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Men's sociosexuality is sensitive to changes in mate availability

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Abstract
Correlational research has linked mate availability to human sexual behavior, whereby unrestricted sociosexuality seems to be most common under conditions of female abundance. In this study, 71 heterosexual men were randomly assigned to one of two mate availability priming conditions, mate scarcity or mate abundance, and subsequently completed measures of sociosexuality as well as infidelity intentions. Results indicated that men in the mate abundance condition reported stronger sociosexual attitudes and desires, and among those currently in relationships, stronger infidelity intentions. These findings were contrasted with those from a separate sample of 66 heterosexual undergraduate women. Mate scarcity had no effects on women's sociosexuality or infidelity intentions. Findings suggest that when mates are scarce, men will adopt a sociosexual orientation aimed at maintaining a single partner.

In most species, male reproductive potential is higher, yet more variable, than that of females (Bateman, 1948; Trivers, 1972). Consequently, males tend to adopt a less discerning and more eager sexuality, a phenomenon termed the *Darwin–Bateman paradigm* (Dewsbury, 2005; Parker & Birkhead, 2013). Human sexual behavior is often considered within this framework. For example, men, more than women, seek out short-term sexual opportunities (Clark & Hatfield, 1989), extramarital affairs (Schmitt, Shackelford, & Buss, 2001; Symons, 1979), as well as pursue a strategy of serial divorce and remarriage to ever-younger partners (Fisher, 1989; Kenrick & Keefe, 1992; Symons, 1979). Research has found that men prefer to have more sex partners over their lifetime than women do and that men tend to require a shorter elapse of time before engaging in sexual acts with a new partner (Buss & Schmitt, 1993; Schmitt et al., 2003). Compared to women, men have more frequent sexual fantasies involving a larger variety of partners (Ellis & Symons, 1990). Some research suggests that men (but not women) who obtain multiple sex partners may ultimately produce more children than those who remain in one purely monogamous pair bond (Forsberg & Tullberg, 1995; Jokela, Rotkirch, Rickard, Pettay, & Lummaa, 2010; cf. Borgerhoff Mulder, 2009).

Even though men appear to benefit more than women from mating with multiple partners, the traditional Darwin–Bateman paradigm fails to endogenize a key variable that influences payoffs to a particular reproductive strategy—the adult sex ratio (Kokko & Jennions, 2008, 2012, 2008; Schacht & Mulder, 2015; Schacht, Rauch, & Mulder, 2014). When the sex ratio is skewed such that potential sex partners are scarce relative to intrasexual rivals, the fitness benefits of a male-typical strategy composed of desertion and mating multiply decrease. Conversely, the fitness benefits of remaining with a single partner increase, provided that remaining with

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the current partner can facilitate reproductive success (e.g., by increasing chances of conception, by ensuring paternity certainty, or by enhancing offspring survival) (Gangestad & Simpson, 2000; Kokko & Jennions, 2008, 2012; Thornhill & Thornhill, 1983; see also Wittenberger & Tilson, 1980).

For this reason, some animal species have been found to exhibit multiple reproductive strategies that are sensitive to changes in mate availability (Webb, Houston, McNamara, & SzéKely, 1999). Specifically, the tendency for a male to remain with (or guard) a female sexual partner at the expense of pursuing additional mating opportunities increases alongside female scarcity in the local mating environment (see Weir, Grant, & Hutchings, 2011, for a relevant meta-analytic review). As one example, Fromhage, McNamara, and Houston's (2008) game theory model of monogamy in spiders suggests that although males should attempt to mate with multiple females (according to the Darwin–Bateman paradigm), a male-biased sex ratio can nevertheless select for monogamy via increased fitness-related benefits. In humans, cross-cultural variation in the sex ratio also seems to correlate with men's mating strategies: More monogamy is observed when there is a surplus of men compared to women (Pedersen, 1991; Schmitt, 2005). However, the direction of this relation is poorly understood given the correlational nature of previous work. In this study, we experimentally manipulated men's perceived mate availability (scarcity vs. abundance) and subsequently assessed their sociosexual orientation and infidelity intentions in order to determine whether individual differences in mating strategy is context dependent.

Can monogamy benefit fitness-related outcomes in humans?

