

Gender Differences as per Response to Visual Sexual Stimuli - Notes

(C-III)

Regarding how men and women respond to the presentation of visual sexual stimuli.

The assumption that men respond more to visual sexual stimuli is generally empirically supported, however sex differences are confounded by the varying of the content of the stimuli presented and of the measurement techniques used.

It has been proposed that the cognitive processing stage of responding to sexual stimuli is the first stage in which sex differences do occur. The divergence between men and women is proposed to occur during this stage, reflected in differences in neural activation

There are a host of factors that might contribute to the variability in sex differences observed in response to visual sexual stimuli. Factors which include; participant variables, such as hormonal state and socialized sexual attitudes and variables specific to the content presented in the stimuli.

It has been proposed that characteristics may differentially produce higher levels of sexual arousal in men and women. Very specifically, that men appear to be more influenced by the sex of the actors depicted in the stimuli, while women's response may differ with the context presented.

Likely influences include; sexual motivation, perceived gender role expectations and sexual attitudes. These are of importance in work that seeks to compare what is appealing to men and to women.

A common assumption in society and the media very generally is that men respond 'more strongly' to visual sexual provocations than do women. Pornographic magazines and videos aimed at men are a multi-billion pound industry, while similar products directed towards women are not as easy to locate. (It is estimated that of the 50 million adults who visit pornography websites annually, 75% are male while only 25% are female).

Where are we in understanding this difference?

The extent of sex difference and the exact mechanism/s producing these are not clear. Let's look quickly at human sex differences in response to visual sexual stimuli and what might influence this sex difference.

Sexual arousal

In the first instance it is prudent to address what are the theoretical construct/s describing the multiple processes it is believed to be involved in producing a response to sexual stimuli.

The response to visual sexual stimuli (arousal) is an emergent product of the combined cognitive and peripheral physiological states of the person. The cognitive contributions to sexual arousal are not completely understood, but do involve the assessment of the stimulus, a categorization of the stimulus as being sexual, and the affect.

The physiological component of sexual arousal includes; changes in cardiovascular function, respiration, and genital response, erection in men, and vaso-congestion in women. When sexual stimuli is presented, physiological responses, such as; heart rate, blood pressure, respiration, erection, and vaginal vaso-congestion, are often conflicting with self-reported subjective perception of sexual arousal, especially with women.

The inconsistency between physiological measures and reports of subjective sexual arousal may suggest that physiological changes on their own are not the only events subjects use to assess sexual stimuli. Additionally, it is unclear whether this conflicting is primarily limited to women, as men typically show a greater, although not complete, agreement between their genital responses and subjective assessments of arousal. Therefore, the precise relationship between subjective and physical sexual arousal (a complex process emerging from multiple cognitive and physiological components) is not clear/understood.

One can suppose that conscious and unconscious cognitive processing in the brain - memory, attention, and emotion, set the internal context for which visual stimuli, as well as the subsequent peripheral physiological responses, are interpreted as sexual.

The cognitive framework in which visual sexual stimuli are viewed thus facilitates the specific response elicited to visual sexual stimuli.

In a 'feedback process', subjective sexual arousal results from ;

- Interaction between cognitive and experiential factors, such as; affective state, previous experience and current social context,
- Setting the conditions for the production of peripheral physiological reactions
- Which then feedback to affect cognitive reactions to the stimuli

- Resulting in feelings of sexual arousal
- Which in turn affect the amount of physiological arousal

This process may go through several repetitions, increasing arousal with each, through the cognitive-physiological loop. Whether the initial cognitive mechanisms are conscious or unconscious is not known, though some have insisted the initial physiological response to sexual stimuli as being a primary determinant of psychological arousal

Men and women determine subjective sexual arousal - the product of physiological sexual arousal within the current cognitive state.

Gender differences as per subjective ratings of sexual stimuli

The best documented sex differences in response to sexual stimuli use subjective ratings of sexual arousal and interest in response to sexual stimuli. When presented with the same stimuli, men and women often report different levels of sexual and positive arousal, as well as ratings of sexual attractiveness of the actors, depending on characteristics of the stimuli.

