

What is Sexual Orientation and Do Women Have One?

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Recent research has focused increased attention on sex differences in the expression of sexuality, including sexual orientation (e.g., Baumeister, 2000; Diamond, 2003). There is an emerging consensus that women's sexual partner choices are sometimes made for different reasons than men's. For example, women are thought to have greater erotic plasticity than men, meaning that their sexual behavior is more apt to be shaped by sociocultural factors (Baumeister). Furthermore, women's sexual desire may be more "fluid" than men's, less rigidly directed toward persons of a particular sex and more changeable over time, depending on relational factors such as romantic attachment (Diamond, 2008).

One strong candidate for a primary mechanism underlying these differences is a striking sex difference in sexual arousal patterns (Chivers, Rieger, Latty, & Bailey, 2004; Chivers, Seto, & Blanchard, 2007). Men, but not women, have a category specific sexual arousal pattern, one that is usually directed much more strongly to members of one sex than to those of the other. For example, almost all men who identify as homosexual are more sexually aroused by men than by women. In contrast, the arousal pattern of heterosexual women tends to be bisexual, and thus irrelevant to most women's partner choices. That is, women who identify themselves as heterosexual tend to be similarly aroused by male and female sexual stimuli. The category specific male sexual arousal pattern is the primary sexual motivation that directs male sexual activity to certain kinds of individuals (most often women, but sometimes men) rather than others. Indeed, I contend that a man's category specific sexual arousal pattern *is* his sexual orientation. Most women lack this strong directional motivation, and so it is not surprising that their sexual behavior is more malleable and sexually fluid.

In this chapter I begin by proposing some definitional distinctions in order to clarify what sexual orientation is not. I review research on the male sexual arousal pattern and argue for equating sexual arousal pattern with sexual orientation. Next I review recent findings on the sexual arousal patterns of women and address some methodological concerns. I conclude with a reconsideration of the idea of women's sexual orientation.

What is Male Sexual Orientation?

Sexual behavior pattern refers to one's history of sexual and romantic relationships with men vs. women. *Private sexual identity* refers to how one conceives of oneself, and *public sexual identity* refers to how one wishes to be considered by others. *Sexual preference* refers to the ultimate choice that one would make, on whatever grounds, regarding the sex of an erotic partner. (Note that here I do not consider "sexual preference" to be synonymous with sexual orientation.)

To clarify these classifications, it is useful to consider how they might differ within a single individual. For example, a man married to a woman but who engages in secret sexual relationships with other men might consider himself bisexual; this would be his private sexual identity. He might well want his wife to consider him heterosexual, and if so, this would be his public sexual identity, at least with respect to her. He may claim a different sexual identity with his male partners. (Public sexual identity can vary across contexts.) This hypothetical man's sexual preference might conceivably be heterosexual, bisexual, or homosexual. For example, he may strongly prefer female partners due to religious beliefs that homosexuality is morally wrong and hence have a heterosexual preference. He may strongly prefer male partners due to intense sexual attraction and thus have a homosexual preference. Or he may have difficulty deciding and have a bisexual preference.

The concepts I have introduced so far can be applied similarly to both men and women. They are all potentially malleable. Any of them might be complexly determined, that is, may reflect the influence of more than one factor. Indeed, sexual feelings need not be the primary determinant of any of them. Finally, although only one of them, public sexual identity, is defined in terms of some kind of self-report, all of them depend on self-report. Unless and until we have major advances in lie detection, that is all we have.

The term *sexual orientation* connotes a mechanism, analogous to a compass, that directs our sexuality. Furthermore, sexual orientation is generally considered to reflect sexual feelings rather than other factors, such as social constraints. Sexual orientation is commonly described in terms of sexual desire, arousal, fantasy, and attraction. Of these, only one, arousal, can be measured directly and independent of self-report. In the next section, I argue that for men, sexual orientation should be conceived of as a sexual arousal pattern.

The Measurement of the Male Sexual Arousal Pattern

Heterosexual men are much more sexually arousable by attractive women than by attractive men, and feelings of sexual arousal are often accompanied by penile erections, which can be measured. Homosexual men show an opposite pattern, with greater arousal to attractive men. These assertions seem obvious, and they have also been demonstrated repeatedly in the laboratory using psychophysiological studies

(e.g., Chivers et al., 2004; Freund, 1963; Mavissakalian, Blanchard, Abel, & Barlow, 1975). In these studies, experimenters present different kinds of erotic stimuli to homosexual and heterosexual men and measure their genital response. The relative arousal to different types of stimuli is an objective, but imperfect, measure of a man's sexual arousal pattern.

In these studies stimuli typically consist of pictures, audiotaped narratives (sometimes presented with pictures), or video clips. Men typically find video clips to be the most arousing stimuli (Julien & Over, 1988). Furthermore, video clips of couples engaged in explicit sex acts are generally more arousing than videos of individuals (Chivers et al., 2007). An effective combination of stimuli to assess male sexual arousal patterns includes videos of attractive male couples, and of attractive female couples, engaged in explicit sexual activity (Chivers et al., 2004, 2007; Mavissakalian et al., 1975; Sakheim, Barlow, Beck, & Abrahamson, 1985). Homosexual men show much greater arousal to videos of the male couples, and heterosexual men to the female couples. Although at first it may seem that the most appropriate stimuli to assess heterosexuality would depict heterosexual couples, this is not so. A heterosexual couple consists of a man and a woman, and thus, both homosexual and heterosexual men can be aroused by watching such a couple, presumably by focusing on the actor of their preferred sex. Indeed, homosexual and heterosexual men tend to experience similar degrees of arousal to videos of heterosexual couples (e.g., Chivers et al., 2004).

Men's erections to each stimulus are measured using penile plethysmography (PPG). There are two general types of PPG. Volumetric PPG relies on changes in air pressure in a small glass cylinder that contains the penis (Freund, 1963). Circumferential PPG measures change in penile girth most commonly using a stretch-sensitive metal-in-rubber gauge; a weak electrical current runs through the metal and changes when penile erection changes its shape (Bancroft, Jones, & Pullan, 1966). Volumetric PPG is more sensitive at low levels of genital arousal (Kuban, Barbaree, & Blanchard, 1999). This is because in the early stages of erection, the penis tends both to lengthen and also to decrease in circumference, with volume increasing. Unfortunately, the volumetric device is expensive and invasive (it must be attached by an experimenter), and it is used in only a few laboratories worldwide. The circumferential PPG, in contrast, is common, and it is the technique used by my lab.

