

Jealousy as Competition:
Imagined Partner Flirting Behavior Increases Testosterone in Partnered Women

by

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Abstract

This study investigated whether actively thinking about a jealousy-provoking situation results in a testosterone (T) response, and what factors might mediate this effect. We compared changes in T resulting from imagining one's partner engaging in one of three activities: a neutral conversation with a co-worker, a flirtatious conversation with an attractive person, or a passionate kiss with an attractive person. In women, participants in the flirting condition experienced a significantly greater increase in T compared to those in the neutral condition ($p = 0.013$). However, T did not increase more in the kissing condition than in the flirting condition ($p = 0.114$) or the neutral condition ($p = 0.286$). There were no effects of jealousy condition on T in men. In women, the flirting condition elicited T responses similar to those associated with engaging in competitions, and T responses to the kissing condition were similar to those associated with defeat.

Keywords: testosterone, jealousy, psychology, relationships, competition, women

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Romantic jealousy describes the perception that a valued relationship is under threat of being lost to another person (Holtzworth-Munroe, Stuart, & Hutchinson, 1997; Mullen, 1991; Puente & Cohen, 2003). Such jealousy may be provoked by threats that are either real or imagined (Rilling, Winslow, & Kilts, 2004; Sheets, Fredendall, & Claypool, 1997). Though jealousy is often spoken of negatively, it is commonly understood that jealous feelings can range from normal to pathological, and that those feelings can be manifested in good or bad ways (Conley, Moors, Matsick, Ziegler, & Valentine, under review; Daly, Wilson, & Weghorst, 1982; Tarrier, Beckett, Harwood, & Bishay, 1990).

One negative impact of jealousy is that it is a primary reason for relationship failure (De Silva, 1997; White & Mullen, 1989). It also appears to play a role in intimate partner violence. A frequent motivation for intimate partner violence is jealousy that results from perceived threatened exclusive access to a partner (Daly & Wilson, 1988; Rilling et al., 2004). This possible consequence is substantial because many women in the U.S. are physically assaulted by an intimate partner each year (Tjaden & Thoennes, 2000), and studies indicate that the lifetime prevalence of intimate partner violence is between 21 and 55 percent (Coker, Derrick, Lumpkin, Aldrich, & Oldendick, 2000; Snow Jones et al., 1999; Tjaden & Thoennes, 2000). More research is needed to determine why jealousy sometimes leads to violence and sometimes does not.

On the other hand, studies have also demonstrated that certain amounts of jealousy can serve to strengthen relationships (Daly, Wilson, & Weghorst, 1982). Jealousy can also highlight commitment and love within a relationship (Dobash & Dobash, 1979; Henton, Cate, Koval,

Lloyd, & Christopher, 1983; Puente & Cohen, 2003), such that a certain amount of jealousy serves as a sign that one partner loves the other (Puente & Cohen, 2003). As such, this literature suggests that it might be beneficial for relationships researchers to understand the mechanisms by which jealousy appears to sometimes strengthen relationships.

Testosterone and Competition

Testosterone (T) is a steroid hormone that has been associated with aggression and sexuality (Goldey & van Anders, 2011; Rupp & Wallen, 2007; Wingfield, Hegner, Dufty, & Ball, 1990). T has also been shown to increase in competitive situations (Hirschenhauser & Oliveira, 2006; van Anders & Watson, 2006), which are defined as behavioral contexts that involve the acquisition or maintenance of resources (e.g., food, territory, or sexual opportunities; van Anders, Goldey, & Kuo, 2011). Experiencing feelings of jealousy may be similar to being involved in a competition since the goal is to maintain exclusive access to a partner in the presence of real or perceived rivals. Because jealousy can be experienced as a competition, it is possible that T increases in response to jealousy-provoking situations. Hormonal correlates of jealousy are not well-researched, but the involvement of T in competition and pair bonding suggests T may be involved with jealousy as well.

The Challenge Hypothesis posits that T is elevated during social competitions (Wingfield et al., 1990). It suggests a trade-off between parenting and low levels of T and challenges and high levels of T (van Anders et al., 2011). However, the Challenge Hypothesis includes certain paradoxes—including the “Aggression Paradox,” wherein peptides are associated with both aggression and social bonds, which are generally thought to be separate categories, and the “Intimacy Paradox,” wherein sexual activity is associated with high T and pair bonds are associated with low T, and the two are assumed to be mutually exclusive categories when in

many cases they occur simultaneously (van Anders et al., 2011). In order to resolve the first discrepancy, the Steroid-Peptide Theory of Social Bonds (S/P Theory) separates aggression into two types that both increase T: antagonistic aggression (which decreases or has no effect on peptides) and protective aggression (which increases peptides), and claims that social bonds might either be promoted or inhibited depending on the type of aggression experienced (van Anders et al., 2011). To resolve the Intimacy Paradox, S/P Theory differentiates between two types of intimacy: sexual intimacy and nurturant intimacy. In both cases, S/P Theory proposes an important divide within categories that were previously thought to be homogenous: aggression and intimacy. In a similar way, it is possible that there are multiple types of jealousy—each involving varying amounts of each type of aggression and intimacy—and that each one has a different effect on T.

Based on S/P Theory, the effects of aggression appear to be more nuanced in humans than in animals, since aggression can either promote or inhibit human social bonds depending on the type. There is additional support for the idea that effects in humans may differ from those in animals, since the challenge hypothesis was originally developed for contrasting mating systems in seasonally breeding birds, and humans' mating systems are highly variable (Archer, 2006; Geary, 2000).

Since competition presents the opportunity for either a win or a loss, T levels have been shown to vary based on whether the individual wins or loses (Booth, Shelley, Mazur, Tharp, & Kittok, 1989; Mazur, Booth, & Dabbs, 1992). For example, one study found that successful chess players had higher levels of T than losing players (Mazur et al., 1992). It appears that losing a competition leads to a decrease in T, and winning a competition causes T levels to continue to increase (Mazur & Lamb, 1980). Therefore, jealousy-provoking situations may have

differential effects depending on whether they are “won” or “lost.” However, regardless of whether a competition is won or lost, we expect an increase in T when anticipating a competition and/or during a competition (Archer, 2006; van Anders et al., 2011).

Jealousy is an affective state that can lead to behavioral responses ranging from putting increased effort into the current relationship to lashing out in violence (Daly et al., 1982; Tarrier et al., 1990). Because jealousy can elicit diverse and potentially dangerous behaviors, research is needed to determine what factors mediate behavioral responses to jealousy. Existing research suggests that important factors, detailed further in the following sections, might include gender/sex (Confer & Cloud, 2011), attachment style (Sheets et al., 1997), personality (Dijkstra & Barelds, 2008; Melamed, 1991), self-esteem (Buunk, 1995), experience with infidelity (Confer & Cloud, 2011), partner quality (Rilling et al., 2004), relationship quality (Buunk & Dijkstra, 2004), relationship characteristics (Buunk & Dijkstra, 2004), mood and stress (Salovey, 1991; Salovey & Rodin, 1984), and physiological characteristics (Park, Wieling, Buunk, & Massar, 2008; Rilling et al., 2004).

Gender/Sex

Though studies have shown that there are no gender differences in the frequency and intensity of jealous feelings (Shackelford, LeBlanc, & Drass, 2000), the interpretation and expression of jealousy may differ by gender/sex. For example, in response to a partner’s infidelity, some studies suggest that men experience anger more frequently than do women (Becker, Sagarin, Guadagno, Millevoi, & Nicastle, 2004; Pietrzak, Laird, Stevens, & Thompson, 2002; Sabini & Green, 2004). However, studies have also shown that gender/sex differences do not emerge for hurt or disgust-related responses in response to hypothetical infidelity (Becker et al., 2004). These findings are highly variable across studies, suggesting that gender/sex

differences are either complex or do not exist with regard to jealousy. One interesting finding is that, though women are more likely to say they would end a relationship following a hypothetical affair, men are more likely to actually have done so in real life (Confer & Cloud, 2011).

Thus, although there are gender/sex differences in the elicitation of jealousy, members of both groups are capable of exhibiting jealousy in response to various types of rivals. Therefore, examining jealousy under the assumption that men respond most jealously to physical and sexual threats and women become most jealous in response to social and emotional threats is misguided in many cases. Most importantly, such a limited perspective may obscure a careful understanding of the additional processes that might underlie jealousy. Since much of the existing research focuses on sex differences in romantic versus sexual jealousy, research is needed that either focuses on one type or combines the two into a romantic/sexual category. The latter option is probably more beneficial, given that romance and sexuality most often occur concurrently in adult relationships.

