



Controversies of Women's Sexual Arousal and Desire

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Abstract: The past three decades have seen an unprecedented increase in empirical research on women's sexual response. In this review, we critically examine current controversies and assumptions associated with the nature of women's sexual arousal and desire. We focus specifically on four assumptions: (1) the assumption that women should be aroused by stimuli that align with their stated preferences, (2) the assumption that women's physiological and self-reported arousal should perfectly align, (3) the assumption that sexual desire precedes sexual arousal, and (4) the assumption that a single pharmaceutical compound will adequately restore women's sexual response to her level of satisfaction. Engaging a gendered psychological framework for conceptualizing women's sexuality, we emphasize the need for models of women's sexual response to be sensitive to the sexed biological processes and gendered psychosocial factors that contribute to a woman's unique sexual experience.

Keywords: women, sexual desire, sexual arousal, sexual psychophysiology, sexual functioning

The past three decades have seen an unprecedented increase in empirical research on women's sexual response. Researchers and clinicians have made significant inroads in terms of understanding the physiological, psychological, and experiential components of women's sexuality. These changes are in recent revisions to the DSM-5 (American Psychiatric Association, 2013). Prior to the mid to late 1990s, women's and men's sexual response were mostly viewed as complementary, as two sides of the same coin (Chivers, 2005). As such, multiple perspectives on women's sexuality, including models of sexual response, the nature of sexual desire, and expressions and treatment of women's sexual concerns, were thought to be identical to those of men, albeit embodied within differently sexed forms. More recently, however, this genderless perspective on sexuality has been challenged as inadequately capturing women's unique experiences (Brotto, 2010; Chivers, 2005, 2010, 2016).

In this review, we will focus on current controversies associated with women's sexual arousal and desire, which we will also refer to collectively as "sexual response." Specifically, we review a number of misconceptions regarding women's sexual response in the context of conceptualizing and assessing typical function, concerns about sexual response, and approaches to treatment. First, we will consider the assumption that women should be

sexually aroused only by stimuli that align with their stated sexual desires. Second, we will consider the assumption that physiological and psychological components of sexual response should correspond perfectly. Third, we will review assumptions regarding the relationships between desire and arousal and their temporal association. Fourth, we will briefly discuss current evidence-based treatments of women's sexual difficulties. Before we engage in these controversies, however, we first provide an overview of models of sexual response and assessment of sexual response in laboratory and clinical settings.

Models of Sexual Response

Original conceptualizations framed sexual desire as spontaneous, preceding arousal and emerging from internal drive states, much like hunger or thirst. Stemming from the foundational psychophysiological research of Masters and Johnson (1966, 1970) and expanded upon by Kaplan (1977) and Lief (1977), this view posited that sexual response unfolded in a linear, tri-phasic manner for women and men: sexual desire was the instigator of a sequence of events leading to arousal and eventual orgasm. Manifestations of sexual desire, such as number of sex acts or orgasms, were considered bona fide behavioral

indicators, reflecting the “sum of the forces that incline us toward and away from sexual behavior” (Levine, 2002, pp. 47). Sexual desire and arousal were, therefore, viewed as distinct and sequential phases of sexual response. The relationship between sexual arousal and sexual desire, and their temporal associations, has since been hotly debated (Brotto, Graham, Binik, Segraves, & Zucker, 2011; DeRogatis, Clayton, Rosen, Sand, & Pyke, 2011; Everaerd, Laan, Both, & van der Velde, 2000; Meana, 2010).

The linear model sharply delineated sexual desire and arousal as distinct aspects of sexual response, paving the way for a diagnostic system where disorders of sexual desire were distinct from disorders of sexual arousal (American Psychiatric Association, 2000). This approach did not, however, adequately characterize women's experiences of sexual arousal and desire. For many women, distinction between sexual desire and arousal is artificial (Beck, Bozman, & Qualtrough, 1991; Brotto, Heiman, & Tolman, 2009; Graham, Sanders, Milhausen, & McBride, 2004). Validated measures of sexual functioning are often unable to separate desire from arousal items (Dennerstein, Leher, & Burger, 2005; Rosen et al., 2000), and there is considerable comorbidity between disorders of sexual desire and sexual arousal (Bancroft, Graham, & McCord, 2001; Fugl-Meyer & Fugl-Meyer, 2002; Laumann, Paik, & Rosen, 1999; Rosen, Taylor, Leiblum, & Bachmann, 1993; Segraves & Segraves, 1991).

A newer model of sexual response, the Incentive Motivation Model (IMM; Singer & Toates, 1987; Toates, 2009), proposes, instead, that sexual desire and arousal are reciprocally-reinforcing, such that sexual desire emerges from experiencing sexual arousal, and that arousal reinforces sexual motivations. Processing of a sexual stimulus automatically engages cognitive and physiological systems preparing the body for sexual activity, producing sexual arousal and triggering responsive sexual desire. Stemming from Emotion Theory (Lang, 1987; as summarized in Everaerd et al., 2000), the IMM posits that sexual motivation is not located “within” the individual, as a trait-like phenomenon, but, rather, is contextually-dependent (Singer & Toates, 1987). The IMM also posits that sexual response arises from the interplay between a sensitive sexual response system, determined by biological factors (hormones and neurotransmitters) as well as (conditioned) expectations based on past experiences, and an effective sexual stimulus. Individual differences in “arousability” also impact the strength and direction of the emerging sexual response, influenced by neurophysiological, personal, psychological, and cultural factors (Laan & Both, 2008).

The IMM identifies sexual response, like other emotions, as responsive, and it challenges previous conceptualizations

that situate sexual desire *within* an individual. It may be that sexual desire and arousal, while still framed within an incentive framework, may be phenomenologically distinguished for the individual. For example, feelings of sexual arousal may represent an awareness of genital changes resulting from sexual stimulation, perhaps combined with a conscious evaluation that the situation is indeed sexual. Sexual desire, on the other hand, may represent the experience of a willingness to behave in a sexual way, and takes place when feedback from physical changes goes beyond the threshold of perception (Laan & Both, 2008; Prause, Janssen, & Hetrick, 2008). In what follows, we distinguish between arousal and desire as a means of organizing existing research on sexual response.

Laboratory and Clinical Assessment of Sexual Response

Sexual Arousal

Sexual arousal is a term used to describe the physiological and psychological phenomena occurring in parallel with the emotional experience of sexual response (Chivers, Suschinsky, Timmers, & Bossio, 2013). Sexual psychophysiology is the measurement of this response, and involves the assessment of central and peripheral physiological changes reflecting activation of the autonomic nervous system by sexual stimuli. Nonspecific increases in sympathetic nervous system tone (e.g., cardiovascular and respiratory responses) are accompanied by increases in pelvic muscle tone (Zuckerman, 1971). Increases in heart rate and blood pressure lead to increased blood flow to the genitals, resulting in genital vasocongestion (Levin & Riley, 2007), the most reliable and valid physiological change associated with sexual response, in terms of specificity to processing sexual stimuli (Laan, Everaerd, & Evers, 1995; Suschinsky, Lalumière, & Chivers, 2009). Genital vasocongestion in women manifests as vulvar, clitoral, and vaginal vasoengorgement, genital lubrication, and increased tactile sensitivity (Paterson, Amsel, & Binik, 2013; Paterson, Jin, Amsel, & Binik, 2014). Most sexual psychophysiology methods assess the initial phases of genital vasocongestion, autonomic activity, and affective responses, though measurement of somatic, cognitive, and experiential aspects of orgasm are becoming more available (e.g., Patterson et al., 2013). The hormonal complement to sexual response is also becoming more routinely assessed as researchers recognize the dynamic and responsive nature of androgens, such as testosterone, to sexual stimuli (Goldey & van Anders, 2011).

Genital Measures of Women's Sexual Response

Vaginal Photoplethysmography (VPP)

The most commonly used method of assessing genital vasocongestion in the vaginal capillary bed is the vaginal photoplethysmograph (VPP). The vaginal photoplethysmograph (VPP; Palti & Bercovici, 1967) is a clear tampon-shaped plastic probe containing a light source (e.g., infrared light-emitting diode, LED) and a light detector (photoresistor), and is the most commonly used means of assessing genital vasocongestion in women (see Chivers et al., 2013 for detailed explanation). VPP output is filtered to extract the AC coupled signal component, vaginal pulse amplitude (VPA), which is thought to reflect the dynamic changes in vasocongestion with each heartbeat, with higher amplitudes indicating higher levels of arousal (Prause & Janssen, 2005). Though some debate exists as to the actual physiological process assessed by VPP (e.g., vasomotion vs. vasocongestion; Levin & Wylie, 2008), the device shows good measurement properties in terms of discriminant, predictive, and construct validity (see Chivers, Seto, Lalumière, Laan, & Grimbos, 2010, for a review and discussion). Its relative ease of use and low cost makes it an attractive choice, however, most researchers recognize that vaginal hemodynamics do not represent the totality of changes to the female genitals during sexual response.

Thermography

Genital vasocongestion increases genital skin temperature (Henson, Rubin, Henson, & Williams, 1977; Webster & Hammer, 1983), a response that can be validly measured using surface thermistors (Henson & Rubin, 1978; Payne & Binik, 2006; Prause & Heiman, 2009; Webster & Hammer, 1983) and thermographic cameras (Kukkonen, Binik, Amsel, & Carrier, 2007, 2010). Labial temperature change is generally correlated with changes in vaginal vasocongestion assessed using VPP (Henson & Rubin, 1978; Henson, Rubin, & Henson, 1979; but see Prause & Heiman, 2009), as is thermal imaging (Huberman, Dawson, & Chivers, 2016). Discriminant validity of thermal imaging, for example, distinguishing between women with and without sexual difficulties, has not been demonstrated, however, this is not atypical for sexual arousal concerns among women (see Sarin, Amsel, & Binik, 2015); many investigators have reported similar patterns of genital vasocongestion among women with and without sexual arousal difficulties (see Brotto, Chivers, Millman, & Albert, 2016 for a discussion).

Other Methods

Less commonly used measures of women's genital sexual response include *laser Doppler imaging* (LDI), which measures cutaneous blood flow to the vulvar skin through laser imaging (Waxman & Pukall, 2009), *Doppler*

ultrasound (Kukkonen et al., 2006), which is useful for targeted assessment of circulation to genital tissues, and *clitoral photoplethysmography* (CP), which is used for measuring clitoral blood volume changes during sexual response (Gerritsen et al., 2009; Suschinsky, Shelley, Gerritsen, Tuiten, & Chivers, 2016). Direct measures of vaginal/vulvar lubrication have been developed (see Dawson, Sawatsky, & Lalumière, 2015, for a discussion), but few have been implemented in clinical and experimental research. A novel and easy-to-use measure was recently developed by Dawson et al. (2015) who demonstrated response specificity with a litmus measure of introital moisture associated with sexual response. Pelvic floor surface electromyography has also been used to assess muscle tone associated with sexual response (Both & Laan, 2007), with preliminary data suggesting that intravaginal electromyography (EMG) is specific to processing sexual stimuli (Both, van Lunsen, Weijnenborg, & Laan, 2012).

Subjective Sexual Arousal

The subjective component of sexual response reflects a person's psychological experiences (e.g., memories, cognitions) along with their appraisals and integration of physical sensations (genital responses and general physiological responses) in response to a sexual stimulus (Laan & Both, 2008; Prause & Heiman, 2010). Self-report measures are most often used to assess individuals' subjective experiences and can take a number of forms. The most routinely used involve reporting feelings of sexual arousal following stimulus presentation using discrete items with Likert-type scales (e.g., How sexually aroused do you feel? How strong were your genital sensations?) or contiguously reported feelings of sexual response during stimulus presentation using a lever, mouse, or keypad (Rellini, McCall, Randall, & Meston, 2005). Both methods are reliable, valid, and typically strongly correlated, but contiguous reporting is less prone to impression management bias (Huberman, Suschinsky, Lalumière, & Chivers, 2013).

Cognitive Measures of Sexual Response

Sexual response is accompanied by a host of cognitive and emotional processes that are not specific to processing sexual stimuli, but can be broadly defined as occurring along the sequence of cognitive and neural events involved in stimulus detection, processing, appraisal, and response generation (see Chivers et al., 2013). A number of researchers have employed cognitive/affective paradigms to objectively assess sexual attractions in the context of forensically-significant sexual interests, such as pedophilia, where self-report may not be reliable, and where genital measurement may not be feasible; Chivers (2016) provides a detailed discussion of cognitive/affective methods to assess sexual interest throughout early stages of cognitive

and affective processing components of women's sexual response. For example, eyetracking can be used to detect capture of attention by specific categories of sexual stimuli, a behavioral correlate of sexual interest and motivation. These paradigms may also be helpful for understanding how sexual stimuli activate different components of the sexual response system in the context of women's sexual functioning.

Sexual Desire

Reconceptualizing sexual desire as a motivational state that is evoked by sexual stimuli, and responsive to contextual factors, significantly influences how and when desire is assessed. By far, the most common methods of assessing sexual desire use self-report, with the majority of measures based on the assumption that sexual desire is a stable, trait-like, and tonic phenomenon. First we review common self-report methods, then we discuss how the presence of sexual cues leads to sexual arousal and motivated sexual behaviors, and last we consider how arousal and desire shift depending on the sexual cues that are present. Because of the largely state-like nature of sexual desire, we argue that most of the conventionally used measures of desire provide an imprecise estimation of women's experiences.

Self-Report Measures

The 14-item Sexual Desire Inventory-2 (SDI; Spector, Carey, & Steinberg, 1996) is one of the most widely used measures of trait-based sexual desire, with good discriminant and convergent validity. It is considered by some to be a more comprehensive measure of sexual desire because it assesses both individual and relational desire by assessing desired frequency of sexual activity through masturbation and with a partner. In clinical contexts, the 19-item Female Sexual Function Index (FSFI; Rosen et al., 2000), popularized in clinical trials throughout the 2000s, is the most widely used measure of sexual functioning due to its brevity and availability of cut-scores validated in clinical samples (Gerstenberger et al., 2010). Desire is assessed with two items about frequency (from never to always) and intensity (from none at all to very high) of sexual desire over the past 4 weeks. Criticisms of the FSFI are that desire is limited to frequency and intensity, it is not valid in women who are not engaging in sexual behavior, and that women may have difficulty rating their own sexual desire retrospectively and without reference to a particular sexual encounter (Forbes, 2014; Forbes, Baillie, & Schniering, 2014; Meyer-Bahlburg & Dolezal, 2007). Moreover, changes in a woman's responsive sexual desire will not be captured by existing trait-based measures. Both the 14-item Changes in Sexual Functioning Questionnaire (Clayton, McGarvey, & Clavet, 1997) and the 22-item Brief Index of Sexual Functioning

for Women (Taylor, Rosen, & Leiblum, 1994) assess desire across two subscales: desire/frequency and desire/interest, and are sensitive to changes following treatment (e.g., Shifren et al., 2000). The 13-item Sexual Interest/Desire Inventory (SIDI; Clayton et al., 2006) takes a more multidimensional view of sexual desire, and assesses the frequency of sexual activity, fantasy, degree of enjoyment with erotic material, and pleasure when thinking about sex. In addition to these correlates of desire, the SIDI also assesses a woman's frequency of initiating sex, her receptivity to sex, and her satisfaction with desire (Clayton et al., 2006).