I have gotten this far without defining sexual arousal. Most researchers conceive of sexual arousal as having physiological, affective, and cognitive components, and these components can be dissociated (e.g., Janssen, Everaerd, Spiering, & Janssen, 2000; Wiegel, Scepkowski, & Barlow, 2007). Sexual arousal is an emotion and hence depends on more than penile erection. In men who are awake, penile erection is usually accompanied by sexual arousal; indeed, penile erection usually requires such arousal. (Healthy men who are asleep often experience spontaneous "nocturnal" erections, and it is doubtful that this represents sexual arousal as I mean it.) The converse is not always true, however. Men are capable of feeling sexual arousal without a measurable erection. This is particularly true of older men and of men with erectile dysfunction. The main point here is, again, that a sexual arousal pattern is

not equivalent to relative erection to different kinds of sexual stimuli. Most men who do not become genitally aroused to any stimuli in a laboratory assessment report that they do feel such arousal to at least some of the stimuli. And presumably all such men have some kind of sexual orientation. As I conceive of it, male sexual arousal is an imperfectly measured latent variable, and erectile measures are good, albeit imperfect, objective indicators of it.

Not all men produce erections in the laboratory, and those who do not do so cannot be accurately classified with respect to arousal pattern. One cost of using circumferential PPG is that depending on one's selection criteria, a high percentage of men may have to be excluded due to insufficient responding. Such men are called nonresponders. It is common to require at least a 2.5-mm increase in circumference to at least one sexual stimulus, relative to response to neutral stimuli. Experimenters using this criterion in a recent study excluded only 4% (2/46) of their sample (Chivers et al., 2007). In a similar study using more stringent exclusion criteria, one-third (23/69) of men were excluded (Chivers et al., 2004). The best criteria for demarcating nonresponders depend on one's purpose, but it is clear that the more men respond, the more accurately they are measured. For example, in the aforementioned study with high exclusion rates (Chivers et al., 2004), three men's genital arousal patterns did not match their self-reported sexual orientation. Although these men met the cut-off criteria for responding, they barely did so; on average their response indices were substantially lower than those of the 43 other included men. With respect to their subjective, self-reported, sexual arousal, each of the three poorly measured men reported that he felt more sexually aroused by the stimuli consistent with his self-reported sexual orientations, and I believe their self-reports. As I have noted, sexual arousal patterns are not identical to genital arousal patterns produced in the laboratory. The latter are objective, often very good, measures of the former, but they contain measurement error.

PPG is not the only possible objective way to measure male sexual arousal patterns. As with all other emotions, sexual arousal is dependent upon the brain for its realization. Advances in neuroimaging techniques allow the possibility of assessing sexual arousal by observing brain activity. In principle, this would be a more direct measure compared with PPG, and it would also be more sensitive. The psychological experience of sexual arousal typically precedes, and can occur without, erection. Thus, fewer men may be nonresponders with brain imaging techniques compared with PPG.

Another scientific advantage of brain imaging as a tool for assessing sexual arousal patterns concerns its multidimensionality. Penile measures are unidimensional – the penis only gets larger or smaller (if it responds at all). In contrast, sexual arousal is undoubtedly complexly determined, the sum of excitatory inputs (e.g., strength of erotic stimulus) and inhibitory inputs (e.g., fatigue, conscious suppression of arousal). Because neurological data are multidimensional, they may be more useful for unraveling the complex determinants of sexual arousal. They are certainly more useful in exploring relevant brain systems. This multidimensionality is an advantage for long-term scientific progress, but it is a disadvantage in the short term. PPG measures are straightforward and uncontroversial as measures of sexual arousal.

We have not yet mapped out the relevant neural architecture, and so assessing sexual arousal patterns with fMRI is less straightforward and more controversial.

My lab has conducted an fMRI study of sexual arousal and male sexual orientation (Safron et al., 2007). We recruited 11 homosexual men and 11 heterosexual men, classified based on their self-reported identities. They viewed erotic and control stimuli in an fMRI scanner. Erotic stimuli consisted of pictures of either single nude men or women or of male or female couples engaged in explicit sexual interactions. Control stimuli consisted of pictures of men or women playing sports, again either singly or in pairs. There were four experimental blocks during which a man saw 100 randomly ordered stimuli. Each picture was presented for 3.5 s followed by a 1.5-s interstimulus interval. Participants also pressed buttons to indicate their subjective appraisal of each stimulus.

Analysis of fMRI data consists of determining differences in brain activation between different conditions or contrasts. We were especially interested in the contrasts of activation to preferred erotic stimuli (i.e., male sexual stimuli for homosexual men and female sexual stimuli for heterosexual men) vs. control (i.e., sports) stimuli as well as activation to nonpreferred erotic stimuli (i.e., male sexual stimuli for heterosexual men and female sexual stimuli for homosexual men) vs. control stimuli. We were also interested in whether these contrasts differed between homosexual and heterosexual men.

For the most part, homosexual and heterosexual men showed very similar patterns of activation (albeit to different erotic stimuli). One possible exception was the amygdala, in which homosexual men showed greater activational differences between preferred and nonpreferred erotic stimuli compared with heterosexual men. However, this difference was not hypothesized a priori, was not large, and was the only group difference found out of many tested. Thus, this finding needs replication.

When preferred erotic stimuli were compared with neutral stimuli, we saw widespread greater brain activation to the former; that is, much of the brain is activated to a greater degree by preferred erotic stimuli than by neutral sports stimuli (Fig. 1a). Areas showing this pattern include the primary and higher-order visual processing areas, regions associated with directed attention (e.g., the anterior and posterior cingulate), regions associated with motivation and reward (e.g., the basal ganglia, the medial orbital frontal cortex, and the ventral striatum). Although fMRI is not the most powerful way to image these structures, the dorsal amygdala and hypothalamus also showed greater activation to preferred sexual stimuli.

