victims of CSA than among comparison women. They suggested that this could be an indication of internalized sexual compulsions.

Recent work has indicated that homosexual men are more likely than heterosexual men to have been sexually abused as children, particularly if the perpetrator was male (Balsam, Rothblum, & Beauchaine, 2005; Eskin, Kaynak-Demir, & Demir, 2005). These studies add weight to other evidence of high rates of CSA among gay and bisexual men (Doll et al., 1992; Jinich et al., 1998; Tomeo, Templer, Anderson, & Kotler, 2001) and men who have sex with men (Paul, Catania, Pollack, & Stall, 2001). This link with CSA might help in understanding the relationship with same-sex attraction and behavior reported by the men with OCSE in our cohort. Our findings that, among men, OCSE was associated with a personality measure that reflected sensitivity, proneness to worry and moodiness, and also with CSA would be in harmony with the theory that a paradoxical mood-sexuality relationship might develop following early experiences such as CSA, which combine sexual response with negative mood (Bancroft & Vukadinovic, 2004).

Our study had major limitations. Chief among them was that we had not been able to enquire about the nature of the fantasies, urges and behaviors that were described as being out of control, including how persistent they were. Zucker (2007) warned of the dangers of single item questions, particularly of making too much of affirmative answers. Our limited material made it difficult to know how OCSE might relate to clinical presentations of out of control sexual behavior. Montaldi (2002) raised the possibility that there is a variant of hypersexuality more akin to personality disorder, in which the person does not feel "out of control", because the behavior is ego-syntonic and part of a valued hypersexual lifestyle despite harmful consequences. Such people would be unlikely to have said "yes" to our initial question. Another limitation was that the sample size was insufficient to allow separate analysis of the subgroup who acknowledged that OCSE had interfered with their lives. Moreover, this question could have been answered negatively by people who had not yet accumulated enough consequences or enough insight to realize that their behavior was interfering with their lives. A further limitation was that many sexual behaviors of interest with regard to OCSE, such as masturbation, online sexual problems, and use of pornography, had not been asked about.

Despite these limitations, the study had the capacity to provide new information, largely because it was based on a sample representative of the general population. Because the study involved longitudinal observations of a birth cohort, we were able to use information that had been collected at an earlier phase and was thus entirely uncontaminated by the OCSE questions. Another strength was that the cohort had reached mature adulthood. This meant that the construct of out of control sexual fantasies, urges or behavior was not complicated by the responses of adolescents to their emerging sexuality. Although at age 32 they would have been younger than some who seek treatment, their age was close to the mean ages of 27–36 years reported by Black (1998) in relation to studies of treatment-seekers or advertisement-responders.

In conclusion, this study has provided the first empirical estimations of the occurrence of OCSE in a representative sample of the general population, with and without the

criteria of interference with life and acknowledgement of need for help. Reporting of actual sexual behavior that was out of control and regarded as interfering with life was uncommon. This suggests that the clinical syndrome of out of control sexual behavior may be unlikely to occur as frequently as has been previously surmised. This study has also offered evidence from a population-based sample that CSA is associated with out of control sexual fantasies, urges or behavior. It has pointed to an association between OCSE and high rates of some measures of impersonal sex among women, and an association with same-sex attraction and behavior in both sexes. These findings require replication and elaboration in larger general population samples and in different cultural contexts. Our understanding of out of control sexual behavior is still in its infancy, and much further research is needed to clarify its nature and significance.

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ORIGINAL PAPER

Commercial Sexual Practices Before and After Legalization in Australia

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Abstract The nature of sex work changes over time for many reasons. In recent decades around the world, there has been movement toward legalization and control of sex economies. Studies of the possible impact of legalization mainly have focused on sexually transmitted infections and violence, with little attention to change in the diversity of sexual services provided. This study examined the practices of sex workers before and after legalization of prostitution. Cross-sectional surveys of comparable samples of female sex workers were conducted in 1991 ($N = 200$, aged 16–46 years) and 2003 ($N = 247$, aged 18–57 years) in Queensland, Australia, spanning a period of major change in regulation of the local industry. In 2003, male clients at brothels and private sole operators ($N = 161$; aged 19–72 years) were also interviewed. Over time, there was a clear increase in the provision of "exotic" sexual services, including bondage and discipline, submission, fantasy, use of sex toys, golden showers, fisting, and lesbian double acts, while "traditional" services mostly remained at similar levels (with substantial decrease in oral sex without a condom). Based on comparisons of self-reports of clients and workers, the demand for anal intercourse, anal play, and urination during sex apparently exceeded supply, especially in licensed brothels. Within this population, legalization of sex work coincided with a substantial increase in diversity of services, but it appears that in the regulated working environments, clients who prefer high risk practices might not dictate what is available to them.

Keywords Sex workers · Clients · Commercial sex · Sexual practices · Legalization

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Introduction

Sex work is a complex activity. Harcourt and Donovan (2005) compiled a typography of commercial sex work and identified at least 25 discrete types existing throughout the world; some of these appear to be ubiquitous, while others are more common to particular regions and cultures. The existence or at least the salience of particular types in any location at any time may be shaped by numerous historical, cultural and social factors, the economy, regulatory policies, and variation in client demand (Carael, Slaymaker, & Sarkar, 2006; Monto, 2004; Rekart, 2005; Sanders & Campbell, 2007; Weitzer, 2005).

Historical analysis mainly has focused on the past 200 years in a few western nations and has revealed the influence of changing economies, wars, other periods of social upheaval and changes in the political status of women (Frances, 1994; Kubiak, Siefert, & Boyd, 2004; Meyer, 1998; Riger, 2000). Given the paucity of epidemiological and social research data in earlier times, such work often relies on police statistics and other civic records, popular literature, newspapers, and, occasionally, oral history.

Interest in the health and safety of sex workers has increased significantly in the past two decades (Albert, Warner, & Hatcher, 1998; Alexander, 1998; Jeal & Salisbury, 2007; Rekart, 2005). Given the diversity of sex work globally, temporal change in risk of sex-related disease, violence, and intimidation varies in different sectors and regions. However, there is a clear over-arching trend over time for increased rates of condom use with commercial partners, and this directly reduces the risk of sexually transmitted infections among sex workers and clients in countries as diverse as England, Australia, The Philippines, and Kenya (Baeten et al., 2000; Harcourt, van Beek, Heslop, McMahon, & Donovan, 2001; Lee, Binger, Hocking, & Fairley, 2005; Morisky, Pena, Tiglao, & Liu, 2002; Ward, Day, & Weber, 1999).

Violence prevention is a major focus for harm reduction strategies for sex workers (Sanders & Campbell, 2007). In a comprehensive review, Rekart (2005) identified seven major strategies that should reduce risk of violence and disease, including education, empowerment, improved access to health and social care services, better access to prevention programs, setting occupational health and safety standards, human rights-based approaches based on the notion of self-determination, and decriminalization. Any strategy can be pursued independently of others. For example, it is possible to have effective education and empowerment of sex workers even in the most difficult and dangerous environments (Rekart, 2005). However, these strategies overlap to a large extent and the superordinate strategy that underpins a mature sex industry is to implement public policy enforced by legislation. This has the primary objective, as Sanders and Campbell (2007) state, of "designing out vulnerability [and] building in respect" (p. 1).

Legalization of sex work is contentious in many parts of the world for moral, religious, and political reasons (Weitzer, 2005). The majority opinion in the scientific literature is that the introduction of laws that separate most forms of sex work from criminal codes and include the legal enforcement and monitoring of specific strategies are likely to protect sex workers' rights, health, and safety (Rekart, 2005). There is little doubt, for example, that sex workers in legally regulated brothels are safer and healthier than those who work in illegal indoor venues or on the streets (Brents & Hausbeck, 2005; Harcourt et al., 2001; Walkowitz, 1980; Weitzer, 2005; Wolffers & van Beelen, 2003).

Apart from health and safety, the reformulation of most types of sex work as legitimate work is likely to change many dimensions of commercial sex. Cameron (2004) has applied economic analysis to the evolution of paid sex markets and described steps in the "maturation" of the industry. In his typology of sex market maturity, Cameron (2004) identified four levels: (1) the sporadic sex economy, (2) the partially clustered economy, (3) the partially laddered economy, and (4) the mature sex economy. At the lowest level, criminal entrepreneurs manage isolated and poorly equipped brothels, massage parlors, or work on the streets. These illegal sex workers and their managers can form into weak clusters, but generally they lack cohesion because the work is clandestine and aggressively competitive and survival often depends upon support of corrupt police and local officials.

At the next level, partial market clusters form based on agreements (usually illegal though tolerated by civic officials) to manage interconnected segments of the industry. Partial clustering within regions of a city or town enables specialization of individual businesses within identifiable zones. The partially laddered sex economy emerges from these clusters, where the prospective consumer is introduced to a wide range of services from basic experiences up to sophisticated value-added products that may offer greater intimacy. These business clusters usually are not legal and often the quality of services is restricted because of ambiguous tolerance policies, zonal restrictions, and intermittent and sometimes corrupt law enforcement (Cameron, 2004; Ryder, 2004; Weitzer, 2005).

The "mature sex economy" displays a high level of organization, clustering, and laddering of goods and services (Cameron, 2004). In many regions, this mature market can survive without legalization or overt decriminalization policies. However, with legalization, the sex markets are integrated into the general framework of markets, and it follows that occupational health and safety standards, workers' and customers' rights, complaints procedures, and financial regulation (including taxation) are enforced and monitored (Rekart, 2005; Sanders & Campbell, 2007).

Apart from studies of rates of sexually transmitted infections and violence, there has been remarkably little empirical analysis of the impact of legislative change upon sex work. We have been unable to locate any prior studies that compared the primary "products" of this industry—providing a diverse variety of sexual experiences for clients—before and after the introduction of legalization.

In the current study, we compared self-reports of sexual services from two samples of sex workers in the state of Queensland, Australia, interviewed in 1991 and in 2003. This 12-year period spanned the enactment of legislation to legalize and actively regulate common forms of sex work (licensed brothels and private sole operators and other sectors of the adult entertainment industry). The criminal status of street-based sex work was retained and police resources were increased to eliminate this type of sex work (Queensland Crime and Misconduct Commission, 2004). Prior to the new laws, the sex economy in this state could best be described as partially clustered and partially laddered (levels 2 and 3), whereas now it carries the hallmarks of a mature sex economy.

The interviews with sex workers illustrate the "supply" of sexual services. To understand the demand for commercial sexual partners, male clients were recruited from licensed brothels and the premises of private sole-operators. Although clients were interviewed in 2003 only, the data provide estimates of the demand for sexual services in the contemporary environment. A comparison of workers' and clients' self-reports should indicate the extent to which supply may meet demand.

Method

Participants

In 1991, 200 female sex workers aged 16–46 years were surveyed throughout Queensland, Australia (Boyle et al., 1997a, 1997b). At that time, all forms of sex work were illegal. The convenience sample was recruited using the snowball technique, where known sex workers referred the interviewers to others and then further referrals were gained. Other participants were recruited directly from a state-wide sex worker advocacy group (SQWISI). The final sample included workers from massage parlors or brothels (16%), escort agencies (52%), from the street (6%), and other sole operators (26%).

Legislation was enacted in 1992 and 1999 which allowed sex workers to operate alone from private premises (private sole operator) and from licensed brothels, respectively, while street-based solicitation and other forms of sex work remained illegal. In 2003, 247 female sex workers aged 18–57 years were interviewed. The latter sample comprised similar numbers of licensed brothel workers (41%) and legal private sole-operators providing both in- and out-calls (42%) and a smaller proportion of women working in illegal sectors of the sex industry (17%). The majority of illegal sex workers were street-based (79%), with only a small proportion of women being recruited from illegal escort agencies or illegal brothels. Again, the samples were recruited through a snowball technique and, in this case, we gained the cooperation of the state's association of registered brothel managers, many of whom referred the researchers to their staff.

Male clients were recruited in several ways. Men were approached by brothel staff or one of two female researchers when they visited licensed brothels. Licensed brothel clients self-completed a questionnaire either before or after the service. A number of private sole operators also recruited their clients on behalf of the research team. Clients were asked to volunteer by the private sex workers when they attended their appointment. Overall, 161 male clients participated: they ranged in age from 19 to 72 years and were recruited at licensed brothels ($N = 106$) or via private sole operators ($N = 55$). All clients were recruited from services operating in South-East Queensland.

Procedure

Data in 1991 and 2003 were collected using a structured questionnaire administered through face-to-face interviews and self-completion. The mode of administration varied depending on the location and preference of the participant. For instance, privacy was limited in many brothels and, therefore, self-completion was the preferred mode of administration whereas face-to-face interviews were preferred in the privacy of participants' homes, private working environments, and in some quiet cafes or restaurants. Female sex workers and their clients were reimbursed $A25 and $A15, respectively. Ethical approval was obtained from University of Queensland ethics committee.