Humans are among the roughly 5% of mammals that have evolved some degree of monogamy (Kleiman, 1977)—be it social monogamy, serial monogamy, pure genetic monogamy, or some other variant characteristic of a restricted sociosexuality (e.g., Low, 2003; Schmitt, 2005). The reasons for the divergence from a purely polygynous mating system are likely diverse and multifaceted (e.g., Buss, 2003). One hypothesis posits that men's parental care offsets the costs of monogamy by increasing the survival rate of offspring (e.g., Bart & Tornes, 1989; Geary, 2000; Hill & Hurtado, 1996; Pleck, 1987). However, some researchers argue that biparental care cannot fully account for the evolution of monogamy in sexually reproducing species (Brotherton & Komers, 2003; Geary, 2000) given that social monogamy has been found to exist even among species wherein biparental care does not occur (Matthews, 2002). Monogamy may also function to provide repeated sexual access to a partner (Shackelford, Goetz, Guta, & Schmitt, 2006) and to prevent a partner's extrapair copulations or to dissuade intrasexual rivals (Benshoof & Thornhill, 1979; Parker, 1974; Quinlan & Quinlan, 2007). Ultimately, remaining with a sexual partner may be an effective tactic for increasing the probability of paternity in the presence of male competitors (Buss, 2003; Jormalainen, Shuster, & Wildey, 1999).

When is monogamy adaptive? The influence of mating opportunity

The fitness benefits of social monogamy may be especially great when females are ecologically dispersed, scarce, or when it is otherwise difficult to obtain multiple mating opportunities (e.g., Dunbar, 1995; Kokko & Jennions, 2008; Wittenberger & Tilson, 1980). Conversely, when females increase in abundance and localization, polygyny becomes more common. For instance, among the blue tit (*Parus caeruleus*; a small passerine bird), polygyny and intrafemale competition has been found to increase alongside females' relative abundance, which can occur due to male predation and/or female immigration (Kempenaers, 1994).

Limited mating opportunities have likely shaped human mating strategies as well (Arnocky, Ribout, Mirza, & Knack, 2014; Geary, 2000). Schmitt (2005) observed that across 48 countries, regions with a female-biased sex ratio exhibited a more

unrestricted sociosexuality (i.e., an orientation toward increased casual sex, low relational commitment, and more infidelity; Mattingly et al., 2011), ostensibly because men can more easily obtain a variety of sexual partners under such conditions (i.e., successful competition for mates is more likely). In regions with a female-biased sex ratio, women are also less likely to be married (Lichter, McLaughlin, Kephart, & Landry, 1992), marriage occurs later in life (Kruger, Fitzgerald, & Peterson, 2010), and there is more sexual activity (Guttentag & Secord, 1983), more single-parenthood (Barber, 2003), and more unwed teenage pregnancy (Barber, 2000). Individuals also exhibit increased testosterone (an androgen implicated in the promotion of mammalian mating) under conditions of high opposite-sex to same-sex ratios (Miller, Maner, & McNulty, 2012).

On the other hand, when the sex ratio is skewed such that there are more men than women in a given mating population, that society exhibits a more restricted sociosexuality (Schmitt, 2005) and is less likely to be polygynous (Ember, 1974). Furthermore, men are more willing to enter monogamous relationships and increase their level of care for the offspring from this monogamous relationship when women are relatively scarce (Pedersen, 1991). The aforementioned studies suggest that humans enact differential mating behaviors depending on the ratio of potential mates to competitors within their environment. To the extent that restricted sociosexuality represents more monogamous tendencies (Simpson, Wilson, & Winterheld, 2004), these findings support the notion that a shortage of women tends to evoke monogamous mating in men and, conversely, an excess of women tends to evoke more polygynous or promiscuous mating strategies (Schmitt, 2005). Given the aforementioned benefits associated with male monogamy in terms of increasing paternity certainty and improving offspring quality via parental care, males may be expected to exhibit lower sociosexuality when competition for mates is increased as is the case under conditions of relative female scarcity (Kokko & Jennions, 2008).

The present study

This study builds upon cross-sectional findings that unrestricted sociosexuality is elevated in circumstances of relative mate abundance compared to relative mate scarcity, using an experimental priming manipulation. Men were randomly assigned to one of two mate availability priming conditions: mate abundance or mate scarcity (Arnocky et al., 2014; Spielmann, MacDonald, & Wilson, 2009). We predicted that men primed with mate abundance would express significantly higher levels of self-reported sociosexual attitudes (H1) and desires (H2). Moreover, we expected that men who were currently in romantic relationships would express stronger intention toward engaging in infidelity in the future when primed with relative mate abundance versus scarcity (H3).