Attachment Style

Jealousy leads to feelings of insecurity when a partner is perceived to be distant and feelings of security when a partner is perceived to be close (Hazan & Shaver, 1987; Sharpsteen & Kirkpatrick, 1997; Sheets et al., 1997). However, responses to jealousy might differ depending on an individual's attachment style. Attachment theory posits that the bonds formed between children and their caretakers affect the way they will relate to others in the future, and attachment styles are relatively constant throughout the lifespan (Bowlby, 1969). Basic attachment styles include secure attachment and three types of insecure attachment: anxious/preoccupied, fearful/avoidant, and dismissive/avoidant (Bartholomew & Horowitz, 1991). People who are securely attached are comfortable with intimacy and are rarely anxious

about relationships. Anxious/preoccupied individuals are highly anxious, particularly relating to their fear of loss. Fearful/avoidant individuals are high in both anxiety and avoidance, as they seek intimacy but are also fearful of it. Dismissive/avoidant individuals are highly avoidant and independent.

Since many characteristics of the relationships between infants and their caregivers are also found in adult romantic relationships, the theory has been extended to include bonds that form in adulthood (Hazan & Shaver, 1987). However, one important difference between the infant-caregiver relationship and the adult romantic relationship is that the latter relies heavily on reciprocity but the former does not (Crowell & Waters, 1994). This reciprocity indicates that people's attitudes and behaviors can at least partially affect whether their partner chooses to remain in a relationship with them. Furthermore, since adult romantic relationships are often sexual in nature, exclusivity may be important for adult relationships, but not for infant-caregiver relationships. Though an infant can share a caregiver's attention, adults are likely to feel that sharing a sexual partner with others is unacceptable or unsafe (Sharpsteen & Kirkpatrick, 1997). This feeling may make the need for an exclusive relationship particularly salient, especially in individuals who have attachment styles characterized by high levels of anxiety. Because certain attachment styles are associated with jealousy, it is important to consider individuals' attachment styles in studies focusing on jealousy.

Personality

When considering individual differences in jealousy, personality is one factor to investigate. Studies have shown that jealousy is positively correlated with neuroticism (Dijkstra & Barelds, 2008; Melamed, 1991), suggesting that personality also partially determines how

jealous a person becomes. Since neuroticism is related to jealousy, it is important to consider in studies regarding jealousy.

Self-esteem

Self-esteem has been shown to decrease following instances of partner infidelity (Buunk, 1995). Specifically, changes in self-esteem following partner infidelity affect self-doubt, such that those with low self-esteem exhibit more self-doubt following their partners' affairs (Buunk, 1995). Since self-esteem tends to decrease following infidelity, levels of self-esteem might also be negatively correlated with jealousy, such that those with high self-esteem are less likely to become jealous than those with low self-esteem. Very little research has been conducted to examine the possible relationship between self-esteem and jealousy. However, one study found that people who exhibit morbid levels of jealousy tend to have low self-esteem (Bishay, Tarrier, Dolan, Beckett, & Harwood, 1996). Although this may indicate a negative association between self-esteem levels and jealousy, self-esteem has only been shown to matter when jealousy levels reach morbid levels. For this reason, it may be important to consider self-esteem in studies that measure common (as opposed to morbid) levels of jealousy in order to reveal an association if one exists.

Experience with Infidelity

It is possible that prior experience with infidelity affects subsequent levels of jealousy. Studies have found that, when exposed to a hypothetical situation of partner infidelity, individuals who have never been unfaithful in real life are more likely than those who have been unfaithful to say they would end the relationship based on that instance of hypothetical infidelity (Confer & Cloud, 2011). The authors proposed that this might be because being unfaithful increases empathy toward partners who do the same. Another proposed reason is that displaying

an understanding attitude toward an unfaithful partner enables people to excuse their own actions (Confer & Cloud, 2011). Though no studies have shown such an effect, it may be that individuals whose partners have been unfaithful in the past will be more prone to jealousy than those who have always been with faithful partners due to decreased partner trust.

Relationship Quality

Although the characteristics of each partner matter, the combination of the two might be even more important in the expression of jealousy. Relationship problems often arise when one partner either intentionally or unintentionally engages in jealousy-evoking behaviors that upset the other partner (Buunk & Dijkstra, 2004). Therefore, relationships with high levels of communication and satisfaction may be associated with less jealousy than relationships with poor communication and low levels of satisfaction (Brewer & Riley, 2009). For this reason, relationship quality may be an important factor in the development and expression of jealousy.

Relationship Characteristics

Jealousy levels might also vary by relationship type. It has been posited that sexual exclusivity is particularly important for humans, whose mating system relies on long-term pair-bonds, including a large amount of male parental care (Rilling et al., 2004). Thus, when compared to species that do not exhibit male parental care, it follows that humans should find exclusive sexual access to be more important (Daly & Wilson, 1988). For the majority of people, exclusive sexual access to partners is important, but that is not the case for everyone. For example, polyamorous individuals have multiple partners and agree to not have exclusive access to them. However, studies have found that although people in polyamorous relationships experience jealousy, it is more manageable than jealousy in monogamous relationships (de Visser & McDonald, 2007), and that the frequency of jealousy in polyamorous relationships is

actually lower than in monogamous relationships (Pines & Aronson, 1981). Therefore, it is important to remember that, although having exclusive access to one partner matters for the majority of people, it is not important for everyone. Additionally, in romantic relationships where exclusive access to one partner is unimportant, jealousy may be experienced very differently than in monogamous romantic relationships (Conley et al., under review).

Mood and Stress

In addition to characteristics of each partner, jealousy may also be related to situational characteristics such as mood and stress. Previous research has shown that jealousy is associated with high levels of stress (Salovey, 1991) and negative affect (Salovey & Rodin, 1984). However, since these studies focused on social-comparison jealousy, rather than romantic or sexual jealousy, research is needed in order to determine whether mood and stress relate to romantic and/or sexual jealousy as well. If there is such an association, it may have important implications for intimate partner violence that can be mitigated using stress-coping strategies.

Jealousy Management

Within relationships, jealousy can be a very serious and upsetting emotion (Pines & Friedman, 1998; Sheets et al., 1997). Because the experience of jealousy can be traumatic, and because it can lead to violence, it is important to consider strategies used to manage jealousy. One of the primary ways that people attempt to reduce jealousy is to engage in monogamous relationships wherein both partners agree to have romantic and sexual contact only with each other (Conley et al., under review). However, agreements to be monogamous with a partner are not always kept, as individuals often engage in extra-dyadic romantic and sexual relationships (Hansen, 1987). Common strategies used in coping with jealousy include ruminating, making threats, repressing or denying jealous feelings, competing with rivals for a partner's attention,

and reinterpreting jealousy as a feeling of pride in one's partner (Francis, 1977). In therapy sessions surrounding the issue of jealousy, attempting to communicate openly with partners is a common focus (Francis, 1977).

The reduction of jealousy appears to only be optimal to a certain extent, given that some level of jealousy is commonly understood as a sign of love (Puenta & Cohen, 2003). Therefore, it is unreasonable for jealousy management to involve the goal of eliminating all jealousy, since some jealousy in relationships is favorable. Most therapists agree that it is necessary to interpret jealousy as a neutral emotion that is not inherently positive or negative, but instead as one that can be shaped in various ways that can either create obstacles for or strengthen a relationship (Clanton & Smith, 1998; Francis, 1977). The goal of jealousy management, then, is to maintain optimal levels of jealousy that are healthy for the individual and for the relationship.

Understanding the hormonal correlates of jealousy may help to identify individual, relationship, or context characteristics that differ between healthy and unhealthy types of jealousy.

The Current Study

This study investigated whether actively thinking about a jealousy-provoking situation results in an endocrine response, and what factors might mediate this effect. We compared changes in T resulting from imagining one's partner engaging in one of three activities: a neutral conversation with a co-worker, a flirtatious conversation with an attractive person, or a passionate kiss with an attractive person. Based on past research presented above, we hypothesized that participants in either of the jealousy-provoking conditions would demonstrate increased T compared to those in the neutral condition, and that the T levels of those in the kissing condition would increase more than those in the flirting condition due to the intensity of the situation. Understanding the effects of jealousy provocation on T levels may help

researchers better identify the link between jealousy and physiology, and may provide insight into the relationship between jealousy and intimate partner violence.