The studies that describe 'specific' aspects of sexual stimuli that differentiate men and women; Women who view clips from erotic films made by women or men report higher levels of sexual arousal to woman-made films. However, their subjective response is not reflected in their physiological response as they show similar genital response to both woman and man-made films. This discordance may reflect that these women also report more negative emotions, such as aversion, guilt, and shame, in response to the man-created compared to the woman-created films.

These negative responses may be due to the fact that man-created films tend to involve no foreplay and focus almost exclusively on sexual intercourse, whereby woman-created films tend to have up to eleven minutes of foreplay. It is unclear whether this reflects a response by the women to male-and female-created films, or to a greater comfort with depictions of foreplay than intercourse.

The disconnect between psychological and physical arousal may be related to the negative emotions causing female subjects to summon other cognitive mechanisms, for example social acceptability of the portrayal of sexuality, thus resulting in a censoring of subjective reporting, but leaving their physiological response unaffected.

A possible characteristic of sexual stimuli that men and women may attend to differently is the physical context or nonsexual details of the stimuli. This is supported by a recent eye tracking studies demonstrating different gaze patterns for men and women viewing

pictures of sexually explicit heterosexual activity. Although all participants spent the majority of their viewing time looking at the genitals, female faces, and female bodies in the photos, women using hormonal contraceptives looked more often at the background of the photos and clothing than did men. That study also found that men looked more often at the female actors' faces in the pictures than did women. Because the men and women in this study did not differ in their ratings of how sexually attractive they found the pictures, women's bias towards the contextual features of the stimuli, specifically the clothing and background, did not appear to be associated with less positive appraisal of the photos.

Evidence from studies examining habituation to sexual stimuli offers further evidence that men and women evaluate sexual stimuli using different strategies. Repeated exposure to sexually explicit slides of men and women typically produces both physiological and subjective habituation of sexual arousal in men, but inconsistent results in women. In one study that found that women did not habituate when repeatedly viewing the same slides, indicated by both genital and subjective measures of arousal, post-experiment interviews discovered a unique strategy used by the women to maintain interest. Eighty-five percent of the female subjects said that as the trials repeated they paid more attention to both context-related and nonsexual details of the stimuli, such as background information or cues about the relationship of the actors.

It is possible, in general, that women may pay more attention to contextual and nonsexual details of sexual stimuli than do men.

The presence of contextual elements in visual sexual stimuli may lead to heightened arousal in women, as supported by the fact that women report more subjective erotic reactions to commercial movies, than do men.

In one study, men and women viewed the same erotic film over four consecutive days and both men and women showed habituation of physiological and subjective measures of arousal. On the fifth day, subjects were presented with either a film depicting the same actors engaged in novel sexual activities, or a film of new actors engaged in the behaviors observed in the original films. Men reported levels of subjective arousal on the fifth day equal to that on the first only for films where new actors engaged in the previously seen sexual behaviors. Conversely, women's subjective arousal returned to first day levels only when viewing films in which the original actors engaged in new behaviors. These data were interpreted as suggesting that men show a preference for sexual stimuli with new people, whereas women respond better to stimuli suggesting the stability and security of a consistent partner. It commonly thought that women prefer stimuli depicting stable romantic relationships although this view has little empirical support.

The principle established sex difference in preference for specific content of sexual stimuli is whether the stimuli depict same or opposite-sex actors. Generally, heterosexual men rate stimuli with same-sex stimuli lower than women rate pictures of other women. When undergraduate men and women were presented photos of men and women masturbating, men reported a significantly less favorable reaction to photos of men than of women. By contrast, women rated photos of both sexes comparably.

Men show a significantly lower level of self-reported sexual arousal to films depicting two men than they did to heterosexual or lesbian films.

Women, in contrast, do not tend to show a difference in reported sexual arousal between heterosexual or female homosexual films. Subjective reports are consistent with recent eye tracking studies using attention to different regions of photos as implicit measures of interest. In these studies, both men and women spent more time looking at the female compared to the male actor in photos depicting heterosexual intercourse.

Previous work suggests that heterosexual men's opposite-sex bias is dependent upon their sexuality, such that men have a specific bias towards the target of their sexual attraction, although women do not.

When men and women watch films of homosexual or heterosexual sex, male genital measures and subjective reports show that men respond highest to films depicting sex with a member of the sex that they were attracted to. This stimulus specificity is true for all the subjects from a sample that included heterosexual men, homosexual men, and male-to-female transsexuals.

