

Women Selectively Guard Their (Desirable) Mates From Ovulating Women

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For women, forming close, cooperative relationships with other women at once poses important opportunities and possible threats—including to mate retention. To maximize the benefits and minimize the costs of same-sex social relationships, we propose that women's mate guarding is functionally flexible and that women are sensitive to both interpersonal and contextual cues indicating whether other women might be likely and effective mate poachers. Here, we assess one such cue: other women's fertility. Because ovulating (i.e., high-fertility) women are both more attractive to men and also more attracted to (desirable) men, ovulating women may be perceived to pose heightened threats to other women's romantic relationships. Across 4 experiments, partnered women were exposed to photographs of other women taken during either their ovulatory or nonovulatory menstrual-cycle phases, and consistently reported intentions to socially avoid ovulating (but not nonovulating) women—but only when their own partners were highly desirable. Exposure to ovulating women also increased women's sexual desires for their (highly desirable) partners. These findings suggest that women can be sensitive to subtle cues of other women's fertility and respond (e.g., via social exclusion, enhanced sexual attention to own mate) in ways that may facilitate their mate retention goals while not thwarting their affiliative goals.

Keywords: mate guarding, close relationships, female sociality, ovulatory cycle effects, social cognition

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For women, forming same-sex friendships provides important opportunities and potentially poses certain threats—including threats to romantic relationships. Indeed, more than 80% of men report that women have attempted to entice them to leave an existing relationship (e.g., Schmitt et al., 2004; Thompson, 1983; Wiederman, 1997), and successful poaching may be easier for a woman's same-sex friends and acquaintances, who often have

increased access to and information about the woman's mate (e.g., Bleske & Shackelford, 2001).

Especially for women, successfully preventing another woman from poaching her partner can bring major benefits, and losing her partner can levy major costs. Therefore, how might women manage the tradeoffs between the potential opportunities inherent in forming new friendships with other women and the potential costs of making new friends who might poach their mates? Rather than being chronically concerned about threats to mate retention and indiscriminately avoiding other women, we suggest that women's concern with mate guarding arises when specific cues suggest that another woman may be a likely and effective mate poacher. Here, we propose that partnered women use one such cue—other women's fertility (i.e., ovulation)—to guide them in strategically navigating their social relationships with other women. Specifically, we hypothesize that partnered women selectively avoid ovulating (but not nonovulating) women.

Women's Mate Retention: High Benefits for Success, High Costs for Failure

Mate retention can be considered a "fundamental" human goal, one designed to secure the many important benefits of long-term mating and to avoid the many potentially devastating costs of partner loss

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and/or defection (e.g., Hill & Hurtado, 1996; Kenrick, Griskevicius, Neuberg, & Schaller, 2010). Historically, both the benefits of retaining a mate and the costs of losing a mate have been especially high for women (Buss, Larson, Westen, & Semmelroth, 1992; Buss & Schmitt, 1993; Wang & Griskevicius, 2014).

For women, the benefits of successful mate retention are typically instantiated through the provision of resources, such as food and protection, which historically have been provided by a woman's male partner (Hurtado, Hill, Hurtado, & Kaplan, 1992; Kaplan, Hill, Lancaster, & Hurtado, 2000; Marlowe, 2003). Desire for continuous, reliable, and often exclusive access to a partner's reproductively relevant resources (e.g., food and protection for women, sexual access for men) is typical of long-term mating relationships (e.g., Kruger, 2008); this access can increase a woman's reproductive fitness in multiple ways, for example, by shortening her interbirth intervals and raising the likelihood of her own survival and that of her offspring (e.g., Buss, 1994; Hurtado & Hill, 1992; Symons, 1979). The combination of (a) women's historical dependence on partner-provided resources and (b) biological sex differences obligating women to expend greater minimal amounts of time and energy on offspring also means that women have typically incurred relatively high fitness costs upon the loss of a depended-upon partner (e.g., a long-term spouse) and/or the diversion of his resources (Geary, 2000; Hurtado & Hill, 1992). For example, in traditional societies, a lack of paternal investment is associated with higher infant mortality rates and lowered aptitude for infants to compete for social and material resources later in life (Geary, 2000). For women, then, successful mate retention can carry major benefits, whereas failed mate retention can levy major costs. Women's mate retention is a high-stakes endeavor.