Method

Participants

Participants ($N = 168$) were 103 women (M age = 20.36 years, $SD = 3.86$) and 65 men (M age = 20.25 years, $SD = 2.72$) who were in committed romantic relationships. Though the majority of participants had one relationship partner, some participants reported having two ($n = 2$), three ($n = 2$), or six or more partners ($n = 1$). Participants were recruited from the undergraduate psychology subject pool and from the community through online advertisements and posters, and were compensated with course credit or \$15 as appropriate. Though the majority were students ($n = 153$), many were employed ($n = 58$), and there was a broad representation of occupations. All participants had graduated from high school, and most ($n = 108$) had some college experience. Participants self-identified their race/ethnicity and we categorized their responses such that there were 10 African American/Black, 31 Asian/Asian American, six Bi/Multiracial, 98 Caucasian/White, one Chinese American, three European, seven Hispanic/Latino/a, three Indian, four Middle Eastern/Southeast Asian individuals (one participant gave a response that could not be categorized [“American”], and four participants did not report race). Participants self-identified their sexual orientation, which we categorized as bisexual ($n = 5$), gay or lesbian ($n = 5$), and heterosexual ($n = 148$) (five participants gave responses that did not fit into these categories (i.e., “male”), and five did not report sexual orientation). Though the majority of participants lived in the U.S. for their entire lives ($n = 133$), some lived in the U.S. for 11-21 years ($n = 14$), and others for 10 years or less ($n = 19$). Nine participants were excluded from analyses involving hormones because they reported taking

hormonal contraceptives ($n = 8$) or reported having testicular surgery ($n = 1$).

Materials

Relationship and partner questionnaire. This 10-item questionnaire included past and present relationship information. See Appendix A for the full questionnaire. Since eligibility criteria for this study indicated that participants had to be in committed relationships, this questionnaire was designed for partnered individuals. Those participants who had multiple partners were instructed to answer based on either (a) the partner to whom they felt most committed, or (b) the partner with whom they had been the longest. Items requested information about current relationship length, frequency of sexual activity, and satisfaction of sexual activity with partner. One item asked participants about the discrepancy that they believe others perceive between their partner's and their own attractiveness on a seven-point scale between "People think I am more attractive than my partner" and "People think my partner is more attractive than me." This question was included because self-rated quality has been identified as an important variable in situations involving competition with rivals (Fisher, Cox, & Gordon, 2009). Assessing self-rated quality relative to one's partner allows us to control for differences in partner quality.

Quality Marriage Index (Norton, 1983). This index contained five brief statements regarding the overall quality of the respondent's relationship. Since the index was originally designed for married individuals, we adapted the instructions and statements for people who are partnered but unmarried. Participants indicated how accurately each statement described their relationship on a seven-point scale ranging from "1" = "Very strong disagreement" to "7" = "Very strong agreement." Finally, the index asked participants to rate their relationship on a scale from "1" = "Very unhappy" to "7" = "Very happy." We measured relationship

satisfaction because those in satisfying relationships may experience jealousy differently than those in unsatisfying relationships.

Affect and Arousal Scale (Heiman & Rowland, 1983). This scale is used to measure levels of physical, psychological, and sexual arousal. It was administered during the baseline questionnaire, directly following the experimental manipulation, and during the second questionnaire in order to measure changes in arousal between these three time points. We removed items pertaining to sexual arousal and added the following items: a desire to be close to a friend, a desire to be close to my partner, sad, happy, stressed, relaxed, jealous, annoyed, apathetic (“do not care”), curious, disappointed, fearful, hostile, frustrated, lonely, surprised, betrayed, hurt, ashamed, humiliated, and violent. These items were added in order to assess emotions that are intuitively associated with jealousy. An altered version of the Affect and Arousal Scale has been used successfully in a similar study (Goldey & van Anders, 2011). Participants indicated how accurately each statement described their current feelings on a seven-point scale ranging from “1” = “*Not at all*” to “7” = “*Intensely*.” The version used for this study contained a total of 46 items. With these items, we constructed 11 subscales: hurt feelings (e.g., “betrayed”), negative self-conscious affect (e.g., “incompetent”), positive affect (e.g., “excited”), intimacy (e.g., “a desire to be close to my partner”), sexual feelings (e.g., “sexually aroused”), shame (e.g., “humiliated”), autonomic arousal (e.g., “faster breathing than normal”), anxious arousal (e.g., “worried”), loneliness (e.g., “a desire to be close to a friend”), deactivation (e.g., “apathetic”), and hostility (“violent”). We omitted two items that did not fit well into any of the subscales (“curious” and “surprised”) and two items that were not relevant to our analyses (“masculine” and “feminine”). We measured arousal and certain types of affect to assess affective responses to reading the vignettes.

Positive and Negative Affect Scale (Watson, Clark, & Tellegen, 1988). This 20-item scale was used to assess positive (e.g., “excited,” “proud,” “active”) and negative (e.g., “afraid,” “upset,” “hostile”) mood. Participants indicated how strongly they felt each emotion, using a five-point scale ranging from “1” = “*Very slightly or not at all*” to “5” = “*Extremely.*” Participants were asked to answer based on their feelings at the present moment. We used this scale to assess whether reading the vignettes altered participants’ positive and/or negative emotions, and whether such emotional changes were associated with hormonal changes.

Experiences in Close Relationships (Brennan, Clark, & Shaver, 1998). We used this measure to assess anxious or avoidant romantic attachment style. It included measures of anxiety (e.g., “I do not often worry about being abandoned”) and avoidance (e.g., “I am nervous when partners get too close to me”), which form the categories of attachment style. For this study, a 12-item, shortened version was used. Participants indicated their agreement with each item on a seven-point scale ranging from “1” = “*Disagree strongly*” to “7” = “*Agree strongly.*” We measured attachment style because it has been associated with jealousy in other studies.

Big Five Inventory-10 (Rammstedt & John, 2007). The 10-item version of the Big Five Inventory was used to measure personality in the Big Five domains of openness, conscientiousness, extraversion, agreeableness, and neuroticism. Participants indicated their agreement with each item on a five-point scale ranging from “1” = “*Disagree strongly*” to “5” = “*Agree strongly.*” We measured personality in an attempt to replicate previous findings that neuroticism is associated with increased jealousy (Dijkstra & Barelds, 2008; Melamed, 1991).

Rosenberg’s Self-Esteem Scale (Rosenberg, 1989). This 10-item scale measured global self-esteem. It included statements such as “I feel that I have a number of good qualities” and “I wish I could have more respect for myself.” Participants indicated their agreement with each

statement on a four-point scale ranging from “1” = “*Strongly agree*” to “4” = “*Strongly disagree*.” Since self-esteem is linked to partner infidelity, we measured it in this study to determine whether it is also associated with jealousy.

Multidimensional Jealousy Scale (Pfeiffer & Wong, 1989). This 24-item scale measured cognitive, emotional, and behavioral forms of jealousy. We made minor adjustments in order to make the scale more applicable to the target population. For example, the phrase “someone of the opposite sex” was changed to “someone else” in order to make the question applicable to non-heterosexual participants. We used this scale to determine trait levels of jealousy.

Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983). This 10-item scale assessed the degree to which a person interprets situations in their life as stressful. Items included, “In the last month, how often have you felt that things were going your way?” and “In the last month, how often have you been able to control irritations in your life?” Participants indicated the frequency with which they experienced each statement on a five-point scale ranging from “0” = “*Never*” to “4” = “*Very often*.” We measured participants’ current stress levels in order to determine whether their jealousy experiences differ based on stress level.

Experimental vignettes. Participants were randomly assigned to one of three conditions: neutral, flirting, or kissing. In each of the three conditions, participants read about and imagined themselves in a social situation involving their current partner. The vignettes used parallel language, keeping the scenarios constant across conditions except for intentional manipulation (see Appendix B for full texts of each condition’s prompts). Pronouns were altered to match the gender/sex of each participant and their partner. For those who choose not to report either individual’s gender/sex, we provided a gender-neutral vignette. The three conditions were:

Neutral. In this condition, the partner is seen speaking with a colleague about a boring work project. The partner and the colleague do not touch while talking. The colleague is the same gender as the participant.

Flirting. In this condition, the partner is seen speaking and laughing with an attractive person. The attractive person rests their hand on the partner's arm while talking. The attractive person is the same gender as the participant.