A notable criticism of these measures of sexual desire is that they tap into sexual desire as conceptualized as a trait phenomenon (e.g., Forbes, 2014; Forbes et al., 2014). Because sexual desire is understood to be responsive to adequate cues or triggers within an incentive motivation framework, this suggests that current measures may offer only an imprecise picture of a woman's experience. As a result, some have assessed state sexual desire by asking about desire to masturbate (one item) and desire for sex with a partner (one item) immediately following an arousal-inducing stimulus (Dawson & Chivers, 2014a, 2014b). One question from the "Arousal Continuation" domain of the SIDI that may be relevant to the concept of responsive sexual desire asks participants to rate the strength of their sexual desire "once you started to become sexually aroused." Future research should seek to validate new measures of state sexual desire that could be amenable to the at-home situation.

Qualitative and Clinical Interviews

Open-ended interviews (Brotto et al., 2009) and focus groups (Graham et al., 2004) aimed at exploring how women experience sexual response shed light on the ways women experience and express sexual arousal and desire (Meana, 2010) that may not be captured by self-report questionnaires. Tolman and Szalacha (1999) used both qualitative and quantitative methods to examine sexual desire in adolescent girls, and differences in how it was experienced between urban and suburban girls. Although approximately two-thirds of the girls reported experiencing sexual desire using quantitative measure, urban girls discussed how they sacrificed sexual pleasure to protect themselves from negative consequences (e.g., pregnancy, AIDS), and suburban girls described more sexual curiosity coupled with conflict given negative cultural messages regarding expression of women's sexuality.

In the clinical setting, experts recommend a comprehensive clinical interview with recall of recent and more distant situations in which sexual desire was and was not experienced. The context of those situations, details about the partner, and a thorough consideration of the woman's thoughts, emotions, and behaviors leading up to and during

the sexual encounter, are often probed (Brotto & Laan, 2015). It is also generally accepted that questions about the kind of sexual activity that she desires may reveal that her sexual desire is stimulus- and context-dependent (and responsive). Recommendations from an international consensus panel argue that none of the validated measures of sexual desire or arousal substitute for a thorough and thoughtful clinical interview (Brotto, Bitzer, Laan, Leiblum, & Luria, 2010). In the absence of a stimulus- and context-dependent assessment of desire, it may not be possible to decipher whether a woman's reportedly low level of sexual response is adaptive to her particular context, or if it reflects a true sexual dysfunction.

Behavioral Measures

The IMM proposes that sexual arousal and desire emerge in the presence of sexual incentives. The strength of sexual motivation is influenced by the reward value of incentives, and, after arbitration, may or may not be expressed as sexual behavior. Using behavioral measures, sexual desire could be assessed by assessing frequencies of sexual activity. Although desire may lead to sexual behavior, this does not necessarily mean that behavior is a valid and reliable index of sexual desire. In terms of the validity of this approach, several gendered factors need to be considered. Gender norms (Alexander & Fisher, 2003), reporting biases (Fisher, Moore, & Pittenger, 2012), and practical restrictions (Dawson & Chivers, 2014a) on expressions of sexual motivation are all factors that might influence whether desire manifests as overt behavior; indeed, desire in the absence of sexual action or behavior is more frequently observed among women than men (Baumeister, Catanese, & Vohs, 2001; Graham et al., 2004; Hill, 1997; Regan & Berscheid, 1995).

Women have traditionally been socialized to espouse more conservative sexual attitudes and suffer more severe social consequences for being sexually expressive and assertive than men, called *the sexual double standard* (Jonason & Fisher, 2009). As such, using only behavioral assessments of sexual desire may significantly underestimate a woman's sexual motivation. Alexander and Fisher (2003) examined the influence of gender stereotypes on the reporting of sexual behaviors using a bogus pipeline paradigm. In this experiment, participants were told that the veracity of their responses could be detected while they responded to questions about their sexuality. Under the bogus pipeline, women reported more sexual partners, consistent with the prediction from the sexual double standard hypothesis. Gender stereotypes may have a similar impact on the reporting on the frequency of sexual thoughts. In an ingenious study where women and men recorded the frequency of sexual and nonsexual thoughts throughout the day using a golf tally counter, Fisher et al. (2012)

demonstrated that observed gender differences in frequency of sexual thoughts may relate to a broader gender difference in frequency of needs-based cognitions; overall, men reported more frequent needs-based cognitions, for sleep and for food, as well as sex.

Women's reported frequency of behaviors may also be influenced by gendered physiological and cultural factors relating to menses, pregnancy, lactation, childbirth, peri- and post-menopause transitions, all normal and expected developmental fluctuations throughout a woman's sexual career. Framing these fluctuations in behavioral expressions of sexual desire as deficits overlooks the gendered environmental conditions, within the woman, in her sexual relationships, and her broader social context, that might impact her sexual expression. Sensitivity to sexual cues, and attractions to sexual partners, also fluctuate with a woman's hormonal cycles. Marked increases in sexual desire related behaviors have been reported during ovulation (e.g., Beck et al., 1991; Dawson, Suschinsky, & Lalumière, 2012; Hill, 1997; Hill & Preston, 1996; Impett & Peplau, 2002, 2003; Meston & Buss, 2007), suggesting a greater sensitivity and proceptivity (Diamond & Wallen, 2011; Diamond et al., 2016) to sexual cues at midcycle.

Sexual behavior can occur for many reasons, some of which are not directly related to sexual desire per se, such as stress reduction, to attain resources or status, or to boost self-esteem (Beck et al., 1991; Hill, 1997; Hill & Preston, 1996; Impett & Peplau, 2002, 2003; Meston & Buss, 2007). Similarly, the goals of sexual behavior may not simply be sexual activity or pleasure, and therefore may not reflect sexual desire. Some women with and without sexual difficulties have reported desiring enhanced intimacy rather than sexual activity (Brotto et al., 2009; Mark, Fortenberry, Herbenick, Sanders, & Reece, 2012); other scholars suggest that the sexual reward of being desired (Meana, 2010) may be particularly potent among women, and that enhancing women's self-consciousness of herself as an object of desire may be one means of cultivating sexual desire (Bogaert & Brotto, 2014). The relationship context of sexual desire must also be considered. The IMM proposes that level of sexual motivation is influenced by the hedonic quality of sexual cues that may change over time, likely owing to habituation to sexual cues (Dawson & Chivers, 2014c); sexual desire declines throughout a relationship and can be reinvigorated with a novel sexual partner (Dennerstein et al., 2005; Klusmann, 2002).

Objective assessment of sexual motivation may circumvent these concerns by, instead, assessing the action tendencies or automatic physiological responses that are associated with sexual desire. For example, Both and colleagues have examined Achilles tendon reflex (T-reflex) modulation – a reliable indicator of motor preparation (Both, Everaerd, & Laan, 2003; Both, Spiering,

Everaerd, & Laan, 2004; Both, van Boxtel, Stekelenburg, Everaerd, & Laan, 2005) and showed sensitivity to cues of sexual stimulus intensity. Moreover, T-reflexes show predictive validity, being positively associated with self-reported sexual behaviors in the 24 hr post-testing (Both et al., 2004).

Reconceptualizing sexual desire as a motivational state, emerging from sexual arousal, several investigators have examined the contextual and stimulus factors influencing responsive desire. These studies have shown that women's desire for sex with a partner, and to masturbate, assessed using self-report measures, can fluctuate within a short time frame in response to sexual stimuli (and at levels that are similar between women and men; Both et al., 2004; Dawson & Chivers, 2014a; Goldey & van Anders, 2012). Dawson and Chivers (2014a, 2014b) and Schmidt (1975) have also reported that both preferred and nonpreferred sexual stimuli (relative to participants' sexual orientation) can activate responsive sexual desire in women, reflecting a larger body of research showing significant variation in the relationships among sexual attractions and sexual response in women (see later in this review). Application of cognitive and affective methods of assessing sexual response may also prove useful in providing a quantitative measure of sexual motivation (Chivers, 2016).

Assumption #1: Women Should Only Respond Sexually to Stimuli That Align With Stated Sexual Desires and Attractions

A growing body of research has focused on the relationships among women's sexual attractions (e.g., sexual orientation, a directed form of sexual desire) and sexual response.

The relationship between subjective and genital measures of sexual arousal shows systematic variation within women, providing an opportunity to explore the unique features that elicit a sexual response among women. The first of these variations is the *category-specificity* of sexual arousal. In this context, *specificity* refers to the degree to which self-reported sexual attractions and sexual desires correspond with patterns of self-reported and genital sexual response to categories of sexual stimuli depicting or describing individuals or activities associated with sexual attractions. In the standard *specificity paradigm*, responses to preferred and nonpreferred sexual stimuli are compared, with a *nonspecific* pattern emerging when the individual shows significant activation to both categories of stimuli that are significantly greater than to neutral

stimuli. The most commonly investigated dimension of specificity of sexual response is sexual orientation, most often interpreted as directions of gendered sexual attractions to adult women (gynephilia hereafter), to men (androphilia), or both (ambiphilia). Sexual orientation can, however, be an umbrella term comprised of multiple dimensions, such as age/sexual maturity (as in the case of the chronophilias, see Seto, 2016), sexual activity preferences (see Chivers, 2016), subjective/nonsubjective sense of sexual identity (as in the case of asexually-identifying individuals, see Brotto & Yule, 2016), and a host of other dimensions including partner number orientation and nurturance (van Anders, 2015).

With respect to *gender* attractions, sexual responses are more variably associated in women than typically observed in men. Androphilic women (typically heterosexually-identified) exhibit a gender-nonspecific pattern of genital response, that is, similar levels of genital response to sexual stimuli depicting their preferred gender or their nonpreferred gender (Bossio, Suschinsky, Puts, & Chivers, 2014; Chivers & Timmers, 2012; Peterson, Janssen, & Laan, 2010; Steinman, Wincze, Sakheim, Barlow, & Mavissakalian, 1981; Suschinsky et al., 2009; Wilson & Lawson, 1978). Self-reported sexual arousal is more variably gender-specific among androphilic women, with some studies reporting greater sexual arousal to sexual stimuli depicting men compared to women (e.g., Chivers, Rieger, Latty, & Bailey, 2004; Chivers, Roy, Grimbos, Cantor, & Seto, 2014; Chivers & Timmers, 2012; Schmidt, 1975; Suschinsky et al., 2009), while others have reported gender-nonspecific self-reported sexual arousal (Bossio et al., 2014; Chivers & Bailey, 2005; Chivers, Seto, & Blanchard, 2007; but see also Pulverman, Hixon, & Meston, 2015, who reported category-specific genital and self-reported response in androphilic but not gynephilic women).

Gynephilic women (typically lesbian-identified) show gender-specific patterns of genital response in studies employing stimuli that depict or describe solitary women and men (Chivers, Bouchard, & Timmers, 2015; Chivers et al., 2007), and gender-nonspecific genital responses when stimuli depict couples engaging in sexual activity (Chivers et al., 2004; Peterson et al., 2010; Wincze & Qualls, 1984). More consistently than androphilic women, however, gynephilic women report gender-specific sexual arousal, though exceptions have been reported (e.g., Pulverman et al., 2015). Ambiphilic women's sexual response has received relatively less attention. Two recent studies suggested that ambiphilic women's sexual responses, both genital and self-reported, are significantly greater to female than male sexual stimuli across two modalities of stimuli: audiovisual (Timmers, Bouchard, & Chivers, 2015) and narrative (Bouchard, Timmers,

& Chivers, 2015). Another study examining self-reported responses only found a gender-nonspecific pattern, consistently with what might be expected for a bisexual woman (Blackford, Doty, & Pollack, 1996).

Gender-nonspecific response among androphilic women is not an artifact of the sexual stimuli typically employed in a specificity paradigm (i.e., usually audiovisual films of coupled sex; e.g., Bossio et al., 2014; Chivers et al., 2004, 2007; Peterson et al., 2010). Studies experimentally varying the intensity of sexual activity (Chivers et al., 2007), stimulus modality (e.g., recorded narratives; Chivers & Timmers, 2012), types of sexual activities (Chivers et al., 2014), and relationship contexts (Chivers & Timmers, 2012) depicted in sexual stimuli all report gender-nonspecific genital responses among androphilic women, ruling out the conclusion that the gender-specific responding is attributable to the type of stimulus used. This pattern of responding is also not moderated by menstrual cycle phase because androphilic women show gender-nonspecific responses in both fertile and nonfertile phases of their cycle (Bossio et al., 2014).

The complexity of the relationships between gendered sexual attractions and women's sexual response in women was recently underscored by Chivers et al. (2015) who demonstrated, across two studies using different stimulus modalities, that only exclusively androphilic women show gender-nonspecific genital responses. Women reporting any degree of gynephilia, even among those who self-identify as heterosexual (and are predominantly androphilic), showed significantly greater response to female versus male sexual stimuli. Self-reported arousal was more variable but generally associated with women's stated sexual attractions. This finding is particularly noteworthy given the implications of understanding how preferred and nonpreferred sexual cues become sexually salient and capable of activating the sexual response among women with no history of sexual attractions or behaviors with women. For example, exclusively androphilic women, that is, women reporting no sexual attraction or prior sexual history with women, showed significant sexual response to both female stimuli and male sexual stimuli, a pattern that is counter to their self-reported sexual attractions. This suggests that direct sexual experience with a sexual stimulus, or self-declared preference for a particular category of sexual stimuli, is not necessary to evoke a significant physical sexual response in women.