Thus, it is a significant challenge for women when other women attempt to poach their partners. For instance, over 50% of women admit to attempting to poach another woman's partner, and over 80% of men admit to having been the object of another woman's poaching—with about half of men admitting to “going along” with the poaching attempt (e.g., Schmitt et al., 2004; Schmitt & Buss, 2001). Women have good reason, then, to mate guard (e.g., Buss, 1988; Buss & Shackelford, 1997). How do they do so?

Women's Mate Guarding: Covert, Pre-Emptive Social Distancing of Other Women

Women's mate-guarding tactics can take many forms, ranging from the subtle (e.g., affectionate displays, prioritizing a partner's needs) to the overt (e.g., physically attacking a potential poacher, forbidding one's partner to spend time with the opposite sex). To preclude potentially costly competition with same-sex rivals, however, women are likely to prefer tactics that subtly and indirectly serve to keep partner and poacher apart (Buss & Shackelford, 1997; Fisher & Cox, 2011; Walters & Crawford, 1994). Why?

First, given traditionally dominant social structures, wherein men have typically had both the physical and social clout to enact mate guarding via a wider array of means (e.g., intimate partner violence, chastity belts, harems), more subtle, often covert means of mate guarding may have been the primary methods open to women (e.g., Ein-Dor, Perry, Hirschberger, Birnbaum, & Deutsch, 2015; Smuts, 1992). Second, as mate acquisition and mate retention can each be viewed as forms of intrasexual competition, more

broadly, we can extrapolate from women's preferred tactics of intrasexual competition for mates (i.e., indirect aggression) to predict which tactics women may prefer in the intrasexual competition to retain mates. When competing to acquire mates, women typically avoid physical, direct aggression and instead prefer to aggress indirectly (e.g., via social exclusion; Benenson, 2013; Campbell, 2002; Hess, 2006; Vaillancourt, 2013). In part, this is because indirect tactics can provide maximal benefits (i.e., can cause the most harm to other women; e.g., Benenson et al., 2013) for minimal costs (i.e., can minimize the likelihood of reputational or physical retaliation; e.g., Björkqvist, 1994). It is plausible that similar cost-benefit considerations apply to women's intrasexual competition to retain mates, leading women to also prefer indirect tactics when mate guarding.

Consistent with this reasoning, women may strategically—though not necessarily consciously—distance female acquaintances whom they suspect of being especially likely and/or effective mate poachers (e.g., Bleske & Shackelford, 2001; Fisher & Cox, 2011; Vaillancourt & Sharma, 2011). Recent evidence supports the notion that women socially distance other women, likely in the course of mating competition (Vaillancourt & Sharma, 2011; Vrangalova et al., 2014). For example, Vrangalova and colleagues (2014) found that young women avoided associating with sexually permissive young women, whose permissiveness may have led to perceptions of them as likely poachers, even as those women were presented as otherwise desirable potential friends. Thus, whereas men have at times physically isolated and sequestered their female partners to restrict other men's access to them (e.g., in harems), women may analogously socially isolate their partners from potential poachers—keeping them apart so as to preclude potentially costly competition for their romantic partners.

The usefulness of this strategy depends on women being able to identify those who might be likely and effective mate poachers, and then excluding them (but not others) from their social circles. If a woman indiscriminately distances herself and her partner from potential poachers (i.e., all other women), she is assured of his fidelity but at the cost of eliminating her access to the numerous benefits of female–female friendships (e.g., Campbell, 2002). For instance, in nonhuman primates, females' close friendships with other females increase the likelihood that their offspring will survive (Silk, Alberts, & Altmann, 2003). Women might reap similar benefits, perhaps via alloparenting, sharing resources with one another, and/or helping one another deal with stressful situations (e.g., Campbell, 2002; Essock-Vitale & McGuire, 1985; Hrdy, 2009; Taylor et al., 2000). Women's same-sex friendships also provide protection against the threat of male violence (e.g., Campbell, 2002; Smuts, 1992), as well as the threat of aggression from other women (e.g., Campbell, 2002; Hess, 2006).

In addition, if a woman were to consistently and indiscriminately exclude other women from her own and, by extension, her partner's social circle, she might gain a reputation for being noncommunal and nonnurturing, and thus, for being an undesirable friend. This might not only thwart her ability to form future friendships with other women, but might also lead her partner to perceive her as highly difficult, uncooperative, controlling, and nontrusting.