Measures

Initial survey development in 1991 involved in-depth interviews with 18 sex workers from different sectors of the industry. The interviews were guided by a schedule of open-ended questions covering a range of topics previously identified in the sex work literature. From these interviews, a number of themes emerged, including type and frequency of sexual services provided, risk taking behavior including substance use and misuse, unwanted sexual experiences both within and outside the sex industry, self reports of sexually transmitted infections, and mental health (Boyle et al., 1997a, 1997b). These themes formed the basis of a structured questionnaire that was piloted, modified, and subsequently used to collect quantitative data in 1991.

The 2003 survey included 333 items about personal demographics, past and current work sectors, sexual services provided, experiences of violence, unwanted sexual experiences, self reported STIs, job satisfaction, and health status (mental and physical health). Where possible, questions from the 1991 questionnaire were included in the more recent survey to allow analysis of questions conducted at both time points. The directly comparable questions were related to sexual service provision, experiences of workplace violence, lifetime and recent STIs, past and current work sectors, and personal information.

The client questionnaire included 165 items related to demographics, the procurement of commercial sexual activity, general physical health, sexual health, substance use, marital status, and relationship satisfaction.[1] Data from clients were collected entirely with the self-completed checklist questionnaire.

[1] The formal questionnaire administered to sex workers and clients is available from the corresponding author upon request.

Results

Change Over Time in Sex Workers and Their Practices

Demographic characteristics of the sex workers are summarized in Table 1. The samples at both time points were quite diverse in terms of age, country of origin, and family relationships. Compared to the 1991 sample, the 2003 sample was older ($M = 26.5$, $SD = 7.0$ compared with $M = 32.1$, $SD = 8.2$, $t(444) = 7.64$, $p < .001$) and less likely to have been born in Australia. Perhaps associated with their age, women interviewed in 2003 were more likely to have been married or divorced/separated than the 1991 sample and were about twice as likely have had at least one child.

Table 2 shows the sexual services provided by the workers at both times. There was a small decline in 2003 in the proportion of sex workers who provided vaginal sex (penis–vagina intercourse) and a substantial decline in reports they had ever provided oral sex to clients with ejaculation in the mouth. There was little change in the other "traditional" services, such as massage, manual masturbation of clients, and rubbing penis between breasts (Spanish), and there was no significant change in the proportion who said they ever provided anal intercourse for clients.

For all other sexual practices, there was a significant increase over time, including the penetrative acts of fisting and fingering (although we did not specify whether this was given to or received from clients, or both). The increase was substantial for all "exotic" services, including use of sex toys, lesbian double acts, submission, fantasy, cross-dressing and urination during sex.

There were similarities and differences between services provided in different sectors in 2003. The most common sexual practices in all three sectors included vaginal sex, oral sex, manual masturbation of clients, and massage. Some exotic services were relatively common, including fantasy/fetish with no significant differences between sectors (see Table 3). Brothel workers were least likely to perform oral sex with ejaculation in the mouth or to engage in bondage and discipline and golden showers. The legal sole operators (also known as private sex workers) were least likely to perform lesbian double acts, while illegal (street-based) workers were most likely to give oral sex (with ejaculation in the mouth), receive anal sex, and perform fantasy, but least likely to report use of sex toys and to receive oral sex from clients.

Clients of Sex Workers After Legalization

Demographic characteristics of clients and data on frequency of commercial sex activity and their main motivations for seeking commercial sex are shown in Table 4. Clients of private sole operators were older than men recruited from licensed brothels ($M = 39.9$, $SD = 10.5$ compared with $M = 33.3, SD = 9.8, t(157) = -4.01, p < .001$). Clients of private sole operators were also more likely to be married than men who were recruited in licensed brothels. There were no significant differences in the country of birth or current occupation. Clients of private sole operators were twice as likely to report visiting a specific sex worker and they also visited more frequently than those recruited at brothels.

Table 1 Characteristics of female sex workers in 1991 and 2003

	1991 ($N = 200$)		2003 ($N = 247$)		χ^2	p
	%	N	%	N		
Country of birth						
Australia	84	164	69	170	18.01	.001
New Zealand	8	16	9	21		
Europe	6	12	10	25		
Asia	2	4	11	27		
Other country	2	4	1	3		
Marital status						
Single (never married)	57	113	48	119	6.58	.017
Married or living with a partner	26	51	23	56		
Divorced, separated or other	18	35	29	72		
Number of children						
None	72	141	47	115	32.78	<.001
One	15	29	17	43		
Two	9	17	20	50		
Three or more	5	10	16	39		

Table 2 Services provided by female sex workers in 1991 and 2003

Variable	1991 ($N = 179$[a])		2003 ($N = 247$)		χ^2	p
	%	N	%	N		
Vaginal sex	100	179	95	235	8.95	.002
Oral sex (no ejaculation in mouth)	97	173	95	232	1.64	ns
Oral sex (ejaculation in mouth)	79	141	50	123	36.97	<.001
Oral sex from client	68	122	70	173	0.17	ns
Anal sex	12	21	16	40	1.68	ns
Fisting (hand in anus)	1	2	11	26	14.96	<.001
Fingering (vagina or anus)	21	37	45	111	26.96	<.001
Sex toys	40	72	69	169	33.59	<.001
Bondage/Discipline	24	43	39	96	10.40	.001
Golden showers (urination)	30	54	43	105	6.76	.009
Manual masturbation (hand relief)	98	175	99	245	1.52	ns
Penis between breasts (Spanish)	59	105	66	164	2.67	ns
Cross-dressing	20	36	41	101	20.54	<.001
Lesbian doubles	31	55	61	149	36.43	<.001
Fantasy/fetish	45	80	68	168	23.21	<.001
Massage	82	147	92	226	8.37	.002
Submission	4	7	18	44	19.04	<.001

[a] Although 200 women were recruited, only 179 women completed all questions about sexual practices in a manner that was directly comparable with 2003 data

Table 3 Services reported by private, brothel and illegal sex workers in 2003

	Private sole operator ($N = 103$) %	Licensed brothel workers ($N = 102$) %	Illegal sex workers ($N = 42$) %	χ^2	p
Vaginal sex	93	98	93	3.54	ns
Oral sex (no ejaculation in mouth)	92	97	95	2.36	ns
Oral sex (ejaculation in mouth)	58	34	69	19.14	<.001
Oral sex from clients	83	68	45	19.89	<.001
Anal sex	13	18	21	1.97	ns
Fisting (hand in anus)	13	9	10	0.79	ns
Fingering (vagina or anus)	53	37	48	5.56	.062
Sex toys	77	67	52	8.27	.016
Bondage/Discipline	47	29	45	7.81	.020
Golden showers (urination)	52	34	41	7.47	.024
Manual masturbation (hand relief)	100	99	98	2.56	ns
Penis between breasts (Spanish)	69	67	60	1.17	ns
Cross-dressing	50	35	36	5.24	.073
Lesbian doubles	50	70	66	9.28	.010
Fantasy/fetish	65	66	81	4.21	ns
Massage	87	97	91	7.39	.025
Submissive services	20	13	24	3.51	ns
Other services	14	8	5	3.40	ns

Regarding men's motivation in seeking commercial sex workers, most said that they did so because sex workers were "professional," sex was less complicated, sex workers provided stress relief, sex workers were "clean," and they could talk frankly with sex workers. Men recruited at private venues were more likely to say they liked the company of sex

Table 5 Characteristics of male clients of female sex workers, 2003

Variable	Clients of licensed brothel ($N = 105$)		Clients of private sole operators ($N = 55$)		χ^2	p
	%	N	%	N		
Country of birth						
Australia	77	81	78	42	0.01	ns
Overseas	23	24	22	12		
Marital status						
Single (never married)	59	62	42	23	5.95	.051
Married or living with a partner	17	18	33	18		
Divorced, separated or other	24	25	25	14		
Current occupation						
Manager or senior professional	23	22	33	17	2.67	ns
Associate professional	15	14	8	4		
Trade related occupation	62	60	59	30		
Regular service provider	31	32	60	31	11.98	.001
Frequency of commercial sex						
Weekly or more	12	13	11	6	7.90	.048
Once every few weeks	16	17	35	19		
Monthly	18	19	18	10		
Less than once a month	54	57	36	20		
Motivations for commercial sex[a]						
Like sex workers company	60	62	78	42	4.89	.027
Commercial sex is less complicated	84	88	87	48	0.34	ns
Sex workers are "clean"	68	71	63	34	0.35	ns
Sex workers are sexually arousing	49	51	57	31	0.99	ns
Sex workers are "professional"	71	74	72	39	0.05	ns
Able to talk frankly with sex workers	62	65	69	38	0.81	ns
Only sex available	24	25	27	15	0.23	ns
High sexual urges	45	47	47	26	0.06	ns
Enjoy sex with a variety of women	65	68	47	26	4.56	.033
Stress relief	65	68	78	42	2.83	.092
Not sexually active with regular partner	18	18	25	13	0.91	ns
Sex workers provide specific service	54	55	65	35	2.24	ns
No regular partner	50	52	47	26	0.11	ns

[a] Multiple responses possible

workers. Conversely, men interviewed at licensed brothels more commonly indicated that they visited sex workers because they liked sex with a variety of women.

Comparing What Clients and Sex Workers Say They Do

The sex workers and clients were recruited contemporaneously in 2003, and the majority of clients were recruited in the same venues in which workers were recruited, which enabled an indirect comparison of services that were reported to have been provided and received. These data are shown in Table 5, with simple prevalence estimates and confidence intervals of estimates. In comparing percentages (e.g., between brothel clients and brothel workers or between clients of brothels versus private workers), a difference in percentages was significant if the confidence intervals did not overlap.

There were several trends. First, clients of private sole operators had somewhat more exotic experiences, as they reported substantially more bondage and discipline, submission, and use of sex toys than did brothel clients. Although the differences were smaller, the same pattern held for golden showers, fantasy, cross-dressing, fisting, and anal sex.

Second, it can be seen that most of the brothel and private sole operators reported that they had provided most of the listed services and these numbers far exceeded the proportions of clients who reported they have received them (apart from the most common practices that were checked by nearly all respondents). However, there were some notable excep-

Table 5 Sexual services provided by workers (ever) and received by clients (ever)

Variable	Clients of licensed brothel ($N = 105$)		Licensed brothel worker ($N = 103$)		Clients of private workers ($N = 55$)		Private sex workers ($N = 102$)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Sexual services provided								
Vaginal sex	97	93–100	98	91–99	87	76–94	93	88–98
Oral sex (no ejaculation in mouth)	69	60–78	97	88–98	72	58–81	92	86–97
Oral sex (ejaculation in mouth)	42	33–51	34	25–43	42	30–55	58	49–68
Oral sex from client	57	48–66	68	57–75	56	42–67	83	75–89
Anal sex	18	12–27	18	11–26	29	19–42	13	7–21
Fisting (hand in anus)	9	4–16	9	5–16	15	7–26	13	7–21
Fingering (vagina or anus)	39	30–49	53	43–62	43	30–55	37	28–46
Sex toys	28	20–38	67	56–74	50	36–62	77	68–84
Bondage/Discipline	9	4–17	29	20–38	42	30–55	47	38–57
Golden showers (urination)	9	5–17	34	25–43	20	11–33	52	43–62
Manual masturbation (hand relief)	61	51–70	99	93–100	60	47–72	100	96–100
Penis between breasts (Spanish)	46	37–56	67	56–74	40	28–53	69	60–78
Cross-dressing	4	1–10	35	26–44	11	5–22	50	40–60
Lesbian doubles	26	19–36	70	59–77	26	16–38	50	40–60
Fantasy/fetish	19	13–28	66	55–74	29	19–42	65	56–74
Massage	69	60–78	97	90–99	69	56–80	87	79–93
Submission	5	2–11	13	7–21	27	17–40	20	14–30

tions. Anal intercourse and anal play (fisting) were reported equally often by both clients and workers in brothels. In the private sole operator sector, the clients were somewhat (though not significantly) more likely than sex workers to report having paid for anal sex (ever). Further, the brothel workers were slightly less likely than were clients to report oral sex with ejaculation in the mouth, and they were significantly less likely than private sole operators to do this activity.

Brothel and Private Clients' Preferences Compared o Their Experience of Sexual Practices

Clients recruited in licensed brothels and from private sole operators indicated their preferences for the kinds of services they would *like to pay* a sex worker to provide and the kinds of services they *have paid* for at some time in their lives. The data are shown in Table 6, separately for men recruited at brothels and private venues. In the first two columns, we show the number who had paid divided by the number who would like to pay for particular acts, and this was expressed as a percentage indicating how consistent their acts were with preferences. In the third column, the denominator is the number who said they would *not like* to pay for these practices, and the fourth shows the percentages of prior experiences that were inconsistent with their stated current preferences.

The level of consistency between past behavior and preference was classified as high (75% or greater), moderate (from 50% to 74%), and low (less than 50% agreement). There were similarities and differences between clients in brothels and private venues.

High Consistency

Preferences of brothel clients were close to their self-reported experiences for six acts: vaginal intercourse, oral sex (no ejaculation in mouth), giving oral sex to a worker, rimming (anal oral contact), manual masturbation, penis between breasts, and massage. For private venue clients, 10 acts were highly consistent: vaginal intercourse, oral sex (no ejaculation in mouth), giving oral, fingering, sex toys, bondage/discipline, golden showers, manual masturbation, penis between breasts, and massage.