Kissing. In this condition, the partner is seen kissing an attractive person passionately in an upstairs room. The attractive person is the same gender as the participant.

Vignette response questionnaire. After reading the randomly assigned vignette, participants responded to a series of 15 open-ended questions related to their feelings and actions based on the imagined situation. Examples of questions were, "What would you feel like doing next, even if you would not go through with it?" and "What would you actually do next?" See Appendix C for a full list of questions. Participants were free to spend as much or as little time answering the questions as they chose. However, the time spent responding to open-ended questions was recorded.

Relationship and infidelity questionnaire. The first item of this questionnaire asked whether the participant has had sexual contacts outside of their current relationship without their partner's consent. The second and third items asked if the participant's current or past partners have had such sexual contacts. Those who respond affirmatively to any of these three questions were then asked follow-up questions related to the type, context, and duration of the sexual contact(s). See Appendix D for the full questionnaire. For questions related to partner infidelity, participants may not know the details of the encounters, so they were instructed to answer to the best of their knowledge.

Health and background questionnaire. This questionnaire asked about demographic information and possible confounds such as eating, drinking, smoking cigarettes, chewing gum, and taking hormonal contraceptives. See Appendix E for the full questionnaire.

Procedure

This study received prior approval from the Institutional Review Board at the University of Michigan. Testing occurred between 12:00 and 19:00 h in order to avoid peaks in steroid hormones that occur in the morning and/or upon waking (Axelsson, Ingre, Akerstedt, & Holmback, 2005; Khan-Dawood, Choe, & Dawood, 1984). Participants were tested between September and November. Women were tested during any phase of their menstrual cycles, since research has shown that menstrual phase need not be controlled for in T analyses unless it is of special interest (Dabbs & de La Rue, 1991; van Anders et al., 2007; van Anders & Watson, 2006). Researchers asked participants to refrain from eating, drinking, smoking, brushing their teeth, or chewing gum for one hour prior to their appointment.

Upon arrival, participants were provided with a consent form, which they read and signed in agreement to participate. They provided a baseline saliva sample (T1) while filling out the baseline questionnaire which included the relationship and partner questionnaire, the Quality Marriage Index, the Affect and Arousal Scale, the Positive and Negative Affect Scale, the Experiences in Close Relationships scale, the Big Five Inventory-10, Rosenberg's Self Esteem Scale, the Multidimensional Jealousy Scale, and the Perceived Stress Scale. Participants then read one of three hypothetical stories involving their relationship partner and imagined themselves in the situation. Next, they answered the vignette response questionnaire, the Affect and Arousal Scale, and the Positive and Negative Affect Scale. Participants then watched a 12-minute travel video in order to occupy time, since the social modulation of T is delayed (Roney,

Lukaszewski, & Simmons, 2007; Schultheiss & Rohde, 2002). Next, participants completed a second saliva sample (T2) while filling out the second questionnaire, which included the Affect and Arousal Scale, the Positive and Negative Affect Scale, the relationship and infidelity questionnaire, and the health and background questionnaire.

Due to the sensitive nature of the study, participants in the flirting and kissing conditions were verbally debriefed in addition to receiving a printed copy of the debriefing form. A researcher explained to each participant that the situations they were asked to imagine may have been upsetting and may have led to strong emotions, but highlighted their artificial nature. This session with a researcher ensured that all participants in the jealousy-provoking conditions were clearly presented with information about the study's purpose and the possible negative results of jealousy. Since jealousy can lead to destructive behaviors, it was particularly important to exercise caution in debriefing participants in order to minimize risk for subsequent violence.

Next, participants in the experimental conditions were asked to answer a short survey, which encouraged them to focus on positive aspects of their relationship (see Appendix F). This activity reinforced the artificial nature of the jealousy-eliciting vignettes by highlighting the positive aspects of participants' actual relationships. Physical and mental health resources were provided in the debriefing form, which was provided to participants in all conditions, and participants were encouraged to ask any questions they had about the study. They were then compensated with course credit or \$15 as appropriate.

Assays

T was measured using saliva samples, which were collected and stored in 17-mL polystyrene tubes. Immediately following collections, samples were frozen and stored at -20°C until assay. Radioimmunoassays were performed at the Core Assay Facility, University of

Michigan, using commercially available kits from Siemens. The intra-assay coefficient of variation was 10.56% and the inter-assay coefficients were 4.98%, 7.41%, and 23.22% for high, medium, and low T, respectively. Assays were performed in duplicate, and the average of duplicates was used for analyses. Salivary T was used for this study because its collection is less invasive than that of blood serum and it is less of a biohazard. This method has been validated, as salivary T has 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 18.0. Since we were interested in changes from baseline to post-condition, we calculated percent change in T (T%) by subtracting participants' baseline hormone from post-condition hormone, and dividing this change by baseline level and multiplying by 100. This provided a change measure of T relative to participants' own baseline levels. Percent change scores are more sensitive than absolute changes due to large between-subjects variability in baseline hormone levels and receptor densities, and thus have been used to analyze hormone changes from baseline (Carre & Putnam, 2010; Goldey & van Anders, 2011; van Anders et al., 2007). Because T levels differ by gender/sex, we conducted analyses separately for men and women, as is standard practice (van Anders et al., 2007).

We conducted analyses of variance (ANOVA) and analyses of covariance (ANCOVA) to investigate the effects of condition on T%, with covariates as indicated below. When there were significant effects, we conducted post hoc analyses using LSD tests. We were also interested in

whether changes in T were correlated with changes in affect and arousal. To test this, we conducted correlations between T% and changes in subscales of the Affect and Arousal Scale within the two experimental conditions. In order to capture changes in affect and arousal, we administered the Affect and Arousal Scale at three different time points and conducted correlations using both immediately post-manipulation minus pre-manipulation and 15 minutes post-manipulation minus pre-manipulation to determine whether either calculation had a stronger association than the other.

Results

Response Check

Participants spent an average of 27.83 seconds reading and imagining the situations ($SD = 15.30$), with no significant differences between conditions, $F(2,165) = 0.60$, $p = 0.549$.

Participants spent an average of 462.71 seconds answering the questions ($SD = 226.41$), and there were no significant differences in this amount of time between conditions, $F(2,165) = 0.84$, $p = 0.434$.

Outliers and Hormone Covariates

We excluded several outliers (more than 3 SDs from the mean, or a visual outlier) from analyses involving hormones. There were two outliers for T1, one for T2 (who was also an outlier for T1), and nine for T%. Due to procedural interruptions, two participants were not able to provide saliva samples, and therefore do not have hormone data available for analysis.

Possible confound variables for T include age (Burger, Dudley, Cui, Dennerstein, & Hopper, 2000; Feldman et al., 2002), time of day (Axelsson et al., 2005), BMI (Goldey & van Anders, 2011), and nicotine use (Chivers & Bailey, 2005). However, we found that none of these were meaningful covariates with T for men (age, $F[2,54] = 1.81$, $p = 0.174$; time, $F[2,54] =$

2.11, $p = 0.132$; BMI, $F[2,54] = 1.98$, $p = 0.148$; nicotine use, $F[2,54] = 1.88$, $p = 0.162$) or for women (age, $F[2,83] = 1.77$, $p = 0.177$; time, $F[2,83] = 1.87$, $p = 0.160$; BMI, $F[2,82] = 2.10$, $p = 0.129$; nicotine use, $F[2,83] = 1.72$, $p = 0.186$).

Women

A univariate ANOVA with condition as the independent variable and T% as the dependent variable revealed no significant effects of condition on T, $F(2,84) = 1.93$, $p = 0.152$.

A univariate ANCOVA with condition as the independent variable, T% as the dependent variable, and past partner infidelity as a covariate revealed a trend for T responses to differ by condition, $F(2,80) = 2.61$, $p = .080$. However, when controlling for past partner infidelity and neuroticism, a univariate ANCOVA with condition as the independent variable and T% as the dependent variable revealed a significant overall effect of condition on T, $F(2,79) = 3.27$, $p = .043$. Post-hoc tests indicated that those in the flirting condition experienced a significantly greater increase in T compared to those in the neutral condition ($p = .013$). However, T did not increase more in the kissing condition than in the flirting condition ($p = .114$) or the neutral condition ($p = .286$). Figure 1 shows percent change in T by condition for women.

