How Sexual is Sexual Desire? Desire and Testosterone in Women

by

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Abstract

Though research has indicated links between sexual desire and testosterone (T) in women, few studies have considered the possibility that sexual desire may not be entirely 'sexual' in all circumstances. In this study, we examined the link between various forms of sexual desire (e.g., desire for orgasm, for emotional connectedness, for stress reduction, etc.) and T in a sample of healthy women. Participants (N = 198), both partnered (n = 83) and single (n = 115), completed the Desire Components Questionnaire (DCQ), a measure we created to address strength of multifaceted components of sexual desire. Participants were randomly assigned to imagine a partner or stranger while answering these questions. We used factor analysis to resolve the 65-item questionnaire into 11 subscales, each exhibiting high internal consistency. There was a significant multivariate effect of relationship status and instruction manipulation on desire score. Scores were correlated with T assayed from saliva samples. Desire scores on the Kink/Reproduce subscale were significantly positively correlated with T, with desire to fantasize and desire to act out a fantasy most strongly accounting for the correlation. Findings from the study suggest that sexual desire is not entirely sexual in nature, but instead may reflect desire characterized by other psychosocial factors (e.g., emotional connectedness, sexual context, stress reduction/distraction, etc.). Results are discussed in light of the Steroid/Peptide Theory of Social Bonds, which argues that sexual phenomena can be subdivided into high and low T categories in ways that are partially supported by the present study.

Keywords: desire, testosterone, women, relationships, sexual

How Sexual is Sexual Desire?

Little phenomenological consensus exists regarding what sexual desire actually is despite widespread and increasing research on it, and much remains to be understood of its complex nature. Sexual desire has only recently been empirically distinguished from sexual arousal, as a state involving some but not all components of the latter (Bancroft, 2010; Bancroft & Graham, 2011). A universal definition of sexual desire has yet to be established, and individual differences between levels of sexual desire have yet to be accounted for. Discrepancies between solitary desire, or interest in behaving sexually with oneself, and dyadic desire, or interest in behaving sexually with a partner, likewise need clarification and explanation (Davis, Yarber, Bauserman, Schreer, & Davis, 1998; van Anders, 2012). Finally, an understanding of particularly what *is* desired in the realm of sexual desire is in need of theorizing and empirical evidence.

The nature of women's sexual desire is especially puzzling to researchers, as conflicting evidence regarding the concept abounds (Meana, 2010; van Anders, 2012; van Anders, Brotto, Farrell, & Yule, 2009; van Anders & Dunn, 2009; van Anders, Hamilton, Schmidt, & Watson, 2007; van Anders & Hampson, 2005), though the smaller body of critical desire research in men points to room for similar complexity (Janssen, McBride, Yarber, Hill, & Butler, 2008; Meana, 2010; van Anders, 2012). Past studies have implicitly assumed sexual desire to be purely sexual and have thus defined the concept as such. However, just how sexual *is* sexual desire? A recent study found that testosterone (T), a hormone positively linked to sexual contexts and negatively linked to nurturant contexts (van Anders, Goldey, & Kuo, 2011), was likewise positively linked to solitary desire in women, with an influence of masturbation frequency on such a link; however, in the same study, T was found *negatively* linked to dyadic desire in women when cortisol and

perceived social stress were controlled for (van Anders, 2012). Though men were included in the study, no significant associations between T and desire in men were recorded (van Anders, 2012). Several related studies similarly reported no significant correlation between T and sexual interest or desire variables in men (Brown, Monti, & Corriveau, 1978; van Anders, 2012), or in some cases studies attributed any possible associations to age and influence of masturbation frequency in addition to presence of depression (Hintikka et al., 2009; Rizvi et al., 2010; Sadowsky, Antonovsky, Sobel, & Maoz, 1993; Schiavi, Schreiner-Engel, White, & Mandeli, 1991; van Anders, 2012). Due to null associations between T and desire in men, the current study examines women only. Such discrepant findings between T and solitary versus dyadic desire in women suggest that perhaps more than a sexual component of desire needs to be accounted for when studying women's desire. Further research is required to gain a fuller understanding of sexual desire, and this study seeks to help characterize the nature of women's desire more generally.

Women's Desire and T in a Clinical Context

Much of the discourse and research surrounding women's sexual desire primarily relates to low or no desire and/or disorders featuring the same. The most commonly reported sexual problem in women is a loss of libido, or sexual desire (Davis & Braunstein, 2012). At least 16 million women over age 50 are described as currently experiencing low sexual desire (Krapf & Simon, 2009). Excessive lack of desire that further causes distress has been characterized as Hypoactive Sexual Desire Disorder (HSDD; Davis & Braunstein, 2012). The dysfunction may be applied to both men and women, with an estimated one in 10 women in the United States alone affected by HSDD and similar numbers seen in men, though it is much more frequently reported and studied in women (Brotto, 2010; DeRogatis et al., 2012; Woodis, McLendon, &

Muzyk, 2012). Symptoms of the dysfunction include fatigue, low libido, and a generally diminished well being (Davis, 1999). Treatment for HSDD differs depending on the patient but may include a combination of sex therapy and T replacement therapy (Bartlik, Legere, & Andersson, 1999).

Because of the frequent diagnosis of HSDD in women, the majority of studies potentially linking T and desire in women have been clinically based, with a focus on the role that T replacement therapy may play in low desire (Davis et al., 2006; Davis et al., 2008; Heiman, 2008; Kingsberg et al., 2007). Application of T therapy has been linked to improved sexual desire in addition to greater arousal, orgasm, responsiveness, self-image, reduced sexual concerns, and decreased distress in women diagnosed with HSDD (Davis et al., 2006; Davis et al., 2008; Heiman, 2008; Kingsberg et al., 2007). However, there is little consensus about the threshold levels of androgen required for 'normal' sexual desire (van Anders, Chernick, Chernick, Hampson, & Fisher, 2005). Administration of T is understood in a basic sense to enhance sexual desire in some women, and reduction of T, such as that resulting from oral contraceptive use, is likewise understood to suppress sexual desire in the same group (Bancroft, 2010). However, other findings have shown no correlation between androgen concentrations and sexual desire (Basson, Brotto, Petkau, & Labrie, 2010; Davis, Davison, Donath, & Bell, 2005). Because of the conflicting evidence, how sexual desire may or may not be clinically linked to T in women remains puzzling for researchers. Perhaps the focus of desire as related to T only studied in regards to HSDD and a restoration of 'normal' levels of desire in women may be attributed to the medicalization of women's sexuality (Tiefer, Hall, & Tavris, 2002). Such medicalization may place too heavy a focus on a sexual aspect of desire alone and consequently overlook other various non-clinical aspects of desire and likewise a fuller understanding of the concept.

Women's Desire and T in a Healthy Population

Much remains to be understood about T and desire of women in the absence of a sexual disorder, however. Still, in examining the association between T and sexual desire in healthy participants, this study could potentially benefit further research concerning treatment of HSDD patients. Additionally, studying healthy participants moves away from a medicalized perspective of women's desire, as restoration to a 'normal' amount of such is irrelevant. Rather, focus on a non-clinical population will allow for a broader understanding of desire—not one that is purely sexual—and will help to characterize women's desire as *is* and not how medical literature perceives it *should* be.

There is increasing evidence that androgens are associated with women's sexuality, coupled with broader psychosocial factors (Davis, 1998). For example, T has been linked with positive orgasm experience in healthy women (van Anders & Dunn, 2009). Moreover, the presence of one or more partners appears to be related to T concentrations in women. Multiple partners have been associated with T, with polyamorous women (women in multiple committed relationships) possessing higher T concentrations than all other women studied, including women who were single, monoamorously partnered (in only one committed relationship), and living a polyamorous lifestyle but not multipartnered at the time of the study (van Anders, Hamilton, & Watson, 2007). Further findings suggest that monoamorously partnered status, as compared to single status, in women is associated with lower baseline values of T though changes in partnered status were not associated with changes in T (van Anders & Watson, 2006a). Notably, frequency of partnered sexual activity was later found to mediate this effect between partnering and T (van Anders & Goldey, 2010). Such a study may suggest an influence of nurturance on T in women. Similarly, partner proximity may be associated with T

concentration in women, as partnered women living in the same city have lower T than single women or women in relationships characterized as long-distance (van Anders & Watson, 2007). Additionally, sexual thoughts have been shown to increase T, though only for women not using hormonal contraceptives, whereas sexual thoughts decreased T in women using hormonal contraceptives (Goldey & van Anders, 2011). Through all of these findings, it is apparent that the association between androgens and sexuality is a complex one, with myriad factors influencing it. This association between T and sexuality is evidenced to be bi-directional such that T may affect sexuality, but it has also been postulated that sexuality and sexual activity may more strongly influence hormones, including T (van Anders et al., 2009). In this way, perhaps feeling desire may also affect T just as T may affect feelings of desire.

In the smaller number of non-clinical studies looking specifically at sexual desire in healthy women, there is conflicting evidence regarding the potential role of T in association with women's desire. Analyses of several studies suggested an association between T and orgasm, as well as between T and sexual desire (van Anders et al., 2007). However, another non-clinical study found association between T and men's sexual desire only, rather pointing to a stronger association between estradiol and women's sexual desire (van Anders & Dunn, 2009). Not only is the possible presence of an association between T and sexual desire controversial, but also further discrepancies are found between associations between T and solitary sexual desire versus dyadic sexual desire (van Anders, 2012; van Anders et al., 2009). Another study exploring the influence of erotic stimuli on hormone levels related to arousal and desire in women collected a saliva sample before and after the introduction of erotic stimuli (van Anders et al., 2009). Only T from the second saliva sample was reported as being significantly linked with solitary sexual desire (van Anders et al., 2009). Though the discrepancies between T and solitary versus dyadic

desire have puzzled researchers and led to increasing research to explore the topic, they have yet to be explained. In order to explain these findings, a shift away from a narrow sexual focus of desire is necessary and consideration of broader components of desire may be beneficial.