Moderate Consistency

Brothel clients reported four acts at this level: Oral sex (ejaculation in mouth), fingering, sex toys and bondage/discipline. For private clients, six acts were moderately consistent with preferences, including oral sex (ejaculation in

Table 6 Consistency between clients' preferences and their experiences of paying for sex

Sexual services	Type of venue	*N* who have paid/*N* who would like to pay	% Consistent with preference	*N* who have paid/*N* who would not like to pay	% Inconsistent with preference
Vaginal sex	Brothel	100/101	99	3/5	–
	Private	45/46	98	3/9	–
Oral sex (no ejaculation in mouth)	Brothel	60/71	85	13/35	37
	Private	32/35	91	7/19	37
Oral sex (ejaculation in mouth)	Brothel	40/65	62	4/39	10
	Private	21/32	66	2/23	9
Oral sex from client	Brothel	54/61	89	6/45	13
	Private	28/30	93	2/24	8
Anal sex	Brothel	15/36	42	4/69	6
	Private	14/23	61	2/31	7
Fisting (hand in anus)	Brothel	7/16	44	2/89	2
	Private	7/13	54	1/42	2
Rimming (tongue in anus)	Brothel	9/11	82	4/94	4
	Private	9/16	56	2/37	5
Fingering (vagina or anus)	Brothel	27/41	66	14/65	22
	Private	20/25	88	1/29	3
Sex toys	Brothel	25/50	50	5/56	9
	Private	25/30	83	2/24	8
Bondage/Discipline	Brothel	7/14	50	2/92	2
	Private	21/23	91	1/31	3
Sadomasochism	Brothel	2/8	–	1/98	1
	Private	5/8	–	1/45	2
Golden showers (urination)	Brothel	8/17	47	2/89	2
	Private	11/13	85	0/42	0
Manual masturbation (hand relief)	Brothel	51/58	88	13/47	28
	Private	28/31	90	5/24	21
Penis between breasts (Spanish)	Brothel	44/58	76	5/48	10
	Private	21/28	75	1/27	4
Cross-dressing	Brothel	1/3	–	3/103	3
	Private	6/9	–	0/45	0
Lesbian doubles	Brothel	21/56	38	7/50	14
	Private	14/25	56	0/29	0
Fantasy/fetish	Brothel	15/40	38	5/66	8
	Private	16/22	73	0/33	0
Massage	Brothel	61/65	94	12/41	29
	Private	30/33	91	8/22	36

mouth), anal intercourse, fisting, rimming, lesbian doubles, and fantasy/fetish.

Low Consistency

Experiences of brothel clients were considerably less than their preferences for anal intercourse, fisting, golden showers, lesbian doubles, and fantasy/fetish. Among private clients, none of the acts had consistency of less than 50%.

Table 6 also shows the consistency between the types of commercial services purchased previously by clients' and the services they desired. This may be an indicator of satisfaction with previous commercial sex encounters. Clearly, inconsistency was very low for the majority of acts, suggesting that these men generally receive what they prefer. It is also evident that some men with prior experience do not like to pay for oral sex with no ejaculation in the mouth, manual masturbation or massage.

Discussion

Interpretation of the findings includes the important caveat that, due to research design limitations, we cannot attribute change in sexual services directly to legalization. In this simple pretest–posttest study, we could not include a non-intervention control group of sex workers, so, therefore, we cannot disentangle a direct intervention main effect from change due to other community-based initiatives in HIV/AIDS education and violence prevention. At best, we can say that any changes coincided with the introduction of legalization.

The most striking finding was the significant increase over time in the provision of "exotic" sexual practices, including bondage, submission, fantasy/fetish, lesbian double acts, and use of sex toys. In contrast, the traditional services did not change much. There was a substantial reduction in oral sex without a condom, no significant change in anal intercourse, and a slight drop in vaginal intercourse. Prior research into change in sex workers' practices has had a narrower focus on safe sex, particularly the relationships between STI infection risk and condom use during sex work. Generally, the present study was consistent with these other studies that have reported a change to safer sexual practices, particularly with regard to decreases in oral sex with ejaculation in the mouth (Lee et al., 2005; Pyett, Haste, & Snow, 1996; Ward, Day, Green, Cooper, & Weber, 2004).

Regarding clients' self-reports, the data from this survey had both similarities and differences to two recent Australian studies. In a large, national population-based random sample of more than 10,000 men, Rissel, Richters, Grulich, de Visser, and Smith (2003) found that about 16% of men reported they had ever paid for sex, and these men described some sexual acts performed at the most recent paid encounter. In a survey of 612 men interviewed at a commercial "Sexpo" public event promoting the adult entertainment industry, 23% had paid for sex, and these men were asked whether they had ever paid for specific acts (Pitts, Smith, Grierson, O'Brien, & Misson, 2004). The proportions of clients who said they paid for vaginal sex (current study, 94%; Rissel et al., 95%; Pitts et al., 81%) and receiving oral sex (70, 66, and 62%, respectively) were similar among the studies. This is interesting, as the Rissel et al. (2003) estimates concern only the most recent paid encounter. The rate of paid anal sex (ever) for this study was 20% compared to 14% ever in the Pitts et al. sample. However, the present sample reported much higher rates of paid for bondage and discipline (19.9% present vs. 1.8%, Pitts et al.), fisting (10.6% vs. 1.8%), golden showers (13.6% vs. 3.5% for "water sports") and fantasy (22.4% vs. 7.1%). It is also notable that the men recruited by Rissel et al. (2003) reported very low rates of bondage/discipline (just 0.8% at last occasion). Together, these studies suggest that findings from research with clients recruited directly at sex work venues might not easily be extrapolated to those found at community events or through random sampling of the population.

One relatively novel observation concerns sex workers receiving oral sex from clients, as few studies worldwide have asked about this experience (Weitzer, 2005). The majority of sex workers (68% in 1991 and 70% in 2003) said they had received oral sex from a client at some time. Further, the majority of clients (57% at brothel, 56% at private venues) reported that they had given oral sex to a worker at some time. When the 2003 sample of sex workers was disaggregated by industry sector, more than 8 in 10 private workers, and around 7 in 10 brothel workers said they had received oral sex from a client compared with less than half of the street workers. This pattern was similar to a study of indoor and outdoor workers in California and Nevada (Lever & Dolnick, 2000). When the clients give oral sex, for many this would include a desire to pleasure the sex worker and be part of a real or assumed emotional relationship (Weitzer, 2005).

It is unfortunate that we did not have comparable data from clients before legalization to gauge change over time. However, the analysis of the consistency (in 2003) between clients' preferences and their prior experience paying for sex suggests some patterns in the post-legalization sex industry. The brothels are highly regulated environments designed to promote health and reduce vulnerability. They are smoke-free and alcohol and drug-free, have a compulsory condom policy, and workers receive compulsory training in personal protection, safe sex negotiation, and visual screening for STIs. The private, sole-operators must work alone and although encouraged to follow the strict guidelines, it is likely they are less compelled to do so.

The personal preferences of the great majority of clients of brothel and private venues for common sexual practices, such as vaginal intercourse and oral sex, were close to their self-reported experiences. However, brothel clients appeared more constrained than private clients, especially for anal sex, fisting, and golden showers. In an earlier Australian study, Perkins (1996) found that over one-third (37.1%) of brothel-based sex workers indicated that anal sex was one of the most requested services by clients. In the present study, 34% of brothel clients and 43% of private clients said they would like to pay for anal sex. Despite this apparent demand, the majority of brothel clients who prefer these acts have not yet paid for them. The situation with private sole operators was different: the majority (61%) of clients who said they prefer anal intercourse had paid for it at least once, although it is notable that only 13% of private workers said they performed this act with clients. This may indicate sub-specialization among some private workers. Taken together, the data in this study suggest that the brothel workers more closely follow the guidelines to reduce exposure to body fluids and traumatic injury to the anus of self or clients.

A competing explanation is that the clients of private workers were more experienced in negotiating for what they want. Certainly, they are older and visit sex workers more often than the typical brothel client and many probably know the sex worker(s) quite well. It may be that the "unrequited desire" of brothel clients reflects their inexperience. However, the data on inconsistency in preferences and experience appear to suggest otherwise. Here, the private and brothel clients were quite similar, in terms of the numbers who have paid for massage, hand relief, and oral sex (no ejaculation in mouth) but they prefer not to pay for such acts. Generally, the clients at both venues appeared to get what they want, with the exception of the lower availability of more dangerous practices in the brothels.

As far as we know, this is the first study that has compared data on behavior collected from sex workers before and after legalization, and one of few that has been able to compare self-reports from contemporaneous samples of workers and clients, and to examine the consistency of clients' preferences and practices. However, there were some limitations in addition to the disadvantages of the pretest–posttest design mentioned earlier. The legislation changed the nature of the sex industry dramatically. For instance, at the time of the early survey (1991) all sex work was illegal and there were no licensed commercial brothels of the type that now function under the new law. These new venues were a major source of recruitment in 2003. Given the differences in settings, direct comparison between subsets over time was not possible. The temporal comparisons, therefore, were limited to the full convenience samples. Also, the estimates of behavior were based solely on reports of lifetime experiences and we have no information about when the experiences occurred. At the time of the data collection, the full legislation had only been implemented for four years, and so clients' and workers' reports might have been referring to activities done in a different industrial climate. Also, we do not know whether the recalled activities occurred at a different type of venue or in a different legal jurisdiction in Australia or elsewhere. Further studies of this type should pay more attention to clarifying the contexts of participants' commercial interactions.

Another weakness is that we could not satisfactorily recruit clients of illegal sex workers. This was attempted during data collection, but we could recruit only 21 clients from one illegal brothel (a bondage and discipline specialist) and 15 completed questionnaires were gathered ostensibly from clients of street-based workers, but these were discarded because we could not be certain about the veracity of about half of those completed questionnaires. In this study, we did not have the resources required to gain trust of clients of illegal workers, who in any case were very difficult to find. However, we have demonstrated that it was feasible within the context of a legal industry to recruit clients primarily through the co-operation of sex workers. Many of the sex workers were enthusiastic in supporting this research. Indeed, many saw themselves as having a role in clients' health education, as has also been found among sex workers in the United Kingdom (Sanders, 2006).

In summary, it is clear that the matured, contemporary sex industry offers a wide variety of specific services. Broadly, the findings were consistent with what would be expected if the legalization acts to protect sex workers, although of course it is possible that these changes could have occurred without legal changes. The study has also illustrated significant diversity among clients in their sexual preferences and practices.

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ORIGINAL PAPER

Sex Differences in Mental Rotation and Line Angle Judgments Are Positively Associated with Gender Equality and Economic Development Across 53 Nations

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Abstract Mental rotation and line angle judgment performance were assessed in more than 90,000 women and 111,000 men from 53 nations. In all nations, men's mean performance exceeded women's on these two visuospatial tasks. Gender equality (as assessed by United Nations indices) and economic development (as assessed by per capita income and life expectancy) were significantly associated, across nations, with larger sex differences, contrary to the predictions of social role theory. For both men and women, across nations, gender equality and economic development were significantly associated with better performance on the two visuospatial tasks. However, these associations were stronger for the mental rotation task than for the line angle judgment task, and they were stronger for men than for women. Results were discussed in terms of evolutionary, social role, and stereotype threat theories of sex differences.

Keywords Evolutionary theory · Sex differences · Social role theory · Stereotype threat theory · Visuospatial ability

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Introduction

Many kinds of visuospatial performance show consistent, on-average sex differences. For example, men tend to score higher than women on tests of mental rotation and on tests of spatial perception and orientation (Halpern et al., 2007; Voyer, Voyer, & Bryden, 1995), whereas women tend to score higher than men on tests of memory for object locations in spatial arrays (Ecuyer-Dab & Robert, 2004; Silverman & Phillips, 1998). Explanations for such differences have focused on a number of possible causal factors, including distal factors (e.g., biological evolution, the cultural evolution of gender roles) and more proximate causes (e.g., the effects of sex-linked abilities and interests, prenatal and post-pubertal sex steroid hormones, gender roles, gender socialization, and gender stereotypes).

Evolutionary theorists have proposed that selection pressures on early humans led to sex differences in some spatial abilities (e.g., see Buss, 1999; Geary, 1998). For example, ancestral men's specialization in tracking, hunting, targeting, and projectile throwing may have favored the development of three-dimensional visualization skills and the ability to visually track and target moving objects, whereas ancestral women's specialization in foraging may have favored the development of accurate memory for object locations and skill in locating foraging sites in relation to geographic landmarks. At a more proximate level of biological analysis, sex-linked genetic factors may contribute to sex differences in visuospatial abilities through their effects on the action of sex hormones at various stages of development. Indeed, several strands of research suggest that exposure to sex steroids during both early (prenatal and perinatal) life and after puberty may be linked to performance on certain visuospatial tasks (Halpern et al., 2007). Consistent with hormonal theories of sex-linked visuospatial performance

are findings that homosexual individuals sometimes differ from same-sex heterosexual individuals, with homosexual men showing more female-typical and lesbians more male-typical levels of performance on some visuospatial tasks (Collaer, Reimers, & Manning, 2007; Peters, Manning, & Reimers, 2007).