For women, on the contrary, genital sexual arousal does not differentiate the sex of the actors engaged in sexual activity. Thus in men and in women sexual arousal is organized differently, in that men are category specific while women are not.

Gender differences as per neural response to sexual stimuli

Studies of a neural involvement in the response to sexual stimuli relies on lesion studies in animal models. Although these studies reveal important information, such as; the critical roles of the hypothalamus and amygdala in sexual motivation and the expression of copulatory behavior, they cannot be replicated in human participants and likely not entirely address more complex cognitive responses to sexual stimuli important in understanding human sexual arousal.

Recent neuro-imaging techniques have facilitated investigation of how the brain responds to sexual stimuli. Both PET and MRI use alterations in blood flow to infer regional differences in neural activity. PET, because it uses the accumulation of radioactive tracers, is more

clearly linked to neural activity and, unlike MRI, which can detect both increased activation and deactivation of neural activity. With MRI, it is only known that activity has changed, but not the direction of the change. Both techniques rely upon the assumption that a change in blood use by the brain implies increased neural activity.

Imaging studies show that, in response to sexual stimuli, both men and women show increased activation in many similar brain regions thought to be involved in the response to visual sexual stimuli, including; the thalamus, amygdala, inferior frontal lobe, orbital prefrontal cortex, medial prefrontal cortex, cingulate cortex, insula, corpus callosum, inferior temporal lobe, fusiform gyrus, occipitotemporal lobe, striatum, caudate, and globus pallidus.

Recent investigations seeking specificity for sex differences in response to the same set of sexual stimuli found that, in response to erotic films, men and women showed many areas of overlap in response to sexual stimuli in the anterior cingulate, medial prefrontal cortex, orbital prefrontal cortex, insula, amygdala, thalamus, and ventral. However, only men showed increased activation in the hypothalamus during the presentation of sexual stimuli and its activation correlated significantly with the men's subjective reports of arousal. An explanation for this sex difference might be that the hypothalamus may be involved in the physiological reaction to sexual stimuli, such as erection, or that sexual arousal activates the hypothalamic gonadal axis, resulting in the increased steroid secretion seen in men following sexual activity.

It is prudent to distinguish whether the sex differences observed in neural activation reflect differences in cognitive processing between men and women in response to sexual stimuli, or simply differences due to inherent physiological sex differences. For example, the increased hypothalamic activation observed in men could well be due to the fact that men can obtain erections and this alters hypothalamic activity. However, sex differences in neural activity in the hypothalamus and amygdala are observed only in response to exposure to visual sexual stimuli and not during orgasm. With orgasm, there is amygdala deactivation and orgasm, and particularly in men, is followed by a period of lessened interest in sexual stimuli. Therefore, the sexually differentiated neural activity during sexual arousal that precedes orgasm seems more likely to reflect the cognitive processing of sexual stimuli, such as motivation and desire, rather than physiological arousal.

Although the general neural networks underlying sexual arousal are the same in men and women, these circuits may be differentially activated based on the characteristics of the sexual stimuli presented. As discussed, there are sex differences in what types of stimuli men and women report to be sexually arousing

Recent work supports the idea that the brains of men and women respond differently to sexual stimuli contingent upon the content of the stimuli. There are sex differences in neural activation between men and women depending upon the sex of the actor in the stimuli. While in the MRI scanner, subjects viewed still photographs depicting male nudes, female nudes, a neutral condition, or fixation, presented in a block design. Activation to sexual stimuli was compared to activation during the neutral condition. Greater activation to opposite sex stimuli compared to same sex stimuli was seen in men in the inferior temporal and occipital lobes. Women did not show any areas of increased activation to opposite sex compared to same sex stimuli. Men showed more differential activation of brain areas related to sexual arousal than women, including the amygdala, hippocampus, basal ganglia, and some areas of the prefrontal cortex. Women did not show these differences, > suggesting that women do not emotionally discriminate between opposite sex and same sex stimuli in the manner that men do. Women only showed increased activation to same sex compared to opposite sex stimuli in visual cortical areas. These differences may reflect different strategies for women in the cognitive processing of stimuli, specifically in how women focus their attention to sexual stimuli.