The contrast of nonpreferred erotic stimuli vs. neutral stimuli looks much different (Fig. 1b). There is much less significant activational difference across brain regions, and what activational differences there are tend to favor the neutral (sports) stimuli. We had hypothesized that the insula might show greater activation to nonpreferred sexual stimuli than to control stimuli, because some research has suggested that the insula plays a role in processing disgust (e.g., Phillips et al., 1997). This hypothesis was not confirmed, however.

We selected brain regions of interest – areas that should be active during sexual arousal – based on available literature on imaging and sexual arousal, and were able to determine that 16 of the 22 participants showed significantly greater activation

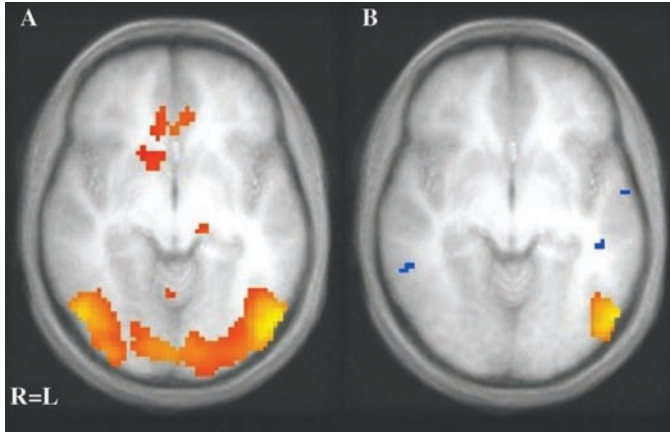


Fig. 1 Areas of differential activity to preferred vs. nonpreferred stimuli ((a): increased activity to preferred stimuli shown in *orange*) and nonpreferred vs. sports stimuli ((b): increased activity to sports stimuli shown in *blue*). Sports images contained actors of the participants' preferred sex. Axial slices are at $Z = -3$ (right = left, according to standard radiological convention)

in these areas to erotic stimuli of one sex than to erotic stimuli of the other sex. (The six participants who did not show significantly greater activation can be thought of as neural nonresponders in our study.) Of these 16 men, 15 had brain activity that matched their stated sexual orientation. The exception was a man who reported that he was heterosexual. This man, however, had an unusual pattern of ratings of the erotic stimuli. He was much more likely than other heterosexual men to admit that he liked male erotic stimuli, and he was much less likely to say that he disliked or strongly disliked it. Our results suggest that fMRI is a promising technique for measuring sexual arousal patterns, even at the level of individual men.

A Man's Sexual Arousal Pattern is his Sexual Orientation

Recall that I described *sexual orientation* as a mechanism that directs a person's sexual desire, fantasies, and attractions. To see that a man's sexual arousal pattern is the best contender for the meaning of *sexual orientation*, consider the following hypothetical, not unrealistic, person. A heterosexually married man insists that he is attracted only to women and tells people he is heterosexual. But in the laboratory he gets erections to male sexual stimuli, and he does not get erections to female sexual stimuli. What is his sexual orientation? No matter what he truly believes (i.e., no matter what his private sexual identity), no matter whom he prefers to have sex with (i.e., regardless of sexual preference), and no matter whom he chooses as his sex partners, I contend that his sexual orientation is homosexual. A man who experiences sexual arousal for men but not for women cannot plausibly be considered *sexually* oriented to women.

Sexual arousal patterns have the advantage of being objectively measurable, but it is not objective measurement that privileges sexual arousal pattern as the meaning of sexual orientation. Rather, it is because a man's sexual arousal pattern is the sexual input that orients his sexual preference. For example, the much stronger sexual arousal that a homosexual man feels for attractive men than for attractive women is strong motivation for him to pursue men as sex partners, despite the disincentive of occasional societal approbation. It induces approach motivation, inspires sexual fantasies, and facilitates sexual interactions. If a man with a homosexual arousal pattern decides to pursue sex with women, then he does so for nonsexual reasons.

Predominant sexual arousal for women is the most common male sexual arousal pattern, and it is evolutionarily adaptive. Obviously in evolutionary history men who had a heterosexual arousal pattern (hence a heterosexual orientation) had a reproductive advantage over men with arousal patterns which motivated them to pursue sexual interactions with people (and things) other than fertile women. A heterosexual arousal pattern motivates men to seek women as sex partners, and it facilitates sexual intercourse with (and hence fertilization of) them. Only slightly less obviously, men with a heterosexual arousal pattern had an advantage over men with indiscriminate arousal patterns, or with no sexual arousal at all. The existence of male sexual arousal patterns producing maximum arousal to people (or things) other than fertile women remains evolutionarily mystifying. Of course, this fact is irrelevant to how socially acceptable nonheterosexual arousal patterns are; to assume otherwise is to commit the naturalistic fallacy. Some putative evolutionary adaptations are not at all admirable (e.g., the propensity to be sexually unfaithful under certain circumstances), and most (such as a heterosexual arousal pattern, compared with a homosexual arousal pattern) are morally neutral.

I do not mean to suggest that sexual arousal is the only motivational factor that attracts heterosexual men to women, or homosexual men to each other. For example, attachment in a long-term relationship is often much more important than sexual desire. I continue to insist, however, that one's sexual arousal pattern has the best claim on the meaning of sexual orientation. A sexual arousal pattern is both sexual and orienting.

One consequence of the view that a man's sexual orientation is equivalent to his sexual arousal pattern is that answers to questions about male sexual orientation may ultimately require the objective assessment of sexual arousal. One example is whether male sexual orientation can be changed. Perhaps the best-known investigation of this question was conducted by Spitzer (2003), who interviewed 143 men (as well as 57 women) who had sought help in changing their sexual orientations. Spitzer concluded that indeed, many men (and women) were capable of genuine changes in their sexual orientation. Spitzer regretted that employing PPG measures was "not feasible" in the study. In my view, claims that male sexual orientation can be changed should be viewed with great skepticism unless and until a study using PPG (or perhaps eventually, fMRI) shows this quite clearly.