We examined additional variables that have been associated with jealousy in previous research as possible covariates, but none changed the effect. These variables included relationship length, self infidelity, current partner infidelity, relationship quality, sexual activity, sexual activity with partner, sexual orientation, positive affect, negative affect, avoidance, anxiety, self-esteem, jealousy, and perceived stress.

For women in the flirting and kissing conditions, T% was significantly positively correlated with the absolute change in the intimacy subscale from time 1 to time 2, *partial* $r(53) = .291$, $p = .031$ and from time 1 to time 3, *partial* $r(53) = .330$, $p = .014$. For women in the

flirting condition only, T% was also significantly positively correlated with the absolute change in intimacy from time 1 to time 2, $partial\ r(23) = .437, p = .029$, and from time 1 to time 3, $partial\ r(23) = .471, p = .017$. T% was not significantly correlated with any of the other subscales of the Affect and Arousal Scale. The means of these subscales are graphed in Figure 2.

Men

A univariate ANOVA with condition as the independent variable and T% as the dependent variable did not reveal a significant effect of condition on T, $F(2,55) = 1.88, p = .163$. Based on our findings in women, we conducted a univariate ANCOVA with condition as the independent variable, T% as the dependent variable, and neuroticism and past partner infidelity as covariates, but there was no significant effect of condition as with women, $F(2,49) = 1.52, p = .229$. Figure 3 shows percent change in T by condition in men. To ensure that other factors were not obscuring any underlying effects, we examined some other variables as possible covariates, but none revealed an effect of condition on T. These variables included relationship length, self infidelity, current partner infidelity, relationship quality, sexual activity, sexual activity with partner, sexual orientation, positive affect, negative affect, avoidance, anxiety, self-esteem, jealousy, and perceived stress.

For those in the flirting and kissing conditions, T% was not significantly correlated with any subscales of the Affect and Arousal Scale. The means of these subscales are graphed in Figure 4.

Discussion

In this experiment, we examined the effects of jealousy-provoking situations on testosterone (T). To do so, we used a vignette design, asking participants to imagine themselves in one of three situations involving their partner, two of which were intended to elicit jealousy.

In women, the results partially supported our first hypothesis as T increased in the flirting condition more than in the neutral condition, but did not support our second hypothesis as T did not increase more in the kissing condition than in the flirting condition. Consistent with previous research (Dijkstra & Barelds, 2008; Melamed, 1991), we found that neuroticism was a significant covariate in the model testing effects of jealousy condition on T. Past partner infidelity was also a meaningful covariate in the effect of condition on T. Results show that the situations imagined to evoke jealousy may not be homogeneous, and that each may lead to differential changes in T. Different T responses between the flirting and kissing conditions may have occurred due to differences in the competitive nature of each condition.

Two types of jealousy-provoking situations were tested in this experiment: flirting and kissing. When one's partner engages in flirting outside of the relationship, or extradyadic flirting, the individual is likely to believe that the rival with whom their partner is flirting threatens the relationship. In such a case, the individual is in a competitive situation as he or she attempts to maintain exclusive access to a resource, which in this case is their partner. As our results show, T increased in women in the flirting condition as they imagined engaging in this competitive situation. On the other hand, when one's partner engages in extradyadic kissing, the individual is likely to believe that the rival whom their partner is kissing has done more than threaten the relationship—the rival has already won. In such a case, the individual may respond as though they have lost a competition, with a decrease or lack of an increase in T (Mazur et al., 1992; Mazur & Lamb, 1980). Our results support this idea, as T did not increase in women in the kissing condition as it did in the flirting condition. Thus, even though kissing and flirting both represent romantic competition, they appear to elicit two very different T responses that are

consistent with other, non-relational, types of competition (Archer, 2006; van Anders et al., 2011).

Although jealousy is often presumed to be a negative emotion with harmful consequences, the findings from this study suggest that jealousy-provoking situations are not all uniform. Though some types of jealousy lead to negative reactions in some people, jealousy may have many different effects on mood. The vignettes in the flirting and kissing conditions were both designed to elicit jealousy, but it is clear that they have important differences in their effect on T. More research is needed to determine whether different types of jealousy-provoking situations elicit different emotions and are more or less likely to result in certain behaviors. For example, is imagining one's partner engaging in extradyadic flirting likely to result in behaviors aimed at protecting the relationship? Is it likely to highlight the partner's desirability and elicit feelings of pride in having a relationship with that partner? Might this differ by gender/sex, socialization, or propensity to violence? Here, we tested two types of jealousy-provoking situations, but more research is needed to identify other types of jealousy that can be tested in similar ways. For example, perhaps situations in which the rival pursues the partner elicit different T responses than situations wherein the partner pursues the rival.

Increases in T% were associated with increases in intimacy in the experimental conditions, and especially in the flirting condition. This is surprising, given that high levels of T tend to be associated with low levels of intimacy based on the Challenge Hypothesis (Wingfield et al., 1990). However, S/P Theory suggests that intimacy should be separated into two types: sexual and nurturant, where sexual intimacy is associated with increases in T and nurturant intimacy is associated with decreases in T (van Anders et al., 2011). If the increased intimacy that participants felt were more sexual than nurturant, this finding would support S/P Theory. In

fact, this appears to be the case, as the intimacy category includes, “loving,” “a desire to be close to my partner,” and “a desire for sexual activity with a partner.” We are uncertain whether the correlation between intimacy and T% reflect actual increases in feelings of intimacy or desire for intimacy, and these two states may be differentially associated with T.

The only Affect and Arousal Scale subscale correlated with T% was intimacy. However, the lack of other associations between T% and items in the Affect and Arousal Scale was not unexpected, given that prior studies have shown that self-reported affect tends not to be associated with changes in hormones (Goldey & van Anders, 2011; van Anders et al., 2007). This could be the case because changes in hormones are not actually linked to affect at all, or instead because changes in hormones and self-reported affect do not occur during the time points at which they have been measured in the past. We tested the second possibility in this study by measuring affect and arousal at three time points: pre-manipulation, post-manipulation, and 15 minutes post-manipulation. The post-manipulation Affect and Arousal Scale was administered directly after reading the vignette and responding to open-ended questions about the situation, and the 15 minutes post-manipulation time point occurred 12 minutes later—after watching the neutral travel video and while providing the second saliva sample. Since the association between T% and change in intimacy was stronger at 15 minutes post-manipulation than at post-manipulation, it is possible that changes in affect and arousal follow changes in T by a delay of a certain amount of time. In future studies, it would be useful to measure affect at a time point comparable to 15 minutes post-manipulation in this study, as well as at another later time point. If associations between affect and T% are stronger when the delay in measuring affect is longer (i.e., if that later time point has a stronger correlation than 15 minutes post-manipulation), it would be reasonable to conclude that changes in affect occur at a delay compared to relevant

changes in hormones, and it should be possible to determine the size of that delay. This type of finding would be helpful to estimate the optimal length of delay to use when measuring affect in hormonal studies.

Although women showed increased levels of T in the flirting condition, neither of our hypotheses were supported in men, as there were no significant differences in T% by condition. There are a few possible reasons for this lack of effect. First, there could have been differences in the way men and women perceive the imagined social situations. For example, it is possible that men did not tend to perceive the experimental conditions as threats to their relationships, and thus did not experience the situation as a challenge. Secondly, since baseline T levels in men tend to be much higher than baseline T levels in women, it is more difficult to show effects on T in men. Experimental studies about nurturance, which predict a decrease in T, tend to find decreases in men but not women (van Anders, Tolman, & Volling, 2010), and studies about sexuality, which predict an increase in T, find more increases in women (Goldey & van Anders, 2011). This might be due to the differences in baseline T in women and men at baseline, such that it is more difficult to decrease T in women than in men, and easier to increase T in women than in men. Thirdly, this experiment involved a subtle manipulation that was not overtly presented as competitive (i.e., the vignettes did not read, “this other man [woman] is trying to steal your partner away from you!”), so it would be reasonable if not all participants perceived the competitive aspects of the situations. Finally, because these scenarios were imagined, it is logical to assume that they would not produce effects comparable to those that would be observed in actual everyday life. Thus, it is possible that men have certain T responses to jealousy-provoking situations, but these effects are not strong enough to appear in imagined social situations.