It is possible that the proposed link between perceived mate scarcity and men's mating attitudes may be an artifact of a broader psychological tendency to value and conserve resources that are increasingly scarce (which is considered one of many potentially adaptive strategies for coping with resource scarcity; see Griskevicius et al., 2013). In order to consider this possibility as it relates to human mating strategies, we included a separate comparison sample of heterosexual university-aged women. Given that mating multiply is typically considered to enhance males' relative to females' total reproductive success (Bateman, 1948; Trivers, 1972) and that men more than women seem to have evolved a psychology that is consistent with mating multiply when it is feasible to do so (Schmitt et al., 2001), we expected that women's sociosexuality and infidelity intentions would not be as sensitive to self-perceived mate availability.

Method

Participants

This research was approved by the Nipissing University Research Ethics Board, and participants provided written consent. Seventy-one heterosexual undergraduate men ($M_{age} = 21.20$, $SD = 2.34$) and 66 heterosexual undergraduate women ($M_{age} = 21.00$,

SD = 3.33) of primarily Caucasian descent (93%) were recruited from common areas at a small Canadian University. Of these, 28 men and 34 women were currently involved in romantic relationships, with an average dating length of more than 1 year. Remuneration consisted of a chance to win a $100 draw.

Materials and procedure

Priming-perceived mate abundance versus mate scarcity

Previous studies have shown that perceptions of mate scarcity versus abundance can be manipulated in humans (Arnocky et al., 2014; Watkins, Jones, Little, DeBruine, & Feinberg, 2012). Participants were randomly assigned to one of two priming conditions (mate scarcity or mate abundance), wherein they read one of two fictitious magazine articles developed by Spielmann et al. (2009). In the mate scarcity condition, the magazine article led participants to believe that good-quality romantic partners were difficult to come by, and that after a break-up, most people remain single for longer than desired. Conversely, in the mate abundance condition, participants were led to believe that good-quality romantic partners were easy to come by, and that after a break-up, most people have no trouble finding another desirable romantic partner quickly. These priming stimuli have previously been shown to be an adequate manipulation of perceived mate availability (ease vs. difficulty of finding a new partner; Spielmann et al., 2009) and have been linked to subsequent mate competition attitudes in humans (Arnocky et al., 2014).

Sociosexuality

Following exposure to one of the two priming conditions, participants completed the Revised Sociosexual Orientation Inventory (SOI–R) attitudes and desires subscales (Penke & Asendorpf, 2008). A high score on these measures indicates unrestricted sociosexuality, whereas a low score indicates restricted sociosexuality (Penke & Asendorpf, 2008). The sociosexual attitude subscale consists of three questions utilizing a 9-point response scale anchored at 1 = *strongly disagree* and 9 = *strongly agree*: "Sex without love is ok," "I can imagine myself being comfortable and enjoying 'casual' sex with different partners," and "I *do not* want to have sex with a person until I am sure that we will have a long-term, serious relationship" (reverse scored). Similarly, the sociosexual desire subscale is anchored at 1 = *never* and 9 = *at least once a day* and comprises the following three items: "How often do you have fantasies about having sex with someone you are not in a committed romantic relationship with?" "How often do you experience sexual arousal when you are in contact with someone you are not in a committed romantic relationship with?" and "In everyday life, how often do you have spontaneous fantasies about having sex with someone you have just met?" Following the SOI–R scoring guide and previous research using these measures, each subscale was averaged to form a mean score. The attitude (men $\alpha = .75$, women $\alpha = .80$) and desire (men $\alpha = .82$, women $\alpha = .87$) subscales each showed good internal consistency.

Anticipated infidelity

Following the priming manipulation, participants also completed the Susceptibility to Infidelity questionnaire (Goetz & Causey, 2009). This measure employs two items meant to capture the participants' likelihood of being sexually unfaithful to their current partner in the future: (a) "How likely do you think it is that you will in the future have sexual intercourse with someone other than your current partner?" and (b) "Please indicate your agreement or disagreement with the following statement: 'I will probably be sexually unfaithful to my partner'." Responses are made along a 7-point Likert-type scale anchored at 1 = *not at all likely/completely disagree* and 7 = *extremely likely/completely agree*. The items showed good intercorrelations; men, $r(28) = .52$, $p < .01$, and women, $r(34) = .52$, $p < .01$.