Pedophilia: A Case Study of the Motivating Force of a Sexual Arousal Pattern

Arguably, the motivational aspects of a sexual arousal pattern can be most clearly observed in an example in which sexual arousal pattern is dysfunctional: pedophilia. Pedophiles are men who are more sexually aroused by children than they are by adults of either sex. That is, their sexual orientation is toward children. Not all men who have sexually molested children are pedophilic in this sense (Seto, 2007, Chapter 2). Among child molesters, a PPG-assessed arousal pattern consistent with pedophilia is a good predictor of recidivism (Hanson & Morton-Bourgon, 2005), which is a good indicator of the motivation to molest children. Although there has been interesting historical variation in the degree to which adult-child sexual interactions are tolerated (e.g., Jenkins, 1998), intolerance of pedophilic acts has been most common and often severe. Pedophiles risk societal disapproval and their own freedom, if they act on their arousal pattern. The fact that some act anyway suggests that for some men, at least, sexual arousal pattern is strongly motivating indeed.

Castration lowers sex drive and erectile capacity, both aspects of sexual arousal. During the twentieth century some European countries (especially Germany and the Netherlands) surgically castrated certain types of sex offenders, including pedophiles. Follow-up studies suggest that this intervention was highly successful. The best study compared recidivism in castrated sex offenders (most but not all of whom were pedophilic) with that in sex offenders who agreed to be castrated but then changed their minds. This 11-year follow-up study yielded a recidivism rate of 3% for 99 castrated offenders, compared with a rate of 46% for 35 uncastrated men (Wille & Beier, 1989). These rates are consistent with those of larger, but less well-controlled studies (Bailey & Greenberg, 1998). Chemical castration is also effective, especially using powerful Gonadotropin-Releasing Hormone (GnRH) agonists such as leuprolide acetate (Lupron). These chemicals reduce testosterone levels even further than surgical castration. While treated with Lupron, 30 men with anomalous sexual orientations (25 of whom were pedophilic) experienced dramatic reductions in sexual fantasies about children, erectile capacity, and masturbation frequency (Rosler & Witzum, 1998). No man committed a sexual offense during treatment. Thus, pedophiles' sexual arousal pattern is motivating enough to encourage some to seek sexual interactions with children, despite the threat of prison. Reducing their sexual arousal to children is enough to discourage the large majority of pedophiles from such interactions.

Sexual Arousal Patterns vs. the Kinsey Scale: The Case of Male Bisexuality

One of Alfred Kinsey's most famous contributions was the Kinsey Scale, a seven-point scale intended to measure sexual orientation. (Kinsey did not use the term "sexual orientation," and I am uncertain whether he would have agreed with my equating

sexual orientation with arousal pattern. Nevertheless, the Kinsey scale has become the most widely used measure of sexual orientation.) Kinsey believed that sexual orientation in men was graded rather than dichotomous, and he proposed the Kinsey scale as an appropriate measure:

Males do not represent two discrete populations, heterosexual and homosexual. The world is not to be divided into sheep and goats. It is a fundamental of taxonomy that nature rarely deals with discrete categories... The living world is a continuum in each and every one of its aspects (Kinsey, Pomeroy, & Martin, 1948, p. 639).

While emphasizing the continuity of the gradations between exclusively heterosexual and exclusively homosexual histories, it has seemed desirable to develop some sort of classification which could be based on the relative amounts of heterosexual and homosexual experience or response in each history... An individual may be assigned a position on this scale, for each period in his life.... A seven-point scale comes nearer to showing the many gradations that actually exist (Kinsey et al., 1948, p. 656).

By Kinsey's scale a score of "0" represents complete heterosexuality, "7" complete homosexuality, and "3" perfect bisexuality, with "1," "2," "4," and "5" representing the gradations therein. The scale can be employed to ask about different aspects of sexual behavior or feelings, such as partner choice ("As an adult, have your sex partners tended to be the other sex or your own sex?"), sexual attraction ("Are you attracted to members of the other sex or those of your own sex?"), sexual fantasy, or sexual arousal. One clear limitation to Kinsey's approach is that it is based on self-report. Of course that limitation is shared with almost all other methods for assessing sexual orientation.

Kinsey's contention that male sexual orientation is fundamentally continuous rather than discrete is challenged by the observation that in large representative samples of men, the distribution of Kinsey scores tends to be bimodal (e.g., Bailey, Dunne, & Martin, 2000; Diamond, 1993; Laumann, Gagnon, Michael, & Michaels, 1994). Men who report scores in the bisexual range of the Kinsey scale (2–4) are rarer than men who report homosexual scores (5–6). Furthermore, bisexuality is often a transitional phase for men. One survey found that 40% of gay men had identified as "bisexual" during some point of their coming out process (Lever, 1994). The eminent sexologist Kurt Freund, who invented PPG, used to remark that he had looked without success for many years to find a man who showed a bisexual arousal pattern (to adults; bisexual pedophilia is not uncommon).

It was this context that led my lab to conduct a study of the sexual arousal patterns of bisexual men. We recruited 33 men who identified themselves as bisexual. Consistent with the notion that bisexuality is a relatively rare phenomenon among men, it took us much longer to recruit our bisexual subsample than it did to recruit the 30 heterosexual and 38 homosexual participants who also participated in this study. We asked all men about their sexual attraction patterns using the Kinsey scale, and all seven points of the Kinsey scale were well represented. Bisexually identified men indeed reported bisexual attraction patterns.

In the lab, the men watched sexually explicit videos of male couples, female couples, and heterosexual couples, as well as neutral stimuli (i.e., nature films). Again, the key stimuli are the same-sex couples. PPG was assessed circumferentially,

and 22 bisexual men responded sufficiently to meet our criteria for adequate measurement of their sexual arousal pattern, as did 21 heterosexual men and 25 homosexual men. In addition, men reported their subjective level of sexual arousal to each stimulus.