Concerns regarding the reliability of nonspecific sexual response center on methods of assessing genital response. All the studies that have detected gender-nonspecific genital response use VPP; therefore, it is natural to wonder if the device cannot provide discriminant data. We can rule out this explanation since gender-specific response patterns have been reported for gynephilic cisgender women,

gynephilic transgender women, and androphilic transgender women (Chivers et al., 2004), and, as will be later discussed, for other sexual orientations. Additionally, we (Huberman & Chivers, 2015) recently demonstrated gender-nonspecific VPA and genital temperature response to solitary masturbation stimuli using concurrent thermography and vaginal photoplethysmography (VPP). Gender-nonspecific sexual response is also not limited to genital responses assessment only (for a review, see Chivers, 2016). Patterns of gender-nonspecific activation of sexual response in androphilic women have been demonstrated at most if not all levels of sexual response, including early visual attention to sexual stimuli measured using eyetracking, cognitive interference measures, viewing time, cortical measures of sexual stimulus processing using electroencephalograms, and functional magnetic resonance imaging (fMRI) assessment of neural responses. Many of these same studies have shown gender-specific patterns of response among gynephilic women (see Chivers, 2016).

Meaningful associations between sexual response and other dimensions of women's sexuality have, however, been demonstrated. Sexual activity preferences, such as preferences for conventional sex acts versus sexual masochism (Chivers et al., 2014), are associated with significantly greater genital and subjective sexual response to narratives describing conventional sex acts than those describing sexual masochism. Notably these effects were mostly independent of the gender of actor described in the stimulus, suggesting that individual differences in sexual activity preferences may also be more relevant to women's sexual response than gender cues.

Sociosexuality, one's willingness to engage in sexual activity as a function of relationship commitment, is also associated with greater genital response to narratives describing sex with unfamiliar than familiar persons, and higher genital response to stimuli depicting low versus high relationship commitment (Timmers & Chivers, 2012). These effects were most pronounced for male sexual stimuli among androphilic women, suggesting that the stimulus cues of relationship context interact with individual differences in sociosexuality and gender attractions to influence patterns of sexual response. Women's genital responses have also been found to vary more strongly with relationship context cues than with gender cues (Chivers & Timmers, 2012), with greatest genital response to stranger and long-term partner versus friendship conditions, but did not differentiate between stories describing women or men; self-reported responses, on the other hand, were gender-specific.

Indeed, contextual elements of sexual stimuli have been theorized as relevant to women's sexual response (e.g., Basson, 2000; Rupp & Wallen, 2007), thus we could speculate that preferred sexual activity cues, certain relationship

contexts, and other contextual features might be more salient to eliciting women's sexual response than the gender of the sexual stimulus. In an indirect test of this hypothesis, we used images of sexually-aroused genitals to examine whether core sexual stimuli, unlike the context-laden complex stimuli such as films, stories, and interpersonal interactions, would be associated with gender-specific responses in androphilic women (Spape, Timmers, Yoon, Ponseti, & Chivers, 2014). Both genital and subjective sexual responses were significantly greater to male than female prepotent sexual stimuli, the only published study thus far demonstrating gender-specific genital response in androphilic women, other than Pulverman et al. (2015). Other features of sexual stimuli, such as relationship context, sexual activities depicted, and a host of other possible cues, are also capable of activating sexual response in women. In a practical sense, women can become aroused by a broad range of sexual cues, including seeing her (male) partner's arousal, countering long-held myths about women's sexual response being less visual, or negative associations with seeing a partner's genitals.

The most frequent misinterpretation of gender-nonspecific sexual response among androphilic women reflects assumptions that genital responses are truer reflections of women's sexual desires than her self-reported feelings of sexual arousal, or self-described sexual attractions. A common confusion from this research is that androphilic women must be ambisexual/bisexual because these women physically respond to sexual images of both women and men. The conceptual incoherence of this argument becomes apparent when considering the broader research showing women can experience genital responses to depictions of nonhuman primate sex acts (Chivers & Bailey, 2005; Chivers et al., 2007) and depictions of heterosexual rape (Both et al., 2004; Laan, Everaerd, van der Velde, & Geer, 1995; Suschinsky & Lalumière, 2011; Suschinsky et al., 2009). If genital response is an objective indicator of women's "true" sexual desires, then we are left with the disturbing and false conclusion that women are sexually aroused by depictions of sexual assault, even in the notable absence of self-reported feelings of sexual arousal. As we recently commented, "Sexual identity (how the individual conceptualizes and socially describes their patterns of sexual attractions and desires), sexual attractions (sexual orientation), and sexual response (sexual arousal and desire) are not interchangeable constructs in women, such that a woman's sexual desires and attractions can be deduced from sexual response patterns (Chivers et al., 2015, pp. 15)." Instead, the variation in the gender- and activity-specificity of women's sexual response provides an opportunity to understand factors associated with the incentivization of sexual cues in women.

Assumption #2: Physiological and Psychological Components of Women's Sexual Response Should Align

Variation in the specificity of sexual response highlights the capacity for components of women's sexual response to operate with some independence. Agreement between multiple measures of a phenomenon is traditionally an index of its construct validity (Campbell & Fiske, 1959). Given this precept, it is therefore reasonable to question whether the low(er) sexual concordance observed among women assessed using VPP, typically in the direction of significant genital response in the absence of concomitant self-reported arousal, might suggest that the VPP is not a valid measure of women's sexual response. Indeed, debate exists regarding the validity of models of sexual response whereby genital and affective responses are expected to be strongly related among women (cf. Basson, 2000).

The case of *sexual concordance*, or agreement between genital and subjective states of sexual response, provides a second example of systematic and meaningful variability in physiological-psychological aspects of sexual response in women. The most conclusive evidence regarding women's sexual concordance comes from a meta-analysis conducted by Chivers and colleagues (2010) quantifying the often-reported gender difference in sexual concordance. Chivers, Seto, Lalumière, Laan, and Grimbos (2010) noted that, although women's sexual concordance tends to be lower on average than men's (average Pearson $r = .26$ compared with $r = .66$ for men based on total samples of 2,505 women and 1,918 men), the confidence intervals for these estimates do not include 0, as would be expected if genital and subjective sexual responses were unrelated. In the meta-analysis, we explored a number of methodological and theoretically-informed factors to understand the wide variation observed in women's sexual concordance. Higher concordance among women was associated with variability in stimulus content, intensity, or modality ($r = .49$), methods of calculating concordance (when operationalized as an individual difference, using within-subjects correlations, $r = .43$), and method of assessing genital response, such that genital temperature methods yield higher estimates than VPP (.55 vs. .26, respectively). Remarkably, however, some have concluded from these meta-analytic data that sexual concordance assessed using VPP is negligible, for example, "most studies have found weak to non-existent relationships between VPA and self-reported sexual response" (Kukkonen, 2014, p. 31), and "there are mixed findings though most studies have low to no correlation" (Kukkonen, 2014,

p. 34) or even that women's sexual responses are "discordant."

Additional misconceptions frame sexual concordance through a gendered lens, relative to men's typically higher concordance, with the tacit assumption that higher concordance is a more valid expression of sexual response; women's lower sexual concordance is therefore, in relative terms, viewed as deficient or problematic. Although women show lower sexual concordance than men do, *on average*, lower sexual concordance among women is not universal. There is significant variation in agreement between physiological and subjective components of sexual response among women, regardless of methodology used to assess this relationship. Among women without sexual concerns, individual sexual concordance estimates vary widely. Some women's reports of sexual arousal are unrelated or even negatively related to genital responses, whereas other women show large and positive correlations between sexual affect and genital arousal, even for thermographic assessments of genital response (Kukkonen, 2014; Kukkonen et al., 2007).

Variation such as this strongly suggests the presence of moderators in the agreement of components of sexual response (Boyer, Pukall, & Holden, 2012). For example, in the meta-analysis, we estimated average sexual concordance correlation for women with various sexual difficulties ($n = 235$) as .04 (–.10 to .17) versus .26 (.21 to .37) for women without sexual difficulties ($n = 1,144$). In subsequent studies of clinical populations, lower sexual concordance has been reported for women with subtypes of DSM-IV female sexual arousal disorder (FSAD) (Meston, Rellini, & McCall, 2010) and FSAD and low desire (DSM-IV hypoactive sexual desire disorder, HSDD; Sarin et al., 2015). Among healthy women, several studies report higher concordance among women who more frequently experience orgasm (Adams, Haynes, & Brayer, 1985; Brody, 2007; Brody, Laan, & van Lunsen, 2003), also suggesting an association between concordance and sexual functioning. In a recent study of women seeking treatment for low sexual desire, the mean concordance estimate was 0.30, and it ranged considerably from –.90 to +0.91 (Brotto et al., 2016). In this study, increased concordance was not associated with greater clinical symptoms of sexual desire or distress; however, this may have been limited by the sample size. Taken together, this body of research consistently finds overall low agreement between genital and self-reported sexual arousal; however, the considerable range evidenced in concordance suggests that, for some women, there is strong alignment between the physical and mental aspects of sexual response, whereas for other women, these components may indeed be "discordant." Rather than viewing such nonalignment as indicative of faulty instrumentation, or a sign that women may be

consciously evading a declaration of sexual arousal, researchers should seek to understand the contributors (and possibly enhancers/inhibitors) to sexual concordance.

Assumption #3: Sexual Desire Precedes Sexual Arousal

Although the general concept of sexual desire emerging after sexual arousal had been acknowledged by Helen Singer Kaplan (1979), it was Basson who developed this concept more fully for clinical populations, proposing a circular sexual response cycle model for women and men (Basson, 2000, 2001). Basson's model articulated that the starting point in a sexual encounter is the individual's consideration of reasons for engaging in sexual activity. Motivation for sex that stemmed from sexual desire experienced spontaneously, or "out of the blue," was not the main trigger for women (Meston & Buss, 2007). Meston and Buss (2007), Impett et al. (Impett, Peplau, & Gable, 2005; Impett, Strachman, Finkel, & Gable, 2008), and others have identified a vast array of reasons why women engage in sexual activity, ranging from a wish for emotional intimacy, to expressions of love, to seeking revenge, versus a primary need to relieve sexual tension.

Basson's (2000, 2001) model normalized receptivity to sexual activity for non-desire related reasons, and posited that once physical signs of arousal emerged, and as long as the stimuli continued to be effective and the context in which they were delivered was appropriate for women, then the desire for ongoing sexual stimulation (i.e., responsive sexual desire) was accessed. At this point in the cycle, women had both their initial motivations for engaging in sexual activity (which may have been nonsexual) fulfilled, plus their now accessed responsive sexual desire further motivating them throughout the sexual encounter. If the outcome was experienced as rewarding for the woman (i.e., emotionally and/or physically, as in the case of orgasm), such rewards may impact her motivation for sex on a subsequent encounter. If the outcome of the event was negative (e.g., her desire for emotional connection was not fulfilled), this would negatively impact her motivation for sex in the future.

Although theoretically and clinically useful, one significant criticism of Basson's (2001) model of responsive sexual desire is that it has not (yet) been directly empirically tested (Segraves & Woodard, 2006) and may apply only to women with sex-related concerns. Indeed, women with lower scores on the FSFI were more likely to endorse the circular/responsive desire cycle, even though about equal groups of women endorsed the circular sexual

response cycle versus linear models of sexual response (Giraldi, Kristensen, & Sand, 2015; Sand & Fisher, 2007).

In contrast to these studies, Nowosielski, Wróbel, and Kowalczyk (2016), and Brotto et al. (2009) found that sexual functioning did not predict adoption of the different models. In their study of women with a variety of DSM-5 sexual dysfunctions (with 80% of them meeting criteria for Sexual Interest/Arousal Disorder) and sexually healthy controls, Nowosielski et al. reported that over a quarter of the women (28.7%) endorsed a linear model, and only 19.5% of women endorsed a circular-type model (with nonsexual motives for sexual activity) but the majority of participants (40.8%) endorsed a model with a combination of sexual and nonsexual reasons for engaging in sexual activity. It is also worth noting that methodological flaws in these studies (Giraldi et al., 2015; Sand & Fisher, 2007) such as concerns regarding order of presentation, model complexity, and differences in model accuracy may have impacted participants' endorsement of the different models (Brotto, Graham, Paterson, Yule, & Zucker, 2015). Most recently, and contrary to prevailing myths about the ever-ready and spontaneous potency of men's sexual desire, an Australian study of 573 men found that men were more likely to endorse a circular model of sexual response compared to the linear "desire first then arousal" model of Masters and Johnson (Connaughton, McCabe, & Karantzas, 2016). Thus, it seems as though prevailing beliefs about the relationship between desire and arousal in women may also apply to men.

Individual endorsement of models is one method of assessing validity: Empirical research testing theoretically-informed predictions regarding the nature of sexual motivation is another. A programmatic body of research from The Netherlands (e.g., Both et al., 2003, 2004; Everaerd & Laan, 1995; Laan & Everaerd, 1995; Laan, Everaerd, et al., 1995) has tested and found support for an Incentive Motivation Model (Toates, 2009) of sexual response, which accounts for the research findings of desire-arousal overlap. Further research in clinical populations testing predictions from the IMM will be useful in identifying effective treatment targets, in addition to addressing controversies regarding spontaneous versus responsive sexual desire. It is unfortunate that the circular sexual response cycle has been misinterpreted as suggesting that women's motives for sex are entirely nonsexual given that a careful reading of the model clearly demonstrates that nonsexual as well as sexual motives may move a woman from neutral toward being receptive to sexual stimuli.

More broadly, and in line with IMM, it is likely that this distinction between "spontaneous" and "responsive" sexual desire is false; after all, the model asserts that sexual response is just that – a response, and that what

spontaneous sexual desire may, in fact, reflect is that the triggers are not *apparent* to the woman. That sexual desire emerges "spontaneously" is also not supported by the evidence. In a direct comparison of women without sexual problems to women scoring low on the sexual desire subscale of the FSFI, McCall and Meston (2006, 2007) found that what distinguished the two groups was not whether one group experienced desire in the absence of triggers and the other group experienced it in response to triggers, as might be predicted by the Sand and Fisher (2007) study, but rather in the variety of cues that elicited motivation for sex. Specifically, women with sexual dysfunction had a smaller range of cues. There is also some evidence that some women with low sexual desire may have a blunted sensitivity to sexual stimuli (Bloemers et al., 2013). Further support for the dissolution of a "spontaneous desire" concept stems from findings of the "Study of Women's Health Across the Nation" which found that among the 2,400 women sampled, 41.4% reported that they never or infrequently felt sexual desire prior to sex (Avis et al., 2005); however, nearly all of the sample reported moderate to extreme levels of sexual satisfaction. Moreover, even among women who report high levels of sexual arousal, the majority (85%) reported that they at least occasionally began a sexual encounter with no awareness of sexual desire but then experience responsive desire as the encounter unfolds (Carvalho, Brotto, & Leal, 2010).