A recent neuroimaging study found that when peripheral contextual elements of stimuli are unavailable, men and women, regardless of sexual preference, show identical patterns of neural activation in response to visual sexual stimuli. In this study, heterosexual and homosexual males and females passively viewed photographs of sexually aroused genitals without any other peripheral body parts or context. The authors demonstrate that men and women did not differ overall in their neuronal response to the sexual stimuli in response to images without available context. What did differ, however, was the type of stimulus that produced increased activation in areas related to reward, specifically the ventral striatum and centromedian thalamus. For both heterosexual and homosexual men and women, the activation of the reward system was highest when viewing pictures of their preferred sex. > This study supports the hypothesis that men and women do not differ in the neural pathways underlying sexual arousal, but only in the stimuli and strategies that activate the systems.

An investigation of the EEG response to same and opposite sex stimuli in men and women supports imaging findings and suggests that the women distinguish less between same and opposite sex stimuli than men do.

Men and women may differ in what types of sexual stimuli initiate sexual motivation and arousal. Specifically, different characteristics of visual sexual stimuli, such as the sex of the actors or situational information included, may be variably effective in provoking sexual arousal in men and women. Therefore, the cognitive stage of sexual arousal during which men and women evaluate sexual stimuli may be a crucial point of divergence that produces observed sex differences in response to sexual stimuli.

The social milieu

The origins of the sexually differentiated response to sexual stimuli are not known. Possible factors could be sociological, evolutionary, physiological, psychological, or a combination thereof.

Social milieu variables likely play a significant role in observed sex differences in reports of sexual arousal. Some researchers have argued that sexuality is largely a socialized phenomenon. Historically, Western culture has given men more sexual freedom and constrained women more in the display of sexual motivation or interest in sexual material, a double standard that exists even to some degree today.

The social teachings experienced by men and women throughout their lives may well mediate their subjective feelings of sexual arousal in response to sexual stimuli. That there are cultural differences in sexual attitudes suggests that social influences contribute to observed differences in sexual attitudes and behavior. Church attendance and identification with religion is correlated with decreased sexual laxity and experimentation. /If religious teachings stigmatize sexuality in women, this may influence women' sexual attitudes and behaviors, and negatively bias their reported responses to sexual stimuli.

It is suggested that differences between men and women in experience, gender roles, and feelings about sexuality may well produce different subjective levels of arousal.

Because women may feel more self-conscious in their response to sexual stimuli due to 'societal expectations', they may try to inhibit their responses to match socialized gender roles in which women do not display high levels of sexual response.

A recent study found that men characterized by high levels of hyper-masculinity and ambivalent sexism reported more sexual partners when they had a female experimenter administering the anonymous survey, than if they had a male experimenter. This effect was only observed, however, when the cover page of the survey contained a statement saying that women were recently shown to be more sexually permissive and experienced than men. The findings that males who identify more strongly with traditionally masculine ideals alter their reporting when there is a message of dominant female sexuality, and that they do so only in the presence of a female experimenter, highlights the complex influence of socialized norms and attitudes on accurate reports of sexual behavior in men. These studies together emphasize the differential and polarizing effects that socialization appears to have on men and women in their reports of sexual behavior, which is important to consider when investigating sex differences in response to sexual stimuli.

This inhibition or enhancement (exaggeration/prevarication) in responding could have significant ramifications, not only for studies measuring subjective reports of sexual arousal, but also for studies of genital arousal or neural activation.

The impact of socialized sexual attitudes and subject's tendencies to match their perceived gender scripts to social expectations may explain much of the variability reported regarding reports of female sexual arousal.

The impact of socialization on women's inhibitions of certain aspects of sexual responding, but not on others, highlights the complexity of women's sexual response. There are multiple cognitive and physiological processes which social influences can differentially influence, altering subjective and genital response. Paradoxically, although women have a less specific peripheral genital response than men, their subjective reporting may be more socially influenced and thus appear more restricted. Women exhibit genital arousal to a variety of stimuli that they would not necessarily report as subjectively sexually arousing, such as the depiction of sexual intercourse between two members of the non-preferred sex or even non-humans.