Results

Multivariate main effects

For men, a two-way between-subjects multivariate analysis of variance (MANOVA)

was conducted, with the mate availability priming condition as the independent variable and sociosexual attitudes and desires as the dependent variable. A statistically insignificant Box's M test indicated homogeneity of the covariance matrices across conditions (Box's $M = 8.119$, *ns*). Results revealed a statistically significant multivariate main effect for condition (scarcity vs. abundance), Wilks's $\lambda = .95$, $F(2, 69) = 5.30$, $p = .007$, $\eta_p^2 = .14$, indicating that 14% variance of the dependent variables was associated with the experimental condition. For women, a statistically insignificant Box's M test was also observed (Box's $M = 5.26$, *ns*). Results revealed a statistically insignificant multivariate main effect for condition (scarcity vs. abundance), Wilks' $\lambda = .94$, $F(2, 64) = 1.46$, *ns*, $\eta_p^2 = .04$, indicating that 4% variance of the dependent variables was associated with the experimental condition.

Univariate effects

Sociosexual attitude

First, the univariate effect of condition (mate abundance vs. mate scarcity) upon sociosexual attitude was examined. For men, results show that the priming manipulation significantly influenced participants' sociosexual attitude scores, $F(1, 69) = 7.97$, $p < .006$, $\eta_p^2 = .10$. Participants specifically exposed to the mate scarcity condition ($M = 5.13$, $SE = .34$) reported significantly lower sociosexual attitudes compared to those participants exposed to the mate abundance condition ($M = 6.51$, $SE = .34$). For women, results revealed that the priming condition did not predict sociosexual attitude scores, $F(1, 64) = 1.91$, *ns*, $\eta_p^2 = .02$, suggesting that perceived mate scarcity influences men's but not women's sociosexual attitude (see Figure 1). For men, condition statistically significantly related to sociosexual attitude, $r = -.32$, $p = .006$. For women, condition did not correlate with sociosexual attitude, $r = -.18$, $p = .15$. Using the Fisher r-to-z transformation, the effect of condition upon sociosexual attitude was not statistically significantly greater for men than for women, $Z = -0.19$, $p = .39$.

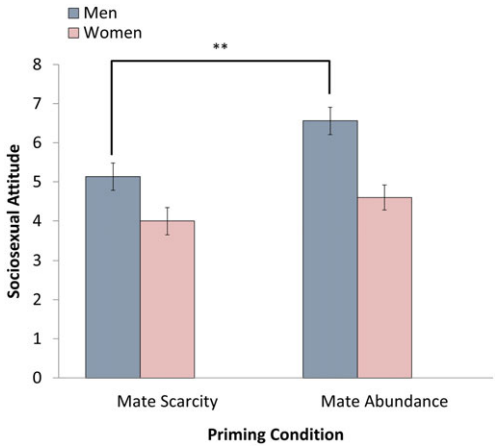

Figure 1. Differences in sociosexual attitude between individuals randomly assigned to a mate scarcity versus a mate abundance priming condition.
$^{**}p < .01$.

Sociosexual desire

Next, the univariate effect of conditions (mate abundance vs. mate scarcity) was examined for sociosexual desire. Similar to findings for sociosexual attitude, results showed that for men, conditions significantly influenced participants' sociosexual desire scores, $F(1, 69) = 6.46$, $p = .013$, $\eta_p^2 = .09$. Participants specifically exposed to the mate scarcity condition ($M = 3.84$, $SE = .32$) reported significantly lower sociosexual desires compared to those participants exposed to the mate abundance condition ($M = 5.00$, $SE = .32$). For women, results showed that priming conditions did not predict sociosexual desire scores, $F(1, 64) = 2.44$, *ns*, $\eta_p^2 = .03$, suggesting that perceived mate scarcity influences men's but not women's sociosexual desire (see Figure 2). Univariate effects were then converted to correlation coefficients and compared across gender. For men, conditions statistically significantly related to sociosexual desire, $r = -.29$, $p = .01$. For women, conditions did not correlate to sociosexual desire, $r = -.20$, $p = .11$. Using the Fisher r-to-z transformation, the effect of condition upon sociosexual desire was not statistically significantly greater for men than for women, $Z = -0.55$, $p = .58$.

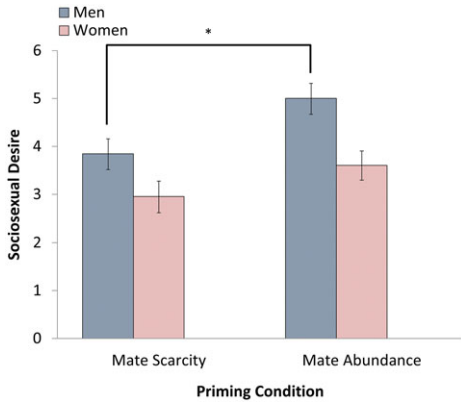

Figure 2. Differences in sociosexual desire between individuals randomly assigned to a mate scarcity versus a mate abundance priming condition.
*$p < .05$.