Interestingly, although Kaplan introduced the term "spontaneous sexual desire" (Kaplan, 1977, 1979), a more careful investigation of her description reveals that it made room for the responsive, or triggered, nature of sexual response, compatible with a model of incentivized sexual response. Specifically, spontaneous desire was defined by Kaplan as desire triggered by internal stimulation, which, upon further reflection, depicted a responsive model of desire, but one in which the triggers (or stimuli) are internal (or perhaps unconscious) rather than external. When considering the IMM, which predicts that sexual desire and arousal emerge simultaneously in response to effective (competent) sexual stimuli, what may appear to be "spontaneous desire" may actually reflect an individual's inability to identify those triggers (Both, Laan, & Schultz, 2010; Both et al., 2004). We agree that "spontaneous sexual desire" is a misnomer, and we encourage researchers to cease making distinctions between "spontaneous" and responsive sexual desire in their work, and instead, to work toward better identifying triggers for sexual response that fall within and outside of the individual's subjective awareness. As articulated in an excellent review of the spontaneous-responsive sexual desire debate by Meana (2010), we support her recommendation that the field "stop making spontaneous sexual desire the default explanation when we fail to identify a sexual stimulus" (p. 117).

State Versus Trait Sexual Desire

As introduced in the earlier section on self-report measures of sexual desire, another important consideration of sexual response relates to its state versus trait properties. A trait view of sexual response aligns with the historic “internal combustion” model that postulates that sexual desire resides within an individual, is tonic, and shows interindividual variation, with men typically having more sexual desire than women. As articulated more fully by Dawson and Chivers (2014a), the trait model of desire frames it as an aspect of personality similar to trait theory, which states that traits are relatively stable and enduring across time and contexts (Eysenck & Eysenck, 1985). Many existing self-report measures of sexual response (e.g., FSFI; Rosen et al., 2000; SDI, Spector et al., 1996) adopt a trait-like approach to assessing sexual desire wherein an individual is asked to recall the intensity and frequency of sexual desire (or arousal) over a specified period of time. However, these measures have been criticized as lacking in content validity and failing to capture the responsive nature of women's sexual desire, which is contextually- and situationally-dependent (Dawson & Chivers, 2014a; Forbes, 2014; Forbes et al., 2014). In contrast to predictions from trait theory, sexual response in women is highly variable, both between and within women (Meana, 2010). One implication of studying state versus trait sexual desire is that it may help to clarify whether or not gender differences exist in the experience of sexual desire. As noted by Dawson and Chivers (2014a), gender differences emerge when desire is measured as a trait (i.e., enduring and temporally stable) but not when measured as a state (i.e., responsive sexual desire following exposure to sexual stimuli), calling into question many of the prevailing conclusions about men having more sexual desire than women (Baumeister et al., 2001). Additionally, experimental paradigms have shown that when trait measures of desire, such as the SDI, are adapted to be administered before and after presentation of erotic stimuli, they are sensitive to arousal induction and potentially tap into state desire, whereas trait desire is not similarly responsive in men (Goldey & van Anders, 2012).

It is possible that considering sexual desire as a state versus a trait may help to reconcile the somewhat paradoxical findings in the literature which find low levels of sexual desire in samples of women despite their reported high levels of sexual satisfaction. For example, in a sample of community-recruited women aged 40–60, reports of “spontaneous” sexual thoughts (tapping into a trait-like sexual desire) were low, and the majority of women, across menopausal categories, reported the frequency of sexual thoughts as occurring mostly “never” or “once/month” (Cawood & Bancroft, 1996). Nonetheless, most of the sample reported a high level of sexual satisfaction. An earlier random sample

of 40-year-old Danish women found that a significantly greater proportion of women endorsed sexual desire in response to something the partner did (i.e., state desire) as opposed to *having* sexual desire at the outset (i.e., trait desire) (Garde & Lunde, 1980). Similarly, 78% of women in the Study of Women's Health Across the Nations engaged in sexual activity and the majority were physically, emotionally, and sexually satisfied, experienced physical pleasure, almost always experienced arousal, and usually did not have pain (Cain et al., 2003). Yet, most of the women reported infrequent (presumably trait) sexual desire (0–2/month). We would posit that had the sexual desire of these samples of women been assessed during a sexual encounter that they would have reported state-dependent sexual desire. Such a possibility remains open to empirical study.

One important clinical implication of adopting a state-like view of sexual response is that for women who may believe that they have “lost their sexual desire,” or that their sexual desire is fundamentally (and permanently) lower than their partner's, it may be fruitful for them to reframe their desire as responsive and explore the triggers of their sexual response. In other words, moving away from a pathologizing deficit model of sexual function, women may be encouraged to explore the variety of different elicitors of sexual desire, to consider their effects across contexts, and to appreciate their interaction with emotional states. In adopting a state model of sexual response, women may come to experience that a key inhibitor of sexual desire pertains more to restricted exposure to effective sexual cues, rather than her own innate deficit of desire. Treatment-outcome research in women's sexual desire has unfortunately adopted solely trait-based assessments that ask the woman to recall “how much sexual desire” she had over the past month. The content validity of these measures of desire has been questioned (e.g., Forbes et al., 2014) and some experts have advocated that researchers cease using these measures to capture changes in sexual desire within treatment-outcome research (Forbes, 2014). We agree that advancements in the science of improving women's sexual desire are dependent on the availability of more comprehensive and valid measures of sexual motivation.

Assumption #4: Pill Versus Skill: Restoring Brain Chemistry Is Sufficient for Cultivating a Satisfying Sexual Experience in Women

Until now, we have focused our remarks on sexual response, and we have considered the contextual,

stimulus-dependent, individual, and relational factors that elicit sexual response. Several large population-based studies have found that a significant proportion of women experience difficulties with sexual response, and that for some of those women, the distressing nature of those symptoms can persist for years (or decades). Cross-sectional, population-based studies of Western samples report that between 30% and 41% of women have experienced low sexual desire lasting several months over the past year, and between 7% and 10% of women report these problems plus significant associated distress (Mitchell et al., 2013; Shifren, Monz, Russo, Segreti, & Johannes, 2008). Rates appear to be even higher in non-Western samples of women, and a multinational study of individuals aged 40–80 in 29 countries found that the prevalence of a lack of interest in having sex for 2 months or more was particularly pronounced among women residing in Middle Eastern and Southeast Asian nations (up to 43% of women) (Laumann et al., 2005). Difficulties with sexual desire/arousal continue to be the most frequent complaint seen in sex therapy clinics, and the majority of women with any sexual difficulty (i.e., desire, arousal, orgasm, or pain-related) state that their low sexual desire is the main source of their distress (Hayes, Bennett, Fairley, & Dennerstein, 2006).

Psychological Treatments

Surprisingly, given the high prevalence of sexual response concerns among women, there are relatively few controlled treatment-outcome studies evaluating psychological therapies. Two treatment modalities, cognitive behavioral therapy (CBT) and mindfulness-based cognitive therapy (MBCT), involve skills aimed at challenging problematic thoughts that interfere with sexual response (in the case of CBT) and enhancing sensitivity to sexual stimulation through attentional mechanisms (in the case of MBCT). CBT is a change-oriented approach that involves identifying and challenging problematic beliefs that give rise to sex-related avoidance and negative emotions. MBCT, on the other hand, espouses an acceptance-based approach, and involves the cultivation of present-moment, nonjudgmental awareness, without any deliberate attempt to change one's experience. Unlike pharmaceutical approaches to treating women's low sexual desire, which rest on the assumption that an imbalance in neural transmitters is the cause of women's loss of sexual desire (Kingsberg, Clayton, & Pfau, 2015), psychological approaches adopt a broader approach to addressing low sexual desire by considering the whole woman in the context of her environment, relationship, culture, and society.

Cognitive Behavioral Therapy

A recent meta-analysis by Frühauf, Gerger, Schmidt, Munder, and Barth (2013) identified a total of 20 studies focused on women with sex-related difficulties that included a wait-list control group, and another eight studies that included direct comparisons with other therapies; however, only four of those studies were focused on women with low sexual desire. The interventions were largely cognitive behavioral and included behavioral skill training to improve communication between partners, increase sexual skills, and reduce sexual and performance anxiety. The meta-analysis found an overall large effect size of $d = 0.91$ for the primary endpoint of low desire and a moderate effect on improving sexual satisfaction, $d = 0.51$. These treatment gains, along with quality of sexual and marital life, sexual satisfaction, perception of sexual arousal, sexual self-esteem, depression, and anxiety, persist up to a year following treatment. Notably, partner presence during therapy is a significant predictor of better outcomes (Günzler & Berner, 2012).

Unfortunately, there have not been any controlled psychological treatment outcome studies focused specifically on women with (genital) sexual arousal complaints. Of note, however, given our support for the IMM, which considers sexual desire and arousal as emerging simultaneously in response to effective stimuli within a responsive sexual system, we would predict that approaches found effective for women with low desire for sex would also be effective for sexual arousal. Not surprisingly, past studies showing the efficacy of CBT for women with low desire typically also found significant improvements in self-reports of arousal.

In spite of a moderate/strong effect size for CBT in the treatment of low sexual desire, it bears mentioning that the change-based approach of CBT does not fit for all treatment-seekers (Mace, 2005), highlighting the need to consider other psychological treatment approaches. Considering this through the lens of IMM, approaches designed to target the relationship between awareness of (competent) sexual stimuli and responsive sexual desire may hold promise for improving sexual response. One approach that lends itself to this particularly well is mindfulness meditation.

Mindfulness-Based Cognitive Behavioral Therapy

Mindfulness is described as “non-judgmental, present-moment awareness” and has long-standing roots in Buddhist meditation (Austin, 1999). Since 2003, mindfulness¹ has been studied in the context of treating a variety of women's sex-related difficulties. Although a

¹ The instructions in a mindfulness-based approach guide the participant to focus their attention on a particular target (e.g., the breath), to notice when the mind wanders, and to guide attention compassionately and nonjudgmentally back to the target.

number of small noncontrolled trials have found 3–4 sessions of group or individual mindfulness to improve sexual arousal and desire (Brotto, Basson, & Luria, 2008; Brotto, Heiman, et al., 2008), to date there have been only two published studies using a control group (Brotto & Basson, 2014; Brotto, Erskine, et al., 2012) and one study that compared mindfulness to CBT (Brotto, Seal, & Rellini, 2012). Compared to a wait-list control group, women receiving three monthly mindfulness sessions had significant improvements in sexual desire ($d = 1.07$), arousal ($d = 1.34$), lubrication ($d = 1.37$), orgasm ($d = 0.73$), satisfaction ($d = 0.97$), and sex-related distress ($d = 0.89$), and effects were retained at a 6-month follow-up assessment (Brotto, Erskine, et al., 2012). In another study employing a group format and a larger sample, mindfulness-based therapy led to significant improvements, compared to wait-list control, in sexual desire ($d = 0.97$), sexual arousal, lubrication, sexual satisfaction, and overall sexual functioning (from $d = 0.75$ to $d = 1.07$) (Brotto & Basson, 2014). Compared to group CBT, group mindfulness led to significant increases in subjective-genital concordance in a sample of women with sexual distress associated with a history of childhood sexual abuse (Brotto, Seal, et al., 2012).

The mechanisms by which mindfulness-based therapy leads to improvements in sexual desire and other domains of function have only begun to be explored, and may include improvements in ability to attend to physiological sexual arousal, reduced anxiety and spectating (or, watching oneself critically), improvements in mood, and reduced distraction and inattention. In a recent study, four sessions of group mindfulness similarly led to significant increases in sexual concordance (Brotto et al., 2016), and multilevel modeling revealed that changes in subjective sexual arousal predicted changes in genital response, but not the reverse. One mechanism by which mindfulness may increase sexual response is through increasing sexual interoception, the ability to perceive sexual sensations during sexual response in the laboratory. In a study of reaction time to sexual stimuli, Silverstein, Brown, Roth, and Britton (2011) found decreased reaction time following mindfulness training, and they speculated that this reflects an increase in interoceptive awareness (awareness of internal bodily sensations). Further evidence that mindfulness may improve sexual functioning by targeting interoceptive awareness comes from the finding that mindfulness training induces functional changes in the insula (an area of the brain associated with awareness of body states), and that it decreases activation of the amygdala and areas of ventromedial prefrontal cortex (Hölzel et al., 2011) associated with emotions. Experienced meditators have been found to maintain body awareness during periods of distraction, and this was associated directly with activity in the insula (Hölzel et al., 2011).

Extrapolating these findings to sexual response, mindfulness training may strengthen the association between a (sexual) stimulus and reward, and/or it may expand the range of (sexual) stimuli that are considered rewarding. For example, throughout these practices, women may have appraised stimuli in a more sexual (and less judgmental or negative) manner, and this may have triggered sexual response. Mindfulness also enhances attention (as reviewed by Wolkin, 2015), and by becoming experienced with sustained attention, women's attention toward sexual stimuli and away from multiple distractions could have also increased sexual response. Mindfulness is not intended to "reassure women that it is normal to have no desire," as postulated by pro-drug critics of the applicability of mindfulness for women's sexuality (Pyke & Clayton, 2015a, 2015b), nor is it meant to cement women where they are ("stuck in the Basson model"; Pyke & Clayton, 2015a, p. 1977). Sadly, this view perpetuates a reductionistic understanding of women's sexuality and stalls progress on psychological approaches for women. Moreover, it denies the prospect of bolstering the sexual response by teaching women to refocus attention to the present-moment sexual situation, thereby increasing the effectiveness of sexual stimuli to trigger responsive desire and to boost interoceptive awareness. Although this hypothesis is supported by neuroscientific data showing the mechanisms of mindfulness in other patient populations and conditions, these insights remain to be tested in samples of women with sex-related difficulties.

Pharmaceutical and Hormonal Treatments

Sildenafil Citrate (Viagra)

Following the approval of sildenafil citrate for men's erectile dysfunction in the late 1990s, there was an intense race to find a medication for the treatment of female sexual dysfunction. Even sildenafil citrate (Viagra) held promise for several years as a treatment for sexual arousal disorder in women, and a small number of uncontrolled studies reported improvements to physical arousal impairments (e.g., Berman et al., 2001) and orgasm latency (Basson & Brotto, 2003). Although sildenafil produced modest increases in VPP-assessed vaginal vasocongestion (see Chivers & Rosen, 2010, for a review), self-reported feelings of sexual response were more strongly related to treatment expectancies. In a placebo-controlled study assessing expectancy effects, women who believed that had received sildenafil reported greater feelings of sexual arousal, regardless of whether they had receive placebo or active medication (Laan et al., 2002). Also problematic is the underlying assumption that increasing genital response should resolve sexual response concerns. This gender-blind approach assumes that women's and men's sexual

response, particularly the relationship between psychological and physiological sexual arousal, follows similar mechanisms, despite clear evidence to the contrary (Chivers & Rosen, 2010). Sildenafil also failed as a treatment for the much more common symptom of low sexual desire (Berman et al., 2003), and the sponsor stopped funding clinical trials.