Other non-clinical studies, however, dismiss a potential association between T and sexual desire altogether; rather, other variables are sought to explain individual differences in sexual desire. Some researchers point to emotional factors as largely linked to desire, with participants self-reporting low desire exhibiting more emotions of disillusion than normal desire counterparts (Carvalho & Nobre, 2010a). Relationship factors have also been suggested to be associated with levels of sexual desire (Brotto, Petkau, Labrie, & Basson, 2011; Carvalho & Nobre, 2010a; Edelstein, Chopik, & Kean, 2011). In particular, quality of relationship may best predict the development of disorders related to desire (Stuart, Hammond, & Pett, 1987). Others have credited cognitive factors, particularly thoughts during sexual activity, as most connected to sexual desire (Brotto et al., 2011; Carvalho & Nobre, 2010b; Goldey & van Anders, 2011). High self-reported stress in daily life has been associated with lower levels of sexual desire, activity, and satisfaction as well (Bodenmann, Atkins, Schar, & Poffet, 2010). Still others have suggested a more interdisciplinary approach to sexual desire. A mix of age, sexual conservatism beliefs, and medical factors has been included in the list of associations with desire (Carvalho & Nobre, 2010b).

More broadly, low desire may be associated with a combination of sociocultural, political, and economic factors, in addition to partner and relationship factors, psychological factors, and medical factors (Tiefer et al., 2002). Furthermore, low desire has largely been medicalized, analogous to the broader medicalization of women's sexuality (Tiefer et al., 2002). Perhaps rather than focus on treatment for this potentially natural state, it is necessary to define a sexual

problem featuring low sexual desire not as a medical problem but as "discontent or dissatisfaction with any emotional, physical, or relational aspect of sexual experience" (Tiefer et al., 2002, p. 229).

Limitations of Past Studies on Healthy Women's Desire and T

Previous research on sexual desire, however, has exhibited a variety of limitations. One such limitation has been a confined population of study. The majority of studies exploring a potential relationship between T and sexual desire examine postmenopausal women only (Moghassemi, Ziaei, & Haidari, 2011). The reason for the disproportional amount of research focusing on older women is most likely due to declining T levels with increasing age (Nappi et al., 2010) or the already existing medicalization of menopause. However, a considerable amount of evidence reveals that the postmenopausal ovary remains a significant source of circulating T even if production rate decreases (Schwenkhagen & Studd, 2009). Very few studies have explored younger populations, though the phenomenon of sexual desire is prevalent regardless of age, and dysfunction related to desire is also prevalent in the premenopausal population (Nappi et al., 2010). In fact, the proportion of women reporting low desire in addition to distress is significantly higher in younger women than in their older counterparts (Nappi et al., 2010). One of the few studies exploring a younger population found that postmenopausal women were more likely to report cues associated with love and emotional bonding compared to premenopausal women (McCall & Meston, 2007). Furthermore, very few studies have explored healthy populations, thus the current study will focus on a healthy, primarily young adult population.

Previous research on the topic has employed restricted definitions of desire. Past studies have solely explored a sexual component of desire. For example, a commonly utilized measure of sexual desire is the Sexual Desire Inventory (SDI; Spector, Carey, & Steinberg, 1996). This

measure defines sexual desire solely as a desire to initiate sexual behavior (Spector et al., 1996). Thus studies that have relied only upon this inventory as a measure of sexual desire have obtained information solely on a sexual aspect of desire (van Anders et al., 2009; van Anders 2012). Another common measure of sexual desire, and more broadly sexual function, is the Female Sexual Function Index (FSFI; Rosen et al., 2000). In this index, sexual desire is defined as "a feeling that includes wanting to have a sexual experience, feeling receptive to a partner's sexual initiation, and thinking or fantasizing about having sex" (Rosen et al., 2000, p. 205). The Cues for Resulting in Desire for Sexual Activity Scale (CSDS) for women likewise defines desire in terms of sexual activity only (McCall & Meston, 2006). Such a definition again includes only a sexual aspect of desire. Similarly, in other studies, sexual desire has been defined as a wish to engage in sexual experience (Schreiner-Engel, Schiavi, White, & Ghizzani, 1989). Some have used a less distinguished scale of sexual desire, defining the concept as interest in sexual expression (Woods, Mitchell, & Julio, 2010). Though each version of sexual desire has subtle differences, all are similar in that they are one-dimensional in definition, focusing only on a sexual component of desire.

How Sexual *is* Sexual Desire?

Desire focused solely on sexual activity may not be the best or only definition of the concept, however, as desire may actually have several dimensions and not be completely sexual. For example, a woman may report not desiring to orgasm herself but still report desire to engage in sexual activity, to please her partner, for example (Beck, Bozman, & Qualtrough, 1991; Brotto, 2010). Thus in this case, the woman's desire seems to be characterized by nurturance rather than a purely sexual aspect. Sociosexuality has similarly been postulated to strongly influence a woman's sexual behaviors (Edelstein et al., 2011). Women have been found to be less likely to

fulfill their sexual urges and more likely to engage in sexual activity that is consistent with their partner's desires (Edelstein et al., 2011). Again in this case, perhaps women engage in sexual activity to make a partner happy, rather than to purely fulfill a sexual urge, their desire more closely aligned with nurturance as opposed to sexual activity alone. Thus although desire and sexual activity for purely sexual reasons are arguably strongly associated with one another, there may be other aspects of desire that are not merely sexual, especially with regards to dyadic desire. Similarly, the steroid/peptide theory of social bonds postulates the need for distinction of a sexual and a nurturant intimacy in order to resolve the paradox in which sexual activity is linked to both high T and pair bond facilitation in intimacy, though paradoxically, T inhibits pair bonds (van Anders et al., 2011). Likewise, the theory suggests distinguishing between antagonistic aggression and protective aggression in order to resolve the paradox that intimacy and aggression are mutually exclusive despite the paradoxical presence of peptides influencing both intimacy and aggression (van Anders et al., 2011). Both types of aggression—antagonistic and protective—increase T, though solely protective aggression also increases peptides (van Anders et al., 2011). The steroid/peptide theory of social bonds thus supports the notion that perhaps just as intimacy and aggression present complexity in multiple manifestations, so too may sexual desire.

Sexual desire thus presents itself as more complex than simply a desire to initiate sex. Instead, sexual desire may not be completely sexual in nature but rather manifest itself in various ways, such as nurturance or power. For many women, the goal of sexual desire is not actually to have sex (Regan & Berscheid, 1996). Rather, women often give love, intimacy, and relationship growth as reasons for engaging in sexual activity (Meana, 2010). Such reasons suggest that the sexual desire these women feel is not directed toward the experience of sexual activity itself but

rather a desire for each of these nurturant qualities. Women have further reported that the thought of being desired is arousing (Meana, 2010). Perhaps the concept of sexual desire additionally includes a desire to be desired in some cases. Past studies have suggested that intimacy is composed of both a sexual and nurturant intimacy, and in the same way, desire may have multiple components (van Anders et al., 2011). The presence of these multiple components of women's sexual desire may be the result of a broader socialization of women's sexuality into intimacy (Tiefer et al., 2002). Because such may be the result of a broad socialization, it is not to suggest that women's sexual desire characterized by anything other than a sexual component alone is natural or unproblematic. Rather, in this way, women's sexual desire inclusive of nurturant intimacy and power relations is very much socially constructed. Similarly, though focus in this paper is on women, complexities with desire in men are important to note, including that what men desire when they experience desire may not be solely sexual and may include aspects like power and nurturance as well (Edelstein et al., 2011; van Anders, 2012; van Anders & Goldey, 2010).

In order to gain a better understanding of the potential association between T and desire in women, the current study seeks to more specifically define desire and differentiate between its various types when measuring androgen levels. Whereas past studies have incorporated solely a sexual component of sexual desire, as it is arguably the most obvious aspect of such, the current study will dissect sexual desire into several distinct components. We will explore potential aspects of sexual desire relating to nurturance, power/control, in addition to sexuality and miscellaneous endpoints of desire. It is expected that such aspects of sexual desire will not be completely distinguishable in every case; although some women will have a clearly stronger inclination towards one aspect of sexual desire, other women may indicate an inclination towards

multiple aspects of sexual desire in her ratings of such. For example, while one woman may be inclined towards a purely sexual aspect of desire and another towards a purely nurturant aspect of desire, another still may be inclined towards a combination of the two, as she may be nurturant towards her partner and consequently more inclined to engage in sexual activity with her partner. Still, the study aims to uncover how these various aspects of sexual desire influence the complex association between T and desire. Furthermore, the study seeks to explore whether differentiation between various aspects of sexual desire help to explain the discrepant association between T and solitary versus dyadic desire. The current study will measure T through saliva and correlate this with various aspects of desire as reported on a questionnaire.

Additionally, the potential effects of relationship status on strength of various sexual desire characterizations will be explored in this study. Some research suggests that motivations for sexual activity may differ for people in a relationship and single people (Meana, 2010). In the same way, motivations related to sexual desire may differ for single versus partnered people (Meana, 2010). For example, a partnered person may be more concerned with maintaining or developing a relationship in feeling sexual desire, directed towards either a current partner or a stranger, whereas a single person may focus more strongly on one's own sexual satisfaction as related to sexual desire in either case (Meana, 2010). Thus this study used these potentially varying motivations to prime a possible effect of relationship status on the complex association between desire and T by randomly assigning women, both single and in relationships, to direct their desire towards either a partner or a stranger when answering relevant questions.