Women's relatively nonspecific genital arousal likely reflects the importance of subjective arousal in women's sexuality. If genital arousal occurs to stimuli that women find subjectively un-arousing, they are unlikely to engage in sex with those stimuli, even though they are physically capable of doing so. By contrast, few sexual stimuli are likely to not result in genital arousal, thus subjective, not genital, arousal becomes the critical factor in modulating women's sexual behavior. This is markedly different from men's sexuality where subjective arousal without genital arousal would preclude most sexual behavior thus making genital arousal a crucial regulatory aspect of men's sexuality.

Together, these studies demonstrate in women a disconnect between physiological and subjective reports of sexual arousal. Whether these differences result from social factors that bias women's reporting and feelings of sexual arousal is unresolved. Whatever their cause, such bias may alter female perception of their physiological arousal such that they do not subjectively experience psychological arousal congruent with their genital response.

Biological effects

Biological differences between men and women likely contribute to the sex differences in response to sexual stimuli. Although social factors may strongly modulate men and women's reactions to sexual stimuli, biological factors may determine the extent to which social factors can modify subjective and physiological arousal. Gonadal steroid hormones are likely candidates for biological influences on the

cognitive component of sexual arousal, including stimulus evaluation, attention, and sexual motivation. Hormones may act by altering the attention to and the valence of sexual stimuli.

Attention and other cognitive processes may be influenced by testosterone levels in men. A PET study found that activation in the right middle occipital gyrus and right inferior frontal gyrus, areas linked to emotion and motivation, in response to viewing erotic film clips was positively correlated with testosterone levels in men. Additionally, hypo-gonadal men, who have chronically low levels of testosterone, do not show neural activation patterns typical of men with normal testosterone levels in response to viewing sexual films. However, following three months of testosterone supplementation, hypo-gonadal men show increased activation in the inferior frontal lobe, cingulate, insula, corpus callosum, thalamus, and globus pallidus, as observed in normal men in response to sexual stimuli. Because untreated hypo-gonadal men are capable of obtaining erections when viewing sexual stimuli at rates equal to normal men, these findings implicate testosterone in the non-physiological response to sexual stimuli. Only recently have MRI scanners developed the resolution to accurately scan this deeply embedded region.

Previous studies suggest that testosterone also influences sexual attention in women. Women, with low levels of testosterone, were correlated with their endogenous (without external cause) levels of testosterone. Subjects were instructed to repeat a target auditory message played into one ear while a distracter message, of either a sexual or nonsexual nature, was presented after a small delay into the other ear. All women made more errors in repeating the target message when the distracter was sexual than when it was neutral stimuli. In the 12 women with lowest testosterone increased, but not in the sample overall, errors to the sexual stimuli was correlated with testosterone, suggesting that there is a threshold for hormone action. The results do suggest that testosterone may increase attention to sexual stimuli. This notion is supported by a study that administered exogenous testosterone to normal women and changed their response to sexual stimuli. Women receiving a single dose of testosterone reported, four hours following administration, increased sexual "yearn" and perceived arousal to erotic videos, suggestive of an activational effect of testosterone on cognitive perception of sexual stimuli.

Testosterone metabolites, particularly estrogen, may also influence the perception of sexual stimuli in men and women. Many studies in women find increased sexual desire, masturbation, and sexual initiation during the ovulatory period that fluctuate over the cycle.. However these menstrual cycle effects are often subtle and some studies do not show any change in subjective levels of arousal across the cycle or increases in arousal outside ovulation.

The incongruent research findings investigating the effect of hormonal influences on women's interest in visual sexual stimuli may be due to issues of methodology. The first common methodological problem is that many studies use subjective units of measurement as indicators of interest in stimuli. The use of subjective measurement may not accurately portray hormone effects. This is because subjective questionnaires often suffer from subject bias and inhibition and do not delve into what constitute much more subtle menstrual cycle effects on women's attractiveness. For example, around ovulation, women report a greater desire to engage in entertainment activities, meet men and demonstrate more personal self-grooming and adornment.

A second common methodological issue in the investigation of menstrual cycle effects on women's interest in visual sexual stimuli is the use of a 'within subjects design'. Using *within* subject comparisons across a woman's menstrual cycle may be problematic considering the results of the study mentioned herein, demonstrating that physiological sexual arousal in response to visual sexual stimuli did not depend on the hormonal state at the time of testing, but rather, on the hormonal state of females during their first exposure. In that study, hormonal state at first test session was shown to mediate subsequent levels of genital response to visual sexual stimuli. Females first exposed to visual sexual stimuli during their luteal phase had lower levels of physiological arousal when subsequently tested across other phases of their menstrual cycle than did females whose initial exposure occurred at another phase. In this way, hormones may have primed or conditioned females to have increased responses to stimuli that they were exposed to when they had higher levels of sexual desire. Therefore, previous work investigating fluctuations in women's interest in visual sexual stimuli across the menstrual cycle may suffer from this confound of hormonal state at first exposure.