Thus, on one hand, the costs of indiscriminately avoiding other women are high because women reap important benefits from making new same-sex friends. On the other hand, women can and do mate poach with frequency, and those women deeply embedded in one's

social circle may have increased access, motivation, and ability to poach successfully. How might women manage this challenge?

We propose that women navigate this social problem by (a) being sensitive to cues that another woman could successfully attract her partner and would be interested in doing so, and (b) responding to these cues with desires to socially distance the potential mate poacher. That is, those other women perceived to be effective and motivated (i.e., credible) mate poachers would be expected to evoke women's mate guarding, but those perceived to be less likely mate poachers would not. Women's mate guarding would, therefore, be functionally flexible and geared toward identifying—and distancing—women who may pose plausible threats to their particular romantic relationships (e.g., *Buss & Shackelford, 1997*). Below, we reason that ovulating women may be perceived as particularly effective and motivated mate poachers, and thus, that cues of fertility in other women may evoke partnered women's mate guarding.

Ovulation Enhances Mate-Poaching Efficacy and Motivation

Because the reproductive consequences of many behaviors depend on their timing in relation to the female's fertile window (e.g., only sex during the fertile window can lead to conception), evolutionary theorists posit that certain perceptions, cognitions, and behaviors will be sensitive and responsive to this window (e.g., *Bullivant et al., 2004; Fessler, 2003; Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Haselton & Gangestad, 2006; Penton-Voak et al., 1999; Puts, 2006*). Indeed, research across species demonstrates that social perceptions, cognitions, and behaviors do temporarily shift in response to ovulation, and that these shifts may enhance individuals' reproductive fitness. For instance, female chimpanzees preferentially copulate with dominant males on days when sexual intercourse is most likely to lead to fertilization, maximizing the possibility that their offspring will share the males' high-quality genes (*Matsumoto-Oda, 1999*), and male marmosets show a sexual attraction to the odors of ovulating females, leading to a greater chance that desired copulation will lead to fertilization (*Kendrick & Dixson, 1983*). Similarly, psychological research on humans has demonstrated that (a) women's perceptions and behaviors shift across their own cycles and (b) men respond to these cyclic shifts. Less work, however, has asked how women might respond to ovulation in other women. If an ovulating woman is more able and motivated to attract desirable men, it would make sense for ovulating women to be perceived by other women as especially likely and effective mate poachers (i.e., as credible threats to mate retention).

Men's Increased Attraction to Ovulating Women

A growing number of studies have shown that men experience increased sexual attraction to women during days when they would be most likely to conceive (i.e., near peak fertility). This increased attraction has been demonstrated with respect to women's faces (*Bobst & Lobmaier, 2012; Puts et al., 2013*), voices (*Bryant & Haselton, 2009; Feinberg, DeBruine, Jones, & Perrett, 2008; Pipitone & Gallup, 2008; Puts et al., 2013*), odors (*Doty, Ford, Preti, & Hugins, 1975; Kuukasjarvi et al., 2004; Thornhill, Gangestad, Miller, Scheyd, McCollough, & Franklin, 2003*), and even gaits

(*Fink, Hugill, & Lange, 2012; Gueguen, 2012a*; see also *Miller, Tybur, & Jordan, 2007*). For instance, *Bobst and Lobmaier (2012)* asked men to rate an "ovulating" (i.e., high-fertility) composite face, consisting of 25 women whose photos were taken at high fertility, as compared with a "luteal" (i.e., low-fertility) composite composed of photos of those same women taken at low fertility. The men rated the ovulating composite as more physically attractive, caring, flirtatious, and likely to go out on a date with them. Together, these findings suggest that men might be particularly motivated to sexually pursue ovulating women.