In the current study, we predict that higher self-reports of sexual desire as having a purely sexual nature will be associated with higher concentrations of T. This may suggest that the positive correlation previously found between T and solitary desire is due to the purely sexual

nature of solitary desire, in that solitary desire may be more likely to express desire for pleasure than dyadic desire does. Next, we predict that higher self-reports of sexual desire as being of a nurturing nature will be associated with lower concentrations of T. This may suggest that the negative correlation previously found between T and dyadic desire is due to the possible nurturant nature in combination with a sexual nature in many circumstances of being with a partner. Finally, we predict that higher self-reports of sexual desire as related to power or control will be associated with higher concentrations of T.

Method

Participants

Participants (N = 198) constituted a diverse sample of healthy, adult women (M age = 19.65 years, SD = 4.49). Participation was limited to women only, as previous research found no significant associations between T and desire in men (Schiavi et al., 1991; van Anders, 2012). Participants were recruited from the University of Michigan undergraduate psychology subject pool as well as through advertising in the local Ann Arbor area and through online advertisements via Craigslist. Participants were compensated with $10 or course credit depending on the recruitment method. While most participants were students (n = 191), many were employed (n = 54). All participants had graduated from high school (n = 198), and many had at least some college experience (n = 113). Participants self-identified their race/ethnicity, which we categorized as African American/Black (n = 9), Asian/Asian American (n = 28), Bi/Multiracial (n = 7), Caucasian/White (n = 109), Chinese/Chinese American (n = 11), European (n = 1), Hispanic/Latino (n = 1), Indian (n = 11), Native American (n = 1), and Middle Eastern/Southeast Asian (n = 18), with two non-responders. Participants likewise self-identified their sexual orientation, which we categorized as bisexual (n = 4), gay or lesbian (n = 4), and

heterosexual (n = 181), though three participants gave responses that did not fit any of these categories (e.g., queer, bisexual, and bicurious), and six participants did not respond. The majority of participants lived in the United States for the duration of their lives (n = 142), though some lived in the U.S. for a variable amount of time, ranging from less than one month to 40 years (n = 55). Four participants were excluded from hormonal analyses because they reported taking hormonal contraceptives (n = 3) or because they had conditions affecting T (n = 1).

Materials and Measures

Health and background questionnaire. This included questions regarding demographic information to ensure inclusion of a diverse sample in our study. Questions about current physical health to ensure a healthy sample were posed here as well. Finally, possible hormonal confounds, including eating, drinking, smoking, or chewing gum within the last hour, as well as taking hormonal contraceptives, were included in this questionnaire. See Appendix A for the full questionnaire.

Relationships questionnaire. This questionnaire asked about current relationships, both romantic and sexual. Participants indicated their current relationship status. If applicable, participants were further asked to respond about the demographics and quality of their current relationship. For example, they were asked to characterize the relationship as romantic, sexual, or both, in addition to characterizing the relationship as long-distance or short-distance. Furthermore, they were asked how much they enjoy the relationship, and if they indicated that they were in multiple relationships, they could comment on each partner separately. See Appendix B for a full list of questions.

Sexuality questionnaire. This included questions about sexual orientation and identity in addition to questions about recent partnered and solitary sexual activity. Specifically,

participants were asked if they have ever changed sexual orientation and to describe if so. Additionally, participants were asked about their lifetime sexual experiences, both physical and non-physical (e.g., phone/Skype sex), and about the orientation of their sexual fantasies. Finally, participants were asked about masturbation and their enjoyment of engaging in the activity. See Appendix C for the full questionnaire.

Desire Components Questionnaire. This 66-item, descriptor-based, multi-dimensional inventory evaluates the strength of subjective sexual desire experience. This questionnaire is designed to measure the strength of various aspects of an individual's desire, including those that are sexual, nurturant, related to power, and miscellaneous. For this questionnaire, participants were assigned to one of four conditions depending on their relationship status, each condition differing only in instruction. Participants in a romantic and/or sexual relationship were randomly assigned to one of two conditions: 1) to think about their current partner (Condition 1) or 2) to think about an attractive stranger who is not their current partner (e.g., a celebrity; Condition 3) while responding to questions about sexual desire. Likewise, participants not in a romantic or sexual relationship currently were randomly assigned to one of two conditions: 1) to imagine that they do have a relationship partner (Condition 2) or 2) to think about an attractive stranger (e.g., a celebrity; Condition 4) while responding to questions about sexual desire. See Appendix D for a full list of questions.

Sexual Desire Inventory (Spector et al., 1996). This 15-item questionnaire measures both solitary and dyadic desire, explicitly defined as desire for sexual activity (Spector et al., 1996). Respondents were asked about their frequency of desire, strength of desire, and importance of fulfilling these desires.

Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988). This 20-item schedule is designed to measure mood within the past week. Participants were asked to rate how strongly they feel various emotions, both positive (e.g., "excited," "proud," "active") and negative (e.g., "afraid," "upset," "hostile") on a scale ranging from 1 (*Very slightly or not at all*) to 5 (*Extremely*). This scale was included in order to assess whether strong emotions were associated with hormonal trends.

Quality Marriage Index (Norton, 1983), Revised. This six-item index was revised to include partnered, unmarried respondents in order to encompass a broader variety of relationships rather than solely marriage. It asks respondents to rank their agreement from 1 (*Very Strong Disagreement*) to 7 (*Very Strong Agreement*) with five statements regarding quality, stability, and strength in the relationship. The sixth item asks respondents to rank their own happiness in the relationship on a scale from 1 (*Very Unhappy*) to 10 (*Very Happy*). This index was only administered to participants who indicated that they were in some form of a committed relationship. We measured relationship satisfaction because quality of relationship may affect strength of various types of desire in some women.

Body Image Self-Consciousness Scale (Wiederman, 2000). This 15-item questionnaire is designed to measure self-consciousness about one's body image. Participants were asked to rate the frequency with which they feel the statements are applicable to them on a scale from 0 (*Never*) to 5 (*Always*). The statements are phrased in such a way that even if a participant has not had a particular experience, she may answer in a hypothetical way.

Feminist Identification Questionnaire (Rudman & Phelan, 2007). These four questions are meant to measure a respondent's agreement with feminist principles and mindset.

Procedure

The study was approved by the University of Michigan Institutional Review Board. Participants were scheduled for testing between the hours of 11:00 and 19:00 in order to avoid peaking steroid hormones in the morning or upon waking (Axelsson, Ingre, Akerstedt, & Holmback, 2005; Khan-Dawood, Choe, & Dawood, 1984). Testing occurred during the months of September through November. Women were tested during any phase of their menstrual cycle, as previous research has found that menstrual phase does not need to be controlled for when specifically looking at T, unless it is of special interest (Dabbs & de La Rue, 1991; van Anders et al., 2007; van Anders & Watson, 2006b). Participants were asked to refrain from eating, drinking anything other than water, smoking, brushing their teeth, or chewing gum for one hour prior to their appointment.

Upon arrival, participants were greeted by a member of the research team (comprised mostly of young adult ethnic majority women) and taken to a private testing room. They were then given a consent form to read and sign in agreement to participate. Participants were then instructed to provide a 5 mL saliva sample by spitting into a polystyrene tube. At the same time, participants were asked to complete a brief online survey comprised of the questionnaires described above. Saliva samples were provided simultaneously with questionnaire completion, though participants were instructed to mainly focus first on providing the saliva sample.

Upon completion of the study, participants returned to the lab with their saliva sample. Participants were given either one hour of subject pool credit or compensated $10, depending on their recruitment method. Finally, participants were given a debriefing form explaining the purpose of the study and providing further resources for related research. At that time, participants were encouraged to ask any questions they may have had about the study. The saliva sample was then processed and stored in a freezer for later assay.

Assays

Saliva samples were collected in 17 mL polystyrene tubes and were immediately processed and frozen at -20°C until assay. Saliva samples were taken to the University of Michigan Core Assay Facility in Psychology, located in East Hall, for hormone radioimmunoassay. Samples were assayed specifically for T using commercially available kits from Siemens. The intra-assay coefficient of variation was 12.18% and the inter-assay coefficients were 61.30%, and 9.85% for high and low T, respectively. Duplicate measures of each sample were performed, and averages for each were used for analyses. Salivary T, as opposed to serum T, was used for the study due to its less invasive nature. Past studies have validated the measure of salivary T as having a strong correlation with free serum T (Granger, Shirtcliff, Booth, Kivlighan, & Schwartz, 2004; Khan-Dawood et al., 1984; Magrini, Chiodoni, Rey, & Felber, 1986; Swinkels, Meulenberg, Ross, & Benraad, 1988; Wang, Plymate, Nieschlag, & Paulsen, 1981) and total serum T (Granger et al., 2004; Shirtcliff, Granger, & Likos, 2002).

Analyses

Analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 19.0. We performed a factor analysis of the Desire Components Questionnaire (DCQ) to more strongly and specifically group desire factors for further analysis. Cronbach's alpha was subsequently calculated for each of the factor analysis components to test for internal consistency of the measure. We further performed a multivariate ANOVA to test whether relationship status and instruction manipulation affected strengths of the various subscales of desire. We additionally used Pearson's correlations to test the association between T and each component of sexual desire as measured by the DCQ. When testing for associations with T, we controlled for age, BMI, nicotine use, time of day of sample, negative affect, and relationship

status. However, controlling for these variables did not change the pattern of results, so we report results without these covariates included. Finally, we used a linear regression to estimate which subscale of sexual desire is the strongest predictor of T.