Testosterone (T)

The role of sex steroids in sexual response is poorly understood, however, testosterone treatment for low desire is currently widely prescribed without regulation. Guidelines from the 2009 International Consultation on Sexual Medicine suggest that testosterone therapy is effective for postmenopausal women with low desire, but its use is strictly "off-label," it should not be used long term, and it is not recommended for pre- or perimenopausal women (BioSante Pharmaceuticals, 2011; Wierman et al., 2010). In 2005, a transdermal form of testosterone became available in Europe for estrogen-treated women who had loss of sexual desire and bilateral oophorectomy plus hysterectomy. Notably, the testosterone patch was removed from the European market in 2012 for commercial reasons. Since then, other hormonal agents (e.g., tibolone, DHEA; Nappi & Cucinella, 2015) have also been the focus of study, but lack of effectiveness, a large placebo response, and concerns about side effects contributed to no hormonal agents being approved by the US Food and Drug Administration.

Given the strong placebo response in testosterone trials with women (Bradford & Meston, 2009), concerns about its safety, and the relative lack of attention to psychosocial or contextual mediators of effect, testosterone administration alone is unlikely to address the psychological components, such as sexual concordance, thought to be integral to experiencing sexual desire. Moreover, the bulk of research examining the testosterone-desire link has focused on *trait* or baseline levels of serum or salivary testosterone and self-reported measures of sexual desire with mixed results (Alexander, Dennerstein, Burger, & Graziottin, 2006; Gerber, Johnson, Bunn, & O'Brien, 2005; Riley & Riley, 2000; Turna et al., 2004). Sex steroids are not static, but responsive to social contexts (Alexander et al., 2006; Gerber et al., 2005; Riley & Riley, 2000; Turna et al., 2004), therefore investigating testosterone responses to sexual stimuli may be more informative than trait levels in understanding its links to sexual desire.

Testosterone is proposed to modulate responses to sexual stimuli over a course of hours or days (Bloemers et al., 2013), thereby increasing the salience of sexual stimuli (Goldey & van Anders, 2012) and a woman's sensitivity to future sexual stimuli (Both, Everaerd, & Laan, 2007). Responsive testosterone is significantly associated with

women's self-reported desire for solitary sexual activity, and with mental and physical sexual arousal in non-laboratory environments (van Anders, Brotto, Farrell, & Yule, 2009), despite lack of associations between perceptions of genital response, subjective arousal, and dyadic sexual desire. Although statistically significant T increases following exposure to sexual stimuli have not been observed in healthy women (van Anders, Hamilton, Schmidt, & Watson, 2007; Heiman, Rowland, Hatch, & Gladue, 1991), small sample sizes, stimulus quality, and the lack of a neutral stimulus condition may be associated with null effect. Experiments involving sexual thoughts or dyadic sexual activity *have* been found to increase testosterone in women (Dennerstein, Hayes, Sand, & Lehert, 2009; Goldey & van Anders, 2012) suggesting that the effects of sexual stimuli on testosterone are mediated by other factors.

Flibanserin, Lybrido, and Lybridos

The pharmaceutical treatment landscape changed in August 2015 when flibanserin (trade name Addyi), then owned by Sprout Pharmaceuticals, became the first nonhormonal medication to be approved by the Food and Drug Administration for the treatment of premenopausal hypoactive sexual desire disorder. Flibanserin is a centrally-acting medication purported to increase dopaminergic activity and inhibit serotonergic activity, though no study to date has demonstrated resolution of neurotransmitter "imbalances" (i.e., that restoration of the brain's dopamine, norepinephrine, and serotonin levels mediates flibanserin's effects on desire) in flibanserin-treated women with low sexual desire. Concerns over interactions with alcohol, prescriber restrictions, and modest efficacy data, however, have been identified as shortcomings of the medication (e.g., Basson, Driscoll, & Correia, 2015), and demand for the drug in its first months of availability was very low. Furthermore, a meta-analysis of published and unpublished studies of flibanserin showed a mean increase of only 0.5 sexually satisfying events per month in the face of clinically significant risk of dizziness, somnolence, nausea, and fatigue (Jaspers et al., 2016). And although number of sexually satisfying events marginally increased, daily diary studies showed no increases in sexual desire or sexual satisfaction.

Most recently, two combination pharmacological treatments, Lybrido (0.5 mg testosterone in a cyclodextrin carrier combined with 50 mg sildenafil citrate) and Lybridos (0.5 mg testosterone in a cyclodextrin carrier combined with 10 mg buspirone), have received much attention because their innovative mechanisms of action tap into the multiplicity of the sexual response system. Lybrido was found to improve sexual desire among women with relative insensitivity to sexual cues whereas Lybridos was effective

among women with strong inhibitory mechanisms (Bloemers et al., 2013; Poels et al., 2013; van Rooij et al., 2013). Each drug combination is designed to address central and peripheral mechanisms of response and putative factors influencing response; testosterone increases sensitivity of the sexual response system to sexual cues, and bupropion reduces inhibition of response; each combination therefore facilitates central processing of sexual stimuli and, with the addition of sildenafil, produces greater genital vasocongestion. Lybridos, in particular, may prove effective for attenuating inhibitory factors, thus allowing sildenafil's effects on genital arousal to be more readily detected by the woman. Given that both of these medications address the potency of sexual stimuli and the importance of the brain's processing of those stimuli, it may be that these two medications, which are currently the subject of Phase III clinical trials, possess the most promise for addressing the etiology of women's impaired sexual responding.

These and countless other pharmacological treatments have been disappointing for improving women's sexual problems. We believe that a single pharmaceutical agent that addresses the multiple underlying contributors to low sexual response does not exist. Furthermore, we reject any treatment approach that fails to be sensitive to the contextual, psychological, relational, and larger sociocultural forces that shape sexual function and inhibit sexual response. When a woman has predominantly unrewarding sexual experiences, there will be very few stimuli that can elicit feelings of arousal. Furthermore, in a predominantly negative relational context, the woman will be reluctant to respond to sexual stimulation. Therefore, stimulation of sexual arousal with medication alone cannot be expected to be very effective (Laan & Both, 2011). Though pro-medication experts criticize psychological treatment outcome research for failing to meet the high methodological standards of drug trials (Pyke & Clayton, 2015b), this view ignores a large body of data repeatedly showing the responsiveness of women's sexuality to contextual triggers that may offer a more holistic restoration of a woman's sexual function which a single drug approach can only promise.

Conclusion

In this review, we have reconsidered a body of literature that addresses four fundamental assumptions about women's sexual response which have hampered forward movement in the field of women's sexuality, and have contributed to a general public ignorance of women's desire. Though countless other misconceptions continue to pervade sociocultural attitudes toward women's sexuality, we focused specifically on (1) the assumption that

women should be aroused by stimuli that align with their stated preferences; (2) the assumption that women's physiological and self-reported arousal should perfectly align; (3) the assumption that sexual desire precedes sexual arousal; and (4) the assumption that a single pharmaceutical compound will adequately restore women's sexual response to her level of satisfaction. Though there is ample evidence challenging each of these assumptions, misleading headlines such as "The Lies Women Tell About Sexual Arousal" (Cormier, 2015) and "FDA approves female Viagra" (Ault, 2015) continue to dominate the media and influence public perception about the nature of women's sexual response.

In this review, we have highlighted how models of spontaneous sexual desire are at odds with established psychological theory and data regarding incentive motivation. Similarly, we demonstrated how conceptualizing sexual desire as a trait is counter to a rich body of data suggesting sexual response is an emotional state, sensitive to contextual factors. We emphasized the multidimensional and multidetermined processes that contribute to women's sexual response, thereby challenging and obviating single-dimension approaches that fail to capture the entirety of women's sexual experiences. In sum, we challenged current conceptualizations of women's sexuality, and emphasized the need for an empirically-based approach that critically examines the multiple assumptions surrounding women's sexual response. To move forward, data-driven, psychological models of conceptualizing, assessing, and treating women's sexual response must continue to be developed, tested, and implemented. Crucial to this process is adopting a gendered approach, where the uniqueness of women's sexuality is integral to theory development, testing, and clinical practice. Instead of concluding that women's sexuality is "more complex" than men's, thereby using male sexuality as a benchmark against which female sexuality is characterized, we encourage other researchers and clinicians to, instead, shed expectations for equivalence or similarity, and consider the gendered factors and sexed biological processes that contribute to a woman's unique sexual experience.

References

- Adams, A. E., Haynes, S. N., & Brayer, M. A. (1985). Cognitive distraction in female sexual arousal. *Psychophysiology*, *22*, 689–696. doi: 10.1111/j.1469-8986.1985.tb01669.x
- Alexander, J. L., Dennerstein, L., Burger, H., & Graziottin, A. (2006). Testosterone and libido in surgically and naturally menopausal women. *Women's Health*, *2*, 459–477. doi: 10.2217/17455057.2.3.459
- Alexander, M. G., & Fisher, T. D. (2003). Truth and consequences: Using the bogus pipeline to examine sex differences in self-reported sexuality. *Journal of Sex Research*, *40*, 27–35. doi: 10.1080/00224490309552164

- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
- Ault, A. (2015, August). FDA approves "Female Viagra" Flibanserin (Addyi). *Medscape*. Retrieved from <http://www.medscape.com/viewarticle/849643>
- Austin, J. H. (1999). *Zen and the brain: Toward an understanding of meditation and consciousness*. Cambridge, MA: MIT Press.
- Avis, N. E., Zhao, X., Johannes, C. B., Ory, M., Brockwell, S., & Greendale, G. A. (2005). Correlates of sexual function among multi-ethnic middle-aged women: Results from the Study of Women's Health Across the Nation (SWAN). *Menopause*, 12, 385–398. doi: 10.1097/01.GME.0000151656.92317.A9
- Bancroft, J., Graham, C. A., & McCord, C. (2001). Conceptualizing women's sexual problems. *Journal of Sex & Marital Therapy*, 27, 95–103. doi: 10.1080/00926230152051716
- Basson, R. (2000). The female sexual response: A different model. *Journal of Sex & Marital Therapy*, 26, 51–65. doi: 10.1080/009262300278641
- Basson, R. (2001). Using a different model for female sexual response to address women's problematic low sexual desire. *Journal of Sex & Marital Therapy*, 27, 395–403. doi: 10.1080/713846827
- Basson, R., & Brotto, L. A. (2003). Sexual psychophysiology and effects of sildenafil citrate in oestrogenised women with acquired genital arousal disorder and impaired orgasm: A randomised controlled trial. *BJOG: An International Journal of Obstetrics & Gynaecology*, 110, 1014–1024. doi: 10.1111/j.1471-0528.2003.02438.x
- Basson, R., Driscoll, M., & Correia, S. (2015). Flibanserin for low sexual desire in women: A molecule from bench to bed? *EBioMedicine*, 2, 772–773. doi: 10.1016/j.ebiom.2015.08.009
- Baumeister, R. F., Catanese, K. R., & Vohs, K. D. (2001). Is there a gender difference in strength of sex drive? Theoretical views, conceptual distinctions, and a review of relevant evidence. *Personality and Social Psychology Review*, 5, 242–273. doi: 10.1207/S15327957PSPR0503_5
- Beck, J. G., Bozman, A. W., & Qualtrough, T. (1991). The experience of sexual desire: Psychological correlates in a college sample. *Journal of Sex Research*, 28, 443–456. doi: 10.1080/00224499109551618
- Berman, J. R., Berman, L. A., Lin, H., Flaherty, E., Lahey, N., Goldstein, I., & Cantey-Kiser, J. (2001). Effect of sildenafil on subjective and physiologic parameters of the female sexual response in women with sexual arousal disorder. *Journal of Sex & Marital Therapy*, 27, 411–420. doi: 10.1080/713846815
- Berman, J. R., Berman, L. A., Toler, S. M., Gill, J., & Haughie, S., Sildenafil Study Group. (2003). Safety and efficacy of sildenafil citrate for the treatment of female sexual arousal disorder: A double-blind, placebo-controlled study. *Journal of Urology*, 170, 2333–2338. doi: 10.1097/01.ju.0000090966.74607.34
- BioSante Pharmaceuticals. (2011). *BioSante Pharmaceuticals announces results from LibiGel efficacy trials*. Retrieved from <http://seekingalpha.com/news-article/2106668-biosantepharmaceuticals-announces-results-from-libigel-efficacy-trials>
- Blackford, L., Doty, S., & Pollack, R. (1996). Differences in subjective sexual arousal in heterosexual, bisexual, and lesbian women. *Canadian Journal of Human Sexuality*, 5, 157–167.
- Bloemers, J., van Rooij, K., Poels, S., Goldstein, I., Everaerd, W., Koppeschaar, H., ... Tuiten, A. (2013). Toward personalized sexual medicine (Part 1): Integrating the "Dual Control Model" into differential drug treatments for hypoactive sexual desire disorder and female sexual arousal disorder. *Journal of Sexual Medicine*, 10, 791–809. doi: 10.1111/j.1743-6109.2012.02984.x
- Bogaert, A. F., & Brotto, L. A. (2014). Object of desire self-consciousness theory. *Journal of Sex & Marital Therapy*, 40, 323–338. doi: 10.1080/0092623X.2012.756841
- Bossio, J. A., Suschinsky, K. D., Puts, D. A., & Chivers, M. L. (2014). Does menstrual cycle phase influence the gender specificity of heterosexual women's genital and subjective sexual arousal? *Archives of Sexual Behavior*, 43, 941–952. doi: 10.1007/s10508-013-0233-7
- Both, S., Everaerd, W., & Laan, E. (2003). Modulation of spinal reflexes by aversive and sexually appetitive stimuli. *Psychophysiology*, 40, 174–183. doi: 10.1111/1469-8986.00019
- Both, S., Everaerd, W., & Laan, E. (2007). Desire emerges from excitement: A psychophysiological perspective on sexual motivation. In E. Janssen (Ed.), *The psychophysiology of sex* (pp. 327–339). Bloomington, IN: Indiana University Press.
- Both, S., & Laan, E. (2007). Simultaneous measurement of pelvic floor muscle activity and vaginal blood flow: A pilot study. *The Journal of Sexual Medicine*, 4, 690–701. doi: 10.1111/j.1743-6109.2007.00457.x
- Both, S., Laan, E., & Schultz, W. W. (2010). Disorders in sexual desire and sexual arousal in women, a 2010 state of the art. *Journal of Psychosomatic Obstetrics & Gynecology*, 31, 207–218. doi: 10.3109/0167482X.2010.528628
- Both, S., Spiering, M., Everaerd, W., & Laan, E. (2004). Sexual behavior and responsiveness to sexual stimuli following laboratory-induced sexual arousal. *Journal of Sex Research*, 41, 242–258. doi: 10.1080/00224490409552232
- Both, S., van Boxtel, G., Stekelenburg, J., Everaerd, W., & Laan, E. (2005). Modulation of spinal reflexes by sexual films of increasing intensity. *Psychophysiology*, 42, 726–731. doi: 10.1111/j.1469-8986.2005.00364.x
- Both, S., van Lunsen, R., Weijnenborg, P., & Laan, E. (2012). A new device for simultaneous measurement of pelvic floor muscle activity and vaginal blood flow: A test in a nonclinical sample. *Journal of Sexual Medicine*, 9, 2888–2902. doi: 10.1111/j.1743-6109.2012.02910.x
- Bouchard, K. N., Timmers, A. D., & Chivers, M. L. (2015). Gender-specificity of genital response and self-reported sexual arousal in women endorsing facets of bisexuality. *Journal of Bisexuality*, 15, 180–203. doi: 10.1080/15299716.2015.1022924
- Boyer, S. C., Pukall, C. F., & Holden, R. R. (2012). The relationship between female sexual arousal and response bias in women with and without provoked vestibulodynia. *Journal of Sex Research*, 49, 519–532. doi: 10.1080/00224499.2011.604747
- Bradford, A., & Meston, C. M. (2009). Placebo response in the treatment of women's sexual dysfunctions: A review and commentary. *Journal of Sex & Marital Therapy*, 35, 164–181. doi: 10.1080/00926230802716302
- Brody, S. (2007). Intercourse orgasm consistency, concordance of women's genital and subjective sexual arousal, and erotic stimulus presentation sequence. *Journal of Sex & Marital Therapy*, 33, 31–39. doi: 10.1080/00926230600998458
- Brody, S., Laan, E., & van Lunsen, R. H. (2003). Concordance between women's physiological and subjective sexual arousal is associated with consistency of orgasm during intercourse but not other sexual behavior. *Journal of Sex & Marital Therapy*, 29, 15–23. doi: 10.1080/713847101
- Brotto, L. A. (2010). The DSM diagnostic criteria for HSDD in women. *Archives of Sexual Behavior*, 39, 221–239. doi: 10.1007/s10508-009-9543-1
- Brotto, L. A., & Basson, R. (2014). Group mindfulness-based therapy significantly improves sexual desire in women. *Behaviour Research and Therapy*, 57, 43–54. doi: 10.1016/j.brat.2014.04.001

