Hormones and Behavior 56 (2009) 206–213

Contents lists available at ScienceDirect

Hormones and Behavior

journal homepage: www.elsevier.com/locate/yhbeh

Are gonadal steroids linked with orgasm perceptions and sexual assertiveness in women and men?

Sari M. van Anders [a,*], Emily J. Dunn [b]

[a] Departments of Psychology and Women's Studies, Program in Neuroscience, Reproductive Sciences Program, University of Michigan, Mail: 530 Church Street, Ann Arbor, MI 48105, USA
[b] Human Biology Program, Indiana University, 1165 E. Third St., Morrison Hall 101, Bloomington, IN 47405, USA

ARTICLE INFO

Article history:
Received 25 February 2009
Revised 28 March 2009
Accepted 24 April 2009
Available online 3 May 2009

Keywords:
Estradiol
Testosterone
Orgasm
Sexuality
Gender
Sex
Hormone
Perception
Relaxation
Assertiveness

ABSTRACT

Past findings suggest links between orgasms and testosterone (T), as well as sexuality and estradiol (E), and we examined hormone–orgasm links in this study via two hypotheses (below). Participants were 86 women and 91 men who provided a saliva sample and completed a demographics questionnaire, the Orgasm Checklist (Mah and Binik, 2002), the Hurlbert (1991) Index of Sexual Assertiveness, and the Sexual Desire Inventory (Spector and Fremeth, 1996). Results supported the first hypothesis of correlations between T and positive orgasm experience in women, specifically with the relaxation, soothing, and peaceful items in both partnered and solitary orgasm contexts. Results also indicated correlations between E and flooding and spreading items in a solitary orgasm context. There were no associations between hormones and men's perceptions of their orgasm experiences. There was no support for the second hypothesis of associations between higher T and more sexual assertiveness. Post hoc analyses showed associations between E and women's sexual desire, and T and men's sexual desire. We discuss implications of these findings including that solitary vs. partnered orgasm experiences may differ, and suggest that T might be associated with perceptions of psychological experiences of orgasms, and E might be associated with perceptions of physical experiences of orgasms.

Researchers have examined links between sexuality and hormones in both healthy and clinical populations (for a review, see Bancroft, 2005). Hormone–sexuality studies often focus on testosterone (T) and clinical populations, though some have addressed sexual questions in healthy populations. For example, sexual activity increases women's T (van Anders et al., 2007a) and perhaps men's T (Dabbs and Mohammed, 1992; cf. e.g. Lee et al., 1974), and viewing erotic stimuli increases men's T (e.g. Rowland et al., 1987) but perhaps not women's T (Heiman et al., 1991; van Anders et al., 2009). Others have included cortisol (C) (e.g. Exton et al., 2000) and estradiol (E) showing that sexual arousal decreases C and increases E (e.g. van Anders et al., 2009). Though much of sex research is conducted with steroids, researchers have found that peptides like prolactin and oxytocin appear to be higher around orgasm in women and men (e.g. Carmichael et al., 1987; Blaicher et al., 1999; Exton et al., 2001; Krüger et al., 2003).

Orgasm studies have largely been conducted with peptide rather than steroid hormones, so rather less is known about associations between steroids and orgasms. Still, some studies have examined T and orgasms in healthy individuals. Mantzoros et al. (1995) found correlations between DHT (a T metabolite) but not T itself and reported frequency of orgasms in men. Bancroft et al. (1983) found significant positive correlations between T and orgasm frequency over menstrual cycles. van Anders et al. (2007a) found evidence of trait-like associations between women's T and presence of orgasms. Exton et al. (1999) found a statistical trend for orgasm to increase T, and though van Anders et al. (2007a) did not find evidence of this, means were in the expected direction. As such, evidence links orgasms and T but in ways that have not been clearly characterized.

There are several possibilities for conceptualizing proximate mechanisms that underscore, and ultimate theories that address, orgasm–hormone associations and we test two of these in this paper. The first hypothesis is that individuals with higher T might experience orgasms in ways that are more positive in some way (e.g. more pleasurable, rewarding, etc.). There is evidence that androgens have reinforcing properties (Wood, 2004), and perhaps higher T women experience more frequent orgasms because they experience more rewarding orgasms. Further, there are correlations between T and interest in sexual stimuli (Rupp and Wallen, 2007) as well as sexual excitement (van Anders et al., 2009). And, Traish et al. (2007) found that T increased vaginal vasocongestion in rats, and van Anders et al. (2009) found that women's T was correlated with reports of past genital wetness. Women with higher T may experience more vaginal vasocongestion, and thus a heightened and more positive physiological/genital experience of orgasm, or they may pay more attention to sexual cues during sexual activity,

* Corresponding author. Fax: +1 734 763 7480.
E-mail addresses: smva@umich.edu (S.M. van Anders), emdunn@indiana.edu (E.J. Dunn).

0018-506X/$ – see front matter © 2009 Elsevier Inc. All rights reserved.
doi:10.1016/j.yhbeh.2009.04.007

which may enhance or increase attention to the positives of orgasm experiences.

The second hypothesis for orgasm–T links is that women with higher T might be more sexually assertive, as past evidence shows links between sexual assertiveness and orgasm frequency (Hurlbert, 1991). And, some evidence, though mixed, does link T with characteristics that might be described as related to assertiveness or confidence (e.g. Udry and Talbert, 1988; Mazur and Booth, 1998; Grant and France, 2001; Cashdan, 1995; van Bokhoven et al., 2006). Accordingly, T may be linked with assertiveness more generally, but with specific ramifications for partnered orgasm experiences. Here, we test for associations, but directionality could be such that higher T leads to more sexual assertiveness, more sexual assertiveness leads to higher T, or a more interactive effect.