A number of social-environmental theories are also relevant to sex differences in visuospatial abilities. Social role theory proposes that psychological sex differences result from men's and women's different family and work roles in modern societies (Eagly & Wood, 1999; Wood & Eagly, 2002), and it predicts that people in societies with strong, polarized gender roles will display larger sex differences than those in societies with weaker, less polarized gender roles. Overlapping with social role theory, gender socialization theories propose that in virtually all societies, boys and girls are subject to different socialization pressures, which sometimes result in psychological sex differences (Ruble & Martin, 1998). For example, gender socialization may lead boys more than girls to play team sports and video games and to practice carpentry and car repair—activities that develop specific spatial competencies. Some social psychological theories suggest that gender stereotypes may lead to self-fulfilling prophecies, with men and women conforming to societal expectations about the stereotypic abilities attributed to their sex (e.g., Lott & Maluso, 1993), whereas others propose that stereotypes about sex differences in abilities can undermine, under certain circumstances, the performance of the sex believed to have lesser ability (Spencer, Steele, & Quinn, 1999; Steele, 1997).

One way to test biological and social-environmental explanations of psychological sex differences is to assess the cross-cultural consistency of sex differences and to investigate whether the sex differences are associated, across societies, with the strength of societies' gender roles (Eagly & Wood, 1999; Lippa, 2005, in press). If sex differences are consistent across cultures and, furthermore, if they are unrelated to the strength of societies' gender roles, then the case for biological influences is bolstered. In contrast, if the direction of sex differences varies across societies—with men exceeding women in some societies, women exceeding men in others, and no differences in still others—then the predictions of biological theories of sex differences are contradicted. In addition, if sex differences covary with the strength of societies' gender roles, such that larger sex differences are associated with stronger gender roles, then social role and gender socialization theories garner support.

A number of recent studies have examined cross-cultural patterns of sex differences in traits such as self-reported personality, emotions, and values, and these studies have often yielded the unexpected result that sex differences tend to be larger in gender egalitarian, economically developed nations than in gender non-egalitarian, less developed nations (Guimond, 2007). Several theories have been offered to explain these counter-intuitive findings. Among them are: (1) attributional theories (e.g., men and women in countries with strong gender roles tend to attribute their differing behaviors to powerful gender roles rather than to internal dispositions, whereas the reverse is true in countries with weaker gender roles; see Costa, Terracciano, & McCrae, 2001); (2) social comparison theories (e.g., when self-reporting personality traits, men and women in countries with strong gender roles tend to compare themselves to in-group members—i.e., members of their own sex—whereas men and women in countries with weaker gender roles compare themselves more to people in general; see Guimond et al., 2007); and (3) evolutionary theories that hypothesize an interaction between evolved sex-linked dispositions and environmental affordances (e.g., the difficult environments more often found in less developed countries may limit both male and female development, thereby reducing some sex differences, whereas the more facilitative environments in developed, gender egalitarian countries may encourage optimal development in both sexes, with the result that divergent innate predispositions are more fully expressed; see Schmitt, Realo, Voracek, & Allik, 2008).

Attributional and social comparison theories would seem to apply more readily to sex differences in self-reported personality, emotions, and values than to sex differences in cognitive abilities. For example, when rating themselves on personality traits such as "aggressiveness," men and women might reasonably ask, "Compared to whom?", and they might plausibly attribute their recalled aggressive behaviors either to strong societal gender roles or to internal dispositions. However, when taking cognitive ability tests, individuals attempt to answer test questions correctly, not to report their traits or to attribute the causes of their recalled modal behaviors.

Although attributional and social comparison theories may be less relevant to sex differences in cognitive abilities than to sex differences in other kinds of psychological traits, one social psychological theory is highly relevant to sex differences in cognitive performance—namely, the theory of stereotype threat (Good, Aronson, & Harder, 2008; Shih, Pittinsky, & Ambady, 1999; Spencer et al., 1999; Steele, 1997). According to this theory, negative stereotypes about the cognitive abilities of one sex (e.g., women's math ability) can lead members of that sex to experience anxiety and intrusive thoughts in test-taking situations, particularly when gender is made salient and when high levels of performance are important to the individual. To explain cross-cultural variations in sex differences in ability, stereotype threat theory requires additional assumptions—for example, that stereotypes about the relative abilities of men and women are stronger in some societies than others, that gender stereotypes are more salient to individuals in some societies than others,

or that high levels of performance are more important to individuals in some societies than others.

A priori, one reasonable hypothesis is that members of gender egalitarian, economically developed societies will tend to hold weaker stereotypes about sex differences in ability than members of gender non-egalitarian, less economically developed societies will. The rationale for this hypothesis is twofold. First, the gender egalitarian ideologies more commonly found in gender egalitarian societies tend to minimize sex differences in ability. Second, to the extent that men and women occupy more diverse roles in gender egalitarian, economically developed countries (e.g., women are physicians and lawyers as well as nurses and secretaries), members of such societies should associate gender with ability less strongly than members of more gender non-egalitarian societies do. If the previous assumptions are correct, then the debilitating effects of gender stereotypes on women's test performance should be stronger in gender non-egalitarian than gender egalitarian societies, leading to larger sex differences in these societies.

Also reasonable, but leading to different predictions, are the hypotheses that women in more developed, gender egalitarian societies may be exposed more often to scientific research on sex differences in cognitive performance leading to more pervasive stereotypes (e.g., see Dar-Nimrod & Heine, 2006; Eccles & Jacobs, 1986) and that women in more developed, gender egalitarian societies have a stronger desire to perform well on stereotypically male-favored tasks than women in less developed, gender non-egalitarian societies. If these assumptions are correct, then the debilitating effects of gender stereotypes on women's test performance may be stronger in gender egalitarian than in gender non-egalitarian societies, leading to larger sex differences in these societies.

Although opposing predictions about systematic cross-cultural variation in sex differences in performance can be derived from stereotype threat theory, depending on additional assumptions, the theory nonetheless seems to imply that women's performance on stereotypically male-favored tasks will vary systematically across societies more than men's performance, because women, not men, are theorized to experience the performance-undermining thought processes resulting from negative gender stereotypes.

In the research reported here, we extended previous research on the cross-cultural consistency of sex differences by examining, across 53 nations, patterns of sex differences in two sex-linked cognitive domains: mental rotation performance and line angle judgment performance. In addition to examining the cross-nation consistency of these sex differences, we also explored whether national indices of gender equality and economic development were related to sex differences in performance and, also, to mean male and female levels of performance on these two visuospatial tasks.

Method

Participants

From February through May 2005, the British Broadcasting Corporation (BBC) conducted an Internet survey on human sex differences for use in its documentary, *Secrets of the Sexes*. A total of 255,114 people responded to at least some items in each of the six sections of the survey. Most of these participants reported their sex and other demographic information and completed a six-item mental rotation test and a 20-item line angle judgment test.

Fifty-three nations in the BBC data set had total samples of 90 or more participants, and the cross-nation analyses reported here focus on these samples. Analyses were restricted to participants who were at least 18 years of age and no older than 80 years of age. The large majority of participants in the BBC survey were young adults 18–40 years of age (see Reimers, 2007). In the current analyses, national samples of men with usable mental rotation scores ranged in size from 52 to 43,783, with a median sample size of 206 and a total sample size of 111,350. National samples of women ranged in size from 19 (36, when the smallest sample—Saudi Arabian women—was excluded) to 36,714, with a median sample size of 169 and a total sample size of 90,433. National samples of men who had usable line angle judgment scores ranged in size from 52 to 54,016, with a median sample size of 217 and a total sample size of 116,368. National samples of women ranged in size from 18 (30, when Saudi women were excluded) to 42,028, with a median sample size of 175 and a total sample size of 95,364. All male samples and all but three female samples included more than 40 individuals.

Measures

Mental Rotation and Line Angle Judgment Tasks

A short, six-item mental rotation test (Peters et al., 1995), similar to that of Vandenberg and Kuse (1978), was implemented in HTML and presented to participants in a pop-up window. Participants viewed a block object diagram to the left of the screen and were asked which two of four diagrams to the right of the screen showed the same object "viewed from a different angle." Participants were instructed to click on two of the four comparison diagrams that were correct answers. Participants had 150 s to complete the entire task and could allot time among the six questions as they wished. A countdown timer on the bottom of the screen showed the amount of time that remained after participants started the task. Performance was scored by awarding a single point for each correct answer chosen, thus yielding a total score that could range from 0 to 12. Mental rotation measures typically show moderate to large sex differences favoring men (Voyer

et al., 1995). For further methodological details about the BBC mental rotation task, see Peters et al. (2007).

The 20-item line angle judgment task was adapted from Collaer (2001) and Benton, Varney, and Hamsher (1978). Similar tasks have shown large sex differences favoring men in laboratory research (Cherney & Collaer, 2005; Collaer & Nelson, 2002). The BBC survey line angle task was implemented as an Adobe Flash movie. Participants viewed a "target line" at the top of the screen, which was displayed in one of 14 angled orientations ranging, in roughly 12.9 degree increments, from horizontal to vertical and back to horizontal, spanning 180 degrees. Beneath the target line was a "fan" of 15 lines that assumed all possible angular orientations. The participant's task, on each trial, was to pick from the set of 15 choices the line that matched the angular orientation of the target line. Participants selected a matching line by clicking on one of the 15 lines in the bottom array. Participants had 10 s to complete each item and the elapsed time for each item was shown by a countdown timer at the bottom of the screen. If a participant failed to respond within the allotted time, a response of "blank" was recorded, which was treated as a wrong answer. A participant's accuracy score was the number of items out of 20 answered correctly. For additional methodological details, see Collaer et al. (2007). In the BBC survey, the line angle judgment task preceded the mental rotation task.

Gender Equality and Economic Development

Statistics for United Nations gender-related development and gender empowerment indices were taken from the United Nations 2005 and 2001 Human Development Reports (available at: http://hdr.undp.org/statistics/data/). The UN gender-related development index assessed nations' gender equity on three dimensions: health and longevity, standard of living, and knowledge and education. The UN gender empowerment measure assessed nations' gender equity on three power dimensions: power over economic resources, participation in economic decision making, and participation in political decision making. In several cases, when 2005 statistics were not available for given nations, we used 2001 statistics instead. United Nations gender empowerment statistics were not available for six of the 53 nations studied here. Two indices of economic development were also obtained from UN Human Development reports: nations' per capita income in U.S. dollars and life expectancy. The four indices tended to be strongly correlated (rs ranged from .68 to .84, all ps $< .001$), indicating that nations that were high on gender equality also tended to be high on economic development.

Demographic Control Variables

Previous analyses of the BBC data showed that performance on the mental rotation and line angle judgment tasks was related to participants' age and education levels, although sex effects tended to be considerably larger than age and education effects (Collaer et al., 2007; Peters et al., 2007). Because national samples may have varied in their mean ages and education levels, we used in some analyses the following control variables computed for each nation: percent of men with greater than high school education, percent of women with greater than high school education, ratio of percent of men to percent of women with greater than high school education, mean age of men, mean age of women, and ratio of men's mean age to women's mean age.

Results

Consistency of Sex Differences Across Nations

Sex differences in mental rotation and line angle judgment performance were universally present across nations, with men's mean scores always exceeding women's mean scores (see Figs. 1, 2). A paired-data t-test comparing men's and women's mean mental rotation scores across nations showed a significant sex difference, $t(52) = 22.67$, $p < .001$, $M = 8.16$ for men and 7.00 for women, mean of 53 national ds $= .47$. Similarly, a paired-data t-test comparing men's and women's mean line angle judgment scores across nations showed a significant sex difference, $t(52) = 23.93, p < .001$, $M = 15.54$ for men and 14.07 for women, mean of 53 national ds $= .49$.

Correlations Between National Indices and Spatial Performance Parameters

Table 1 presents correlations between national indices of gender equality and economic development and three mental rotation parameters: men's means, women's means, and sex differences. UN gender development and empowerment indices and life expectancy were significantly correlated with sex differences in mental rotation performance, with higher levels of gender equality and economic development associated with larger sex differences. Partial correlations that controlled for variations in age and education across samples showed that two of three correlations remained significant after controlling for these factors. Across nations, indices of gender equality and economic development were strongly correlated with men's and women's mean performance on the mental rotation task, such that greater gender equality and economic development were associated with better performance.