In addition to hormonal influences on overall sexual interest and arousal, female perception of male attractiveness varies with their ovarian cycle. What women find attractive in relation to the masculinity of a males' face fluctuates across the menstrual cycle. Women show a preference for masculine male traits during their ovulatory phase of the cycle that is not observed during other phases. In fact, when tested during the luteal phase, women find feminine male faces more attractive than masculine faces. The fluctuation in preferences may reflect variability in reproductive priorities across the menstrual cycle. Although males with more masculine features may provide genes with higher fitness, masculine males are less likely to invest in offspring and enter partnered relationships. At ovulation, when conception is likely, women may prioritize acquiring fit genes and be more attracted to masculine men. During the luteal phase, in contrast, when hormones are preparing for potential pregnancy, the priority may shift from mating with masculine males to finding a stable partner who can provide more parental investment and resources. A mate choice is a complex decision balancing the potential reward of high genetic quality with the risks of low paternal care or sexually

transmitted infection and disease. It is currently unknown how the hormonal states correlated with fluctuating mate preferences modulate females' preferences for male traits. It is possible that this is a central cognitive effect and that the hormonal state of an individual sets a cyclically fluctuating context in which potential mates are evaluated.

Changes in overall sexual arousal and desire and mate preferences with fluctuations in hormone levels across the menstrual cycle may be due to variability in the cognitive processing of sexual stimuli across the cycle. This hypothesis is supported by a recent neuroimaging study that found differences in neural activation in women looking at visual sexual stimuli depending on their menstrual phase at the time of testing. Specifically, women had more activation in the anterior cingulate, left insula, and left orbitofrontal cortex when tested during their mid-luteal compared to menstrual phase.

Although relevant data are comparatively it is apparent that the hormonal state of the subjects is likely an important variable to consider when investigating sex differences in the cognitive response to sexual stimuli.

Concluding Remarks

The currently available data strongly supports the argument that men and women differ in the sorts of stimuli that they find sexually attractive and arousing. We still do not know the relationship between these sex differences in preference and differences in physiological arousal as there is not yet a common metric to compare physiological arousal in men and women.

A variety of factors clearly moderate responses to sexual stimuli in men and women. Evidence supports the thesis that some previously observed sex differences in response to sexual stimuli may, in part, reflect a differential response to the content of the stimuli used. >> Men are influenced by the sex of the actor portrayed in the stimulus while contextual factors, possibly allowing for the creation of a social scenario, may be more important to women. Additionally, men generally prefer stimuli that allow objectification of the actor and projection of themselves into the scenario, while women are aroused primarily by stimuli allowing projection, although men also use the projection strategy which is positively associated with sexual arousal. Whether these preferences are learned or innate is not known. Women are less specific in their arousal patterns than are men, possibly as a protective mechanism.

Understanding these differences is of practical importance to future research and application on sexual arousal that aims to use experimental stimuli comparably appealing to men and to women.

The sex differences observed in subjective sexual arousal to visual sexual stimuli are possibly the combined product of social and biological influences on cognitive processes that direct the perception and assessment of these stimuli. Based on how men and women differently regard these stimuli as positive and arousing there will result in apparent differences in physiological and psychological responses. Sexual motivation, perceived gender role expectations, and sexual attitudes are cognitive factors that likely influence participant's response to sexual stimuli, especially in women. Strong support for this notion is evident in the common finding that subjective and physiological measures of sexual arousal in women are often uncorrelated.

Psychological therapy for sexual dysfunction in men and women primarily addresses the physiological component of sexual arousal, ie. the ability to maintain an erection or to produce vaginal lubrication. It is argued that despite requisite recent advances in pharmacology the most appropriate treatment is cognitive therapy. Women, especially, may be better served by sexual therapy targeting cognitive components of sexual arousal, rather than pursuing pharmaceutical relief, which may be ineffective.

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