The current study demonstrated an increase in T in women who imagine their partners engaging in extradyadic flirting, compared to extradyadic kissing and compared to neutral extradyadic encounters. The difference between the flirting and kissing conditions suggests that jealousy might represent a type of competition in which an individual either attempts to maintain exclusive access to their partner or realizes that such access has been violated and perceives the extradyadic encounter as a loss. There is much left to be discovered about jealousy and its various types. For example, are all types of jealousy comparable to competition? Do people consciously perceive jealousy-provoking situations as competition to maintain exclusive access to a partner? The current study employs an imagined situation method that avoids the need to provoke jealousy in real life. Results of this study demonstrate that this model is successful for discovering hormonal effects of romantic jealousy and could be used in the future to test some of the questions raised by this study.

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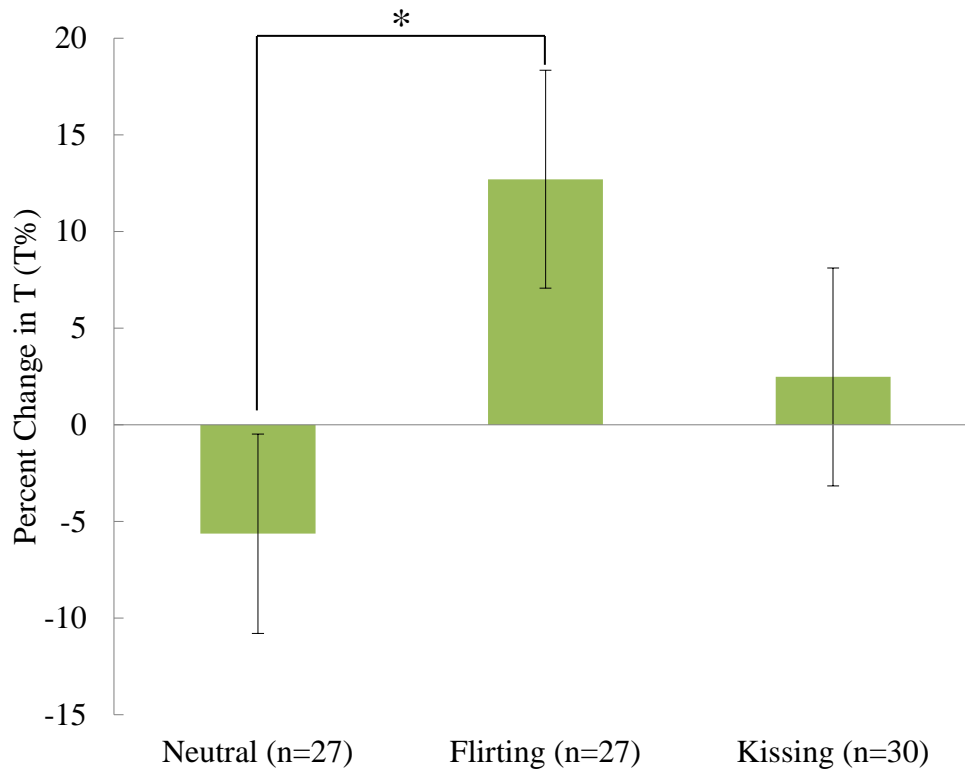


Figure 1. Mean percent change in testosterone in women by condition, with standard error bars, controlling for past partner infidelity and neuroticism. “*” signifies a significant difference at $p < 0.05$.

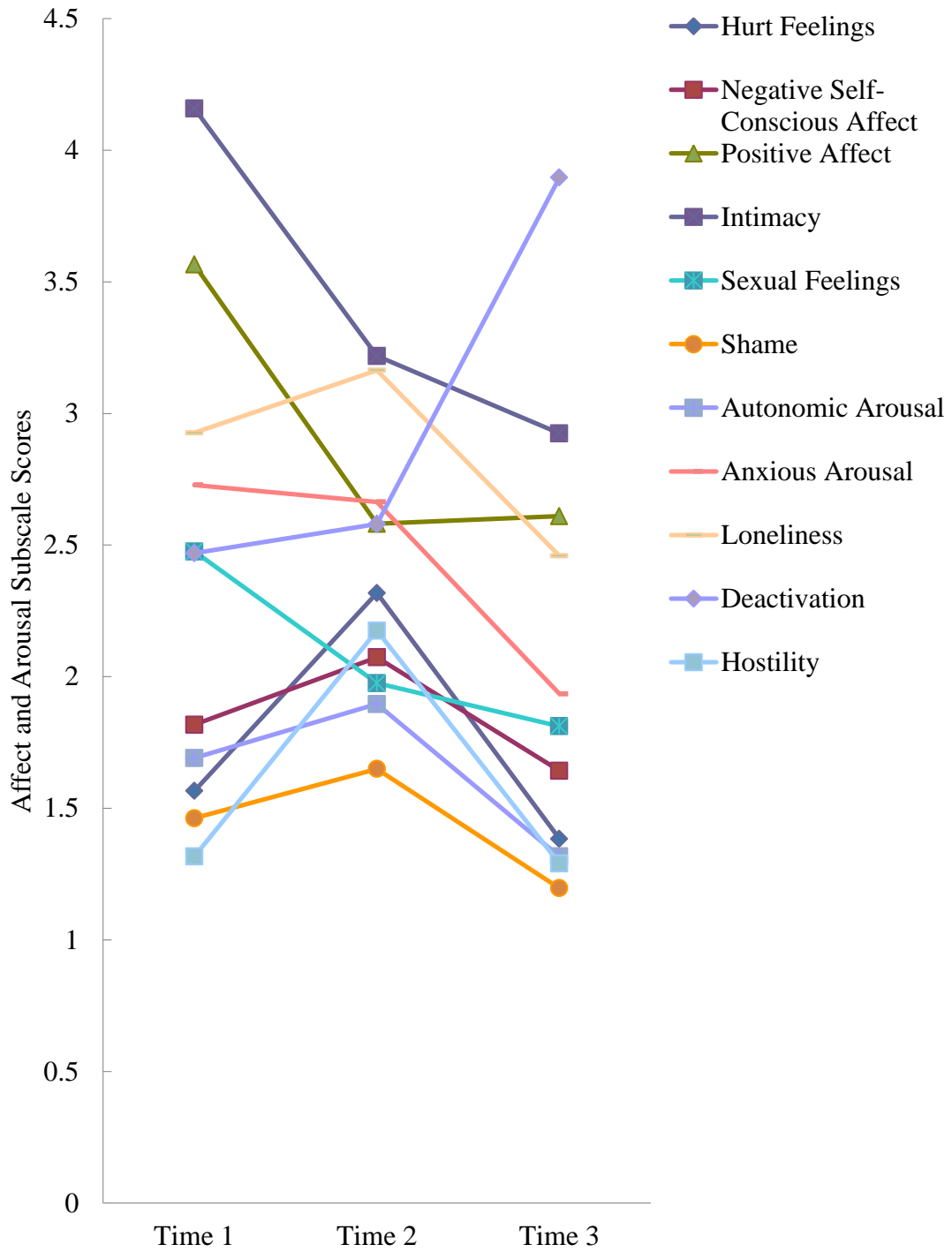


Figure 2. Mean Affect and Arousal Scale subscale scores at three time points for women in the two experimental conditions (flirting and kissing).