Table 2 presents correlations between national indices of gender equality and economic development and three line angle judgment parameters: men's means, women's means, and sex differences. All UN gender equality indices and

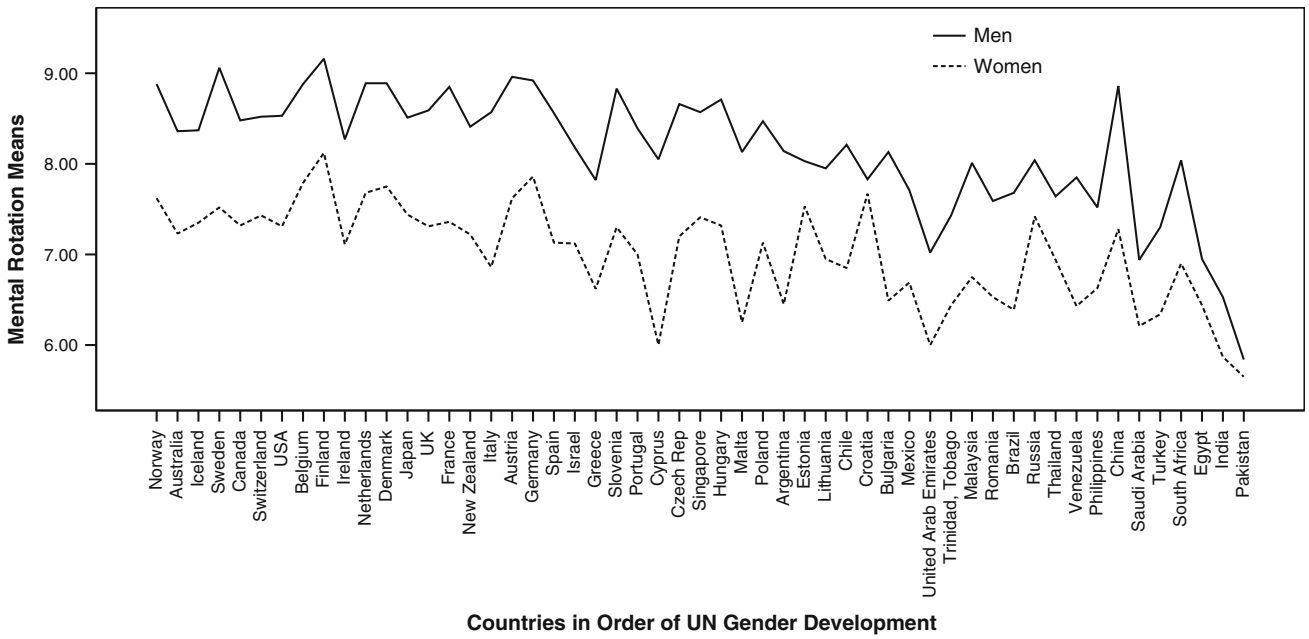

Fig. 1 Men's and women's mental rotation means across 53 nations listed in order of their UN gender development score (with the most gender egalitarian nations at the left and least egalitarian at the right)

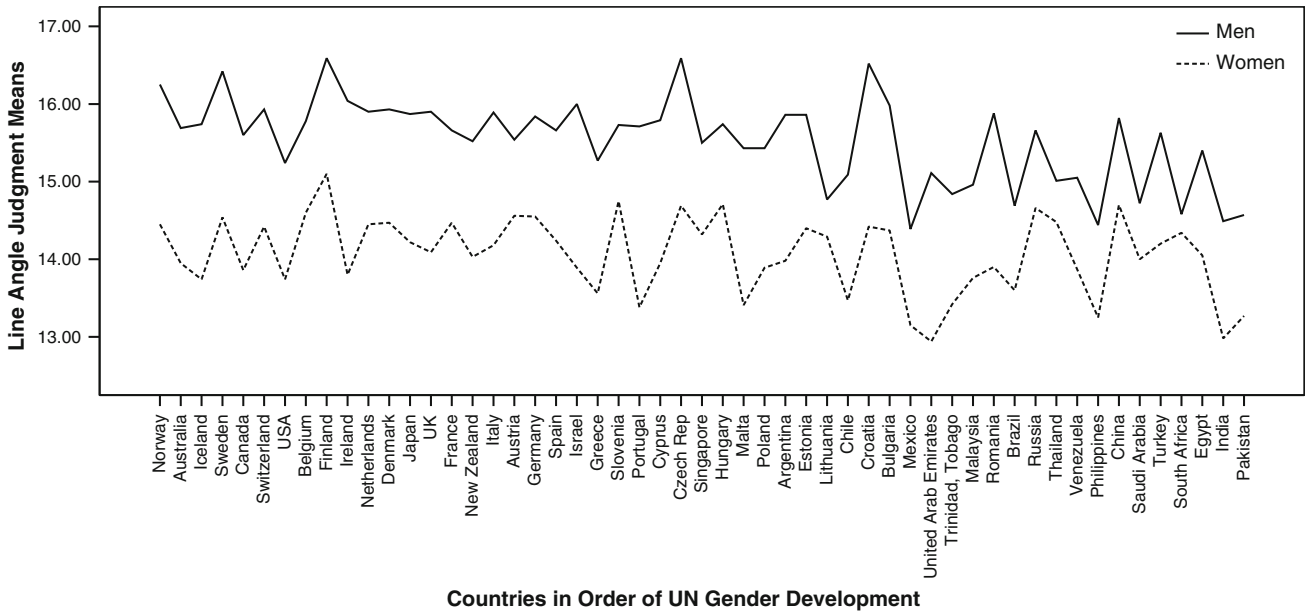

Fig. 2 Men's and women's line angle judgment means across 53 nations listed in order of their UN gender development score (with the most gender egalitarian nations at the left and least egalitarian at the right)

indices of economic development were significantly correlated with sex differences in line angle judgment performance, with higher levels of gender equality and economic development associated with larger sex differences. These correlations remained significant after controlling for variations in age and education across samples. National indices of gender equality and economic development were significantly correlated with mean performance on the line angle judgment task. However, these correlations tended to be smaller than the corresponding correlations for mental rotation performance, and correlations for men tended to be larger than those for women.

Relation Between Mental Rotation and Line Angle Judgment Parameters, Across Nations

Across nations, men's and women's mean performance on the mental rotation task correlated substantially with men's

Table 1 Correlations between national indices of gender equality and economic development and national mental rotation parameters (men's means, women's means, and standardized sex differences)

	Men's mean mental rotation	Women's mean mental rotation	Sex differences (*d*s)	Sex differences (*d*s), controlling for education and age variables
UN gender development	.83*** (53)	.70*** (53)	.47*** (53)	.42** (53)
UN gender empowerment	.77*** (47)	.72*** (47)	.29* (47)	.11 (47)
Per capita income	.65*** (52)	.64*** (52)	.22 (52)	.08 (52)
Life expectancy	.58*** (53)	.44** (53)	.40** (53)	.33* (53)

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. Numbers in parentheses are sample sizes. Control variables in partial correlations were: percent of men with greater than high school education, percent of women with greater than high school education, ratio of percent of men to percent of women with greater than high school education; mean age of men, mean age of women, ratio of men's mean age to women's mean age

Table 2 Correlations between national indices of gender equality and economic development and national line angle judgment parameters (men's means, women's means, and standardized sex differences)

	Men's mean line angle judgment	Women's mean line angle judgment	Sex differences (*d*s)	Sex differences (*d*s), controlling for education and age variables
UN gender development	.63*** (53)	.37** (53)	.41** (53)	.47** (53)
UN gender empowerment	.48** (47)	.29* (47)	.33* (47)	.31* (47)
Per capita income	.51*** (52)	.30* (52)	.34* (52)	.42** (52)
Life expectancy	.54*** (53)	.12 (53)	.57*** (53)	.68*** (53)

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. Numbers in parentheses are sample sizes. Control variables in partial correlations were: percent of men with greater than high school education, percent of women with greater than high school education, ratio of percent of men to percent of women with greater than high school education; mean age of men, mean age of women, ratio of men's mean age to women's mean age

and women's mean performance on the line angle judgment task (correlations ranged from .62 to .72; all significant at $p < .001$). Thus, mean performance on the two tasks covaried, across nations. In contrast, the magnitude of sex differences in mental rotation and sex differences in line-angle judgment performance were not significantly correlated across nations, $r(52) = .23$, $p = .105$. Despite the lack of significant relationship between sex differences in mental rotation and line angle judgment performance, across nations, the cross-nation patterns in sex differences shown in Tables 1 and 2 were similar—i.e., sex differences in both mental rotation and line angle judgment performance tended to be larger in gender egalitarian and economically developed nations than in less egalitarian and less developed nations.

Discussion

The current findings extend recent research on the cross-cultural consistency of sex differences to two cognitive domains: mental rotation performance and line angle judgment performance. Analysis of data from the BBC Internet study showed that universally, across 53 nations, men's mean performance exceeded women's mean performance on these two visuospatial tasks. Furthermore, the magnitude of the sex differences tended to be positively associated with nations' gender equality and economic development, a finding that runs counter to the predictions of social role and gender socialization theories. This pattern of results remained after controlling for variations in mean age and education levels across national samples.

These results were inconsistent with hypotheses derived from stereotype threat theory, when augmented by the assumption that gender stereotypes about sex differences in cognitive abilities are likely to be stronger in gender non-egalitarian than gender egalitarian societies. In contrast, the current results were consistent with hypotheses derived from stereotype threat theory, when augmented by the assumptions that (1) information about scientific research on sex differences in cognitive performance may be more widely disseminated in economically developed, gender egalitarian countries and (2) women in economically developed, gender egalitarian countries may have a greater desire to perform well on stereotypically male-favored tasks than do women in less developed, gender non-egalitarian countries. Adequate future testing of the application of stereotype threat theory to cross-cultural variations in sex differences in cognitive performance will require that researchers assess, across nations, a number of factors—e.g., the strength of relevant stereotypes, the level of men's and women's knowledge about scientific research on sex differences, and the importance that men and women assign to performing well in various cognitive domains—and then examine the correlation of

these factors with sex differences in performance across nations.

As noted earlier, attributional and social comparison theories that attempt to explain how psychological sex differences vary across countries seem to apply more readily to psychological traits that entail self-ratings (e.g., self-reported personality, emotions, values) than to cognitive traits. Thus, the current findings—that sex differences in mental rotation and line angle judgment performance showed cross-cultural patterns similar to those found in research on other traits—provide new information about possible causes of cross-cultural variations in cognitive sex differences.

The pattern of results reported here was consistent with the predictions of evolutionary theories that hypothesize an interaction between evolved sex-linked dispositions and environmental affordances (Schmitt et al., 2008). Specifically, the current results showed that sex differences tended to be larger in gender egalitarian, economically advanced nations, which were hypothesized to facilitate optimal development in both men and women, and smaller in gender non-egalitarian and less developed nations, which were hypothesized to limit both men's and women's development. One prediction that followed from evolutionary theories, but ran counter to the predictions of social role and stereotype threat theories, was that national variations in gender roles and economic development may impact men's more than women's performance, assuming that males are more vulnerable than females to environmental challenges (see Halpern et al., 2007; Levine, Vasilyeva, Lourenco, Newcombe, & Huttenlocher, 2005). Although the current data do not offer conclusive evidence on this point, correlations between national indices and men's national mean performance were consistently larger than corresponding correlations for women (see Tables 1, 2).

Several limitations to the BBC data are worth noting. First, the BBC participants did not comprise a random sample. Because the BBC survey was implemented via the Internet, it tended to attract participants who were young, educated, and computer savvy (see Reimers, 2007). At the same time, the national samples assessed by the BBC survey were often larger and more diverse, in terms of participants' age and geographic locale, than the samples assessed in many recent cross-cultural studies of sex differences and, unlike much recent cross-cultural research on sex differences, the BBC sample included many non-college-student participants.

The BBC survey was implemented in English, which may have affected the responses of participants from non-English-speaking counties. Although instructions for the mental rotation and line angle judgment tasks were in English, the tests themselves were "nonverbal," and thus it could be argued that performance on these tests was less affected by English fluency than other measures in the BBC survey. Finally, the mental rotation test used in the BBC survey was shorter than standard paper-and-pencil mental rotation tests, and participants' performance on the mental rotation and line angle judgment tasks in the BBC survey may have been subject to more sources of error variance than performance under more standardized laboratory settings. Indeed, mental rotation and line angle judgment tasks administered in controlled settings often show larger mean sex differences than those reported here (Collaer et al., 2007; Peters et al., 2007). Thus, the current results, if anything, may underestimate the true strength of associations.

Finally, it is important to note that men's and women's mean levels of performance on the two visuospatial tasks were linked to social, cultural, and environmental factors. Although associations were stronger for mental rotation performance than for line angle judgment performance, measures of gender equality and measures of economic development tended to be significantly associated, across nations, with both kinds of visuospatial performance, and these associations were present for both men and women. We can only speculate why visuospatial performance tended to be positively associated with gender equality and economic development, across nations. Contributing factors may have included national differences in health care and nutrition, education, exposure to computers and video games, and architectural environments. Further research is warranted that investigates why people in different nations vary systematically in their visuospatial performance.