Ovulating Women's Intersexual and Intrasexual Behavior

Perhaps more relevant than ovulating women's increased attractiveness to men is ovulating women's increased sexual attraction to and motivations to seek out short-term sexual activity with men (*Bullivant et al., 2004; Cantu et al., 2014; Dawson, Suchinsky, & Lalumiere, 2012; Pillsworth, Haselton, & Buss, 2004; Roney & Simmons, 2013*). For example, women report greater interest in going out (e.g., to clubs, parties) to meet men during fertile versus nonfertile days of their cycles (*Haselton & Gangestad, 2006*). Ovulating women are particularly favorable toward, receptive to, and motivated to seek out short-term sexual activity with so-called "sexy" men—men with cues of high-quality genes, such as facial symmetry, masculinity, and social dominance (*Cantu et al., 2014; Durante, Griskevicius, Simpson, Cantu, & Li, 2012; Gangestad et al., 2004, 2007; Gangestad, Thornhill, & Garver-Apgar, 2005; Garver-Apgar, Gangestad, & Thornhill, 2008; Feinberg et al., 2006; Lukaszewski & Roney, 2009; Roney & Simmons, 2008; Roney, Simmons, & Gray, 2011*). Ovulating women's increased, but targeted, sexual attraction suggests that they may pose an enhanced mate poaching threat, especially to women whose partners are highly desirable.

Further, ovulation may cause women to increase their intrasexual competition for mates. For instance, near peak fertility, women are more likely to dress in ways that attract sexual attention from men (e.g., baring more skin; *Durante, Li, & Haselton, 2008; Gueguen, 2009; Haselton et al., 2007*). Ovulating women also strengthen their own competitive edge through appearance-enhancing products (*Durante, Griskevicius, Hill, Perilloux, & Li, 2011; Durante, Li, & Haselton, 2008; Gueguen, 2012b; Haselton et al., 2007; Saad & Stenstrom, 2012; Zhuang & Wang, 2014*). Amplifying their attractiveness to men is not only a form of intrasexual competition for desirable mates, but it might also increase their ability to successfully mate-poach. Further, ovulating women also engage in additional forms of intrasexual mating competition. For instance, near peak fertility, women are less likely to cooperate with and are more likely to derogate and even dehumanize potential rivals (*Baenninger, Baenninger, & Houle, 1993; Fisher, 2004; Lucas & Koff, 2013; Piccoli, Foroni, & Carnaghi, 2013*). These behavioral tendencies may reduce ovulating women's hesitation to pursue a partnered man. One might expect partnered women to be especially wary of ovulating women.

Increased Costs of a Partner's Copulation With An Ovulating (Versus a Nonovulating) Woman

Women's wariness may be further exacerbated by the unique costs of a partner's extrapair liaison with an ovulating (rather than a non-

ovulating) woman. That is, a sexual affair with a nonovulating woman is potentially accompanied by a diversion of resources from the current partner to the new woman, which can have severe consequences for that female partner and her offspring (e.g., Hill & Hurtado, 1996). However, because even a one-off act of sexual intercourse with an ovulating interloper is more likely to lead to pregnancy, and because men have an interest in the welfare of their offspring, the possibility that a man will divert future resources from his current partner to an ovulating woman (and their potential offspring) is even greater. Thus, the costs of failing to guard against an ovulating woman's poaching attempts are potentially magnified.

Little research has explored women's perceptions of ovulation in other women. The work that does exist, however, provides initial support for our view that women may view ovulating targets as especially threatening competitors. Like men, women report finding that other women are more physically attractive during high- versus low-fertility periods (e.g., Roberts et al., 2004). Moreover, women rate the faces and voices of high-fertility women as more attractive to men (Puts et al., 2013). Given men's comparative prioritization of prospective partners' physical attractiveness (e.g., Buss, 1989; Li & Kenrick, 2006; Shackelford, Schmitt, & Buss, 2005), women may see ovulating (vs. nonovulating) others as more formidable competitors for male mates. Indeed, Maner and McNulty (2013) found that women increase testosterone production in response to the odor of ovulating women, suggesting that contact with an ovulating woman physiologically readies women for intrasexual competition.

The Benefits (and Costs) of Socially Distancing Ovulating Women

Ovulation may make women both more attractive to men and more sexually attracted to (some) men. Moreover, women face high fitness costs at the defection of a partner and the diversion of his resources. Thus, we predict that partnered women will be especially wary of ovulating (relative to nonovulating) potential interlopers, and that cues of ovulation will evoke a mate guarding psychology in these partnered women. As a consequence, we expect that partnered women will want to socially distance both themselves and their partners from ovulating women. Such desires may facilitate women's mate guarding by precluding potentially costly competition over their committed mates.