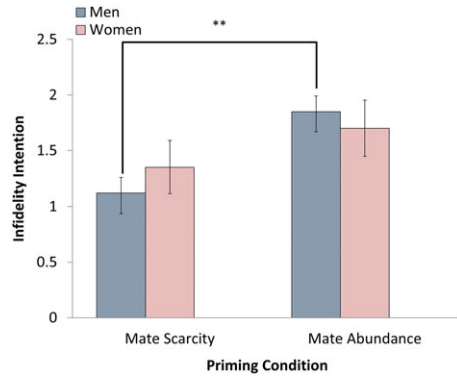

Figure 3. Differences in infidelity intention between individuals randomly assigned to a mate scarcity versus a mate abundance priming condition.
**$p < .01$.

Expressed likelihood of infidelity

Lastly, given that one of our measures (susceptibility to infidelity) asked participants to respond only if they were currently in a committed relationship (28 of 71 men and 34 of 66 women), a separate univariate analysis of variance was conducted for this outcome for each gender. For men, results showed that conditions influenced participants' expressed likelihood to engage in infidelity, $F(1, 27) = 8.33$, $p = .008$, $\eta_p^2 = .24$, indicating that 24% of explained variance in likelihood to cheat was attributable to the priming condition. Those in the mate scarcity condition specifically reported a significantly lower likelihood of infidelity ($M = 1.11$, $SE = .14$) compared to those exposed to the mate abundance condition ($M = 1.90$, $SE = .17$). For women, results revealed that priming condition did not predict infidelity intentions, $F(1, 32) = 2.19$, *ns*, $\eta_p^2 = .06$, suggesting that perceived mate scarcity influences men's but not women's intention to commit infidelity (see Figure 3). Univariate effects were then converted to correlation coefficients and compared across gender. For men, condition statistically significantly related to infidelity intention, $r = -.49$, $p = .008$. For women, condition did not correlate with infidelity intention, $r = -.24$, $p = .17$. Using the Fisher r-to-z transformation, the effect of conditions upon infidelity was not statistically significantly greater for men than for women, $Z = 1.08$, $p = .28$.

Discussion

Studies of nonhuman species have shown that variability in polygyny and mate guarding often coincides with skewed sex ratios and/or female geographical dispersion (e.g., Jormalainen et al., 1999; Latty, 2006; Parker, 1974; Weir et al., 2011; Wilson & Swaddle, 2013). Polygyny is more likely to occur when female partners are abundant and accessible in the local mating environment, whereas under conditions of relative mate scarcity, monogamy may evolve as a competitive strategy meant to improve reproductive fitness (e.g., Wittenberger & Tilson, 1980). However, the influence of mate availability is poorly understood with respect to the menu of mating strategies exhibited among humans. Correlational research suggests that sociosexuality appears to be higher in regions where women are relatively abundant (Schmitt, 2005). However, the lack of experimental research on this important topic precludes any directional conclusions regarding the potential influence of mate availability in one's environment and the mating strategies they employ (Schmitt, 2005). Given this, this study set out to determine if sociosexuality, as well as expressed likelihood to commit infidelity, would be altered when participants

were primed with perceptions of mate abundance versus mate scarcity. We hypothesized that men who were randomly assigned to a mate scarcity condition would express less likelihood of being unfaithful to their current partner as well as show a more restricted sociosexual orientation when compared to men primed with the mate abundance condition.

Results from this study support the hypotheses that perceived mate scarcity to an effect on men's mating psychology. First, men in the mate scarcity condition reported that they would be less likely to commit infidelity in their current relationship when compared to men in the mate abundance condition. This finding makes sense in light of the fact that when mates are scarce, there is less likelihood of finding someone with whom to commit infidelity. Moreover, there is a slimmer chance of finding a new partner if the infidelity is discovered and the existing relationship is terminated as a result. Given this, it is arguably adaptive to reduce one's expressed likelihood to commit infidelity when mates are perceived to be scarce. Second, men in the mate scarcity condition endorsed a more restricted sociosexual orientation compared to those in the mate abundance condition. Previous research suggests that when women are relatively scarce, societies tend to exhibit more monogamy (Ember, 1974). Conversely, when women are relatively abundant, marriage occurs later in life (Kruger et al., 2010), there is more single parenthood (Barber, 2003), and there is more unwed teenage pregnancy (Barber, 2000). Taken together, results of this study suggest that men may attune their sociosexuality in accordance with *their perception* of the relative ease with which they can find sexual partners.