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ORIGINAL ARTICLE: CLINICAL CASE REPORT SERIES

Renegotiating Sexuality and Intimacy in the Context of Cancer: The Experiences of Carers

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Abstract There is a growing body of evidence to show that cancer can result in dramatic changes in sexuality, sexual functioning, and intimate couple relationships, with significant implications for both quality of life and psychological well-being. However, the experiences of intimate partners are often neglected in research on sexuality and intimacy in the context of cancer. This study used a material-discursive framework and a qualitative methodology to investigate the ways in which intimacy and sexuality are renegotiated in the context of cancer, and what factors are associated with successful or unsuccessful renegotiation, from the perspective of partners caring for a person with cancer. Twenty participants were interviewed, across a range of cancer types, stages, and age groups. Eleven participants reported that they were unable to negotiate other ways of being sexually intimate when penetrative sexual intercourse was no longer physiologically possible or desirable. Nine were able to renegotiate sexual intimacy in the context of cancer to include practices previously positioned as secondary to "real sex," such as mutual masturbation, self masturbation, manual stimulation, oral sex, massage, the use of vibrators, kissing, and hugging. Grounded theory analysis identified two themes associated with renegotiation: "Alternative" sexual practices-redefining sexual intimacy, and couple communication and relationship context. Difficulties in renegotiation were associated with adherence to the coital imperative, sexual relationship or communication problems which existed prior to cancer, and the positioning of the person with cancer as a child or an asexual sick patient rather than a sexual partner. The implications for health professional intervention to ameliorate changes to sexuality in the context of cancer are discussed.

Keywords Sexuality · Cancer · Caring · Intimacy · Relationships

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Introduction

Cancer is increasingly seen as an illness that affects the psychological well-being and quality of life both of the person diagnosed and receiving treatment and their family members, in particular their intimate partner (Hodges, Humphris, & Macfarlane, 2005). Sexuality and intimacy are central to psychological well-being and quality of life (World Health Organisation, 1995), and there is a growing body of evidence to show that cancer can result in significant changes to sexuality, sexual functioning, and intimate couple relationships (Gurevich, Bishop, Bower, Malka, & Nyhof-Young, 2004; Juraskova et al., 2003). Indeed, these changes can be experienced as the most significant in the life of the person with cancer (Anderson & Golden-Kreutz, 2000).

While the experiences of intimate partners are often neglected in research on sexuality and intimacy in the context of cancer (Reichers, 2004), there is growing acknowledgement of their unmet needs in this area (De Groot et al., 2005; Perez, Skinner, & Meyerowitz, 2002). Reported disruptions include, fear of initiating sex with the person with cancer, difficulty maintaining a level of "normality" within the sexual relationship, decreases in their own sex drive, and feeling unwanted and unattractive following cessation of sex (Harden et al., 2002; Maughan, Heyman, & Matthews, 2002; Sanders, Pedro, Bantum, & Galbraith, 2006). Changes to sexuality in the context of cancer can also have ramifications beyond sex as an activity. It has been argued that when sexual intercourse

ceases in the context of illness, other forms of affectionate physical contact also diminish (Kuyper & Wester, 1998), because of a perception among some couples that these forms of affection necessarily lead to sexual intercourse, which is either deemed inappropriate or not physically possible (Hughes, 2000). Equally, if all forms of sexual intimacy within the couple relationship disappear, couples facing cancer can feel isolated, anxious or depressed (Germino, Fife, & Funk, 1995), inadequate (Anllo, 2000), or emotionally distant from each other (Rolland, 1994). Conversely, sexual intimacy has also been found to make the experience of cancer more manageable and assist in the recovery process (Schultz & Van de Wiel, 2003) or be central to couple closeness and quality of life in palliative care (Lemieux, Kaiser, Pereira, & Meadows, 2004).

The specific issues of whether, and in what ways, intimate partners "renegotiate" their sexual relationship if coitus is no longer physiologically possible or desirable in the context of cancer has been under-researched. However, there is a body of research that has explored how couples renegotiate their sexual relationship in the context of physical disability, spinal cord injury, and most notably, erectile dysfunction (ED)—an issue that couples facing cancer often have to negotiate. For example, in the area of ED, a study by Warkentin, Gray, and Wassersug (2006) examined how dildos could be used as an alternative to erectile dysfunction treatments for men and found that, in time, the dildo became a normal erotic part of sexual life, with a key factor in the sexual satisfaction within the relationship being that the couple were working together to explore sexual activities. In a similar vein, Potts (2006) reported that when it was difficult for individuals to engage in coitus because of ED, sexual repertoires can become more varied. One of the possibilities to emerge was the experience that sex is not confined to the organic body and that the "sex" can be deepened to include sexual feelings produced without physical touching. This has resulted in the development of "flexibility" in couples' sexual repertoire, becoming a central aspect of interventions conducted by sex therapists (Barsky, Friedman, & Rosen, 2008; Schover, Evans, & von Eschenbach, 1987).

The few studies that have examined sexual renegotiation in the context of cancer have shown that for the most part couples are unable to renegotiate sexuality and intimacy. This inability is reportedly associated with difficulties in communicating about sexual matters (Arrington, 2003; Foy & Rose, 2001; Holmberg, Scott, Alexy, & Fife, 2001), for fear of creating feelings of guilt in the person with cancer (Kuyper & Wester, 1998). In addition, for intimate partners who are also the carer of a person with cancer, renegotiating a sexual relationship may be particularly problematic given the discursive construction of the "good carer," who should subordinate their own needs, put the person with cancer first, and engage in the "emotion work" of managing their own feelings and the feelings of others (Hodges et al., 2005; see also Thomas, Morris, & Harman, 2002). It has also been reported that partner carers subordinate their own sexual needs in the light of what is considered "the proper thing to do" when in a caring role—including not initiating sex, not pressuring their partner to be sexually intimate, and not being sexually demanding (Gilbert, Ussher, & Hawkins, in press). Carers may come to consider the person with cancer purely as a "patient," and as such, dependent upon them for their basic needs—needs that are often antithetical to the expression of sexuality within the relationship (Gilbert et al., in press; Parker, 1990; Pope, 1999). For example, Manderson (2005) found that people with a stoma and their partners find it difficult to sexualise a body on which there is now attached a bag containing in a very visual way "abject" urinary fluid and defecation.

Equally, when an individual is diagnosed with cancer and comes to be seen as "ill," a different set of norms emerge for acceptable behavior within their illness state (Wellard, 1998), including the notion that people with cancer have either limited sexual needs or are asexual (D'Ardenne, 2004). According to Schildrick (2005), people with a disability or serious illness are disqualified from normative discourses of sexuality, as "proper" sexuality is associated only with able bodied, healthy, and usually young individuals, which "legitimates a denial of sexual desire and pleasure" (p. 334) for those falling outside these discourses. This disqualification and denial is also associated with the prominence of the "coital imperative" in medical, social, and legal discourse (Gavey, McPhillips, & Braun, 1999).[1] The coital imperative positions intercourse as "real sex," as a sign of a healthy and normal relationship, and positions those who cannot perform it properly as dysfunctional (Tiefer, 1996, 2001). It is thus not surprising that intercourse has been found to be strongly connected with feelings of acceptance, intimacy, and love, and absence of intercourse with feelings of self-doubt (Gavey et al., 1999).

In the present study, in order to examine the ways in which intimacy and sexuality are renegotiated in the context of cancer, from the perspective of intimate partners who are caring for a person with cancer, a material-discursive approach was adopted (Ussher, 1997), embedded within a critical realist epistemology (Bhaskar, 1989) and a qualitative methodology. Described as a way forward for research on health within a sociocultural context (Williams, 2003),

[1] An example of the way in which coitus is seen as "real sex" is in the socio-legal discourse surrounding the Bill Clinton and Monica Lewinsky sex scandal. When asked if he had ever had "sexual relations" with Monica Lewinsky, (as the term "sexual relations" is defined by the Court) Bill Clinton answered that he had never had sexual relations with Monica Lewinsky, because he believed the agreed-upon definition of "sexual relations" excluded his receiving oral sex.

Critical realism is an epistemological standpoint which recognizes the materiality of the body, and other aspects of experience, but conceptualizes this materiality as always mediated by discourse and culture (Bhaskar, 1989), and accepts the legitimacy of subjective experience evaluated through qualitative research methods (Sayer, 2000). Thus, while the material consequences of cancer or cancer treatments on sexuality are acknowledged, cultural discourses about sexuality and caring are deemed to provide the context within which individuals renegotiate changes to their sexual relationship in the context of cancer.

The present study addressed the call for more qualitative research that can "excavate the contours of the lived experience of cancer care" (Thomas et al., 2002), as the majority of research to date has been framed within a positivist research paradigm, focusing on measuring the impact of cancer or the caring role on carers' psychological well-being (Hodges et al., 2005) or on their sexual attitudes and behaviors (Perez et al., 2002). This neglects the subjective meanings and interpretations partners who are cancer carers have of their own sexuality and of their sexual relationship. The two research questions were: How do carers who are the intimate partner of a person with cancer renegotiate their sexual relationship following the onset of cancer and the caring role? What factors are associated with successful or unsuccessful renegotiation?

Method

Participants

Twenty Australian informal carers, who were the intimate partner of a person with cancer, were purposely selected from their participation in a larger mixed methods study examining the needs and concerns of informal cancer carers. An informal carer was defined as a partner, husband, or wife, who is the primary caregiver of a person with cancer, and who, without payment, provides a range of emotional, physical, and practical support (Heaton, 1999). From a sample of 300 carers who participated in the larger study, 156 (55 men, 101 women) who were caring for an intimate partner/patient with cancer responded to the question "does their cancer impact on your sexual relationship?" A total of 122 (78%) of the 156 partner carers reported that the onset of cancer had negatively impacted upon their sexuality and their sexual relationship and completed open-ended questions describing the changes. Sixty three percent experienced either a decrease in the frequency of sexual intimacy or a complete loss of their sexual relationship, and only 16% of participants reported being able to renegotiate their sexual relationship. Of the 46% of partner carers who indicated a willingness to be interviewed about sexuality, 20 were selected on the basis of whether they had been involved in, or were currently involved in, a sexual or intimate relationship with the person for whom they care/d, and self-reported changes to sexuality since the diagnosis of their partner's cancer, stratified by gender, cancer stage and type.

The interview sample was comprised of 13 women—11 of whom were heterosexual and 2 were lesbian, and 7 heterosexual men. The participants' ages ranged from 29 to 76 years, with a mean age of 53 years. The average age of the person for whom they care/d was 56. Eight of the participants were currently caring for a person with cancer and 12 participants had cared in the past. Of the 12 participants who had cared in the past, 5 were caring for a person who had survived cancer and were in remission at the time of interview and the remaining 7 participants were bereaved. In terms of cultural background, 18 of the participants were either Anglo-Australian or Anglo-Saxon, one participant was Filipina, and one was Italian. Of the 20 participants, 3 were caring for people with brain cancer, 4 for people with prostate cancer, 2 for people with lung cancer, 7 for people with breast cancer, 1 for a person with pancreatic cancer, 1 for a person with mesothelioma, and 2 were caring for people with a combination of bowel, liver, lung, prostate, and brain cancer.

Procedure

The research was approved by the appropriate University Research and Area Health Services ethics committees. Prior to the start of the interviews, participants were sent a consent form to sign and a letter outlining, in broad terms, some of the issues to be discussed in the interviews. The interviews were one-off and usually lasted between 60 and 90 min, and took place from May 2006 to December 2006. The semi-structured nature of the interviews meant that some predetermined questions were asked, but the questions were purposely broad and open-ended to encourage participants to share, in their own words, their experiences of their sexually intimate relationship. The interview questions guided participants to talk about: their experiences of "disruptions" to their sexually intimate relationship; feelings about their current sexual relationship; the ability to express their own sexual needs and concerns to the person with cancer; experiences of renegotiating their sexual relationship; and the experiences of the caring role. Some examples of the interview questions include: "Can you tell me a little bit about the changes to your intimate/sexual relationship since your partner's cancer diagnosis?," "How have these changes made you feel?," "Are your feelings about your intimate/sexual relationship now different from those prior to the cancer?," "How do you feel about talking about the changes to your intimate/sexual relationship with your partner?," and "Can you tell me a little bit about how caring for your partner has affected your intimate/sexual relationship?"

All of the interviews were conducted by female interviewers and were tape-recorded and transcribed verbatim. To preserve anonymity, all of the participants and the people to whom they refer have been de-identified and been given pseudonyms. The excerpts that appear have been edited only to the extent that a few irrelevant sentences and words have been replaced with ellipses, and excessive uses of colloquialisms, such as "like" and "um" have been removed. Ellipses (…) are used to indicate the removal of irrelevant sentences. Square brackets indicate certain undercurrents in the interview, such as [laughter]. When sentences trail off without further elaboration, … is used as an indicator, and … indicates a pause.

