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FEMALE SEXUAL FUNCTION

Differences in Perceived and Physiologic Genital Arousal Between Women With and Without Sexual Dysfunction

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ABSTRACT

Background: Many sexual psychophysiologic studies have failed to find differences in physiologic genital arousal between women with and those without sexual dysfunction. However, differences in self-reported (ie, perceived) measures of genital responses between these 2 groups of women have been noted.

Aims: To determine whether women with and without sexual dysfunction differ on measures of physiologic and perceived genital arousal based on type of analytic technique used, to explore differences in perceived genital arousal, and to assess the relation between physiologic and perceived genital arousal.

Methods: Data from 5 studies (N = 214) were used in this analysis. Women were categorized into 3 groups: women with arousal-specific sexual dysfunction (n = 40), women with decreased sexual function (n = 72), and women who were sexually functional (n = 102). Women viewed an erotic film while their physiologic genital arousal was measured using a vaginal photoplethysmograph. After watching the film, women completed a self-report measure of perceived genital arousal.

Outcomes: There were differences in vaginal pulse amplitude (VPA) levels and association of VPA with perceived genital sensations based on level of sexual function.

Results: Commonly used methods of analysis failed to identify significant differences in VPA among these groups of women. When VPA data were analyzed with hierarchical linear modeling, significant differences emerged. Notably, women with arousal-specific dysfunction exhibited lower VPA than sexually functional women at the beginning of the assessment. As the erotic film progressed, women with arousal-specific dysfunction became aroused at a faster rate than sexually functional women, and these 2 groups ultimately reached a similar level of VPA. Sexually functional women reported the highest levels of perceived genital responses among the 3 groups of women. No significant relation between VPA and perceived genital arousal emerged.

Clinical Translation: Women's perception of their genital responses could play a role in women's experience of sexual dysfunction and might be more clinically relevant for women with sexual dysfunction than genital blood flow.

Strengths and Limitations: This study's large sample is unique in sexual psychophysiology, and it strengthens the credibility of the findings. However, this study is limited in that arousal-specific dysfunction was determined with self-report measures, not by a clinician-administered assessment.

Conclusion: These findings suggest distinct response trajectories in women with and without sexual dysfunction, and although perceived genital responses are important for women who are experiencing problems with arousal, they do not seem to be related to objective measures of physiologic arousal. **Handy AB, Stanton AM, Pulverman CS, Meston CM. Differences in Perceived and Physiologic Genital Arousal Between Women With and Without Sexual Dysfunction. J Sex Med 2018;15:52–63.**

Key Words: Vaginal Photoplethysmography; Sexual Arousal; Female Sexual Dysfunction; Female Sexual Arousal Disorder; Perceived Arousal

INTRODUCTION

Vaginal photoplethysmography is the most commonly used measurement of genital sexual arousal in women. The vaginal photoplethysmograph contains a light-emitting diode or transistor that emits infrared or incandescent light. The light reflects

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off blood in the vaginal canal and is subsequently detected by the probe.[1,2] Vaginal photoplethysmography has been shown to be a sensitive and reliable index of women's physiologic sexual arousal.[3] Research has consistently found that vaginal pulse amplitude (VPA), the corresponding unit of physiologic sexual arousal, increases specifically during exposure to erotic stimuli. Exposure to anxiety-provoking stimuli, which also produces physiologic activation (eg, increased heart rate, galvanic skin response), does not increase VPA,[3] suggesting that VPA is uniquely sensitive to sexual arousal as opposed to general bodily arousal.

Several studies have suggested that VPA also might be sensitive to treatment effects of drugs intended to increase a woman's sexual arousal response. Meston and Worcel[4] found an increase in VPA response to erotic stimuli in women treated for sexual dysfunction with combined L-arginine glutamate plus yohimbine but not in women treated with placebo or yohimbine alone. Similarly, ginkgo biloba extract increased VPA to a greater extent than placebo in women with a diagnosis of female sexual arousal disorder (FSAD).[5,6] In postmenopausal women taking tibolone hormone therapy, Laan et al[7] found significant increases in VPA responses compared with women given placebo. Laboratory studies also have shown increases in genital responding with sildenafil[8,9] and combination testosterone plus vardenafil[10] (but see a review by Chivers and Rosen[11] for exceptions).