Results

Desire Components Questionnaire

Though our hypothesized subscales of the DCQ exhibited high internal consistency (all α's $>$ .85), in order to develop more specific subscales, we performed a factor analysis of the DCQ. The analysis identified 11 factors, or subscales, which we named based on the items that formed each factor. All factors had a high internal consistency. The 11 subscales were: "Emotional Connectedness" (29 items; α = .97), "Sexual Context" (25 items; α = .95), "Stress Reduction/Distraction" (9 items; α = .86), "Partner First" (8 items; α = .89), "Esteem Boost" (9 items; α = .89), "Sensation Seeking" (9 items; α = .86), "Power/Control" (5 items α = .75), "Conflict Management" (6 items; α = .81), "Kink/Reproduce" (4 items; α = .75), "Boredom" (2 items; α = .70), and "Partner Physical" (3 items; α = .76). The percent of total variance explained by the 11 factors was 70.1%, with Emotional Connectedness accounting for 19.8%, Sexual Context accounting for 14.0%, Stress Reduction/Distraction accounting for 6.0%, Partner First accounting for 5.2%, Esteem Boost accounting for 4.6%, Sensation Seeking accounting for 3.7%, Power/Control accounting for 3.7%, Conflict Management accounting for 3.7%, Kink/Reproduce accounting for 3.3%, Boredom accounting for 2.8%, and Partner Physical accounting for 2.1% of total variance. Each of the 65 descriptors compiling the DCQ loaded onto and was included in the subscales of at least one of the 11 factors.

Effect of Relationship Status and Instruction Manipulation on Desire

We conducted a Multivariate ANOVA to test whether relationship status and/or instruction condition affected scores on the different subscales of the DCQ. We entered DCQ scores for each subscale as the dependent variable, and we entered relationship status (single or partnered) and instruction manipulation (imagine stranger or imagine partner) as the independent variables. Overall, there was a significant multivariate effect of relationship status, F (11, 155) = 3.09, p = .001, and instruction manipulation on strength of desire subscale scores, F (11, 155) = 5.96, p < .001, but no significant multivariate interaction between relationship status and instruction manipulation, F (11, 155) = 1.59, p = .105.

When we followed up the significant multivariate effects, significant univariate effects of relationship status on desire score were found for Emotional Connectedness, Esteem Boost, and Kink/Reproduce subscales (see Table 1). For each of these three subscales, single people reported significantly higher desire relative to partnered people (see Figure 1). Significant univariate effects of instruction manipulation on desire score were found for Emotional Connectedness, Sexual Context, Partner First, and Conflict Management components (see Table 1). For each of these four subscales, the 'imagine a partner' instruction manipulation elicited higher desire relative to the 'imagine a stranger' instruction manipulation (see Figures 1-5). Overall, results indicated that participants who were partnered and participants who were asked to imagine a stranger reported lower desire on several subscales, whereas participants who were single and participants who were asked to imagine a partner reported higher desire on several subscales.

Correlations Between Desire and T

The Kink/Reproduce subscale of the DCQ was significantly positively correlated with T, r (181) = .17, p = .024. We controlled for age, BMI, nicotine use, time of day of sample,

negative affect, and relationship status, though none made a significant difference in correlation strength. To further examine the association between Kink/Reproduce and strength of desire, we correlated T with each of the four individual items in the Kink/Reproduce subscale. T was significantly positively correlated with desire to act out a sexual fantasy, r (184) = .16, p = .025, and with desire to fantasize, r (184) = .16, p = .031, but not desire to view an erotic film or read an erotic story, r (182) = .12, p = .118, or desire to reproduce, r (182) = .06, p = .443. T was not significantly associated with any other DCQ subscales or SDI subscales.

We also examined correlations between T and desire in partnered participants and single participants separately. When analyzing partnered participants in both conditions, Partner First was significantly negatively associated with T, r (71) = -.24, p = .037, and Boredom was significantly positively associated with T, r (74) = .26, p = .026. When analyzing only the single participants in both conditions, Kink/Reproduce alone was significantly positively associated with T, r (106) = .22, p =.025. Because Kink/Reproduce was associated with T when analyzing participants in all groups together as well as when analyzing single participants alone, it seems that single participants are driving the overall correlation between Kink/Reproduce-related desire and T.

Predictors of T

To examine which component of desire predicted T most strongly, we conducted a Multiple Linear Regression with the 11 desire subscales as predictors and T as the dependent variable. The model accounted for 11.7% of the variance in T (R^2_{adj} = .053), F (11, 151) = 1.82, p =.055. The only significant predictor of T was the Kink/Reproduce component, which positively predicted T, β = .330, t (151) = 3.01, p = .003 (see Table 2).

Desire Components Questionnaire and the SDI

Finally, we conducted a Hierarchical Multiple Regression in order to examine whether the Kink/Reproduce subscale of the DCQ predicted T over and above the SDI. We entered T as the dependent variable, SDI solitary and SDI dyadic scores as predictors in step one, and the Kink/Reproduce subscale of the DCQ as a predictor in step two. There was a trend for Kink/Reproduce to explain variation in T over and above the SDI, $\Delta R^2 = .016$, $F(1, 175) = 2.90$, $p = .090$.

Discussion

In the current study, we examined the associations between sexual desire and T in a sample of healthy women. More specifically, we conceptualized sexual desire as more than solely sexual in nature through utilization of the DCQ and examined how various forms of desire related to T, if at all. The present results suggest that sexual desire may not be homogenously characterized as entirely sexual in nature but instead may manifest itself in a variety of forms. Such various forms may further be differentially associated with T, with higher T linked specifically to more explicitly sexual measures like kink.

Desire Components Questionnaire

We originally predicted that the DCQ could be grouped into four subscales: desire that is purely sexual, desire that is nurturant, desire that relates to power/control, and a miscellaneous group of desire. Though the four predicted subscales did show relatively high internal consistency, we performed a factor analysis to more specifically group various forms of desire. The factor analysis generally supported our hypothesized subscales; however, it also suggested more specific components. Factor analysis identified 11 interrelated factors: Emotional Connectedness, Sexual Context, Stress Reduction/Distraction, Partner First, Esteem Boost, Sensation Seeking, Power/Control, Conflict Management, Kink/Reproduce, Boredom, and

Partner Physical, and together these factors accounted for over 70% of the explained variance of all descriptors. Factor analysis affirmed the validity of the questionnaire's structure, and measures of internal consistency also provided strong evidence for the reliability of the DCQ and its 11 subscales.

The factor analysis further showed that the Emotional Connectedness subscale, reflecting desires to develop or maintain a connection with another person (e.g., desires to experience companionship, express love for a partner, make a partner feel more secure about a relationship with him/her, etc.), accounted for the most variance of the DCQ of all the subscales. A Sexual Context subscale of desire, characterized by purely sexual motivations (e.g., desires to experience orgasm, to experience specific sexual activities, to feel sexually satisfied, etc.), however, accounted for less of the questionnaire's total variance relative to Emotional Connectedness. This finding suggests that the subjective experience of sexual desire is thus not universally characterized by a sexual aspect of desire alone. In fact, for many people, it seems that the sexual aspect of desire may not even be the most important aspect of desire (Beck et al., 1991; Brotto, 2010). Such a finding, in addition to the presence of nine other components of sexual desire, supports our hypothesis that sexual desire may not be completely sexual and confirms suggestions from past studies regarding the existence of alternate forms of sexual desire (Meana, 2010; van Anders, 2012).

Additionally, the factor analysis demonstrated the interrelatedness of various forms of desire through the overlap of many of the DCQ subscales. While particular items (e.g., desires to achieve orgasm, to feel dominant/powerful, to relieve stress, to reproduce, etc.), loaded onto solely one subscale, the majority of items loaded onto two subscales, and some items (e.g., desires to feel wanted/desired, to feel happy, to make yourself feel good, and to experience

relaxation) loaded onto as many as three subscales. Such factor interrelatedness reflects the complexity of sexual desire and its various forms. It seems that, in many cases, desire may indeed be sexual; however, it may additionally manifest itself as a desire for an emotional connection, or may map onto any of the other 10 subscales, simultaneously. Thus, we may not always be able to differentiate between the types of sexual desire that an individual feels, though results of the current study suggest that it is certainly possible that an individual's sexual desire may be multifaceted, reflecting both sexual and non-sexual drives.

Desire Components Questionnaire and T

We predicted that higher scores of nurturant forms of desire on the DCQ would be negatively correlated with T. However, our results did not yield any significant correlations between T and any nurturant-related subscales of desire, such as Emotional Connectedness, Partner First, or Conflict Management, when analyzing all groups together. Though past research has reported negative correlations between dyadic desire and T (van Anders, 2012) and similarly negative correlations between nurturant contexts and T (van Anders et al., 2011), such studies have also reported cortisol (C), a stress hormone, as largely moderating these associations, with high C women alone exhibiting a negative correlation between T and dyadic desire (van Anders, 2012). However, because we did not measure C or any type of perceived stress, we cannot be certain whether any stress variable has a significant impact on the lack of association seen in the current study. Still, it may be the case that despite widespread belief that T and desire are linked in some way, desire may simply not be strongly correlated with T in either direction. However, when analyzing partnered and single women separately, we found that in partnered women alone, the Partner First subscale of the DCQ, characterized by motivations to please a partner (e.g., desires to make a partner happy, express love for a partner, surprise a partner, etc.),

was significantly negatively associated with T. Such a finding relates to previous findings showing that nurturance within pair bonds is linked with lower T (van Anders et al., 2011). Oppositely, in partnered women, the Boredom subscale was significantly positively associated with T. It is curious why a desire to alleviate boredom combined with a desire to fall asleep, the two descriptors composing the Boredom subscale, would be positively linked with T. Perhaps these desires drive sexual thoughts, which are linked with increased T (Goldey & van Anders, 2011). Boredom may further be characterized as a self-driven need; if a woman engages in sex to relieve boredom, she is doing this for herself, not for the needs of a partner. Such an idea reflects past findings that T is most strongly linked with types of desire motivated by one's own pleasure, including solitary desire (van Anders, 2012). Desire characterized by a desire to fall asleep may further indicate sexual satisfaction, or fulfillment of one's own pleasure, again positively linked with T (van Anders, 2012).