Analysis

By systematically integrating the data collection and data analysis stages, a grounded theory approach was used to generate a theory around participants' (re)negotiation of changes to sexuality in the context of cancer. Consistent with this approach, the research was largely inductive, where the concepts and categories came from the data, rather than being deductive or informed by existing preconceptions about cancer caring and sexuality (Janesick, 1994). Each interview transcript was coded, memos were attached to the transcripts, and to attain a high level of abstraction three stages of coding were employed. Author one developed an initial coding frame, and discussion and competing explanations between all of the authors, during the coding process, allowed the coding frame to be revised and refined (Barbour, 2001). To begin, the data were subject to "open coding," involving a reading of each transcript to identify "first order concepts" segment by segment (Charmaz, 2006). At this stage, labels/concepts, such as "decreased frequency of sex," "increase in masturbation," "use of vibrators," and "oral sex" were attached to pieces of the data, and thus began the initial process of data inference (see Minichiello, Aroni, Timewell, & Alexander, 1990). After creating first order concepts, "axial coding" was employed to develop categories which subsumed many of the first order concepts (Bryman & Burgess, 1994). Some of these categories were "renegotiation of sexuality," "accounting for decreases in sexuality and intimacy post-cancer diagnosis," "feelings about changes to sexuality," "couple communication and relationship context," and "alternative sexual practices." During the axial stage of coding, relationships and interactions between categories were compared and explored, new connections were made, and re-coding occurred where appropriate (McLane, Jones, Lydiatt, & Richards, 2003). As the analysis proceeded, the authors met regularly to discuss the results and discussion sections of the paper, and in the final stage of selective coding, the core categories of "alternative sexual practices-redefining sexual intimacy" and "couple communication and relationship context" were developed, which essentially linked all of the concepts and categories.

All of the partners reported that after the onset of cancer and caring they experienced disruptions to the frequency of sexual activity and sexual expression within their relationship. For 11 of these participants these disruptions led to a complete cessation of all sexual intimacy within the relationship, particularly if penetrative vaginal sexual intercourse could no longer be performed. However, 9 of the participants reported having actively renegotiated their behaviors of sexual intimacy to include practices that had previously been marginalised in relation to sexual intercourse. These 9 participants are categorized as the "renegotiators" as they reported openness to explore and incorporate previously marginalised non-coital sexual practices into their sexual repertoire after the onset of cancer and caring in order to maintain a sexually intimate relationship. The demographic characteristics of the two groups were as follows: "Renegotiators": 6 women, 3 men; cancer types-brain (2), lung (2), prostate (2), breast (3); average age 46 years; median length of time caring was 12 months with a range of 1 month-6 years. "Non-negotiators": 7 women, 4 men; cancer types-breast (4), prostate (2), brain (2), bowel & lung (1), pancreatic (1), mesothelioma (1); average age 60 years; median length of time caring 12 months, range 6 months to 27 years. In this article, we will examine accounts and explanations for the renegotiation of the sexual relationship, and contrast these with accounts of participants who reported a cessation of sex. The results will be presented under two themes: "Alternative" sexual practices-redefining sexual intimacy; and couple communication and relationship context. For detailed analysis of accounts of disruptions to the sexual relationship, and feelings about such disruptions, see Gilbert et al. (in press).

Results

"Alternative" Sexual Practices-Redefining Sexual Intimacy

The participants who reported having actively renegotiated their practices of sexual intimacy to include sexual practices that had previously been marginalized in relation to sexual intercourse demonstrated an ability to re-define the meaning of sexual intimacy outside of the coital imperative. One of the participants discussed the exploration of self masturbation, 4 participants discussed mutual masturbation, and 3 participants talked about receiving manual stimulation from the person with cancer when penetrative sex was physically difficult, as a result of the physiological effects of cancer and cancer treatments. For the male participants, masturbation was seen as a way of being sexually intimate with their partner without the fear of physically hurting her by engaging

in the type of "physical" penetrative sex they had engaged in prior to the onset of cancer. For example, Gary described how:

> (…) when making love before it was pretty physical, and it was enjoyable, you know, like, just basically straight sex and all that, but it was very physical, and afterwards when she would feel pain or something, "Oh my god," you know, like, it's "No, I can't do this." (Gary, 61 year old bereaved carer for 43 year old female partner who had lung cancer).

For one of the heterosexual women, self masturbation was positioned as a way of achieving sexual pleasure when her partner had difficulty getting or sustaining an erection. As Diana (age 44, caring for 58 year old husband with second stage prostate cancer, involving radical prostatectomy, radiotherapy, and hormone treatment) pointed out, masturbation was something "I can do for myself," which, she said, "sort of keeps me satisfied." Similarly, when asked to describe the changes to her sexual relationship since the onset of cancer, Jenny talked about the increased importance of mutual masturbation in her sexual relationship:

> Jenny: And then he started to get better, that's when we just take the opportunity when it came up and that's when, if I was feeling like it he would masturbate me or he would do something else so that he could still please me and likewise, you know, I would do anything to help him along (…)
>
> Interviewer: (…) are you able to sort of give yourself pleasure like if he wasn't there that's still ok?
>
> Jenny: Yeah, that's fine and he understands. (…) Yeah, and I mean we probably wouldn't have masturbated each other anywhere near as often as we do now… (Jenny, 29 year old carer for 33 year old husband with recurrent brain cancer, involving surgery, radiotherapy, and chemotherapy treatment).

Three of the participants also talked about engaging more frequently in oral sex with their partner, where oral sex was described as a way of being intimate that did not necessarily involve vaginal penetration. As Janice commented:

> Janice: Oh, look, we liked oral sex. He was really good [laugh]. He used to make me feel so good.
>
> Interviewer: Yeah.
>
> Janice: (…) I didn't have to have sex to feel great about this man… (Janice, 68 year old bereaved carer for 69 year old husband with brain cancer).

Similarly, there was one participant, Ed, who, when talking about the "alternatives" to penetrative sex, said that he and his wife were exploring both oral sex and the use of vibrators:

> We're trying to explore oral. (…) That's both ways, it's not just her on me, it's both ways. She has the biggest problem with me on her. We've explored the use of vibrators, not greatly at the moment (…) we did a couple of times during chemo, but you've got to be very careful because if you over-sensitize something there are other reactions. (Ed, 54 year old carer for 52 year old wife with second stage breast cancer, involving radiotherapy treatment).

Although he initially thought his sexual relationship would not "return to what it used to be, but return to the best we can get," in the extract below Ed described how he and his wife could "maybe even make it better," through the exploration of alternatives.

> Ed: If we continue to explore alternatives, then maybe some will work and we can come out of it and put together a reasonable physical relationship again. Maybe even a better one.

Practices such as hugging, kissing, and giving and receiving affection were mentioned by all 9 of the renegotiators. These practices were described as sexually satisfying and rewarding and not positioned by participants or the people with cancer as "foreplay." For example, Jenny described how, despite being initially frustrated and unable to negotiate the lack of penetrative sex within her relationship, "At first I would just walk out of the room and just get furious because I still wanted it," she now enjoys a whole range of "other ways" of being intimate with her partner, independent of coitus, such as falling asleep "holding each other" and "kiss(ing) like nothing else:"

> (…) we never used to do massage whereas now, now we'll buy nice smelling oils and massage and candles (…) probably the biggest thing is we put more effort into it now (…) I mean I think that's good. (…) we both now know that if he loses an erection half way through then he'll find another way to help me to climax and that's fine.

Jenny was not alone. John (age 31, carer for 30 year old wife now in remission from breast cancer, involving surgery and a course of radiotherapy treatment) said that although penetrative sex had decreased since the onset of cancer, there was "certainly other affection" within their relationship, including "lots of snuggling, canoodling on the couch." Similarly, Diana talked about how touching and kissing enables her to maintain a "very close" relationship with her partner. Both of the lesbian participants described a renegotiated sexual relationship in these terms. As Debbie (age 61,

bereaved carer for 52 year old female partner who had lung cancer) said, she and her partner "got used to being very, very intimate and very cuddly and kissy and all that but not necessarily getting full-on into huge amounts of sexual activity."

For 6 of the participants, this renegotiated intimacy was positioned as having brought them closer together, as John said, he "probably has a more affectionate relationship at this point in our lives, and marriage" than prior to the onset of cancer. Ed also said, "these cancers either blow the relationship apart or they pull you closer together." For Bella, who says that she and her husband are "a very affectionate couple," there is "still the same level of intimacy regardless of the sex there between us." In fact, when referring to her sexually intimate relationship, Bella said that "maybe the cancer thing has brought us closer together," and went on to say that:

> I mean we didn't need to do acrobatic flip-flops or anything to feel that we are closer together because our relationship is rock solid (…). (Bella, 36 year old carer for 59 year old husband in remission from early stage prostate cancer, involving surgery).

In contrast, the two thirds of participants who had not renegotiated sexuality in the context of cancer gave accounts which were in accordance with the coital imperative. For example, when asked if she and her husband were intimate, Connie (age 70, caring for her 81 year old husband with advanced prostate cancer, involving radiotherapy and chemotherapy) said that they had not had "full sex" for many years. "Full sex" according to Connie was penetrative vaginal/penis intercourse and was "real sex." Any other practice of sex or intimacy was discounted in Connie's account. Other women whose partners were no longer able to get and sustain an erection due either to prostate surgery and treatment, or treatments for other cancer types, commonly reported that considering their own sexual needs "wouldn't have been appropriate" (Maxine, age 67, bereaved carer for her 85 year old husband who had prostate, bowel, lung and brain cancer). Although suppression of their sexual needs was described as distressing by these women, their own sexual needs were positioned as secondary to the risk of their partners' feeling inadequate about their masculinity.

The complexity of this issue is illustrated by Melanie, who talked about the importance of an erection to a man's sense of identity.

> Melanie: Oh well, there's no erection (…) And I just think well why get yourself all stimulated if you can't do anything anyway. I mean he'll get frustrated. He is already frustrated enough knowing that he's not what he was, and I think me trying to make him even be aroused or be intimate is going to frustrate him more. So better to leave that one alone.
>
> Interviewer: Yeah, yeah.
>
> Melanie: If we don't even go there then we don't have to deal with the fallout of you can't do it, I'm left in mid air. And I've spoken to different ones about it and like just fellows that have had prostate cancer and of course the first thing they always say to Derek is you know, is it still working and whatever, because it's a male thing. I don't think every woman would put so much emphasis on it as the males do. It's just the be all and end all, and when it's not there it's, they're just so crushed and they don't feel as if they're a man anymore, and oh my God, their life's, it's just not worth living anymore if they can't do it. (Melanie, 52 year old carer for 55 year old husband with early stage prostate cancer, involving chemotherapy and hormone treatment).

Melanie questioned the constructed centrality of an erection to masculinity, "I don't think every woman would put so much emphasis on it as the males do," while at the same time implicitly suggesting that because "there's no erection" her sexual needs can no longer be met by her husband and as a result she'll be "left in mid air." Melanie thus appears, paradoxically, both to be complicit in discourses surrounding hetero-normative sexuality, and resistant to them. Her comment, "they're just so crushed and they don't feel as if they're a man anymore," provides an explanation for her lack of initiative in attempting to renegotiate sexuality in the context of cancer: her fear of the effect on her husband's masculine identity if the issue of sexuality were raised.

Couple Communication and Relationship Context

The predominant explanation given by participants for their ability to renegotiate the sexual relationship in the context of cancer was positive communication and a good relationship context. Participants who gave accounts of renegotiation described being able to communicate about their sexual needs and concerns with the person with cancer, as well as having positive experiences within the relationship more generally. Although it was not necessarily comfortable or "easy" for these participants to express their own sexual needs and concerns to the person with cancer, "making the effort" to communicate was described as rewarding both for their sexual relationship, and the couple relationship more generally. For example, when asked if she felt she could express her concerns about the changes to their sexual relationship, Jenny stated that she and her husband "always promised to always have really good communication before this happened" and they have both "really made an effort to keep that going" throughout the cancer journey. Jenny continued that although it is often difficult to negotiate, she and

her husband continue to invest time and effort in maintaining their sexually intimate relationship:

> We went away last weekend, we met his mum in [name of town] for Mother's Day so we made a weekend of it and so, you know, he surprised me with booking a double spa, like things like that. We knew where we were going and we knew the hotel and I knew the hotel but he, you know, rung up and said I want to upgrade to a double spa. So, like he knows how to make me feel special and he hasn't lost that. So I think that's good.

Similarly, Ed noted that he and his wife "have had a number of discussions over, say the last 6 months" about the changes to their sexual relationship. These discussions "sometimes" made Ed "feel very bad" because he feels as though he is "talking to her about something which, in a sense she is the cause, and she's already got enough on her plate." However, Ed thinks these discussions are "something that has had to be done." When asked how he wife has responded to these discussions, Ed said that:

> Her response has been quite understanding. She admits to the fact that even now her own desires are down low, lower than she'd like them to be, but it's just something we, it's got to be worked on and resolved as a couple not as a single person.

Like Ed, Bella indicated that although it made her "feel guilty" to talk about her sexual needs and concerns, because her husband "didn't need to hear all that" as "he was the victim," she reported that communication was important to maintaining their "rock solid" relationship. The two lesbian participants also reported being in relationships where they could openly communicate about their sexual needs, with Jessie (36 year old carer for 38 year old female partner in remission from early stage breast cancer) saying "we discussed it a lot" and Debbie saying that "if there was a need for something else (sexually) then one or the other would say so."