Despite several studies indicating VPA is a sensitive marker of sexual-specific arousal and drug treatment effects, the degree to which VPA can reliably discriminate between women with and those without sexual dysfunction is questionable. Using VPA percentage of change* scores as a means of measurement, several studies have not found differences in genital responsiveness between women with and those without sexual dysfunction.[12–14] In a large well-controlled study, Laan et al[15] did not find significant differences in the mean† or maximum‡ VPA scores between women with and those without FSAD.[5] To this end, Laan et al suggested that genital blood flow might not play a critical role in women's sexual arousal problems. Rather, they suggested that women's access to effectively arousing stimuli at home, negative affect related to sexual stimuli, or a lack of awareness of genital arousal could explain, in part, the lack of differences in genital blood flow between women with and those without FSAD. In other words, if women cannot obtain sufficiently arousing stimuli, or if sexual stimuli evoke negative feelings or anxiety, or if women with FSAD are unaware of genital changes associated with sexual arousal (cf Handy and Meston[16]), then they might present with symptoms of sexual arousal dysfunction.

In contrast to these null findings, Meston et al[17] reported differences in VPA based on theoretical sexual arousal dysfunction subtypes using hierarchical linear modeling (HLM), an analytic technique designed to handle a large number of data points. Women with genital arousal disorder had notably lower levels of VPA than did women with subjective (also known as "mental") arousal disorder and women who were sexually functional. They proposed that, in addition to the potential explanations described by Laan et al,[15] methodologic limitations might have contributed to the null findings of previous studies; using VPA mean, maximum, or percentage of change condenses continuous data into a single datum, thus compromising the richness and variability in the data. Condensing many data points into a single average value could mask potential fluctuations in VPA that might be clinically relevant and can be detected only when analyzing data continuously over time. HLM fits models to continuous, nested, multilevel data and estimates coefficients based on the unique slopes and intercepts of each subject.[18] This technique allows for the analysis of group data while still accounting for individual variability. Similarly, smoothing regression splines, a non-parametric form of regression, balances the fit between continuous data points with the number of contours in the modeled trajectory by minimizing the differences between actual and predicted y values.[19] Smoothing regression splines analysis is sensitive enough to detect category specificity in heterosexual women,[20] an effect that was previously undocumented in the literature.[21] However, most sexual psychophysiology studies rely on analyses of variance (ANOVAs) with just 1 average per film or condition. Although ANOVAs can be expanded using multiple observations (which would make better use of the continuous nature of VPA and would increase statistical power), these analytic techniques typically examine group, rather than individual, changes in VPA. HLM analyzes changes within individuals to determine the strength of the overall relation. An individual approach is particularly beneficial when examining VPA data, because VPA has no absolute values. Therefore, examining change within individuals allows for each woman to serve as her own control.

The studies cited earlier focused on objective measurements of genital responding (ie, vaginal photoplethysmographic recordings of genital responses). Interestingly, in the study conducted by Laan et al,[15] women with and without FSAD differed in their *perception* of their genital responses, although they did not differ in objective measurements of genital responding. Specifically, when asked whether they perceived any genital responses (eg, genital pulsing, throbbing, tingling, and wetness) during exposure to the erotic stimulus, women with FSAD reported significantly lower levels of genital responses compared with healthy controls. In addition, objective measurements of genital responding (VPA mean and maximum) were meaningfully related to perceived genital responses only in sexually functional women. Laan et al's finding suggests that FSAD might be more related to a lack of *perceived* genital responses than to problems with decreased genital responding (ie, decreased vasocongestion).

* A change score is a participant's mean VPA during the erotic film minus her mean VPA during the neutral film, divided by her mean VPA during the neutral film, and then multiplied by 100.

† A mean VPA score is a participant's mean VPA during the erotic film minus her mean VPA during the neutral film.

‡ A maximum VPA score is a participant's highest 30-second epoch of VPA during the erotic film minus her mean VPA during the neutral film.