We further predicted that higher scores of purely sexual forms of desire would be positively correlated with T. Though we would expect the subscales Sexual Context and Partner Physical to be associated with T, Kink/Reproduce was the only significant type of desire positively correlated with T when analyzing all groups together. The Kink/Reproduce subscale of desire reflects desires to fantasize, to act out a sexual fantasy, to view erotic films or read an erotic story, and to reproduce. Specifically, analyses showed that the desire to fantasize and the desire to act out a sexual fantasy appeared to be most strongly associated with T within the Kink/Reproduce subscale. Such results are consistent with past research that sexual thoughts alone may increase T in women not taking hormonal contraceptives (Goldey & van Anders, 2011). Likewise, T has been positively linked with sexual contexts as well as solitary desire (van Anders 2012; van Anders et al., 2011). Interestingly, the present association existed when single

women were considered alone but not when partnered women were considered alone. Such a finding suggests that perhaps fantasy is more strongly associated with T in single women than in partnered women. Fantasy may be characterized by a more sexual nature in single women as opposed to a more nurturant nature in partnered women, reflecting the positive links between T and sexual context (van Anders et al., 2011).

Furthermore, results suggest that the Kink/Reproduce subscale of the DCQ may explain variation in T beyond the SDI's capability to do so. While the SDI assumes sexual desire to solely be a desire to initiate sexual behavior (Spector et al., 1996), the DCQ explores the possibility that desire may not be completely sexual and may consist of more complex factors than simply the desire to initiate sex. For example, an individual may desire to fantasize about a sexual act but not actually wish to engage in it. Though the SDI does address sexual thoughts and fantasy, it focuses solely on frequency of such and assumes that all sexual thoughts or fantasies are driven by a desire to initiate sex. However, this may not be the case all of the time. The DCQ allows for the possibility that desire is characterized by the desire to fantasize alone whether a desire to initiate sex exists or not. The DCQ may thus be a more effective tool for measuring sexual desire in conjunction with T sampling, or when specific components of desire are of particular interest and may overall better inform understandings of desire.

Effect of Instruction and Relationship Status on Strength of Desire

In the current study, we also explored whether relationship status and instruction condition might have an effect on strength of the various forms of desire. We predicted that partnered people would be more concerned with developing or maintaining a relationship as it relates to desire, and thus should score higher on forms of desire dealing with nurturance. Oppositely, we predicted that single people would be more strongly concerned with their own

satisfaction and pleasure as it relates to sexual desire and should therefore score higher on purely sexual forms of desire.

In analyzing subscales of the DCQ in which significant differences were found in regards to relationship status (e.g., Emotional Connectedness, Esteem Boost, and Kink/Reproduce), the means for single women's scores were higher in all cases relative to partnered women. This is not to say that single people have higher sexual desire than partnered people in general; rather, perhaps those who are single express sexual desire that is characterized by a desire for an emotional connection with another person more so than a partnered person who already has one. Furthermore, it may be the case that single people's desire is characterized by a desire to boost one's own self-esteem more so than a partnered person who has a partner to reaffirm self-esteem. Single individuals' desires may furthermore be more strongly characterized than their partnered counterparts by a desire to fantasize or act out a fantasy.

Additionally, women, both partnered and single, were assigned to answer questions about their desire towards either a partner or a stranger when completing the DCQ. We found that for the subscales of desire in which significant differences were seen, including Emotional Connectedness, Sexual Context, Partner First, and Conflict Management, mean scores were higher when considering towards a partner relative to a stranger. Such a finding is logical for the Emotional Connectedness, Partner First, and Conflict Management subscales, as each might be more likely to occur in the context of a committed partnership. However, that this finding holds true for the Sexual Context subscale proves more curious, as we might expect desire towards a stranger to be sexual, while desire towards a relationship partner may be more nurturant. However, the current study suggests that perhaps desire towards a partner is both more nurturant *and* more sexual while desire towards a stranger is relatively less so. Perhaps such a finding has

to do with influences of socialization that intertwine sexual and nurturant relationships for women; for example, women may be socialized to believe that sexuality is only acceptable in the context of a romantic relationship, reflecting why desire toward a partner would be stronger than that toward a stranger.

Limitations and Future Directions

The sample for the current study consisted primarily of college-age students. This may account for the higher strength of certain characterizations of sexual desire over others. For example, the current study has demonstrated that in general, college-age women's desire is not characterized by a desire to reproduce, though in an older sample, it may be. A study including a wider age-range of women may more accurately characterize the breakdown of women's desire generally. However, much research on sexual desire and T has focused on menopausal and postmenopausal aged populations (Moghassemi et al., 2011), thus a focus on a younger age group is a beneficial contribution to the literature in many ways.

The present study further cannot make assumptions about causality or directionality in relation to the correlations between desire and T. Though controlling for potential moderators such as age, BMI, nicotine use, relationship status, and negative affect did not affect presence or strength of correlations, we cannot be certain whether desire more strongly predicts T or whether T more strongly predicts desire, or even if these two variables are directly related in women, though extensive prior research would suggest they are (van Anders et al., 2009; van Anders et al., 2007; van Anders & Hampson, 2005).

Conclusion

Just how sexual *is* sexual desire? In utilizing the DCQ, this study suggests that women's sexual desire is not necessarily sexual in nature, but rather may include components relating to

emotional connectedness, stress reduction or distraction, focus on partner pleasure, self-esteem, conflict management, sensation seeking, and boredom in addition to sexual context. The interrelatedness of these subscales reflects the complexity of sexual desire itself. Furthermore, such components of sexual desire appear to interact with T differently. Of all types of desire analyzed, sexual desire characterized by a desire to fantasize or act out a fantasy most strongly positively predicts T. Relationship status and the target of desire (i.e., a stranger vs. a romantic partner) may further have an effect on strength of various types of sexual desire. The study thus suggests that sexual desire is not entirely sexual in nature, but instead may reflect desire characterized by a variety of psychosocial factors and may be influenced by relationship and desire target context.

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Table 1

Effect of Relationship Status and Instruction on Desire Components Scores

	Statistic		Significant Difference	
Factor	Instruction	Relationship Status	Instruction	Relationship Status
1-Emotional Connectedness	F (1, 165) = 9.96, p = .002	F (1, 165) = 5.84, p = .017	Partner> Stranger	Single> Partner
2-Sexual Context	F (1, 165) = 5.75, p = .018	F (1, 165) = 0.91, p = .341	Partner> Stranger	
3-Stress Reduction/Distraction	F (1, 165) = 1.36, p = .246	F (1, 165) < .010, p = .955		
4-Partner First	F (1, 165) = 33.53, p < .001	F (1, 165) = 0.12, p = .734	Partner> Stranger	
5-Esteem Boost	F (1, 165) = 1.33, p = .251	F (1, 165) = 4.81, p = .030		Single> Partner
6-Sensation-Seeking	F (1, 165) = 2.55, p = .113	F (1, 165) = 3.60, p = .060		
7-Power/Control	F (1, 165) = 2.78, p = .097	F (1, 165) = 0.09, p = .768		
8-Conflict Management	F (1, 165) = 8.55, p = .004	F (1, 165) = 0.18, p = .672	Partner> Stranger	
9-Kink/Reproduce	F (1, 165) = 2.07, p = .152	F (1, 165) = 7.83, p = .006		Single> Partner
10-Boredom	F (1, 165) = 0.11, p = .738	F (1, 165) < .010, p = .986		
11-Partner Physical	F (1, 165) = 0.96, p = .328	F (1, 165) = 0.42, p = .516		

Table 2

Multiple Linear Regression Predicting Testosterone from Desire Components

Component	β (standard error)	*t*	*p*
1-Emotional Connectedness	-0.183	-0.952	0.343
2-Sexual Context	-0.087	-0.338	0.736
3-Stress Reduction/Distraction	0.226	1.560	0.121
4-Partner First	0.075	0.523	0.602
5-Esteem Boost	-0.023	-0.136	0.892
6-Sensation-Seeking	-0.115	-0.741	0.460
7-Power/Control	0.020	0.175	0.861
8-Conflict Management	-0.057	-0.413	0.680
9-Kink/Reproduce	0.341	3.009	0.003*
10-Boredom	-0.046	-0.452	0.652
11-Partner Physical	0.005	0.037	0.970