As noted above, however, distancing women who are simultaneously potential friends and possible rivals can also preclude the many important benefits of forming new female-female friendships; thus, women's social distancing of novel female acquaintances is likely to be sensitive to interpersonal and contextual factors that might moderate the mate-retention threats that these other women may pose. Whether women socially exclude another woman is likely to take into account both interpersonal and contextual features that may cue whether another woman is a more or less likely poacher of their particular partners. For instance, given that ovulating women are specifically attracted to *desirable* men, the female partners of desirable men may be especially wary of new (ovulating) women in their social orbits and, thus, especially likely to engage in mate guarding. Moreover, the effectiveness of a poacher depends on her ability to be in physical proximity to one's partner; in the event that another woman poses potential affiliative benefits and has no means of accessing a woman's (desirable) mate, the potential costs of distancing another woman—even if she would otherwise be considered a cred-

ible mate poacher—may outweigh the potential benefits of losing her as a possible ally.¹

Overview of Studies

Studies 1a and 1b test the basic prediction that partnered women—perhaps especially those partnered to men they perceive to be highly desirable—are inclined to socially distance themselves and their partners from a novel ovulating (but not nonovulating) female acquaintance. In those studies, women viewed composite photographs taken of target women while ovulating or not (Bobst & Lobmaier, 2012) and also filled out an established mate-guarding measure (e.g., Vaillancourt & Sharma, 2011; Vrangalova et al., 2014). Dependent variables assess partnered women's intentions to selectively and strategically manage potential poachers' access to their mates. We also test candidate mediators of women's mate guarding. Both studies support the hypothesis that women with mates they deem desirable want to keep ovulating women at a distance, and further analyses suggest that this effect is statistically mediated by the perception that ovulating potential interlopers are untrustworthy. Study 2 shows that the observed effect holds even in situations where mating and mate-retention goals are not inherently relevant and the (desirable) partner is not immediately present. This study also suggests that the effect depends on the current psychological salience of women's (highly desirable) partners. Finally, because composite photographs tend to be attractive (e.g., Alley & Cunningham, 1991), Study 3 used noncomposite photographs of attractive and unattractive young women taken at both high and low fertility (Puts et al., 2013), and found that social distancing was evoked only by *physically attractive*, ovulating targets. This study also found that a particular tactic that focuses on the partner rather than the potential poacher—expressing sexual interest in one's partner—is evoked both by attractive and unattractive ovulating targets.

Study 1a: Do Women With (Desirable) Romantic Partners Seek Social Distance From Ovulating Women?

We predict that partnered women—perhaps especially those partnered with men they perceive to be highly desirable—will respond toward ovulating women (but not nonovulating women) with intentions to seek social distance as a means of mate guarding.

We also explore potential mediators of inclinations to socially distance ovulating women. The existing mate guarding literature suggests several candidates. In particular, the perceived trustwor-

¹ We are not suggesting that women consciously evaluate all new potential female friends on some mate-poacher checklist. In fact, we suspect that this threat-detection process frequently occurs outside of awareness, indexed consciously by feelings of distrust or dislike. We are also not suggesting that friendship decisions are driven primarily by concerns related to mate retention, with women befriending only those who score below some threshold of threat. The desire to befriend (or avoid) another is shaped by many variables, as the literature clearly shows. We are suggesting, however, that mate retention concerns—and the role of other women's ovulation cues—play some role in women's prosociality toward other women, particularly when mate retention is more salient (see Study 2).

thinness of other women is central to adaptationist theories of mate guarding, in that it may cue another woman's intent to steal her long-term mate (Bleske & Shackelford, 2001). We also assess perceptions of target physical attractiveness and flirtatiousness, characteristics that might signal that another woman, particularly an ovulating other woman, is especially able and willing to attract male attention (e.g., Vrangalova et al., 2014; Welling & Puts, 2014). Other characteristics (e.g., "friendliness"), although less indicative of the target's intent or ability to mate poach, may also be influenced by target fertility (and/or partner desirability). We include these for exploratory purposes, as well as to test whether biased judgments of target characteristics are specific to certain characteristics or reflect instead a more general tendency to derogate threatening targets.