We were primarily interested in the question of whether bisexual men (that is, men who identified as bisexual and reported attraction patterns on the Kinsey scale in the bisexual range) would have a bisexual arousal pattern. But what would a bisexual arousal pattern look like? We reasoned as follows: A bisexual arousal pattern does not necessarily imply very similar levels of arousal to both men and women. A bisexual man might, for example, have more arousal to men than to women. But if he has a bisexual arousal pattern, his arousal to women should be appreciable. That is, a bisexual arousal pattern implies substantial arousal to both men and women, and to both male and female erotic stimuli. Furthermore, a man with a bisexual arousal pattern should be more aroused by men than heterosexual men are, and he should be more aroused by women than homosexual men are.

Thus, in our first and most important analysis, we created a variable “Minimum Arousal” representing the minimum of arousal to male stimuli and arousal to female stimuli. That is, we looked at each person’s average level of arousal to the male stimuli and his average level of arousal to the female stimuli; whichever of these was lower was his “Minimum Arousal” score. Separate variables were created for subjective and genital arousal (Minimum Subjective Arousal and Minimum Genital Arousal, respectively). The specific hypothesis tested was that men with bisexual (i.e., middle) Kinsey scores should have higher Minimum Arousal than men with heterosexual or homosexual Kinsey scores. Specifically, the regression of Minimum Arousal on Kinsey scores should be negatively quadratic. For Subjective (i.e., self-reported) Minimum Arousal, this is exactly the pattern that we found (Fig. 1a). For Minimum Genital Arousal, however, we did not find this (Fig. 1b). Instead, we found that bisexual men’s Minimum Genital Arousal was statistically indistinguishable from heterosexual and homosexual men’s. Thus, we found no evidence that bisexual men had a *uniquely* bisexual arousal pattern – that is, any more than heterosexual and homosexual men do. To be sure, heterosexual and homosexual men showed more genital arousal to their nonpreferred erotic stimuli (male and female erotic stimuli, respectively) than to neutral stimuli, and one might thus argue that *all* men, regardless of sexual orientation, are somewhat bisexual. I am skeptical of this argument, however, because arousal to the nonpreferred sexual stimuli was much less than arousal to the preferred stimuli. Furthermore, our fMRI study suggested that patterns of activation to preferred and nonpreferred sexual stimuli were different in kind and not just degree (e.g., Fig. 2b).

In a second analysis we examined whether bisexual men’s arousal patterns tend to be more similar to that of homosexual men than to heterosexual men. This would be consistent with the observation that many bisexually identified men eventually identify as homosexual. Indeed, we found that bisexual men tended to be more genitally and subjectively aroused to the male stimuli than to the female stimuli. There were exceptions, however. Thus, most bisexual men in our study had a homosexual arousal pattern, but a few had a heterosexual pattern.

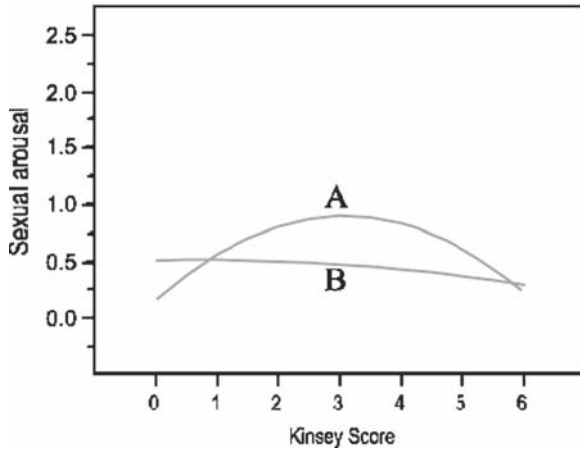


Fig. 2 Quadratic regression curves obtained by regressing Minimum Subjective Arousal (a) and Minimum Genital Arousal (b) onto Kinsey score. Kinsey score was assessed as self-reported relative attraction to men and women

Our study failed to find good evidence for a bisexual arousal pattern (and hence, a bisexual orientation) among men with bisexual identities and self-reported bisexual feelings. To use the terms introduced at the beginning of this chapter, bisexual behavior patterns certainly exist. In addition, many men publicly identify as bisexual and, to the best of our ability to measure, also seem privately to think of themselves as bisexual. Many men insist that their sexual feelings are bisexual, and many choose partners of both sexes; thus by the aforementioned definition, their sexual preferences are bisexual. However, our findings suggest that their sexual arousal patterns are not bisexual. It is possible that bisexual arousal patterns exist among men, but that we failed to detect them. For example, perhaps male bisexual arousal patterns occur but are rare. Perhaps we did not have a sufficient number of such men to detect bisexual arousal patterns. Our study did show a clear dissociation between genital arousal patterns and self-reports using the Kinsey scale. I like to think that Kinsey would feel challenged by our data, and that in light of it, he would consider it an open, scientific, question whether homosexual and heterosexual men represent two separate populations, like “sheep and goats.”

Female Sexual Arousal Patterns and Sexual Choices

What about women? Is a woman’s sexual orientation her sexual arousal pattern? Research on women’s sexual arousal patterns has lagged far behind that on men’s. In part this undoubtedly reflects scientific privileging of male concerns, perhaps

especially in the sexual sphere. In part, however, it reflects measurement difficulty. Genital arousal assessment is much more difficult to do in women than in men. Thus, our discussion of women's arousal patterns begins with their measurement.

Measurement of Female Genital Arousal

Genital arousal is a more complex phenomenon in women than in men. Rather than a single observable output (i.e., penile erection), women have three main responses: clitoral erection, vasocongestion (engorgement of blood) of the labia and vaginal walls, and lubrication of the vagina. So far, psychophysicologists have had success measuring only one of these, namely vaginal vasocongestion.

Vasocongestion causes a darkening of vaginal tissue, as the pooled blood loses its oxygen. The primary method of measuring female sexual arousal exploits this color change. The vaginal photoplethysmograph consists of a clear acrylic tampon-sized tube that contains both a light source and a light detector (Geer, Morokoff, & Greenwood, 1974). The device outputs two signals, one of which is thought to measure vaginal blood volume (VBV) and the other of which is thought to measure vaginal pulse amplitude (VPA), or the phasic changes in the vascular walls due to pressure changes. VPA has greater construct validity than VBV as a measure of genital arousal, and it is used far more often (Geer & Janssen 2000; Janssen 2001; Laan, Everaerd, & Evers, 1995). Obviously, VPA is a more indirect and complex measure of genital sexual arousal compared with PPG in men.