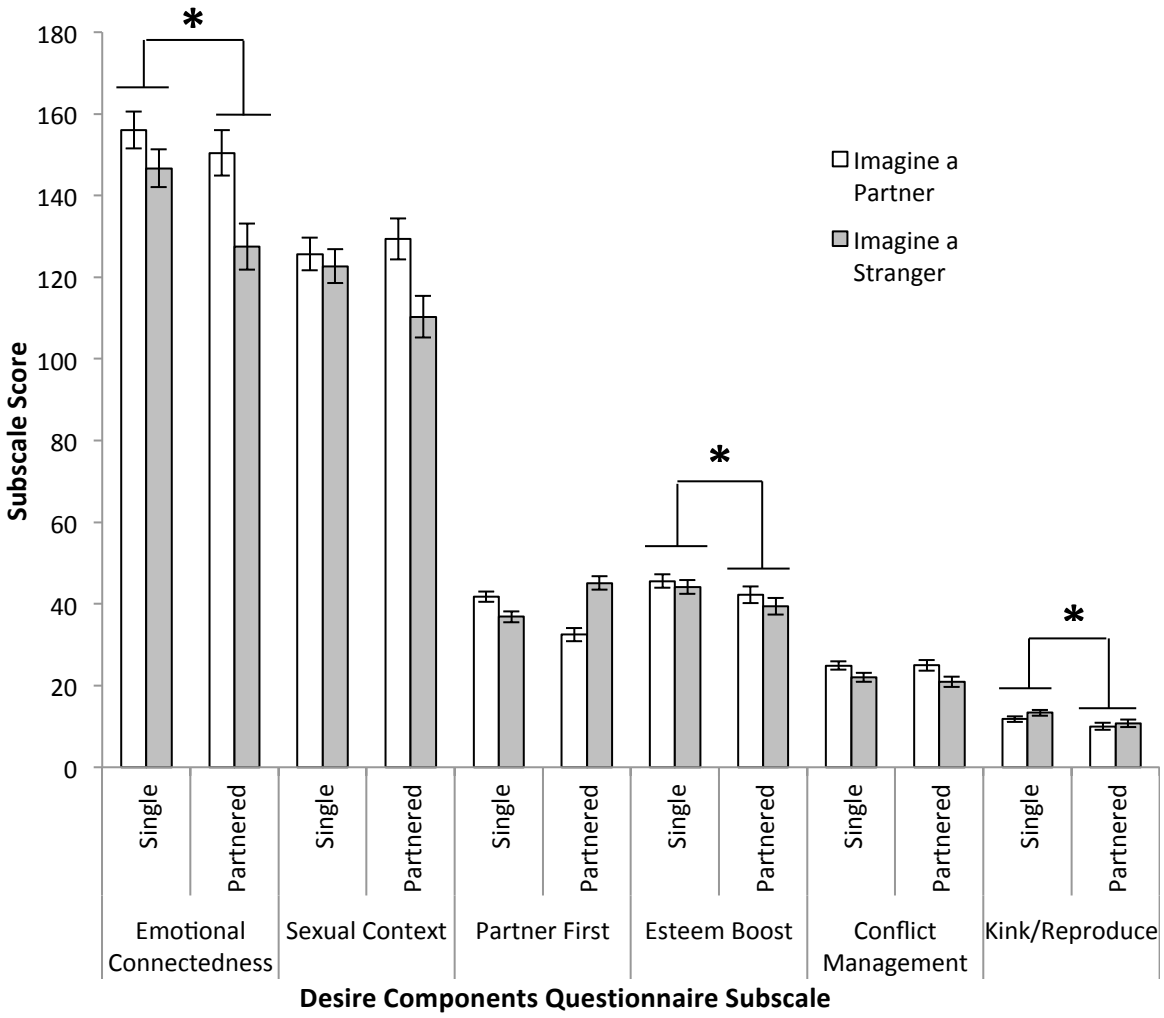

Figure 1. Effect of Relationship Status and Instruction Manipulation on Desire Components Questionnaire subscales exhibiting significant differences. This figure illustrates the multivariate effects of relationship status and instruction manipulation on scores of the Emotional Connectedness, Sexual Context, Partner First, Esteem Boost, Conflict Management, and Kink/Reproduce subscales of the Desire Components Questionnaire. Bars indicate a main effect, and * = a significant difference.

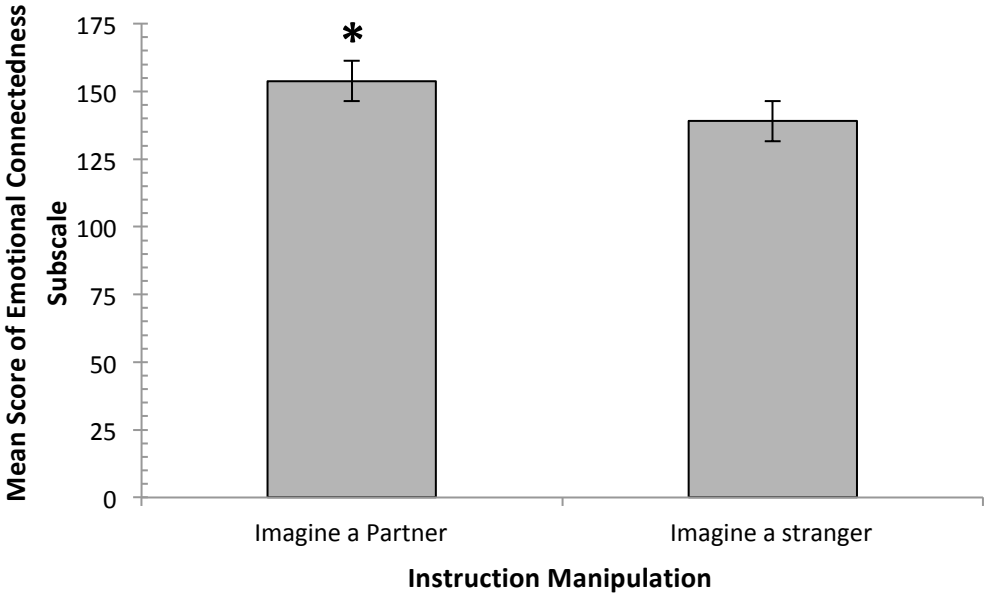

Figure 2. The effect of Instruction Manipulation on mean scores of the Emotional Connectedness subscale of the Desire Components Questionnaire. * = a significant difference.

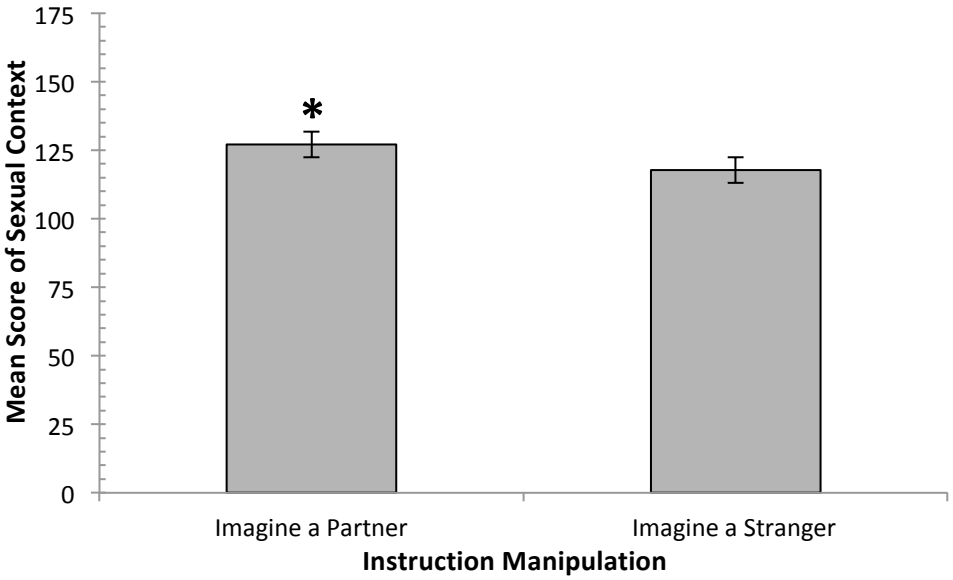

Figure 3. The effect of Instruction Manipulation on mean scores of the Sexual Context subscale of the Desire Components Questionnaire. * = a significant difference.

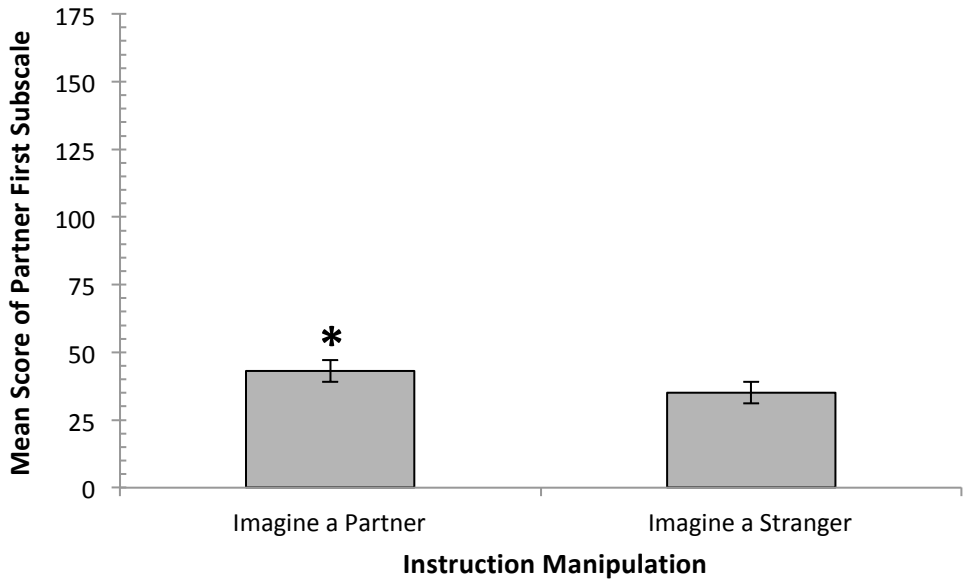

Figure 4. The effect of Instruction Manipulation on mean scores of the Partner First subscale of the Desire Components Questionnaire. * = a significant difference.