Method

Participants. Thirty-six engaged or married women were recruited from Amazon's Mechanical Turk (MTurk) online participant platform ($M_{\text{age}} = 34.5$, $SD_{\text{age}} = 11.9$), and were paid for participating.^{2,3}

Procedure, materials, and measures. Participants were told they would be completing a study regarding the accuracy of first impressions. Before the focal task, participants provided demographic information (e.g., gender, age) and completed scales assessing perceptions of both their own and their partner's mate-value (i.e., desirability to the opposite sex). The eight-item Landolt Mate-Value Scale (Landolt, Lalumiere, & Quinsey, 1995) was used to assess participants' self-perceived desirability to the opposite sex (e.g., "Members of the opposite sex are attracted to me"). Items were averaged to form a single composite of self-perceived *mate-value* ($\alpha = .94$). Participants also completed a modified version of the Landolt Mate-Value Scale to assess their perceptions of how sexually desirable their partners are to the opposite sex (e.g., "Other women seem to notice my partner"). Items were averaged to form a single composite of *partner mate-value* ($\alpha = .87$).⁴

In the focal task, participants were randomly assigned to view one of two photographs of "Sara" accompanying a vignette about seeing her at a social event. The two target photographs were created by Bobst and Lobmaier (2012); each photograph is a composite of the faces of the same 25 women, photographed during high fertility (late follicular) and low fertility (luteal) phases of their ovulatory cycles: Urine and saliva samples were used to assess luteinizing hormone, progesterone, and estradiol, thereby confirming cycle phases for the women in the photos. Below either photo of Sara was the same short vignette. In it, participants were asked to imagine themselves at a housewarming party where they saw Sara (the target) and another woman speaking with her partner, with Sara making an ambiguously flirtatious gesture toward him (i.e., laughing and touching his arm).⁵ See Appendix A for the full vignette.

Participants then answered a series of questions, ostensibly dealing with their first impressions of Sara. Items about behavioral inclinations toward distancing themselves and their partners from Sara and questions about their perceptions of Sara were presented in random order. We assessed mate guarding via an established measure (e.g., Vaillancourt & Sharma, 2011; Vrangalova et al., 2014). To assess *self-distancing mate guarding*, whereby participants could partially prevent access to their partners via restricting their own socializing with the target, we averaged responses to the

following items: (a) the amount of contact they would like to have with the target ($-3 = I \text{ wouldn't want any kind of contact to } 3 = I \text{ could see her as a best friend}$); (b) willingness to consider the target a close friend ($-3 = \text{very unwilling to } 3 = \text{very willing}$); and (c) overall impressions of the target ($-3 = I \text{ strongly dislike her to } 3 = I \text{ very much like her}$; $\alpha = .92$). To assess *partner-distancing mate guarding*, we asked participants to rate their willingness to allow the target to befriend their own romantic partner ($-3 = \text{very unwilling to } 3 = \text{very willing}$). All scores were converted to a 1 to 7 scale for ease of reporting. For both self- and partner-distancing mate-guarding, higher scores indicate greater

² Exclusive, committed long-term relationships often imply the reliable and continuous exchange of reproductively relevant resources between relationship partners (i.e., sexual access, resources; e.g., Baumeister & Vohs, 2004; Buss, 2003; Kruger, 2008). Engagements, marriages, or both, may most unequivocally represent the presence of such exclusive, committed long-term relationships, signaling commitment between partners not only to each other but to others as well (e.g., via wedding bands). For women, gaining reliable and continuous access to the additional resources a partner would provide can enhance reproductive fitness (e.g., Buss, 1994; Hurtado, Hill, Hurtado, & Kaplan, 1992; Symons, 1979). Because engaged and married women are likely to have traditionally depended upon the reliable and continuous provisioning of resources from their partners, the threat of mate poaching (and the diversion of partner-provided resources) may be greatest among such women. By contrast, dating relationships imply ambiguous or varying levels of commitment and exclusivity, and partners who are dating may have differing expectations of the extent and form of relationship commitment. Women in dating relationships may thus have heterogeneous expectations about the reliability, exclusivity, and likely duration of partner provisioning. Thus, we focus on engaged and married women here to (a) address a population with unambiguous and largely homogenous levels of exclusivity, commitment, and relationship duration expectations and to (b) examine a population wherein the threat of mate poaching would be greatest.

³ We were unsure as to the proportion of female MTurk workers who were engaged and married. Although we titled our online MTurk survey in such a way as to target recruitment toward those engaged/married women—the study was titled "First Impressions Study 'Engaged/Married Women'"—our experience in targeting recruitment groups via MTurk led us to anticipate participation not only from women who were neither engaged nor married, but also from a few men. (Hence, we included questions of biological sex as well as relationship status. Doing so encourages participant honesty while also allowing us to filter out participants whose participation was not specifically invited.) Study 1a suffers from a small sample size because of a larger than expected participation in the study by those not targeted (e.g., men, single women).