Evidence for construct validity of VPA includes the fact that VPA reliably increases in most women as they process erotic stimuli (typically, erotic videos). Furthermore, VPA increases as stimuli become more explicit (Laan & Janssen, 2007). The far greater consumption of visual pornography by men compared with women (e.g., Hald, 2006) has led researchers to examine whether women's genital arousal is provoked by different stimulus media compared with men's. This does not appear to be the case, however. For example, women have more genital arousal while watching sexually explicit videos than they do reading erotic stories or engaging in erotic fantasy (van Dam, Honnebier, van Zelingen, & Barendregt, 1976), and romantic content does not appear to enhance genital arousal (Heiman, 1977). Like men, they have more genital arousal watching videos of couples interacting sexually compared with videos of nude exercising or masturbating individuals (Chivers et al., 2007).

One striking difference between female and male genital arousal data is that there is a much lower concordance between genital and self-reported subjective arousal measures for women than for men (Chivers, Seto, Lalumiere, Laan, & Grimbos, 2006). That is, when men are genitally aroused, they usually report that they are subjectively aroused as well. This is substantially less true for women. We do not currently understand why this unlinking of genital and subjective sexual arousal occurs in women.

Female Sexual Arousal Patterns

In 1996 Ellen Laan and colleagues reported the surprising results of a study on the arousal patterns of self-identified heterosexual and homosexual women. Participants watched sexually explicit videos of heterosexual couples and of lesbian couples, while their genital arousal (VPA) was assessed, and while providing ratings of their subjective arousal. Neither genital nor subjective arousal pattern differed between the two groups. Both groups showed highest arousal to the stimuli featuring the heterosexual couple (Laan, Sonderman, & Janssen, 1996). This was quite surprising in view of male findings. The analogous result for men would be for homosexual and heterosexual men to have similar arousal patterns to sexually explicit videos of heterosexual couples and homosexual male couples. Such a result is unheard of in the male literature.

With some methodological modifications my lab attempted to replicate this surprising finding using a sample of women recruited from the Chicago area (Chivers et al., 2004). For example, we collected extensive self-report data concerning participants' sexual feelings. This allowed us to make sure that participants who identified as lesbian also reported much stronger sexual feelings for women than for men, and that participants who identified as heterosexual showed the opposite pattern. Most importantly, we included erotic stimuli featuring male couples. As I have noted, arousal to sexual stimuli featuring heterosexual couples is less informative in studies of sexual orientation, because such couples contain both a man and a woman.

With respect to genital arousal (VPA), the heterosexual women showed a strikingly flat profile. That is, VPA was similar for the three kinds of stimuli (videos of the male–male couples, female–female couples, and male–female couples). Lesbians were somewhat more genitally aroused by the female–female stimuli than by the male–male stimuli, although this difference was much less than the analogous differences seen in male arousal patterns. [Figure 3](#) shows the sex difference in patterns of genital arousal (figure adapted from Chivers et al., 2004). This figure combines homosexual and heterosexual men, who had very similar arousal patterns, but it separates homosexual and heterosexual women, whose sexual arousal patterns differed somewhat. The figure plots participants' average genital arousal to stimuli featuring their preferred sex (for heterosexual men and homosexual women, this is women; for homosexual men and heterosexual women, this is men) and their nonpreferred sex (for heterosexual men and homosexual women, this is men; for homosexual men and heterosexual women, this is women). Men showed a substantial difference in genital arousal to stimuli depicting their preferred sex compared with stimuli depicting their nonpreferred sex. Overall, women showed a small, nonsignificant difference. Furthermore, women's slightly greater arousal to stimuli featuring their preferred sex was entirely due to the lesbian participants.

What about women's self-reported subjective arousal patterns ([Figure 4](#))? Lesbians' results showed a similar pattern to men's. Specifically, they reported far greater arousal to their preferred sex than to their nonpreferred sex (with arousal to

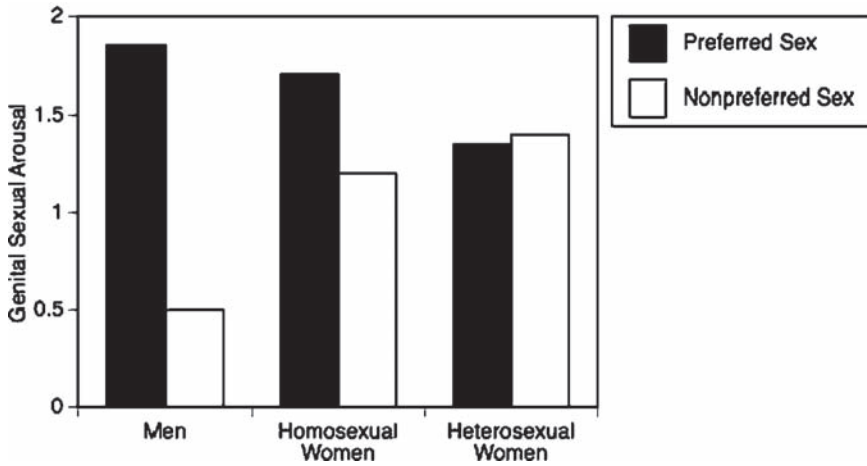


Fig. 3 Genital sexual arousal to sexually explicit videos containing same-sex couples of participants' preferred sex or nonpreferred sex. Arousal to neutral stimuli has been subtracted. Units are within-subjects standard deviations. Adapted from Chivers et al. (2004)