These accounts stand in contrast to the accounts of those who did not renegotiate sexuality or intimacy in the context of cancer, who reported having negative sexual experiences within the couple relationship more broadly, and being unable to communicate about their sexual needs and concerns with their partner. For example, Ben (51 year old carer for his 45 year old wife in remission from breast cancer) talked about how he felt "more serviced (sexually) through most of the relationship," resulting in his feeling "emotionally abused." Ben reported that their sexual relationship "was never brilliant." When asked to think back to a particular time when, post-cancer diagnosis, he asked his wife to explore masturbation as a way of being intimate, Ben recounted that his wife wanted him "to hurry up" and that he "could feel from her hand that she was not that interested." Ben said that his experience of his wife's lack of interest in masturbating him made him feel like he was asking her to do a "chore," as well as making him feel "rejected, or not wanted, or not being good enough."

Melanie also indicated that it was often difficult for her to express her feelings and sexual needs to her husband, a concern shared by Margaret (age 71, bereaved carer for 75 year old husband who had bowel, lung and liver cancer) who said that she was "used to having a virtually non-existent, lousy sex life for over [pause], for some many years prior to cancer." Margaret suggested that the lack of discussion within her relationship about sex was "perhaps a lot to do with the fact that we are products of the 1950s" and because "he was brought up in an atmosphere of 'you don't talk about it'." Similarly, Sean (age 64, caring for 55 year old wife with early breast cancer, involving radiotherapy and chemotherapy treatment) said that the sexual communication within his relationship was "not perfect," and that one of the "problems" within his relationship, both pre-cancer and during the cancer journey, has been his wife's low libido. Although Sean sees his and his wife's incompatible libidos as problematic, he is "not talking to her about it" because he does not "want to put that stress on her," and has "resisted imposing that on her."

Other participants of both genders described the way in which the caring role and the kinds of care provided—care that is often similar to that provided to a child—led them to see their partner as childlike or as an asexual sick person (Gilbert et al., in press). These positionings made it difficult for these participants to continue to see their partner as a sexual being. For example, Sarah (age 57, caring for 53 year old husband with advanced brain cancer, involving chemotherapy treatment), stated that her sexual relationship has been redefined from that of a sharing intimate relationship to one that she would have with her children: "it's like looking after one of your children now [pause] you don't have any sexual feelings for your children." As Melanie explained, helping her husband with bathing, assisting him in the bathroom, and shaving him, meant that she no longer saw him as sexual, "they're not the person that they were (…) they're now this person that you care for" and that her husband "could be my brother or whatever, because I don't have any physical attraction towards him whatsoever."

Discussion

After the onset of cancer, all of the participants interviewed in this study reported decreases in the frequency of sexual activity and in the level of sexual expression within their relationship, confirming previous research (Maughan et al., 2002; Soothill et al., 2003; Thomas et al., 2002). For a proportion of the participants, the disruptions meant that they no

longer shared any sexual intimacy and were unable to negotiate other ways of being sexually intimate when penetrative sexual intercourse was no longer physiologically possible or desirable, again confirming previous reports (Kuyper & Wester, 1998; Pope, 1999). However, a number of the participants were able to renegotiate sexuality in the context of cancer, and their accounts of this experience provide us with insight into the reasons couples report difficulties in this arena, as well as providing indicators as to how the renegotiation process might be facilitated by health professionals. This is an issue that has been not been examined in previous research in the area of cancer caring and sexuality.

Participants who reported actively renegotiating their experiences of sexual intimacy to include practices that had previously been marginalized to penetrative sex—including mutual masturbation, self masturbation, manual stimulation, oral sex, massage, the use of vibrators, kissing, and hugging—were able to resist the coital imperative and redefine their experience of sexual intimacy. The fact that the two lesbian participants were able to re-negotiate their sexuality is not surprising; they are already outside of the heterosexual matrix (Butler, 1993) which reifies the coital imperative. However, a number of heterosexual participants were also able to negotiate non-coital ways of being intimate, that may have initially been positioned as "alternatives," and for some were positioned as less satisfying than intercourse, however over time these alternatives come to be reconceptualised as the norm. Indeed, for these participants, maintaining close physical contact was reported to be fundamental to the overall wellbeing of their relationship, and in most cases, participants stated that the onset of cancer had brought them and their partner closer together, confirming previous research (Rolland, 1994; Walsh, Manuel, & Avis, 2005), as well as evidence of benefit finding following cancer (Tomich & Helgeson, 2004).

In contrast, participants who did not report sexual renegotiation in the context of cancer appeared to be invested in hegemonic discourses of heterosexuality and the coital imperative. In particular, a number of heterosexual women participants whose partner was not able to get and sustain an erection due to the effects of cancer, reported distress about the fact that their own sexual needs could no longer be met, but actively subordinated their own distress and sexual needs, so that their partner did not feel inadequate about his masculinity. Their protectiveness was not misplaced. There is a wealth of research which shows that for men who have undergone treatment for prostate cancer, their lack of ability to perform sexually causes them to feel less "manly" (Powel & Clark, 2005). However, regardless of cancer type, the reluctance to explore alternative ways of being intimate on the part of the non-renegotiating partner carers appears to be based on a shared assumption that "real sex" is penetrative vaginal intercourse, and that there are no viable alternatives—the coital imperative. It is not surprising that the average age within this group of participants was greater than in the group who did renegotiate sexual intimacy, as "alternative" sexual practices have been reported to be less common or acceptable in older age groups (Sundquist & Yee, 2003).

Given our finding that some participants are able to actively renegotiate their sexual relationship, we would argue that the onset of cancer can actually open up for people with cancer and their partners a space to transgress and call into question the taken for granted nature of heterosex. In fact, in his examination of human corporeality as a site of transgression, Williams (1998) raised an issue similar to that being argued here, that of "dys-appearing' bodies"—the idea that we only know our body when it is dysfunctional. For both people with cancer and their partner, it appears that the onset of illness, where pain, fatigue, and physiological disruption make the normalised idea of penetrative sexual intercourse impossible, is a turning point that allows them to transgress the norm of heterosex and to explore "alternatives" to this norm, as has previously been reported in the context of erectile dysfunction (Potts, 2006; Warkentin et al., 2006). It appears that discourses of intimacy become more salient than discourses of heterosex for couples during the cancer journey.

The sexual relationship context in which participants find themselves was crucial to their ability to openly negotiate "alternative" sexual practices. Willingness on the part of the participants to "make the effort" to maintain intimacy, and to openly communicate with their partner about their own sexual needs and concerns, were central to the sexual renegotiation process. Although many of these participants found it difficult or uncomfortable to talk about their own sexual needs to their partner, because they did not want to "burden" the person with cancer they persisted with the discussion, and were able to reach an understanding about the kinds of sexual practices and activities that would work for themselves and the person with cancer (see also Lemieux et al., 2004). In contrast, many of the participants who have not renegotiated their sexual relationship reported poor levels of communication, and avoiding communication with their partner.

As other studies in the area of cancer and sexuality have shown, couples who find it difficult to communicate about sex have more problems related to sexual functioning, and more partner-related concerns, including feelings of isolation, anxiety, depression (Germino et al., 1995), distress (Anllo, 2000; Mulley, 1998), and inadequacy (Sabo, 1990). Equally, poor communication results both in decreased relationship satisfaction and decreased sexual satisfaction (Boehmer & Clarke, 2001; Byers, 2005), a cyclical pattern that needs to be addressed by health care professionals if couples are to be assisted with their sexual satisfaction (McNeil & Byers, 1997), relationship satisfaction (Gottman & Krokoff, 1989; Young, Denny, Luquis, & Young, 1998), as

well as their experiences of intimacy and affection (McCabe, 1999) and overall psychological well-being, after the onset of cancer (Lemieux et al., 2004).

The caring role and its impact upon participants' experiences of sexuality and their sexual relationship was reported to make it difficult for some to renegotiate their sexual relationship, or to maintain any sexual intimacy within the relationship. This lack of renegotiation was due in large part to a repositioning by participants of the person with cancer as a child or an asexual sick patient rather than a sexual person, confirming patterns found in other spheres of health care (Parker, 1990; Pope, 1999). Kelly and Field (1996) have discussed this issue in the broader context of chronic illness, and argue that the onset of illness not only changes the physiology of body but also changes a person's sense of self and the way in which "others" define or position them. That is, the ill person objectifies themselves as someone who is in pain and experiencing discomfort and others define and actively position the person as "sick." Here, both the ill person and others construct and confirm a new identity for the ill person. Although there has been some recent work done in Australia that has explored how individuals and their partner negotiate their experiences of their body and sexuality after stoma surgery (see Manderson, 2005), this work has not specifically looked at sexual renegotiation following the onset both of cancer and caring, and this, as our findings show, is an area in much need of further attention.

There are a number of limitations of the present study. The majority of participants were heterosexual and from Anglo-Australian backgrounds. Future research should examine the different ways in which sexuality is experienced and negotiated in the context of cancer across a range of cultural groups, where sexuality may have a very different meaning from that described in this study, given the socio-cultural construction of sex (Varga, 1997). It is also important for research to include a focus on sexuality in gay male and lesbian relationships in the context of cancer, as there is evidence that non-heterosexual relationships differ from heterosexual relationships in a number of spheres that are relevant to research on cancer and sexuality, including communication, connectedness, and negotiation of conflict (Connolly, 2005; Green, Bettinger, & Zacks, 1996; Kurdek, 2003). In the present study, concerted attempts were made to recruit gay and lesbian participants, with only two lesbians volunteering to be interviewed, limiting the ability to generalize beyond these two accounts. Equally, while a range of cancer types and stages was included in the sample, systematic differences across cancer stage or type was not able to be conducted, due to the relatively limited sample size. For example, it may be that people caring for a partner with brain cancer have issues relating to memory loss or reduced cognitive functioning that impact upon their sexual relationship differently than for people caring for a partner with breast cancer. Future research could use mixed methods, including qualitative and quantitative measures, and a larger sample size, to examine these issues. Finally, we only interviewed the partner carers in this research. Future research could usefully include both the person with cancer and their partner, allowing analysis of their different perspectives and accounts.

Given that sexuality and intimacy is a central feature of relationship satisfaction and quality of life (Daker-White & Donovan, 2002), and is instrumental in helping couples manage the experience of cancer (Schultz & Van de Wiel, 2003), it is paramount that research addresses both the mechanisms through which a renegotiation of sexual practices in the context of cancer can occur, and the factors that impinge upon a couple's ability to do so. The findings of the present study suggest that couples can challenge or resist hegemonic constructions of sexuality which legitimate the coital imperative, however, it is notable that not one interviewee discussed having received professional advice or support in this process.

The importance of health professionals facilitating discussion and renegotiation of sexuality and intimacy in the context of cancer has been emphasised in recent research (Hordern & Street, 2007a, b), and in psychosocial guidelines for the care of people with cancer in Australia (National Breast Cancer Centre and National Cancer Control Initiative, 2003). However, it has been reported that few health professionals engage in such discussions, even in areas where it might be expected, such as ovarian cancer (Stead, Brown, Fallowfield, & Selby, 2002). Equally, while a range of psychosocial interventions have been developed for both people with cancer and their carers, few interventions include consideration of sexuality and intimacy, and even if they do, sexuality is positioned as merely one aspect of the cancer experience that couples need assistance with (e.g., Helgeson, Lepore, & Eton, 2006; Wardle et al., 2003). At the same time, sexuality focused interventions that do exist tend to focus on restoring sexual functioning (for an exception see Brotto et al., 2008), rather than on examining the quality of intimate physical contact, or renegotiation of sexual relationships through the development of alternative practices (Hordern & Street, 2007a). Interventions also focus on "sexual" cancers, such as prostate (Manne, Babb, Pinover, Horwitz, & Ebbert, 2004), or breast cancer (Lethborg & Kissane, 2003; Manne, Kendall, Patrick-Miller, & Winkel, 2007; Marcus et al., 1998), with little offered to address the needs and concerns of couples living with other types of cancer. The findings of the present study demonstrate that cancer can impact on sexuality and intimacy in both "sexual" and non-sexual cancers, and that cancer type may not necessarily predict renegotiation. This suggests that sexuality and intimacy, in the context of a couple's ongoing relationship and communication patterns, need to be considered by health professionals working across all areas of cancer.

Health care professionals can play a significant role in legitimating discussion of sexuality in the context of cancer and cancer caring and "give permission" for couples to be sexually intimate following the onset of cancer (Schwartz & Plawecki, 2002). This could involve psycho-education related to the effects of cancer and its treatments on sexuality and sexual functioning (Rees, Bath, & Lloyd-Williams, 1998), as well as challenges to hegemonic discourses of sexuality which emphasis the coital imperative (Liao, 2003). Discussing issues surrounding sexuality with health care professionals would not only inform people with cancer and cancer survivors about what to expect in terms of cancer and caring on sexuality, but may also act in an empowering way to give licence to couples to discuss these issues together-helping open the lines of communication about sexual issues, and potentially avoiding irrevocable relationship problems, as well as supporting the person with cancer, and their partner, through the relational aspects of the cancer journey.

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