- Brotto, L. A., Basson, R., & Luria, M. (2008). A mindfulness-based group psychoeducational intervention targeting sexual arousal disorder in women. *The Journal of Sexual Medicine*, 5, 1646–1659. doi: 10.1111/j.1743-6109.2008.00850.x
- Brotto, L. A., Bitzer, J., Laan, E., Leiblum, S., & Luria, M. (2010). Women's sexual desire and arousal disorders. *The Journal of Sexual Medicine*, 7, 586–614. doi: 10.1111/j.1743-6109.2009.01630.x
- Brotto, L. A., Chivers, M. L., Millman, R., & Albert, A. (2016). Mindfulness-based sex therapy improves genital-subjective arousal concordance in women with sexual desire/arousal difficulties. *Archives of Sexual Behavior*. Advance online publication. doi: 10.1007/s10508-015-0689-8
- Brotto, L. A., Erskine, Y., Carey, M., Ehlen, T., Finlayson, S., Heywood, M., ... Miller, D. (2012). A brief mindfulness-based cognitive behavioral intervention improves sexual functioning versus wait-list control in women treated for gynecologic cancer. *Gynecologic Oncology*, 125, 320–325. doi: 10.1016/j.ygyno.2012.01.035
- Brotto, L. A., Graham, C. A., Binik, Y. M., Segraves, R. T., & Zucker, K. J. (2011). Should sexual desire and arousal disorders in women be merged? A response to DeRogatis, Clayton, Rosen, Sand, and Pyke (2010). *Archives of Sexual Behavior*, 40, 221–225. doi: 10.1007/s10508-010-9706-0
- Brotto, L. A., Graham, C. A., Paterson, L. Q., Yule, M. A., & Zucker, K. J. (2015). Women's endorsement of different models of sexual functioning supports polythetic criteria of female sexual interest/arousal disorder in DSM-5. *The Journal of Sexual Medicine*, 12, 1978–1981. doi: 10.1111/jsm.12965
- Brotto, L. A., Heiman, J. R., Goff, B., Greer, B., Lentz, G. M., Swisher, E., ... Van Blaricom, A. (2008). A psychoeducational intervention for sexual dysfunction in women with gynecologic cancer. *Archives of Sexual Behavior*, 37, 317–329. doi: 10.1007/s10508-007-9196-x
- Brotto, L. A., Heiman, J. R., & Tolman, D. L. (2009). Narratives of desire in mid-age women with and without arousal difficulties. *Journal of Sex Research*, 46, 387–398. doi: 10.1080/00224490902792624
- Brotto, L. A., & Laan, E. (2015). Problems of sexual desire and arousal in women. In K. Wylie (Ed.), *ABC of Sexual Health* (3rd ed., pp. 59–67). Hoboken, NJ: Wiley-Blackwell.
- Brotto, L. A., Seal, B. N., & Rellini, A. (2012). Pilot study of a brief cognitive behavioral versus mindfulness-based intervention for women with sexual distress and a history of childhood sexual abuse. *Journal of Sex & Marital Therapy*, 38, 1–27. doi: 10.1080/0092623X.2011.569636
- Brotto, L. A., & Yule, M. (2016). Asexuality: Orientation, paraphilia, dysfunction, or none of the above? *Archives of Sexual Behavior*. Advance online publication. doi: 10.1007/s10508-016-0802-7
- Cain, V. S., Johannes, C. B., Avis, N. E., Mohr, B., Schocken, M., Skurnick, J., & Ory, M. (2003). Sexual functioning and practices in a multi-ethnic study of midlife women: Baseline results from SWAN. *Journal of Sex Research*, 40, 266–276. doi: 10.1080/00224490309552191
- Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56, 81–105. doi: 10.1037/h0046016
- Carvalho, A. A., Brotto, L. A., & Leal, I. (2010). Women's motivations for sex: Exploring the diagnostic and statistical manual, text revision criteria for hypoactive sexual desire and female sexual arousal disorders. *The Journal of Sexual Medicine*, 7, 1454–1463. doi: 10.1111/j.1743-6109.2009.01693.x
- Cawood, E. H., & Bancroft, J. (1996). Steroid hormones, the menopause, sexuality and well-being of women. *Psychological Medicine*, 26, 925–936. doi: 10.1017/S0033291700035261
- Chivers, M. L. (2005). A brief review and discussion of sex differences in the specificity of sexual arousal. *Sexual and Relationship Therapy*, 20, 377–390. doi: 10.1080/14681990500238802
- Chivers, M. L. (2010). A brief update on the specificity of sexual arousal. *Sexual and Relationship Therapy*, 25, 407–414. doi: 10.1080/14681994.2010.495979
- Chivers, M. L. (in press). The specificity of women's sexual response and its relationship with sexual orientations: A review and ten hypotheses. *Archives of Sexual Behavior*. Manuscript submitted for publication.
- Chivers, M. L., & Bailey, J. M. (2005). A sex difference in features that elicit genital response. *Biological Psychology*, 70, 115–120. doi: 10.1016/j.biopsycho.2004.12.002
- Chivers, M. L., Bouchard, K. N., & Timmers, A. D. (2015). Straight but not narrow: Within-gender variation in the gender-specificity of women's sexual response. *PLoS One*, 10, e0142575. doi: 10.1371/journal.pone.0142575
- Chivers, M. L., Rieger, G., Latty, E., & Bailey, J. M. (2004). A sex difference in the specificity of sexual arousal. *Psychological Science*, 15, 736–744. doi: 10.1111/j.0956-7976.2004.00750.x
- Chivers, M. L., & Rosen, R. C. (2010). Phosphodiesterase Type 5 inhibitors and female sexual response: Faulty protocols or paradigms? *Journal of Sexual Medicine*, 7, 858–872. doi: 10.1111/j.1743-6109.2009.01599.x
- Chivers, M. L., Roy, C., Grimbos, T., Cantor, J. M., & Seto, M. C. (2014). Specificity of sexual arousal for sexual activities in men and women with conventional and masochistic sexual interests. *Archives of Sexual Behavior*, 43, 931–940. doi: 10.1007/s10508-013-0174-1
- Chivers, M. L., Seto, M. C., & Blanchard, R. (2007). Gender and sexual orientation differences in sexual response to sexual activities versus gender of actors in sexual films. *Journal of Personality and Social Psychology*, 93, 1108–1121. doi: 10.1037/0022-3514.93.6.1108
- Chivers, M. L., Seto, M. C., Lalumière, M. L., Laan, E., & Grimbos, T. (2010). Agreement of self-reported and genital measures of sexual arousal in men and women: A meta-analysis. *Archives of Sexual Behavior*, 39, 5–56. doi: 10.1007/s10508-009-9556-9
- Chivers, M. L., Suschinsky, K., Timmers, A., & Bossio, J. (2013). Experimental, neuroimaging, and psychophysiological methods in sexuality research. In L. A. Diamond & D. Tolman (Eds.), *Handbook of human sexuality*. Vol. 1. American Psychological Association.
- Chivers, M. L., & Timmers, A. D. (2012). Effects of gender and relationship context in audio narratives on genital and subjective sexual response in heterosexual women and men. *Archives of Sexual Behavior*, 41, 185–197. doi: 10.1007/s10508-012-9937-3
- Clayton, A. H., McGarvey, E. L., & Clavet, G. J. (1997). The Changes in Sexual Functioning Questionnaire (CSFQ): Development, reliability, and validity. *Psychopharmacology Bulletin*, 33, 731–745.
- Clayton, A. H., Segraves, R. T., Leiblum, S., Basson, R., Pyke, R., Cotton, D., ... Wunderlich, G. R. (2006). Reliability and validity of the Sexual Interest and Desire Inventory – Female (SIDI-F), a scale designed to measure severity of female hypoactive sexual desire disorder. *Journal of Sex & Marital Therapy*, 32, 115–135. doi: 10.1080/00926230500442300
- Connaughton, C., McCabe, M., & Karantzas, G. (2016). Conceptualization of the sexual response models in men: Are there differences between sexually functional and dysfunctional men? *Journal of Sexual Medicine*, 13, 453–463. doi: 10.1016/j.jsxm.2015.12.032
- Cormier, Z. (2015, January). The lies women tell about sexual arousal. *The Daily Beast*. Retrieved from <http://www.thedailybeast.com/articles/2016/01/31/the-lies-women-tell-about-sexual-arousal.html>