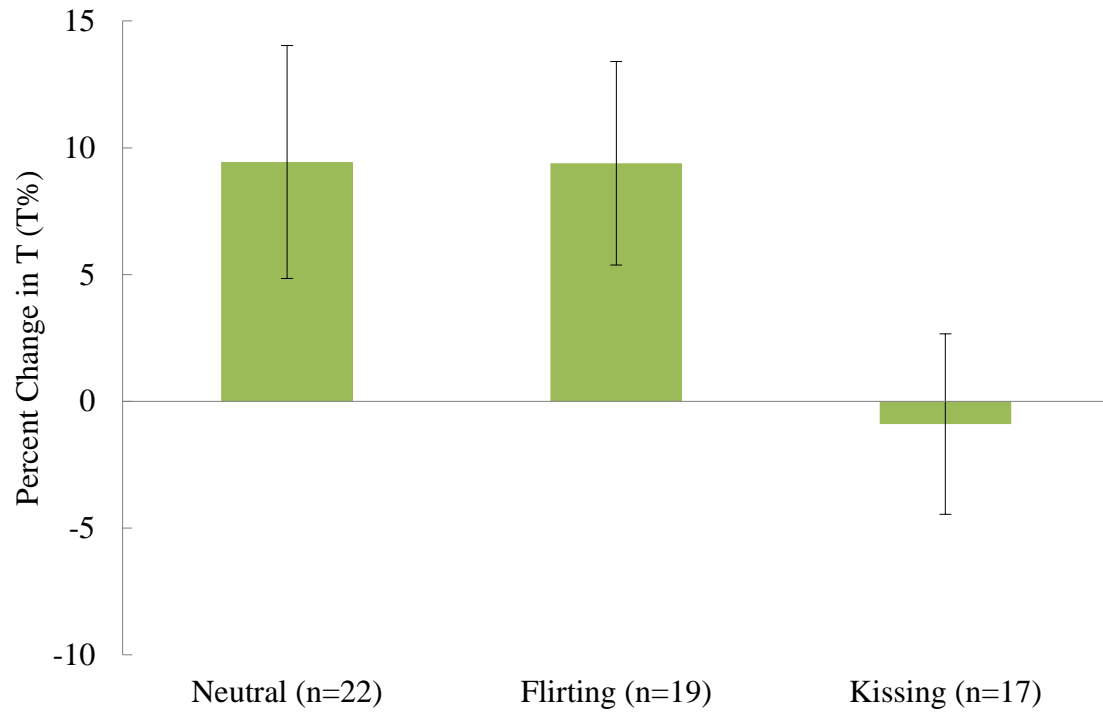


Figure 3. Mean percent change in testosterone in men by condition, with standard error bars.

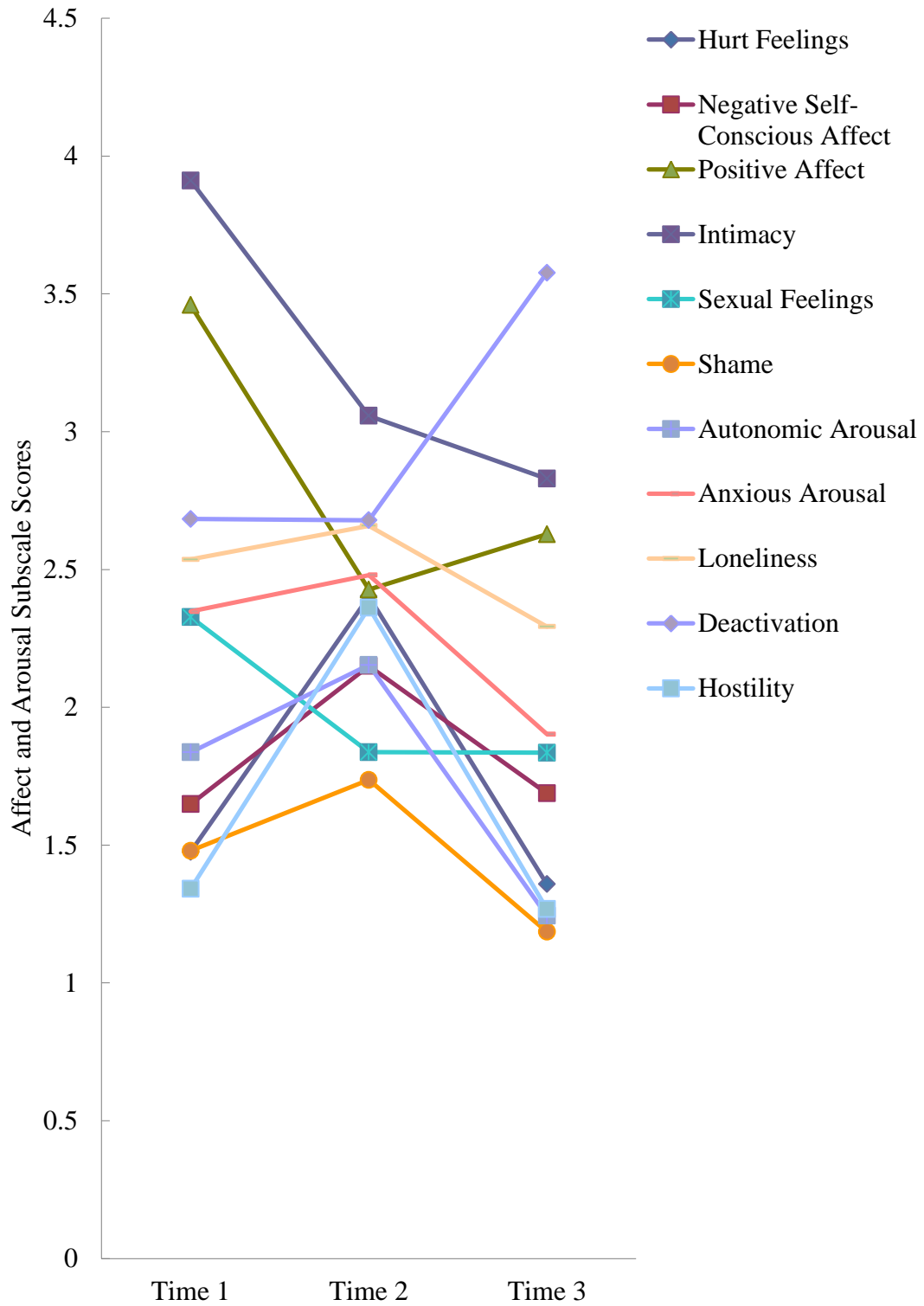


Figure 4. Mean Affect and Arousal Scale subscale scores at three time points for men in the two experimental conditions (flirting and kissing).

*Appendix A***Relationships and Partner Questionnaire**

1. Have you ever been divorced or separated?

Yes

No

2. For how long have you been divorced or separated?

(text entry)

3. Are you currently having sexual contact?

Yes

No

4. With how many people are you having sexual contact?

1

2

3

4

5

6 or more

5. Are you having sexual or romantic contacts that are not in committed relationships?

Yes

No

6. With how many people are you having sexual or romantic contacts that are not in committed relationships?

1

2

3

4

5

6 or more

The following questions refer to your current partner. If you are involved with multiple people, please answer based on either (a) the partner to whom you feel most committed, or (b) the partner that you have been with the longest.

7. For how long have you been with your partner?

(text entry)

8. How sexually active are you with your 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

9. I currently enjoy my sexual activity with my partner:

- 0 (Not at all)
- 1
- 2
- 3 (Moderately)
- 4
- 5
- 6 (Very much)

10. Please respond to the following item based on how you think others perceive you and your partner.

- 1 (People think I am much more attractive than my partner)
- 2
- 3
- 4 (People think my partner and I are equally attractive)
- 5
- 6
- 7 (People think my partner is much more attractive than me)

*Appendix B***Experimental Vignettes**

Neutral. “Imagine that you and your partner have gone to a party together. The party is hosted by a mutual friend, and both of you are friends with many people there. Your partner left to use the restroom over 15 minutes ago, and has still not returned. When you go to look for him [her], you find that he [she] is talking with a female [male] colleague whom you have never met. They are standing about two feet away from each other, and both are holding a drink in one hand, and a plate of fruit in the other. You overhear them talking about how boring their new work project is.”

Flirting. “Imagine that you and your partner have gone to a party together. The party is hosted by a mutual friend, and both of you are friends with many people there. Your partner left to use the restroom over 15 minutes ago, and has still not returned. When you go to look for him [her], you find that he [she] is talking with a very attractive woman [man] whom you have never met. They are standing about 6 inches away from each other, and the woman’s [man’s] hand is on your partner’s arm. You overhear them talking and laughing.

Kissing. “Imagine that you and your partner have gone to a party together. The party is hosted by a mutual friend, and both of you are friends with many people there. Your partner left to use the restroom over 15 minutes ago, and has still not returned. When you go to look for him [her], you cannot find him [her]. A friend tells you that they saw your partner go upstairs. You go upstairs and open some of the doors. When opening one of the doors, you find that he [she] is with a very attractive woman [man] whom you do not know. They are passionately kissing each other.”

*Appendix C***Situation Response Questionnaire**

Please answer the following questions about your feelings and actions in the situation that you just read. We reproduce the story here for your convenience: (vignette)

1. What would be your first thought about this situation?
2. How would you feel?
3. How would you interpret this situation (i.e. what does it mean)?
4. What would you feel like doing next, even if you would not go through with it?
5. What would you actually do next?

Please answer the following questions about your feelings and actions in the situation that you just read. We reproduce the story here for your convenience: (vignette)

6. How would you feel like acting toward your partner, even if you would not actually go through with it?
7. How would you actually act toward your partner?
8. How would you feel like acting toward the other person, even if you would not actually go through with it?
9. How would you actually act toward the other person?
10. Would you change anything about your relationship?