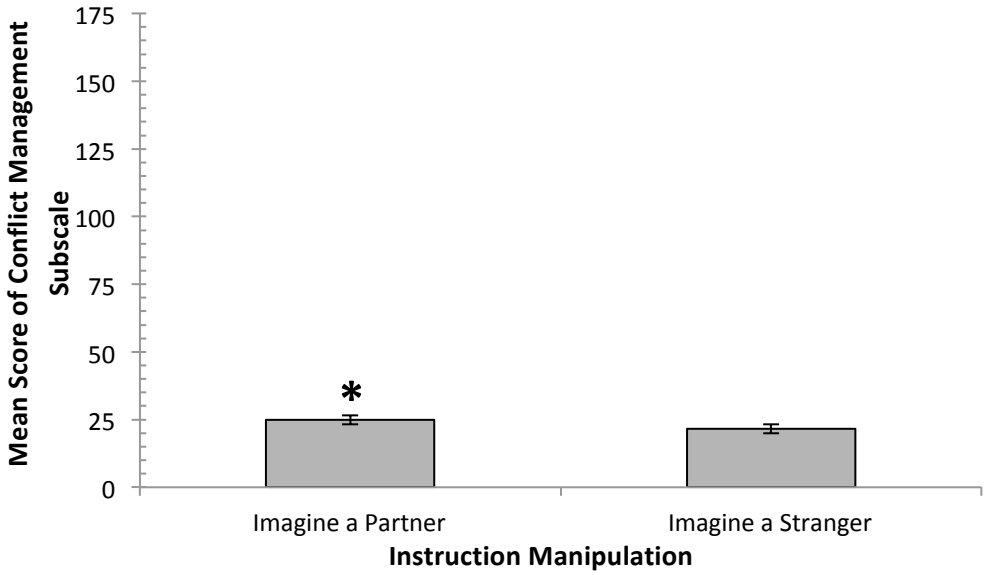

Figure 5. The effect of Instruction Manipulation on mean scores of the Conflict Management subscale of the Desire Components Questionnaire. * = a significant difference.

Appendix A

Health and Background Questionnaire

1. Please enter your participant ID number here:
(text entry)

Please answer the following questions to the best of your ability. Your responses are strictly confidential and will be used for research purposes only. If you come to a question that you prefer not to answer, please skip over it and move to the next question. If you have comments, there is a space for them at the end of the section.

2. What is your age?
(text entry)

3. How do you define your gender/sex?
Female, Male, If your gender is not listed here please identify it below (text entry)

4. Are you a student?
Yes; at what level (e.g., undergrad, grad, etc.)? (text entry)
No

5. Are you currently employed?
Yes, full time
Yes, part time
No

6.What is your job title and the number of hours you work per week?
(text entry)

7. What is your yearly household income?
Less than $20,000
$21,000 - $40,000
$41,000 - $60,000
$61,000 - $80,000
$81,000 - $100,000
Greater than $100,000

8. What is the highest level of education you have completed?
Less than high school
Some high school
High school graduate
Some college
Finished training other than college (e.g., vocational school)
Graduated from 2-year college
Graduated from 4-year college or university
Some graduate or professional school

Received masters, professional or doctoral degree

9. Do you have children?
Yes; Please indicate the gender and age of each (text entry)
No

10. Please indicate your religion/religious affiliation:
(text entry)

11. How long have you lived in the USA?
All my life
For this long: (text entry)

12. People identify their cultural, racial, and ethnic backgrounds in multiple ways and we use this information (grouped into larger categories, to maintain anonymity) to help describe our participants. One example might be "African American" or "Black; Nigerian". Another might be "White and Dutch". Another might be "Southeast Asian; Vietnamese". Still another might be "Multiracial". Everyone has a race/ethnicity and a culture, even if that race/ethnicity is "white" and that culture is "American". How do you identify your race, ethnicity, and culture?
(text entry)
13. In the last hour, have you:
(matrix; Yes/No)
Had anything to eat?
Had a beverage other than water?
Had a cigarette or nicotine products?
Brushed your teeth?
Chewed gum?

14. Are you currently taking any prescription medications, non-prescription medications, hormone supplements, or herbal supplements?
No; I am not currently taking any of these
Yes; please list: (text entry)

15. Are you using hormonal contraceptives at present (e.g. the Pill, the ring), either for contraceptive or other reasons?
Yes
No

16. If yes, what kind of hormonal contraceptive are you currently using?
(text entry)

17. If yes, for how long have you been using hormonal contraceptives?
(text entry)

18. If no, have you used hormonal contraceptives in the past?
Yes, in the past 0-3 months

Yes, in the past 3-6 months
Yes, in the past 6-12 months
Yes, more than 12 months ago
No

19. Have you ever been diagnosed with any physical condition that might alter your hormones (e.g. PCOS, thyroid conditions)?
No, I do not have any physical conditions that might alter my hormones.
Yes, please list the conditions: (text entry)

20. Have you ever had surgery on or medical attention to your ovaries or testes?
No
Yes, please describe: (text entry)

21. On the next page are some questions regarding menstrual cycles. Please indicate whether or not these questions are relevant to you.
Yes, I have experienced menstruation (my period) at least once in my life.
No, I have never experienced menstruation.

22. Are you currently pregnant?
Yes
No

23. Are you breast-feeding an infant at present?
Yes
No

24. Do you have periods?
Yes
No, I am taking hormonal contraceptives that prevent menstruation.
No, I have a clinical condition such that I do not menstruate.
No, I am a post-menopausal woman.
No, I transitioned sex.
No, another reason (text entry)

25. If yes, what is the normal length of your menstrual cycle, i.e., how many days generally pass from the first day of one menstrual period to the first day of the next menstrual period? If you are unsure of the exact number of days, choose your closest estimate.
20 days or less
21
22
23
24
25
26
27

28
29
30
31
32
33
34
More than 35 days

26. If you selected “more than 35 days,” please specify the normal length of your menstrual cycle in days:
(text entry)

27. If you selected “less than 20 days,” please specify the normal length of your menstrual cycle in days:
(text entry)

28. How regular are your menstrual cycles in their time of onset?
(Slide the bar to the value that best fits: Completely predictable----------Completely unpredictable)

29. Do you ever go through long periods of time without having menstrual periods (for reasons other than pregnancy)?
Yes
No

30. Has this happened in the last 6 months (for reasons other than pregnancy)?
Yes
No

31. Are you having your period today?
Yes; what date did your current period begin? (text entry)
No; what date did your last period begin? (text entry)

32. If no, in how many days do you expect your next period? Or, you can indicate the calendar date if you know that.
(text entry)

33. Do you have any type of infection, illness, or sickness (e.g., flu, cold, or chronic conditions such as lupus)?
NO; I do not have any infection, illness, or sickness.
YES; please list: (text entry)

34. What is your weight? Please select either kilograms or pounds and enter your weight.
in pounds: (text entry)
in kilograms: (text entry)

35. What is your height? Please select either feet/inches or meters and enter your height.
feet and inches (text entry)
meters (text entry)

36. What time did you go to sleep last night? Please select AM or PM and enter the time (remember, midnight is 12:00AM):
AM: (text entry)
PM: (text entry)

37. What time did you wake up this morning? Please select AM or PM and enter the time (remember, noon is 12:00PM):
AM: (text entry)
PM: (text entry)

38. Do you use nicotine products (e.g., cigarettes)?
No; I do not use nicotine products
Yes; how often per week? (e.g. 20 cigarettes) (text entry)

39. Do you drink alcoholic beverages?
No
Yes; how many alcoholic beverages do you drink per week: (text entry)

40. Do you exercise or engage in physical activity?
Yes; please describe the activity/activities and how often per week you engage in them: (text entry)
No

41. How did you find out about this study?
(text entry)

42. If you have any questions or comments about the previous section, please write them below.
(text entry)

Appendix B

Relationship questionnaire

Please answer the following questions to the best of your ability. Your responses are strictly confidential and will be used for research purposes only.

1. Please indicate your relationship status:
Single (not romantically involved with anyone)
Dating (Dating refers to a casual relationship you have with another person that may be sexual and is 'romantic' [that is, you 'like' or are interested in the other person]. Going to the movies or dinner is an example of dating.)
Committed relationship with one person (Committed relationships are those you have with another person that are romantic and usually sexual. They involve a commitment on the part of you and the person to be together as relationship partners for some time. Boy/girlfriends, 'going-out,' and long-term relationships are some examples.)
Committed relationships with more than one person
Committed relationship with one person and dating other people
Committed relationships with more than one person and dating other people

2. Is there a term you use to describe your approach to romantic relationships? (e.g., polyamorous, single by choice, monoamorous)
(text entry)

3. Are you currently having partnered sexual contacts?
No
Yes, with one person
Yes, with more than one person

4. (If Yes, more than one person is selected) How many people are you having partnered sexual contacts with?
(text entry)

5. Is there a term you use to describe your approach to sexual relationships? (e.g., player, asexual, monogamous, slut)
(text entry)

6. Please describe your current sexual and romantic relationships in detail. (e.g., "I have one committed female relationship partner", "I have two male dating partners", "I have one committed female relationship partner and two female sexual partners")
(text entry)

7. How many romantic relationship partners have you had in your life? (e.g., boyfriends or girlfriends, people you were "going out with") These often but do not always include sexual contact.
(text entry)

The following questions refer to your partner (the person that you are romantically and/or sexually involved with). If you are involved with multiple partners, please begin with the relationship that is most important to you. You will be asked the same questions for your other partners afterward. If all of your relationships with different partners are equally important, please select the first partner at random.

8. How long have you been in a relationship with this partner?
(text entry)

9. How would you characterize this relationship?
Romantic
Sexual
Both romantic and sexual

10. Is this a long distance relationship?
Yes
No

11. How close/intimate is this relationship?
Not close/intimate at all
Not very close/intimate
Neutral
Close/intimate
Very close/intimate

12. How committed are you to this partner?
Not committed at all
Not very committed
Neutral
Committed
Very committed

13. How supportive of you do you feel your partner is?
Not supportive at all
Not very supportive
Neutral
Supportive
Very supportive

14. How does your partner identify their gender/sex?
Male
Female
Other (Please explain) (text entry)

15. How sexually active are you with this partner currently?

Not at all
Less than once per month
1-3 times per month
Once per week
2-4 times per week
5-6 times per week
Once per day
More than once per day

16. How much do you currently enjoy sexual activity with this partner?
Not at all
I don't enjoy it much
Neutral
I enjoy it
I enjoy it a lot

17. Do you currently have another partner (either romantic or sexual)?
Yes
No

(If No is selected, skip to end of survey; If Yes is selected, repeat questions 8-17 for each relationship partner.)