Conversely, women's exposure to the mate abundance or mate scarcity priming manipulation had no statistically significant effects on their sociosexual orientation or their intended infidelity. However, when the strength of the effects were compared among the male and female samples, results showed that the difference between the genders was not statistically significant (i.e., for women, each dependent variable trended in the same direction as was observed among men such that when men were abundant, women exhibited slightly more sociosexuality). This contrasts with recent findings from Moss and Maner (2016) who showed that women primed with mate abundance exhibited a more restricted sexuality. Here, we consider two possible explanations for our finding. First, it is possible that the effects of mate scarcity promote a domain-general response of valuing and conserving scarce resources more greatly than abundant resources (in this case, mates), which has been observed to occur in high-socioeconomic samples (see Griskevicius et al., 2013, for review of various strategies employed under conditions of scarce resources). Second, researchers have begun to show that contrary to traditional parental investment models, females of many species can benefit from mating multiply and have been observed to engage in intrasexual competition for mating opportunities (Ah-King, 2011; Rosvall, 2011) and that women can also benefit from competing for mates (Arnocky & Piché, 2014; Arnocky, Sunderani, Miller, & Vaillancourt, 2012; Arnocky & Vaillancourt, 2012) and from mating with multiple partners (see Arnocky, Sunderani, & Vaillancourt, 2013, for review). Extant correlational research suggests that sociosexuality is stronger among women when men are scarce rather than abundant (Schmitt, 2005). Researchers have typically interpreted this finding as women conforming to men's preference for multiple matings when men are scarce, whereas when women are relatively scarce, they are perceived to have more "bargaining power" to exact a preference for marriage and monogamy (Kruger et al., 2010). Yet research has also shown that a woman's jealousy and self-reported willingness to engage in aggressive mate guarding increases under conditions of perceived mate scarcity (Arnocky et al., 2014). It is well accepted that retaining a mate who will invest in offspring can benefit women's reproductive fitness, and therefore, it may be expected that women would exhibit a preference for monogamy when men are scarce, even if they are simultaneously willing to engage in more short-term sexual behavior. Future research using larger sample sizes might explore women's preferred mating strategies more deeply as they relate to

the availability of mates, perhaps by directly examining attitudes toward monogamy (e.g., Schmookler & Bursik, 2007) and whether other cultural or contextual factors might influence the expression of these strategies.

Taken together, results of this study support recent reformulated models of sexual selection, which extend beyond traditional parental investment theory in suggesting that mating systems are influenced by more than anisogamy and obligatory parental care but also by environmental pressures (such as sex ratios) that bear upon the efficacy of a given mating strategy (Gangestad & Simpson, 2000; Kokko & Jennions, 2008). The fact that *perceived* mate availability was shown to influence sociosexuality may help to account for interindividual variability in mating strategies within regions and cultures. It is well understood that individuals tend to under perceive the availability of valued things—a psychological phenomenon termed the *value heuristic* (Dai, Wertenbroch, & Brendl, 2008). This suggests that to the extent that mating opportunities are considered valuable to a particular individual at a given point in their life, one might believe mates to be scarce even when living in a modern environment in which there are, in reality, many potential mates available.

Limitations and future directions

This study utilized a priming manipulation followed by a self-report questionnaire. Future extensions of this research would benefit from moving beyond self-reported attitudinal outcomes, which to this point have been the norm in the sociosexuality literature, by observing behaviors that are perhaps more representative of actual mating behavior. For instance, priming mate scarcity versus abundance prior to a speed-dating or online dating paradigm in which participants are given the opportunity to contact as many or as few potential partners as desired might yield interesting results.

Conclusions

Correlational studies have proposed that mate availability can influence sociosexuality and infidelity (Schmitt, 2005). This study shows that group differences in men's sociosexual orientation and infidelity intention can be experimentally induced by priming mate scarcity versus abundance. This study provides support for the hypothesis that mating strategies and systems are shaped by the relative availability of mates within the environment, whereby men are willing to adopt more polygyny when women are perceived to be abundant. This study highlights that human sexual strategies are influenced by environmental factors, which may help explain why humans currently utilize a variety of reproductive strategies.

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