Evidence also points to associations between E and sexuality, though few studies have been conducted with men. In many if not most relevant species, E facilitates estrus behaviors (e.g. Giraldi et al., 2004). E and sexual behaviors have also been strongly linked in non-human primates (e.g. Wallen and Zehr, 2004). In women, E is associated with vaginal processes like vasocongestion and lubrication (e.g. Sarrel, 2000), which are likely to be relevant to orgasm experiences. Research with postmenopausal women tends to show that lower levels of E are associated with lower vaginal lubrication (Alexander et al., 2004), and that E administration increases vaginal lubrication (e.g. Alexander et al., 2004; Cayan et al., 2008) as well as neural responses to erotic stimuli (Archer et al., 2006). Fewer studies have included premenopausal women, but findings do indicate E–sexuality links. For example, van Anders et al. (2009) found that women's E increased upon viewing erotic stimuli and predicted genital sexual arousal, and was also correlated with the Orgasm Subscale of the Female Sexual Function Index (FSFI: Rosen et al., 2000). Since there is less research with healthy premenopausal women's sexuality and E (and very little with men's), analyses with E were exploratory.

The majority of sexuality–hormone research is conducted within men or within women, and this decreases the ability to ask the same questions while taking gender into account. Further, the majority of sexuality research with men and premenopausal women includes T but not E, and few studies with men have included E at all. As such, we attempt to examine orgasm associations in men as well as women, including T and E. We hope to extend our limited knowledge about hormone–sexuality associations, and more specifically provide a foundation for future research on links between gonadal steroid hormones and orgasms in healthy men and women.

Methods

Participants

Participants ($N = 177$, mean age = 21 yrs, SD = 3 yrs) were recruited via advertisements posted in the community and via the Psychology Subject Pool, receiving $10 or class credit respectively for their participation. Participants included 91 men and 86 women, and the majority ($n = 162$) were students. Participants were diverse by employment status[1], self-identified ethnicity[2], religion[3], and had mostly resided in the U.S. for their entire lives[4].

Participants mostly self-identified as heterosexual ($n = 151$), with three participants identifying as bisexual, one as pansexual, four as gay, one as queer, one as lesbian, and one as homosexual, with 15 nonresponders. The Kinsey questions of sexual orientation via fantasy and behavior (Kinsey et al., 1948) produced a similar number of heterosexual individuals ($n = 152$) and GLQ (gay, lesbian, queer) individuals ($n = 6$), but a higher number of bisexual individuals ($n = 19$).

Participants were varied by relationship status: single ($n = 69$), dating one person ($n = 20$), dating more than one person ($n = 9$), in a long-term relationship of less than a year ($n = 35$), married, common-law, or in a long-term relationship greater than one year ($n = 34$), in a committed relationship and having other partners ($n = 6$), with four nonresponders.

The data from those women using hormonal contraceptives who volunteered despite selection criteria and two women who reported being menopausal were not analyzed as IRB approval was for women not using hormonal contraceptives. We use gender/sex throughout this paper despite the focus on hormones, because differences cannot knowingly be attributed to biology or gender socialization.

Materials and methods

Health and background questionnaire

This questionnaire contained questions about background and demographics to aid in characterizing the sample, sexual activity and relationships, and possible confounds with hormone measures. Sexual questions had options for individuals to indicate that they were not sexually active with their partners. Sexual activity was defined as activity where the participant's genitals (e.g. penis, clitoris, vagina) were stimulated. Participants were asked to indicate how often they (a) engaged in partnered sexual activity, (b) engaged in masturbation, and (c) experienced orgasm with their partner in the past 7 days, 30 days (on average per week), and six months (on average per week). Self-reported frequencies over the past week, month, and 6 months were highly and significantly correlated for the three variables (ranging from correlations of .43 to .84); as such, we used responses from the past week to minimize the number of analyses and control error inflation. For these and other analyses, both women and men demonstrated variability in their sexual experiences. Participants who selected the N/A response were not included in the relevant analyses.

Orgasm Checklist (Mah and Binik, 2002)

The Orgasm Checklist has two separate lists to characterize orgasms: (1) solitary masturbation, and (2) partnered sexual activity (participants are asked to indicate how they had this orgasm with their partner through five options including a self-listing option). The checklists are otherwise the same though the instructions differ. In each case, participants are instructed to recall their most recent orgasm. Participants are given the opportunity to indicate that they have never experienced either type of orgasm and are then instructed to skip the questionnaire. Participants who have experienced the relevant orgasm are asked to indicate how well each word from a list of 40 options characterizes that orgasm using a 6-pt scale from '0' = 'does not describe it at all' to '5' = 'describes it perfectly'. The 40 items make up 10 Components, which themselves make up three Dimensions (Evaluative, Affective, Sensory). The Orgasm Checklist has high reliability for women and men in the solitary and partnered contexts (Cronbach's $\alpha = .88–.92$) (Mah and Binik, 2002) and has been validated in nonclinical populations of younger men and women (e.g. Mah and Binik, 2002, 2005).

Hurlbert Index of Sexual Assertiveness (Hurlbert, 1991)

This index contains 25 brief statements regarding comfort with one's sexual activity, sexuality, sexual body, and ability to communicate sexually. Participants indicate how well each statement characterizes them on a five point scale from '0' = 'all of the time' to '4' = 'never'. The index was originally designed for people with current sexual partners, so we adapted the instructions such that single people could consider their last sexual partner. Participants who had never been sexually active with a partner were instructed to skip this questionnaire. The index was tested on a nonclinical sample of premenopausal younger women (18–31 yrs), who were divided based on a median score of 73 into demographically matched high and low scoring women (Hurlbert, 1991). As would be expected, more