⁴ Women's reported perceptions of their partners' desirability to the opposite sex are likely influenced by their partner's actual, objective desirability to other women. Other relationship factors (e.g., relationship insecurities, partner idealization; e.g., Simpson, Ickes, & Blackstone, 1995) may enhance the felt importance to women of maintaining their relationships and, therefore, also influence reported perceptions of their partners' desirability. We explore the role of relationship insecurities in Study 1b and return to the broader measurement issue in the General Discussion.

⁵ We present Sara as a novel same-sex acquaintance—a woman who occupies the fringes of another woman's social circle (e.g., a friend of friend). A same-sex acquaintance has the potential to be at once a new friend (e.g., she has been "vetted" by an existing friend) and a threatening rival (e.g., her position at the fringe of the social circle could give her increased proximity to one's partner). Exploring how partnered women intend to behave toward such women—wanting to invite them further in or wanting to maintain them further out—is a logical place to begin exploring the question of how women navigate simultaneous affiliative and mate retention goals. Conceivably, women might also be expected to similarly manage their existing relationships with women already present in their social circles (i.e., existing friends). We address this possibility in the General Discussion.

desire for social contact and lower scores indicate greater desire for social distance.

We also assessed participants' perceptions of Sara's characteristics. On 7-point scales, participants indicated how *trustworthy*, *physically attractive*, and *flirtatious* Sara was (1 = *not at all* to 7 = *extremely*). We also explored participants' judgments of Sara as *friendly*, *outgoing*, and *warm* on the same response scale.

Results

To examine the specific hypothesis—that women with partners they perceive as being desirable want to restrict ovulating targets' access to their partners—we regressed each of the mate guarding measures, respectively, onto Target Fertility, Partner Mate-value (centered), and the interaction term.

Self-distancing mate guarding. There were significant main effects of Target Fertility, $t(33) = 3.55, p = .001, \beta = .46$, and Partner Mate-value, $t(33) = -2.95, p = .006, \beta = -.66$. Overall, women wanted greater social distance from the ovulating target, and women with more desirable partners also wanted greater social distance from the target. The Target Fertility \times Partner Mate-value interaction was also significant, $t(33) = 3.63, p = .001, \beta = .81$.

Following Aiken and West (1991), we probed the interaction at 1 *SD* above and below the mean of partner mate-value. As expected, women with highly desirable partners wanted greater social distance from the ovulating target (predicted $M = 2.15$) than from the non-ovulating target (predicted $M = 4.83$), $t(33) = 5.01, p < .001, \beta = .97$. For women with lower mate-value partners, there was no such difference, $t(33) = -0.22, p = .827, \beta = -.42$ (see Figure 1a). Women's mate guarding intentions were selectively deployed: only women partnered to desirable men (toward whom ovulating women are likely to direct their interests) wanted social distance from the ovulating (but not the nonovulating) target.

Women who themselves have lower self-perceived mate-value may be particularly concerned about the loss of their long-term partner, the poaching inclinations and ability of ovulating women, or both. It is also possible that women's perceptions of their partners' mate-value serve as a proxy for a participant's own mate-value, given assortative partnering between men and women.

Therefore, we also ran a regression model using self-perceived mate-value, target fertility, and their interaction. Self-perceived mate-value and the interaction term each failed to reach significance ($ps > .17$). Moreover, including self-perceived mate-value in a regression model with partner mate-value, target fertility, and their interaction did not render nonsignificant the Target Fertility \times Partner Mate-value interaction. The effects of target fertility and partner mate-value on social distancing were not attributable to participants' own mate value.

Partner-distancing mate guarding. Participants also reported their inclinations toward specifically keeping Sara away from their partners. Although the pattern for this measure matched that found for the more indirect measure of self-distancing (see Figure 2a), the Target Fertility \times Partner Mate-value interaction was not significant ($p = .34$), nor were the main effects of Fertility or Partner Mate-value.

Specific target characteristics. We hypothesized that perceptions of target (un)trustworthiness, attractiveness, and flirtatiousness might mediate partnered women's desires for social distance from potential poachers. Thus, we first tested whether each of these perceived characteristics—as well as exploratory characteristics of friendliness, outgoingness, and warmth—differed as a function of Sara's fertility and participants' partner's mate-value. Later, aggregating across the samples from Studies 1a and 1b to maximize power, we formally test these as statistical mediators.