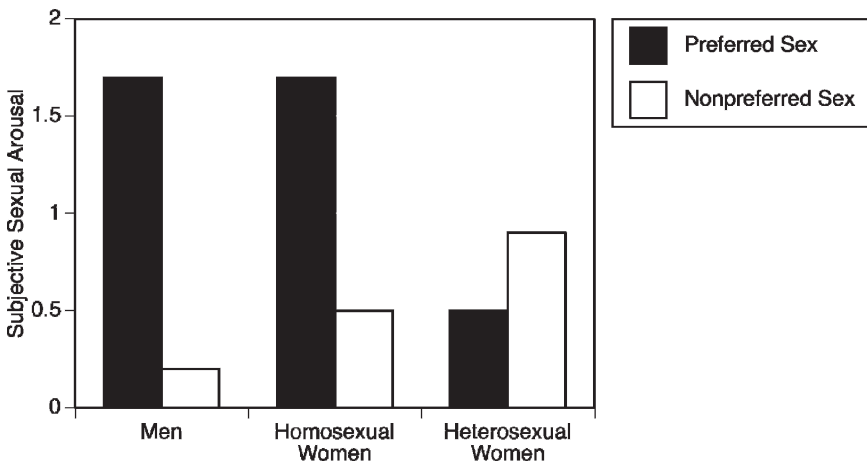


Fig. 4 Subjective self-reported sexual arousal to sexually explicit videos containing same-sex couples of participants' preferred sex or nonpreferred sex. Arousal to neutral stimuli has been subtracted. Units are within-subjects standard deviations. Adapted from Chivers et al. (2004)

the mixed-sex videos intermediate). However, heterosexual women reported the *least* arousal to videos featuring only their preferred sex (i.e., the male couples). They reported greatest arousal to the mixed-sex couple (Chivers et al., 2004). Across all our female participants, the correlation between their subjective and genital male–female contrasts (i.e., the difference between arousal to the male–male and female–female films) was 0.48; the analogous correlation for men was 0.88.

Thus, most women's sexual arousal patterns seemed profoundly different than men's. Although lesbians' arousal pattern might be viewed as a much-attenuated version of the male pattern (i.e., with highest arousal to stimuli containing the preferred sex), heterosexual women's arousal pattern was nothing like men's. With respect to genital arousal pattern, heterosexual women appeared almost perfectly bisexual. With respect to subjective arousal pattern, heterosexual women's response to the same-sex stimuli was opposite that of men's. Men's sexual arousal is *category specific*, meaning that it is highest to sexual stimuli featuring the category of person that men are most attracted to. Women's sexual arousal does not appear to be category specific.

One possible methodological concern is that volunteers for our female arousal study were unusual women from whom generalization is risky (Morokoff, 1986). In general, most women are reluctant to consider participating in a study requiring them to watch pornography in a laboratory with a gauge inserted in their vaginas. Perhaps those willing to do so are different in ways that include their sexual arousal patterns. To address this concern, we recruited a group of young heterosexual women through university psychology classes. Recruitment was phased, with an initial information session, followed by an assessment of both willingness to participate in a sexual arousal study and aspects of their sexual behavior and attitudes. Finally, women who agreed to proceed had their sexual arousal patterns assessed in the laboratory.

Women who agreed to participate in the sexual arousal assessment (Volunteers) did in fact differ from women who did not (Refusers) in several respects. The former had more lifetime sexual partners, masturbated more frequently, achieved orgasm more frequently via masturbation, and consumed erotica more frequently. Among the Volunteers, however, there was considerable variability in all these predictors. For example, two of the Volunteers were virgins. We examined whether variation in these predictors was associated with sexual arousal pattern (i.e., subjective or genital arousal to male–male, female–female, or male–female sexual stimuli). It was not, and so we concluded that volunteer bias probably did not account for our participants' sexual arousal patterns. What was the average sexual arousal pattern of this young, heterosexual female sample? Just as in our older, more experienced, community sample of heterosexual women, the genital arousal pattern was nearly flat, with similar levels of genital arousal to videos featuring male–male, female–female, and male–female couples. The two samples also had very similar subjective arousal patterns, with highest arousal to videos featuring the heterosexual couple and lowest arousal to those featuring the male couple.

A second methodological concern we have addressed involves the limitations of vaginal photoplethysmography. In general, sex researchers are considerably less satisfied with female genital assessment than with male genital assessment (e.g., Levin, 1998). Vaginal photoplethysmography is a less direct measure, and its construct validity is much less well established. Perhaps it cannot detect a category specific sexual arousal pattern even if one exists. To examine this concern, we recruited a group of women whom we believed might indeed have a

category specific sexual arousal pattern: postoperative male-to-female transsexuals. These *new women* had surgically constructed neovaginas, and so assessing their genital arousal would require vaginal photoplethysmography. Because the transsexuals had all been born male, and because men have category specific arousal patterns, we thought they might as well. Furthermore, we capitalized on the fact that there are two types of male-to-female transsexuals, one type primarily attracted to men and the other type primarily attracted to women (Bailey, 2003; Blanchard, 1989). The transsexuals could be perfectly classified according to their genital sexual arousal patterns. All six who preferred men had greater genital arousal to the male-male videos, and all five who preferred women had greater arousal to the female-female videos. This shows that vaginal photoplethysmography is not to blame in our failure to find category specific genital arousal in natal women.

Another interesting conclusion from this study concerns the sensitivity of vaginal arousal assessment. Every single transsexual became sufficiently aroused genitally to be counted as a responder and to have her genital arousal pattern correctly assessed, despite having been castrated and taking female hormones. Both of these drastically reduce the level of testosterone, which is necessary for male sexual arousal. A castrated man on female hormones would stand little chance of attaining enough genital arousal to meet minimum PPG criteria. This suggests that VPA is a far more sensitive measure of genital arousal compared with PPG. Another interesting conclusion from this study concerns the development of category specificity of male sexual arousal. Male-to-female transsexuals who are attracted to men are in many respects extraordinarily feminine (Bailey, 2000, 2003). Yet, their sexual arousal patterns show the male-typical, category specific, pattern. Evidently, whatever has feminized some parts of their minds and brains has left untouched the mechanisms that direct their sexual arousal (Chivers et al., 2004, Lawrence, Latty, Chivers, & Bailey, 2005).