Appendix C

Sexuality Questionnaire

These questions ask about your sexuality. If you come to a question you prefer not to answer, please skip over it and move on to the next question. If a question or its response options do not fit you well, there will be a box at the end of this section for you to clarify responses or leave comments.

1. What is your sexual orientation/identity currently (e.g., gay, heterosexual, etc.)?
(text entry)

2. Have you changed your sexual orientation/identity?
Yes
No

3. If yes, please describe how it changed.
(text entry)

4. Which of the following best describes your actual sexual experiences (including romantic kissing, petting, intercourse, etc.) from puberty until now? Other sex refers to contact with an individual of a different sex than yourself. Same sex refers to contact with an individual who is the same sex as yourself. Please select one.
Exclusively other sex with no same sex contact
Predominantly other sex with only a few same sex contacts
Predominantly other sex with more than a few same sex contacts
Equally other sex and same sex in contact
Predominantly same sex with more than a few other sex contacts
Predominantly same sex with only a few other sex contacts
Exclusively same sex with no other sex contact
No contact

5. Which of the following best describes your sexual attractions/fantasies from puberty until now? Other sex refers to attractions to/fantasies of an individual who is a different sex than yourself. Same sex refers to attractions to/fantasies of an individual who is the same sex as yourself. Please select one.
Exclusively other sex with no same sex attractions/fantasies
Predominantly other sex with only a few same sex attractions/fantasies
Predominantly other sex with more than a few same sex attractions/fantasies
Equally other sex and same sex in attractions/fantasies
Predominantly same sex with more than a few other sex attractions/fantasies
Predominantly same sex with only a few other sex attractions/fantasies

Exclusively same sex with no other sex attractions/fantasies

6. Have you ever engaged in consensual physical sexual activity with another person?
Yes
No
7. If yes, how many consensual sexual partners have you had in your life? (we are asking about the number of different people, not the number of times)
(text entry)

8. Are you currently having consensual NON-physical sexual contact with anyone at present (e.g., phone sex, sexting, Skype sex)?
No
Yes, with a relationship partner
Yes, with someone other than a relationship partner
Yes, with both a relationship partner and someone else

9. Have you ever engaged in masturbation?
Yes
No

10. If yes, how often do you engage in masturbation?
Not at all
Once per month or less
2-3 times per month
Once per week
2-3 times per week
4-6 times per week
Once per day
More than once per day

11. If yes (to question 9), how much do you enjoy masturbation?
1 Not at all
2
3
4 Moderately
5
6
7 Very much

12. How often do you use sexual “media” (e.g. erotic books, internet pornography)?

Not at all
Once per month or less
2-3 times per month
Once per week
2-3 times per week
4-6 times per week
Once per day
2-3 times per day
4 or more times per day

13. How often do you use sex toys (e.g., vibrator, dildo, anal beads, fleshlight)?
Not at all
Once per month or less
2-3 times per month
Once per week
2-3 times per week
4-6 times per week
Once per day
2-3 times a day
4 or more times a day

14. If you have any questions or comments about the previous section, please write them here: (text entry)

Appendix D

Desire Components Questionnaire

Condition One—[For the following questionnaire, think about a relationship partner.]
Condition Two—[For the following questionnaire, imagine that you are in a relationship with someone you are close to and find attractive.]
Condition Three—[For the following questionnaire, think about a person you find attractive who is NOT your relationship partner and who you either do not know, or do not know well (you may, for example, think about someone famous or an acquaintance).]
Condition Four—[For the following questionnaire, think about a person you find attractive who you either do not know, or do not know well (you may, for example, think about someone famous or an acquaintance).]

For each question, rank your agreement with the following:

When you have experienced sexual desire for this partner, is it generally characterized by a desire to…?

	1 Strongly Disagree	2	3	4 Neither Agree nor disagree	5	6	7 Strongly Agree
1. Experience orgasm	1	2	3	4	5	6	7
2. Give your partner physical pleasure	1	2	3	4	5	6	7
3. Feel wanted/desired	1	2	3	4	5	6	7
4. Be touched	1	2	3	4	5	6	7
5. Have a thrill	1	2	3	4	5	6	7
6. Make your partner feel happy	1	2	3	4	5	6	7
7. Feel dominant/powerful	1	2	3	4	5	6	7
8. Experience specific sexual activities	1	2	3	4	5	6	7
9. Feel protected	1	2	3	4	5	6	7
10. Try something new	1	2	3	4	5	6	7
11. Experience companionship	1	2	3	4	5	6	7
12. Feel irresistible	1	2	3	4	5	6	7
13. Relieve stress	1	2	3	4	5	6	7
14. Do something exciting	1	2	3	4	5	6	7
15. Express love for your partner	1	2	3	4	5	6	7
16. Surprise your partner	1	2	3	4	5	6	7
17. Be distracted from some other anxiety-provoking issue	1	2	3	4	5	6	7
18. Act out a sexual fantasy	1	2	3	4	5	6	7
19. Fall asleep	1	2	3	4	5	6	7
20. Alleviate boredom	1	2	3	4	5	6	7
21. Be dominated	1	2	3	4	5	6	7
22. Please your partner	1	2	3	4	5	6	7

23. Impress your partner	1	2	3	4	5	6	7
24. Feel happy	1	2	3	4	5	6	7
25. Make your partner feel emotionally closer to you	1	2	3	4	5	6	7
26. Make your partner feel wanted/desired	1	2	3	4	5	6	7
27. Feel sexually excited or aroused	1	2	3	4	5	6	7
28. Fantasize	1	2	3	4	5	6	7
29. Make your partner feel more secure about your relationship with him/her	1	2	3	4	5	6	7
30. Feel sexually satisfied	1	2	3	4	5	6	7
31. Feel a sense of commitment from your partner	1	2	3	4	5	6	7
32. Be physically close to your partner in a sexual way	1	2	3	4	5	6	7
33. Experience power/control	1	2	3	4	5	6	7
34. End craving	1	2	3	4	5	6	7
35. Reconcile with your partner/end a fight	1	2	3	4	5	6	7
36. Feel sexy	1	2	3	4	5	6	7
37. Experience intimacy	1	2	3	4	5	6	7
38. Feel independent and in control of your body	1	2	3	4	5	6	7
39. Show your partner that you care	1	2	3	4	5	6	7
40. Feel cared for	1	2	3	4	5	6	7
41. Be protective	1	2	3	4	5	6	7
42.Touch your partner’s body	1	2	3	4	5	6	7
43. Reproduce	1	2	3	4	5	6	7
44. Feel special	1	2	3	4	5	6	7
45. View erotic films or read an erotic story	1	2	3	4	5	6	7
46. Feel in control of your relationship	1	2	3	4	5	6	7
47. Initiate or maintain a romantic relationship	1	2	3	4	5	6	7
48. Feel loved	1	2	3	4	5	6	7
49. Experience romance	1	2	3	4	5	6	7
50. Feel emotionally closer to your partner	1	2	3	4	5	6	7
51. Make your partner feel that you are committed	1	2	3	4	5	6	7
52. Cuddle with your partner	1	2	3	4	5	6	7
53. See your partner naked	1	2	3	4	5	6	7
54. Boost your self-esteem or feel	1	2	3	4	5	6	7

good about yourself							
55. Feel more secure about your relationship with your partner	1	2	3	4	5	6	7
56. Relieve tension/frustration	1	2	3	4	5	6	7
57. Experience desire for its own sake/no goal	1	2	3	4	5	6	7
58. Make your partner feel that you are supportive of him/her	1	2	3	4	5	6	7
59. Make yourself feel good	1	2	3	4	5	6	7
60. Avoid conflict with your partner	1	2	3	4	5	6	7
61. Make your partner feel special	1	2	3	4	5	6	7
62. Feel a sense of support from your partner	1	2	3	4	5	6	7
63. Experience physical pleasure	1	2	3	4	5	6	7
64. Grow closer to your partner or develop a stronger connection with him/her	1	2	3	4	5	6	7
65. Experience relaxation	1	2	3	4	5	6	7

66. Can you please identify who you imagined? You do not need to give a specific name; please provide your relation to this person (e.g., relationship partner, famous person, friend, etc.).

Desire Components Questionnaire Subscales:

Emotional Connectedness—sum of items 3, 6, 9, 11, 15, 24, 25, 26, 29, 31, 32, 37, 39, 40, 41, 44, 46, 47, 48, 49, 50, 51, 52, 55, 58, 59, 61, 62, & 64

Sexual Context—sum of items 1, 2, 3, 4, 5, 8, 12, 14, 18, 22, 24, 27, 28, 30, 32, 34, 36, 37, 38, 42, 53, 57, 59, 63, & 65

Stress Reduction/Distraction—sum of items 13, 17, 20, 21, 35, 56, 57, 59, & 65

Partner First—sum of items 2, 6, 15, 16, 22, 23, 26, & 61

Esteem Boost—sum of items 3, 12, 23, 28, 36, 40, 44, 54, & 5

Sensation Seeking—sum of items 5, 8, 9, 10, 14, 16, 24, 38, & 65

Power/Control—sum of items 7, 21, 33, 34, & 46

Conflict Management—sum of items 29, 35, 38, 58, 60, & 61

Kink/Reproduce—sum of items 18, 28, 43, & 45

Boredom—sum of items 19 & 20

Partner Physical—sum of items 42, 52, & 53