- Dawson, S. J., & Chivers, M. L. (2014a). Gender differences and similarities in sexual desire. *Current Sexual Health Reports*, 6, 211–219. doi: 10.1007/s11930-014-0027-5
- Dawson, S. J., & Chivers, M. L. (2014b). Gender-specificity of solitary and dyadic sexual desire among gynephilic and androphilic women and men. *Journal of Sexual Medicine*, 11, 980–994. doi: 10.1111/jsm.12430
- Dawson, S. J., & Chivers, M. L. (2014c, October). *Patterns of responsive sexual desire: Does it matter if it is a stranger, friend, or long-term partner?* Poster presented at the Annual Meeting of the Canadian Sex Research Forum, Kingston, ON.
- Dawson, S. J., Sawatsky, M. L., & Lalumière, M. L. (2015). Assessment of introital lubrication. *Archives of Sexual Behavior*, 44, 1527–1535. doi: 10.1007/s10508-015-0519-z
- Dawson, S. J., Suschinsky, K. D., & Lalumière, M. L. (2012). Sexual fantasies and viewing times across the menstrual cycle: A diary study. *Archives of Sexual Behavior*, 41, 173–183. doi: 10.1007/s10508-012-9939-1
- Dennerstein, L., Hayes, R., Sand, M., & Leher, P. (2009). Attitudes toward and frequency of partner interactions among women reporting decreased sexual desire. *The Journal of Sexual Medicine*, 6, 1668–1673. doi: 10.1111/j.1743-6109.2009.01274.x
- Dennerstein, L., Leher, P., & Burger, H. (2005). The relative effects of hormones and relationship factors on sexual function of women through the natural menopausal transition. *Fertility and Sterility*, 84, 174–180. doi: 10.1016/j.fertnstert.2005.01.119
- DeRogatis, L. R., Clayton, A. H., Rosen, R. C., Sand, M., & Pyke, R. E. (2011). Should sexual desire and arousal disorders in women be merged? [Letter to the editor]. *Archives of Sexual Behavior*, 40, 217–219. doi: 10.1007/s10508-010-9677-1
- Diamond, L. M., Dickenson, J., & Blair, K. (2016). Stability of sexual attractions across different time scales: The roles of bisexuality and gender. *Archives of Sexual Behavior*.
- Diamond, L. M., & Wallen, K. (2011). Sexual minority women's sexual motivation around the time of ovulation. *Archives of Sexual Behavior*, 40, 237–246. doi: 10.1007/s10508-010-9631-2
- Everaerd, W., & Laan, E. (1995). Desire for passion: Energetics of sexual response. *Journal of Sex & Marital Therapy*, 21, 255–263. doi: 10.1080/00926239508414645
- Everaerd, W., Laan, E. T. M., Both, S., & van der Velde, J. (2000). Female sexuality. In L. T. Szuchman & F. Muscarella (Eds.), *Psychological perspectives on human sexuality* (pp. 101–148). Hoboken, NJ: Wiley.
- Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences: A natural science perspective*. New York, NY: Plenum.
- Fisher, T. D., Moore, Z. T., & Pittenger, M. J. (2012). Sex on the brain? An examination of frequency of sexual cognitions as a function of gender, erotophilia, and social desirability. *Journal of Sex Research*, 49, 69–77. doi: 10.1080/00224499.2011.565429
- Forbes, M. K. (2014). Response to Rosen et al. (2014) "Commentary on 'Critical Flaws in the FSFI and IIEF'". *The Journal of Sex Research*, 51, 498–502. doi: 10.1080/00224499.2014.895795
- Forbes, M. K., Baillie, A. J., & Schniering, C. A. (2014). Critical flaws in the Female Sexual Function Index and the International Index of Erectile Function. *The Journal of Sex Research*, 51, 485–491. doi: 10.1080/00224499.2013.876607
- Frühauf, S., Gerger, H., Schmidt, H. M., Munder, T., & Barth, J. (2013). Efficacy of psychological interventions for sexual dysfunction: A systematic review and meta-analysis. *Archives of Sexual Behavior*, 42, 915–933. doi: 10.1007/s10508-012-0062-0
- Fugl-Meyer, K. S., & Fugl-Meyer, A. R. (2002). Sexual disabilities are not singularities. *International Journal of Impotence Research*, 14, 487–493. doi: 10.1038/sj.ijir.3900914
- Garde, K., & Lunde, I. (1980). Female sexual behaviour: A study in a random sample of 40-year-old women. *Maturitas*, 2, 225–240. doi: 10.1016/0378-5122(80)90007-9
- Gerber, J. R., Johnson, J. V., Bunn, J. Y., & O'Brien, S. L. (2005). A longitudinal study of the effects of free testosterone and other psychosocial variables on sexual function during the natural traverse of menopause. *Fertility and Sterility*, 83, 643–648. doi: 10.1016/j.fertnstert.2004.08.028
- Gerritsen, J., Van Der Made, F., Bloemers, J., Van Ham, D., Kleiverda, G., Everaerd, W., ... Tuiten, A. (2009). The clitoral photoplethysmograph: A new way of assessing genital arousal in women. *The Journal of Sexual Medicine*, 6, 1678–1687. doi: 10.1111/j.1743-6109.2009.01228.x
- Gerstenberger, E. P., Rosen, R. C., Brewer, J. V., Meston, C. M., Brotto, L. A., Wiegel, M., & Sand, M. (2010). Sexual desire and the Female Sexual Function Index (FSFI): A sexual desire cutpoint for clinical interpretation of the FSFI in women with and without hypoactive sexual desire disorder. *The Journal of Sexual Medicine*, 7, 3096–3103. doi: 10.1111/j.1743-6109.2010.01871.x
- Giraldi, A., Kristensen, E., & Sand, M. (2015). Endorsement of models describing sexual response of men and women with a sexual partner: An online survey in a population sample of Danish adults ages 20–65 years. *The Journal of Sexual Medicine*, 12, 116–128. doi: 10.1111/jsm.12720
- Goldey, K. L., & van Anders, S. M. (2011). Sexy thoughts: Effects of sexual cognitions on testosterone, cortisol, and arousal in women. *Hormones and Behavior*, 59, 754–764. doi: 10.1016/j.yhbeh.2010.12.005
- Goldey, K. L., & van Anders, S. M. (2012). Sexual arousal and desire: Interrelations and responses to three modalities of sexual stimuli. *The Journal of Sexual Medicine*, 9, 2315–2329. doi: 10.1111/j.1743-6109.2012.02845.x
- Graham, C. A., Sanders, S. A., Milhausen, R. R., & McBride, K. R. (2004). Turning on and turning off: A focus group study of the factors that affect women's sexual arousal. *Archives of Sexual Behavior*, 33, 527–538. doi: 10.1023/B:ASEB.0000044737.62561.f0
- Günzler, C., & Berner, M. M. (2012). Efficacy of psychosocial interventions in men and women with sexual dysfunctions: A systematic review of controlled clinical trials. *The Journal of Sexual Medicine*, 9, 3108–3125. doi: 10.1111/j.1743-6109.2012.02965.x
- Hayes, R. D., Bennett, C. M., Fairley, C. K., & Dennerstein, L. (2006). What can prevalence studies tell us about female sexual difficulty and dysfunction? *The Journal of Sexual Medicine*, 3, 589–595. doi: 10.1111/j.1743-6109.2006.00241.x
- Heiman, J. R., Rowland, D. L., Hatch, J. P., & Gladue, B. A. (1991). Psychophysiological and endocrine responses to sexual arousal in women. *Archives of Sexual Behavior*, 20, 171–186. doi: 10.1007/BF01541942
- Henson, D. E., & Rubin, H. B. (1978). A comparison of two objective measures of sexual arousal of women. *Behaviour Research and Therapy*, 16, 143–151. doi: 10.1016/0005-7967(78)90060-8
- Henson, C., Rubin, H., & Henson, D. E. (1979). Women's sexual arousal concurrently assessed by three genital measures. *Archives of Sexual Behavior*, 8, 459–469. doi: 10.1007/BF01541413
- Henson, D. E., Rubin, H. B., Henson, C., & Williams, J. R. (1977). Temperature change of the labia minora as an objective measure of female eroticism. *Journal of Behavior Therapy and Experimental Psychiatry*, 8, 401–410. doi: 10.1016/0005-7916(77)90011-8
- Hill, C. A. (1997). The distinctiveness of sexual motives in relation to sexual desire and desirable partner attributes. *Journal of Sex Research*, 34, 139–153. doi: 10.1080/00224499709551878

- Hill, C. A., & Preston, L. K. (1996). Individual differences in the experience of sexual motivation: Theory and measurement of dispositional sexual motives. *Journal of Sex Research, 33*, 27–45. doi: 10.1080/00224499609551812
- Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science, 6*, 537–559. doi: 10.1177/1745691611419671
- Huberman, J. S., & Chivers, M. L. (2015). Examining gender specificity of sexual response with concurrent thermography and plethysmography. *Psychophysiology, 52*, 1382–1395. doi: 10.1111/psyp.12466
- Huberman, J. S., Dawson, S. J., & Chivers, M. L. (2016). *Examining the time course of sexual response in women and men with concurrent plethysmography and thermography*. Manuscript submitted for publication.
- Huberman, J. S., Suschinsky, K. D., Lalumière, M. L., & Chivers, M. L. (2013). Relationship between impression management and three measures of women's self-reported sexual arousal. *Canadian Journal of Behavioural Science, 45*, 259–273. doi: 10.1037/a0033397
- Impett, E. A., & Peplau, L. A. (2002). Why some women consent to unwanted sex with a dating partner: Insights from attachment theory. *Psychology of Women Quarterly, 26*, 360–370. doi: 10.1111/1471-6402.t01-1-00075
- Impett, E. A., & Peplau, L. A. (2003). Sexual compliance: Gender, motivational, and relationship perspectives. *Journal of Sex Research, 40*, 87–100. doi: 10.1080/00224490309552169
- Impett, E. A., Peplau, L. A., & Gable, S. L. (2005). Approach and avoidance sexual motives: Implications for personal and interpersonal well-being. *Personal Relationships, 12*, 465–482. doi: 10.1111/j.1475-6811.2005.00126.x
- Impett, E. A., Strachman, A., Finkel, E. J., & Gable, S. L. (2008). Maintaining sexual desire in intimate relationships: The importance of approach goals. *Journal of Personality and Social Psychology, 94*, 808–823. doi: 10.1037/0022-3514.94.5.808
- Jaspers, L., Feys, F., Bramer, W. M., Franco, O. H., Leusink, P., & Laan, E. T. M. (2016). Efficacy and safety of flibanserin for the treatment of Hypoactive Sexual Desire Disorder in women: A systematic review and meta-analysis. *JAMA Internal Medicine*. Advance online publication. doi: 10.1001/jamainternmed.2015.8565
- Jonason, P. K., & Fisher, T. D. (2009). The power of prestige: Why young men report having more sex partners than young women. *Sex Roles, 60*, 151–159. doi: 10.1007/s11199-008-9506-3
- Kaplan, H. S. (1977). Hypoactive sexual desire. *Journal of Sex & Marital Therapy, 3*, 3–9. doi: 10.1080/00926237708405343
- Kaplan, H. S. (1979). *Disorders of sexual desire*. New York, NY: Brunner/Mazel.
- Kingsberg, S. A., Clayton, A. H., & Pfafs, J. G. (2015). The female sexual response: Current models, neurobiological underpinnings and agents currently approved or under investigation for the treatment of hypoactive sexual desire disorder. *CNS Drugs, 29*, 915–933. doi: 10.1007/s40263-015-0288-1
- Klusmann, D. (2002). Sexual motivation and the duration of partnership. *Archives of Sexual Behaviour, 31*, 275–287. doi: 10.1023/A:1015205020769
- Kukkonen, T. M. (2014). What is the best method of measuring the physiology of female sexual arousal? *Current Sexual Health Reports, 6*, 30–37. doi: 10.1007/s11930-013-0010-6
- Kukkonen, T. M., Binik, Y. M., Amsel, R., & Carrier, S. (2007). Thermography as a physiological measure of sexual arousal in both men and women. *Journal of Sexual Medicine, 4*, 93–105. doi: 10.1111/j.1743-6109.2006.00399.x
- Kukkonen, T. M., Binik, Y. M., Amsel, R., & Carrier, S. (2010). An evaluation of the validity of thermography as a physiological measure of sexual arousal in a non-university adult sample. *Archives of Sexual Behavior, 39*, 861–873. doi: 10.1007/s10508-009-9496-4
- Kukkonen, T. M., Paterson, L., Binik, Y. M., Amsel, R., Bouvier, F., & Khalifé, S. (2006). Convergent and discriminant validity of clitoral color Doppler ultrasonography as a measure of female sexual arousal. *Journal of Sex & Marital Therapy, 32*, 281–287. doi: 10.1080/00926230600666220
- Laan, E., & Both, S. (2008). What makes women experience desire? *Feminism & Psychology, 18*, 505–514. doi: 10.1177/0959353508095533
- Laan, E., & Both, S. (2011). Sexual desire and arousal disorders in women. *Advances in Psychosomatic Medicine, 31*, 16–34. doi: 10.1159/000328806
- Laan, E., & Everaerd, W. (1995). Determinants of female sexual arousal: Psychophysiological theory and data. *Annual Review of Sex Research, 6*, 32–76. doi: 10.1080/10532528.1995.10559901
- Laan, E., Everaerd, W., & Evers, A. (1995). Assessment of female sexual arousal: Response specificity and construct validity. *Psychophysiology, 32*, 476–485. doi: 10.1111/j.1469-8986.1995.tb02099.x
- Laan, E., Everaerd, W., van der Velde, J., & Geer, J. H. (1995). Determinants of subjective experience of sexual arousal in women: Feedback from genital arousal and erotic stimulus content. *Psychophysiology, 32*, 444–451. doi: 10.1111/j.1469-8986.1995.tb02095.x
- Laan, E., van Lunsen, R. H. W., Everaerd, W., Riley, A., Scott, E., & Boolell, M. (2002). The enhancement of vaginal vasocongestion by sildenafil in healthy premenopausal women. *Journal of Women's Health & Gender-Based Medicine, 11*, 357–365. doi: 10.1089/152460902317585994
- Lang, P. J. (1987). Fear and anxiety: Cognition, memory and behavior. In D. Magnusson & A. Ohman (Eds.), *Psychopathology: An interactional perspective* (pp. 159–176). Orlando, FL: Academic Press.
- Laumann, E. O., Nicolosi, A., Glasser, D. B., Paik, A., Gingell, C., Moreira, E., & Wang, T. (2005). Sexual problems among women and men aged 40–80 y: Prevalence and correlates identified in the Global Study of Sexual Attitudes and Behaviors. *International Journal of Impotence Research, 17*, 39–57. doi: 10.1038/sj.ijir.3901250
- Laumann, E. O., Paik, A., & Rosen, R. C. (1999). Sexual dysfunction in the United States: Prevalence and predictors. *Journal of the American Medical Association, 281*, 537–544. doi: 10.1001/jama.281.6.537
- Levin, R., & Riley, A. (2007). The physiology of human sexual function. *Psychiatry, 6*, 90–94. doi: 10.1016/j.mppsy.2007.01.004
- Levin, R. J., & Wylie, K. (2008). Vaginal vasomotion: Its appearance, measurement, and usefulness in assessing the mechanisms of vasodilatation. *The Journal of Sexual Medicine, 5*, 377–386. doi: 10.1111/j.1743-6109.2007.00669.x
- Levine, S. B. (2002). Reexploring the concept of sexual desire. *Journal of Sex & Marital Therapy, 28*, 39–51. doi: 10.1080/009262302317251007
- Lief, H. I. (1977). Inhibited sexual desire. *Medical Aspects of Human Sexuality, 7*, 94–95.
- Mace, C. (2005). Book review of “What Works for Whom? A Critical Review of Psychotherapy Research (2nd ed.)”. *British Journal of Psychiatry, 187*, 491.
- Mark, K. P., Fortenberry, J. D., Herbenick, D., Sanders, S., & Reece, M. (2012). *The object of sexual desire: Examining the “what” in “what do you desire?”* Oral presentation at the Annual Meeting of the Canadian Sex Research Forum, Ottawa, ON.