The nonspecific sexual arousal patterns of natal women do not appear to be due to methodological artifacts of sampling or measurement. And it has been recently replicated yet one more time, using additional stimuli unlike those employed previously (Chivers et al., 2007). This study included videos of individual men and women who were either masturbating or exercising in the nude, as well as sexually explicit videos of couples, as in the prior studies of this topic. Both men and women were most sexually aroused by the sexually interacting couples and least sexually aroused by the nude exercise videos. However, men were substantially aroused only to videos featuring actors of their preferred sex. Women showed the same basic arousal pattern as earlier research. Heterosexual women showed a genital arousal pattern that can only be described as bisexual, and their subjective arousal pattern was if anything opposite what one would expect based on their self-reported identity and attractions (i.e., they reported more arousal to female than to male stimuli). Homosexual women did show significant genital and subjective bias toward female rather than male sexual stimuli, but their genital bias was less than that found among the men in the study. Still, it seems that homosexual women are more category specific than heterosexual

women in their sexual arousal pattern. Perhaps homosexual women's minds and brains have been masculinized to some degree, on average, and this masculinization has encompassed sexual arousal.

Do Most Women Have Sexual Orientations?

I have argued that a man's sexual orientation is precisely his sexual arousal pattern. If we insist that women have sexual orientations and that *sexual orientation* must have the same mechanism for both sexes, this leads us to the odd conclusion that most women with heterosexual identities and preferences have a bisexual orientation. (Some lesbians appear to have sexual arousal patterns that match their partner preferences, so I focus on the difficulty of understanding heterosexual women, who comprise the large majority of women.) It would also follow that for heterosexual women, sexual identity and preference have little to do with sexual orientation. This is a logically defensible position, but it is not one that I favor.

An alternative possibility is that laboratory studies have suggested a highly misleading picture of female sexual arousal patterns, which are truly category specific. It would certainly be useful to explore whether other methods (e.g., other kinds of sexual stimuli) might lead to different conclusions. But I do not think it is likely that they will. When I have discussed our findings with women, they have not complained that our results are invalid or misleading, and they have not insisted that they have a sexual arousal pattern that is analogous to that of men. Certainly no one has offered a promising alternative methodology to reveal a category specific sexual arousal pattern in women.

Another alternative is that for most women sexual orientation – the orienting of sexual feelings and behavior toward certain targets and not others – is not about a sexual arousal pattern. In contrast to the male heterosexual arousal pattern, the female heterosexual arousal pattern does not appear to have been designed by evolution to motivate women to seek opposite-sex partners. For most women, their sexual arousal pattern is an ineffective orienting device indeed. One problem with this position is that it requires us to define the same concept, sexual orientation, differently for men and women. A second problem is that if we take this route, we have no good idea what female sexual orientation is. That is, female sexual orientation is a hypothesized mechanism whose existence is unproven and whose nature is unknown. The flip side to this position is that most women may have nothing like a sexual orientation, if sexual orientation is conceived of as a well-designed sexual mechanism that strongly motivates women to select sexual partners of one sex or the other (or both).

At least one other alternative exists: reject my claim that a man's sexual orientation is the same as his sexual arousal pattern, and continue to use the term to mean the same thing in both sexes, such as the propensity to be attracted to men or to women or to both. This approach has at least two problems,

however. First, it obscures the importance of arousal patterns in men's sexuality. Second, it implies similarity between the sexes where there may be fundamental difference.

If heterosexual women had no sexual orientation, how might they manage to wind up with male partners? Even if they had the potential to enjoy sex with men and women, most women might choose men due to overwhelming socialization pressures. From early childhood most people are exposed to a largely heterosexual world, are encouraged in various ways to behave heterosexually, and discouraged from behaving homosexually. Even if women's sexuality is potentially very socially malleable (Baumeister, 2000) and flexible (Diamond, 2008), current social forces in most of the world work to mold heterosexual lives.

The possibility that women do not have sexual orientations is consistent with the observation that few if any women have paraphilias such as pedophilia (American Psychiatric Association, 2000). Pedophilia occurs in men despite immense societal pressure and stigma. Although a few women have sexual fantasies about children, and some even molest them (e.g., Federoff, Fishell, & Federoff, 1999), these women are quite rare. Furthermore, there is no persuasive evidence that such women are motivated by an arousal system directed much more strongly toward children than adults. Perhaps because most women do not have sexual arousal patterns directed at a particular kind of person, they cannot easily develop misdirected sexual arousal patterns and dysfunctional sexual orientations.

The best evidence that women may have a sexual orientation analogous to men's is indirect. There is striking similarity between the sexes in the development of sexual preference. Both male and female homosexuality is associated with gender nonconformity in both childhood and adulthood. Gender nonconformity is manifested differently at different developmental stages. In childhood it may include preferences for play behavior more typical of the other sex, for opposite-sex playmates, and for clothing of the other sex. Retrospective studies of both sexes have shown that homosexual individuals recall substantially more childhood gender nonconformity compared with heterosexual individuals (Bailey & Zucker, 1995). The retrospective studies have been confirmed by prospective studies (e.g., Green, 1987; Zucker et al., 2008). In adulthood relevant behavior includes recreational and occupational interests somewhat typical of the other sex (Lippa, 2000, 2002) as well as superficial overt behavior including patterns of speech, dress, and movement (Ambady, Hallahan, & Conner, 1999; Johnson, Gill, Reichman, & Tassinary, 2007; Rieger, Linsenmeier, Gygax, & Bailey, 2008). These highly robust findings suggest symmetry between the sexes in the development and causes of sexual preference. It seems less likely in this light that men have a sexual orientation mechanism that has no close analog in women. If women possess such a mechanism, however, we have little idea what it is.

Let me be clear that I am not asserting that most women have no sexual orientation; I am merely raising the possibility that this might be so. My main point has been to clarify the meaning of sexual orientation in men, and to show that for most women, sexual orientation cannot plausibly mean the same thing. In her insightful attempt to explain how some apparently heterosexual women fall in love with other

women, Lisa Diamond (2003) asked: “What does sexual orientation orient?” Asking this question about women seems premature to me. Diamond’s observations about sexual fluidity – the degree to which some women’s partner choices, sexual feelings, and sexual identities can shift back and forth over time, from men to women – are consistent with the idea that women are less constrained than men by a focused sexual arousal pattern. Before asking what sexual orientation orients, we should first ask whether *anything* sexually orients women.

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