Please answer the following questions about your feelings and actions in the situation that you just read.

11. Would you feel like talking to anyone else about this situation? If so, who would you feel like talking to? If not, why not?
12. Would you actually talk to anyone about this situation? If so, who would you talk to? If not, why not?

Please answer the following questions about the situation that you just read.

13. Do you see this as something that goes against the agreements in your relationship? Why or why not?
14. When imagining this situation, did you imagine someone specific who was interacting with your partner? If so, whom?
15. Did you enjoy imagining this situation? If so, why? If not, why not?

*Appendix D***Relationships and Infidelity Questionnaire**

1. Have you had sexual contacts, including romantic kissing, outside of your current relationship, without your partner's consent?

Yes

No

2. Were any of these sexual contacts repeatedly with the same person (for example: an affair; sexual contacts that were ongoing for a period of time)?

Yes

No

3. With how many people did you have repeated sexual contacts outside of your current relationship (for example: an affair; sexual contacts that were ongoing for a period of time)?
(text entry)

4. Were any of these sexual contacts outside of your current relationship one-time only?

Yes

No

5. How many of these sexual contacts outside of your current relationship were one-time only?
(text entry)

6. Who has usually initiated these sexual contacts?

1 Usually me, 2, 3, About equal, 5, 6, 7 Usually someone else

7. How long ago did these sexual contacts occur?

(text entry)

8. Are any of the sexual contacts occurring now?

Yes

No

The following questions refer to your current relationship partner. You may not know the answer to all of these questions. Whenever you are unsure, please answer to the best of your knowledge.

9. Has your current partner had sexual contacts, including romantic kissing, outside of your current relationship, without your consent?

Yes

No

10. Were any of these sexual contacts repeatedly with the same person (for example: an affair, sexual contacts that were ongoing for a period of time)?

Yes

No

11. With how many people did your partner have repeated sexual contacts outside of your current relationship (for example: an affair; sexual contacts that were ongoing for a period of time)?

(text entry)

12. Were any of these sexual contacts outside of your current relationship one-time only?

Yes

No

13. How many of these sexual contacts were one-time only?

(text entry)

14. Who has usually initiated these contacts?

1 Usually my partner, 2, 3, About equal, 5, 6, 7 Usually someone else

15. How long ago did these sexual contacts occur?

(text entry)

16. Are any of the sexual contacts occurring now?

Yes

No

17. Do you have any past relationship partners, besides your current relationship partner?

Yes

No

The following questions refer to your past relationship partners. You may not know the answer to all of these questions. Whenever you are unsure, please answer to the best of your knowledge.

18. Have any of your past partners had sexual contacts, including romantic kissing, outside of your relationship, without your consent?

Yes

No

19. Were any of these sexual contacts repeatedly with the same person (for example: an affair; sexual contacts that were ongoing for a period of time)?

Yes

No

20. With how many people did your past partner have repeated contacts outside of your current relationship (for example: an affair; sexual contacts that were ongoing for a period of time)?

(text entry)

21. Were any of these sexual contacts one-time only?

Yes

No

22. How many of these sexual contacts were one-time only?

(text entry)

23. Who has usually initiated these sexual contacts?

1 Usually my past partner, 2, 3, About equal, 5, 6, 7 Usually someone else

24. How long ago did these sexual contacts occur?

(text entry)

*Appendix E***Health and Background Questionnaire I**

1. Please enter your participant ID number here.
(text entry)
2. What is your age?
(text entry)
3. Are you currently in a relationship?
Yes
No
4. With how many people are you in a committed relationship?
1
2
3
4
5
6 or more
5. How do you define your gender/sex?
Male, Female, If your gender is not listed, please identify it here (text entry)
6. What is your partner's gender/sex?
Male, Female, If their gender is not listed, please identify it here (text entry)

Health and Background Questionnaire II

1. What is your sexual orientation?
(text entry)
2. Are you a student?
Yes; at what level (e.g. undergrad, grad, etc.)? (text entry)
No
3. Are you currently employed?
Yes
No
4. What is your job title and the number of hours you work per week?
(text entry)
5. What is your yearly household income?
Less than \$20,000

\$20,001 - \$40,000
\$40,001 - \$60,000
\$60,001 - \$80,000
\$80,001 - \$100,000
Greater than \$100,000

6 .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

7. Do you live with anyone?

NO, I live alone

Yes: Please identify with gender, e.g. female partner, mother, male roommate (text entry)

8. Do you have children?

Yes

No

9. How many children do you have?

(text entry)

10. What are their genders and ages?

(text entry)

11. Please indicate your religion/religious affiliation:

(text entry)

12. How long have you lived in the USA?

All my life

For this long: (text entry)

13. What is your ethnicity/race (e.g. African American, Asian, etc.)?

(text entry)

14. Some people have grown up 'in a culture' within the country they live in. These cultures are sometimes linked to nationalities/countries (e.g. Romanian, Filipino, Coast Salish, German, Nigerian, Brazilian, etc.). If applicable, what is your culture?

(text entry)

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

16. In the last hour, have you:
(matrix)

Had anything to eat?

Had a beverage other than water?

Had a cigarette or nicotine products?

Brushed your teeth?

Chewed gum?

17. 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)

18. Are you using hormonal contraceptives at present (e.g. the Pill, the ring), either for contraceptive or other reasons?

Yes

No

19. What kind of hormonal contraceptive are you currently using?
(text entry)

20. For how long have you been using hormonal contraceptives?
(text entry)

21. 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

22. Have you ever been diagnosed with any physical condition that might alter your hormones?

No, I do not have any physical conditions that might alter my hormones.

Yes, please list the conditions: (text entry)

23. Have you ever had surgery on or medical attention to your ovaries or testes?

No

Yes, please describe: (text entry)

24. 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.

25. If you do not menstruate currently, why?

I am a post-menopausal woman

I have a clinical condition such that I do not menstruate

I am taking hormonal contraceptives that prevent menstruation

I transitioned sex

Another reason: (text entry)

N/A (I do menstruate currently)

26. Are you currently pregnant?

Yes

No

27. Are you breast-feeding an infant at present?

Yes

No

28. 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.

10 days or less

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40 days or more

N/A (I do not menstruate currently)

29. If you selected “more than 40 days,” please specify the normal length of your menstrual cycle in days:

(text entry)

30. If you selected “less than 10 days,” please specify the normal length of your menstrual cycle in days:

(text entry)

31. How regular are your menstrual cycles in their time of onset? For example, do they come around the same time each month, a day or two off, a few days off, or are they completely unpredictable?

(text entry)

32. Do you ever go through long periods of time without having menstrual periods (for reasons other than pregnancy)?

Yes

No

33. Has this happened in the last 6 months (for reasons other than pregnancy)?

Yes

No

34. 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)

35. In how many days do you expect your next period? Or, you can indicate the calendar date if you know that.

(text entry)

36. Do you have any type of infection (e.g. flu), illness, or sickness (including sexually transmitted diseases/infections STDs/STIs)?

NO; I do not have any infection, illness, or sickness.

YES; please list: (text entry)

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

in kilograms: (text entry)

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

39. What time did you go to sleep last night? Please select AM or PM and enter the time:
AM: (text entry)
PM: (text entry)

40. What time did you wake up this morning? Please select AM or PM and enter the time:
AM: (text entry)
PM: (text entry)

41. When you feel like you would like to go to sleep, do you have a difficult time actually falling asleep?
No
Yes

42. Please indicate how many times per week you have difficulty falling asleep:
1
2
3
4
5
6
7

43. Do you use nicotine products (e.g., cigarettes)?
No; I do not use nicotine products
Yes; At least once per day; this many times per day: (text entry)
Yes; Less than once per day; this many times per week: (text entry)

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

45. 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

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

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

*Appendix F***Debriefing Activity**

We understand that imagining this situation may have been upsetting to you. Now that you have heard the purpose of the study, we hope that you understand why we asked you to do these things. Please remember that the situation described in our study was not real and does not reflect on your relationship with your partner. Based on our research aims, we have asked you to focus on negative aspects of relationships, even though they were only imaginary. Since the positive aspects of relationships are important, we would like to you take a moment to respond to the following questions that will help you think about your partner in positive ways.

1. What do you like best about your partner?
2. What is the biggest strength of your relationship, compared to other couples you know?
3. Please describe a time when your partner supported you. How did your partner help you during this time?