- Masters, W. H., & Johnson, V. E. (1966). *Human sexual response*. New York, NY: Bantam Books.
- Masters, W. H., & Johnson, V. E. (1970). *Human sexual inadequacy*. New York, NY: Bantam Books.
- McCall, K. M., & Meston, C. M. (2006). Cues resulting in desire for sexual activity in women. *Journal of Sexual Medicine*, 3, 838–852. doi: 10.1111/j.1743-6109.2006.00301.x
- McCall, K. M., & Meston, C. M. (2007). The effects of false positive and false negative physiological feedback on sexual arousal: A comparison of women with or without sexual arousal disorder. *Archives of Sexual Behavior*, 36, 518–530. doi: 10.1007/s10508-006-9140-9145
- Meana, M. (2010). Elucidating women's (hetero)sexual desire: Definitional challenges and content expansion. *Journal of Sex Research*, 47, 104–122. doi: 10.1080/00224490903402546
- Meston, C. M., & Buss, D. M. (2007). Why humans have sex. *Archives of Sexual Behavior*, 36, 477–507. doi: 10.1007/s10508-007-9175-2
- Meston, C. M., Rellini, A. H., & McCall, K. (2010). The sensitivity of continuous laboratory measures of physiological and subjective sexual arousal for diagnosing women with sexual arousal disorder. *Journal of Sexual Medicine*, 7, 938–950. doi: 10.1111/j.1743-6109.2009.01548.x
- Meyer-Bahlburg, H. F., & Dolezal, C. (2007). The Female Sexual Function Index: A methodological critique and suggestions for improvement. *Journal of Sex & Marital Therapy*, 33, 217–224. doi: 10.1080/00926230701267852
- Mitchell, K. R., Mercer, C. H., Ploubidis, G. B., Jones, K. G., Datta, J., Field, N., ... Clifton, S. (2013). Sexual function in Britain: Findings from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3). *The Lancet*, 382, 1817–1829. doi: 10.1016/S0140-6736(13)62366-1
- Nappi, R. E., & Cucinella, L. (2015). Advances in pharmacotherapy for treating female sexual dysfunction. *Expert Opinion on Pharmacotherapy*, 16, 875–887. doi: 10.1517/14656566.2015.1020791
- Nowosielski, K., Wróbel, B., & Kowalczyk, R. (2016). Women's endorsement of models of sexual response: Correlates and predictors. *Archives of Sexual Behavior*, 45, 291–302. doi: 10.1007/s10508-015-0611-4
- Palti, Y., & Bercovici, B. (1967). Photoplethysmographic study of the vaginal blood pulse. *American Journal of Obstetrics & Gynecology*, 97, 143–153.
- Paterson, L. Q. P., Amsel, R., & Binik, Y. M. (2013). Pleasure and pain: The effect of (almost) having an orgasm on genital and nongenital sensitivity. *Journal of Sexual Medicine*, 10, 1531–1544. doi: 10.1111/jsm.12144
- Paterson, L. Q. P., Jin, E. S., Amsel, R., & Binik, Y. M. (2014). Gender similarities and differences in sexual arousal, desire, and orgasmic pleasure in the laboratory. *The Journal of Sex Research*, 51, 801–813. doi: 10.1080/00224499.2013.867922
- Payne, K. A., & Binik, Y. M. (2006). Reviving the labial thermistor clip. *Archives of Sexual Behavior*, 35, 111–113. doi: 10.1007/s10508-005-9017-z
- Peterson, Z. D., Janssen, E., & Laan, E. (2010). Women's sexual responses to heterosexual and lesbian erotica: The role of stimulus intensity, affective reaction, and sexual history. *Archives of Sexual Behavior*, 39, 880–897. doi: 10.1007/s10508-009-9546-y
- Poels, S., Bloemers, J., van Rooij, K., Goldstein, I., Gerritsen, J., van Ham, D., ... Tuiten, A. (2013). Toward personalized sexual medicine (part 2): Testosterone combined with a PDE5 inhibitor increases sexual satisfaction in women with HSDD and FSAD, and a low sensitive system for sexual cues. *Journal of Sexual Medicine*, 10, 810–823. doi: 10.1111/j.1743-6109.2012.02983.x
- Prause, N., & Heiman, J. R. (2009). Assessing female sexual arousal with the labial thermistor: Response specificity and construct validity. *International Journal of Psychophysiology*, 72, 115–122. doi: 10.1016/j.ijpsycho.2008.11.002
- Prause, N., & Heiman, J. (2010). Reduced labial temperature in response to sexual films with distractors among women with lower sexual desire. *The Journal of Sexual Medicine*, 7, 951–963. doi: 10.1111/j.1743-6109.2009.01525.x
- Prause, N., & Janssen, E. (2005). Blood flow: Vaginal photoplethysmography. In I. Goldstein, C. M. Meston, S. R. Davis, & A. M. Traish (Eds.), *Women's sexual function and dysfunction: Study, diagnosis and treatment* (pp. 359–367). New York, NY: CRC Press.
- Prause, N., Janssen, E., & Hetrick, W. P. (2008). Attention and emotional responses to sexual stimuli and their relationship to sexual desire. *Archives of Sexual Behavior*, 37, 934–949. doi: 10.1007/s10508-007-9236-6
- Pulverman, C. S., Hixon, J. G., & Meston, C. M. (2015). Uncovering category specificity of genital sexual arousal in women: The critical role of analytic technique. *Psychophysiology*, 52, 1396–1408. doi: 10.1111/psyp.12467
- Pyke, R. E., & Clayton, A. (2015a). Models vs. realities in female sexual dysfunction. *Letter to the Editor. Journal of Sexual Medicine*, 12, 1977–1982. doi: 10.1111/jsm.12963
- Pyke, R. E., & Clayton, A. H. (2015b). Psychological treatment trials for hypoactive sexual desire disorder: A sexual medicine critique and perspective. *Journal of Sexual Medicine*, 12, 2451–2458. doi: 10.1111/jsm.13056
- Regan, P. C., & Berscheid, E. (1995). Gender differences in beliefs about the causes of male and female sexual desire. *Personal Relationships*, 2, 345–358. doi: 10.1111/j.1475-6811.1995.tb00097.x
- Rellini, A. H., McCall, K. M., Randall, P. K., & Meston, C. M. (2005). The relationship between women's subjective and physiological sexual arousal. *Psychophysiology*, 42, 116–124. doi: 10.1111/j.1469-8986.2005.00259.x
- Riley, A., & Riley, E. (2000). Controlled studies on women presenting with sexual drive disorder: I. Endocrine status. *Journal of Sex & Marital Therapy*, 26, 269–283. doi: 10.1080/00926230050084669
- Rosen, R., Brown, C., Heiman, J., Leiblum, S., Meston, C., Shabsigh, R., ... D'Agostino, R. (2000). The Female Sexual Function Index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. *Journal of Sex & Marital Therapy*, 26, 191–208. doi: 10.1080/009262300278597
- Rosen, R. C., Taylor, J. F., Leiblum, S. R., & Bachmann, G. A. (1993). Prevalence of sexual dysfunction in women: Results of a survey study of 329 women in an outpatient gynecological clinic. *Journal of Sex & Marital Therapy*, 19, 171–188. doi: 10.1080/00926239308404902
- Rupp, H. A., & Wallen, K. (2007). Sex differences in viewing sexual stimuli: An eye-tracking study in men and women. *Hormones and Behavior*, 51, 524–533. doi: 10.1016/j.yhbeh.2007.01.008
- Sand, M., & Fisher, W. A. (2007). Women's endorsement of models of female sexual response: The nurses' sexuality study. *The Journal of Sexual Medicine*, 4, 708–719. doi: 10.1111/j.1743-6109.2007.00496.x
- Sarin, S., Amsel, R., & Binik, Y. M. (2016). A Streetcar Named "Derousal"? A Psychophysiological Examination of the Desire-Arousal Distinction in Sexually Functional and Dysfunctional Women. *Journal of Sex Research*, 53(6), 711–729.
- Schmidt, G. (1975). Male-female differences in sexual arousal and behavior during and after exposure to sexually explicit stimuli. In E. A. Rubenstein, R. Green, & E. Brecher (Eds.), *New directions in sex research* (pp. 31–43). New York, NY: Springer. doi: 10.1007/978-1-4684-2280-1_4

- Segraves, K. B., & Segraves, R. T. (1991). Hypoactive sexual desire disorder: Prevalence and comorbidity in 906 subjects. *Journal of Sex & Marital Therapy, 17*, 55–58. doi: 10.1080/00926239108405469
- Segraves, R., & Woodard, T. (2006). Female hypoactive sexual desire disorder: History and current status. *The Journal of Sexual Medicine, 3*, 408–418. doi: 10.1111/j.1743-6109.2006.00246.x
- Seto, M. C. (2016). The puzzle of male chronophilias. *Archives of Sexual Behaviour*. Advance online publication. doi: 10.1007/s10508-016-0799-y
- Shifren, J. L., Braunstein, G. D., Simon, J. A., Casson, P. R., Buster, J. E., Redmond, G. P., ... Caramelli, K. E. (2000). Transdermal testosterone treatment in women with impaired sexual function after oophorectomy. *New England Journal of Medicine, 343*, 682–688. doi: 10.1056/NEJM200009073431002
- Shifren, J. L., Monz, B. U., Russo, P. A., Segreti, A., & Johannes, C. B. (2008). Sexual problems and distress in United States women: Prevalence and correlates. *Obstetrics & Gynecology, 112*, 970–978. doi: 10.1097/AOG.0b013e3181898cdb
- Silverstein, R. G., Brown, A. C. H., Roth, H. D., & Britton, W. B. (2011). Effects of mindfulness training on body awareness to sexual stimuli: Implications for female sexual dysfunction. *Psychosomatic Medicine, 73*, 817–825. doi: 10.1097/PSY.0b013e318234e628
- Singer, B., & Toates, F. M. (1987). Sexual motivation. *Journal of Sex Research, 23*, 481–501. doi: 10.1080/00224498709551386
- Spape, J., Timmers, A. D., Yoon, S., Ponseti, J., & Chivers, M. L. (2014). Gender-specific genital and subjective sexual arousal to prepotent sexual features in heterosexual women and men. *Biological Psychology, 102*, 1–9. doi: 10.1016/j.biopsycho.2014.07.008
- Spector, I. P., Carey, M. P., & Steinberg, L. (1996). The Sexual Desire Inventory: Development, factor structure, and evidence of reliability. *Journal of Sex & Marital Therapy, 22*, 175–190. doi: 10.1080/00926239608414655
- Steinman, D. L., Wincze, J. P., Sakheim, D. K., Barlow, D. H., & Mavissakalian, M. (1981). A comparison of male and female patterns of sexual arousal. *Archives of Sexual Behavior, 10*, 477–492. doi: 10.1007/BF01541588
- Suschinsky, K. D., & Lalumière, M. L. (2011). Prepared for anything? An Investigation of Female Genital Arousal in Response to Rape Cues. *Psychological Science, 15*, 736–744. doi: 10.1177/0956797610394660
- Suschinsky, K. D., Lalumière, M. L., & Chivers, M. L. (2009). Sex differences in patterns of genital sexual arousal: Measurement artifacts or true phenomena? *Archives of Sexual Behavior, 38*, 559–573. doi: 10.1007/s10508-008-9339-8
- Suschinsky, K. D., Shelley, A. J., Gerritsen, J., Tuiten, A., & Chivers, M. L. (2016). The clitoral photoplethysmograph: A pilot study examining discriminant and convergent validity. *The Journal of Sexual Medicine, 12*, 2324–2338. doi: 10.1111/jsm.13047
- Taylor, J. F., Rosen, R. C., & Leiblum, S. R. (1994). Self-report assessment of female sexual function: Psychometric evaluation of the Brief Index of Sexual Functioning for Women. *Archives of Sexual Behavior, 23*, 627–643. doi: 10.1007/BF01541816
- Timmers, A. D., Bouchard, K. N., & Chivers, M. L. (2015). Effects of gender and sexual activity cues on the sexual responses of women with multidimensionally defined bisexuality. *Journal of Bisexuality, 15*, 154–179. doi: 10.1080/15299716.2015.1023389
- Timmers, A. D., & Chivers, M. L. (2012). Sociosexuality and sexual arousal. *Canadian Journal of Human Sexuality, 21*, 135–146.
- Toates, F. (2009). An integrative theoretical framework for understanding sexual motivation, arousal, and behavior. *Journal of Sex Research, 46*, 168–193. doi: 10.1080/00224490902747768
- Tolman, D. L., & Szalacha, L. A. (1999). Dimensions of desire. *Psychology of Women Quarterly, 23*, 7–39. doi: 10.1111/j.1471-6402.1999.tb00338.x
- Turna, B., Apaydin, E., Semerci, B., Altay, B., Cikili, N., & Nazli, O. (2004). Women with low libido: Correlation of decreased androgen levels with Female Sexual Function Index. *International Journal of Impotence Research, 17*, 148–153. doi: 10.1038/sj.ijir.3901294
- van Anders, S. M. (2015). Beyond sexual orientation: Integrating gender/sex and diverse sexualities via sexual configurations theory. *Archives of Sexual Behavior, 44*, 1177–1213. doi: 10.1007/s10508-015-0490-8
- van Anders, S. M., Brotto, L., Farrell, J., & Yule, M. (2009). Associations among physiological and subjective sexual response, sexual desire, and salivary steroid hormones in healthy premenopausal women. *The Journal of Sexual Medicine, 6*, 739–751. doi: 10.1111/j.1743-6109.2008.01123.x
- van Anders, S. M., Hamilton, L. D., Schmidt, N., & Watson, N. V. (2007). Associations between testosterone secretion and sexual activity in women. *Hormones and Behavior, 51*, 477–482. doi: 10.1016/j.yhbeh.2007.01.003
- van Rooij, K., Poels, S., Bloemers, J., Goldstein, I., Gerritsen, J., van Ham, D., ... Olivier, B. (2013). Toward personalized sexual medicine (part 3): Testosterone combined with a Serotonin1A receptor agonist increases sexual satisfaction in women with HSDD and FSAD, and dysfunctional activation of sexual inhibitory mechanisms. *The Journal of Sexual Medicine, 10*, 824–837. doi: 10.1111/j.1743-6109.2012.02982.x
- Waxman, S. E., & Pukall, C. F. (2009). Laser Doppler imaging of genital blood flow: A direct measure of female sexual arousal. *The Journal of Sexual Medicine, 6*, 2278–2285. doi: 10.1111/j.1743-6109.2009.01326.x
- Webster, J. S., & Hammer, D. (1983). Thermistor measurement of male sexual arousal. *Psychophysiology, 20*, 111–115. doi: 10.1111/j.1469-8986.1983.tb00911.x
- Wierman, M. E., Nappi, R. E., Avis, N., Davis, S. R., Labrie, F., Rosner, W., & Shifren, J. L. (2010). Endocrine aspects of women's sexual function. *The Journal of Sexual Medicine, 7*, 561–585. doi: 10.1111/j.1743-6109.2009.01629.x
- Wilson, G. T., & Lawson, D. M. (1978). Expectancies, alcohol, and sexual arousal in women. *Journal of Abnormal Psychology, 87*, 358–67. doi: 10.1037/0021-843X.87.8.358
- Wincze, J. P., & Qualls, C. B. (1984). A comparison of structural patterns of sexual arousal in male and female homosexuals. *Archives of Sexual Behavior, 13*, 361–370. doi: 10.1007/BF01541908
- Wolkin, J. R. (2015). Cultivating multiple aspects of attention through mindfulness meditation accounts for psychological well-being through decreased rumination. *Psychology Research and Behavior Management, 8*, 171–180. doi: 10.2147/PRBM.S31458
- Zuckerman, M. (1971). Physiological measures of sexual arousal in the human. *Psychological Bulletin, 75*, 297–329.

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