Trustworthy. In addition to significant main effects of Target Fertility, $t(33) = 3.62, p = .001, \beta = .50$, and Partner Mate-value, $t(33) = -2.69, p = .011, \beta = -.63$, there was a significant Target Fertility \times Partner Mate-value interaction, $t(33) = 2.55, p = .015, \beta = .60$. Echoing the patterns of data for social distancing, women with highly desirable partners perceived the ovulating Sara (predicted $M = 2.11$) as less trustworthy than the nonovulating Sara (predicted $M = 4.45$), $t(33) = 4.28, p < .001, \beta = .87$. There was no difference for women with less desirable partners (predicted $M_{ovulating} = 3.84$; predicted $M_{nonovulating} = 4.17$), $t(33) = 0.62, p = .537, \beta = .12$.

Physically attractive. A woman's physical attractiveness is one cue of her ability (but not her intent) to successfully poach another's mate. There were, however, no significant effects of Target Fertility,

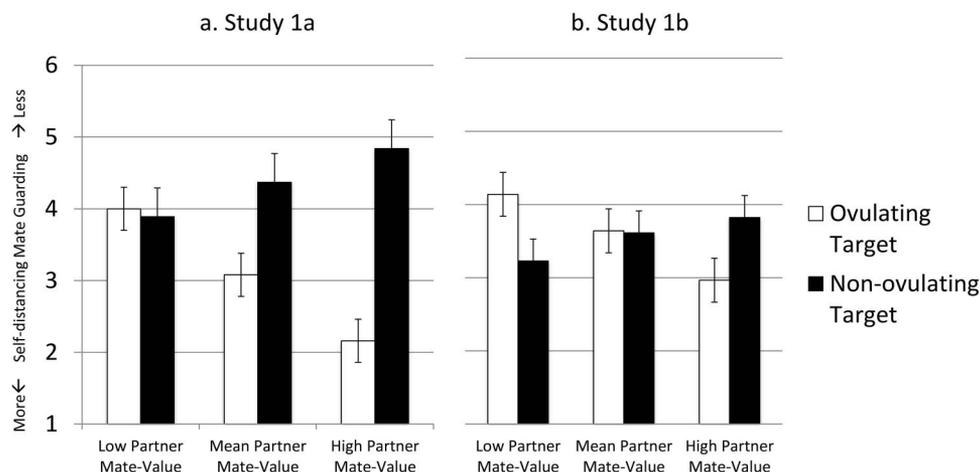


Figure 1. Women's self-distancing mate guarding in Study 1a (a) and 1b (b). Error bars represent *SEs*.

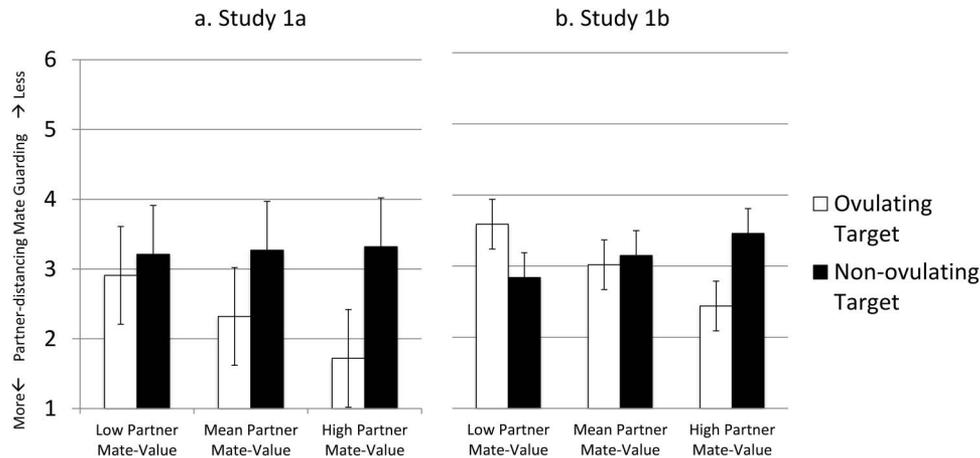


Figure 2. Women's partner-distancing mate guarding in Study 1a (a) and 1b (b). Error bars represent SEs.

Partner Mate-value, or their interaction on perceived attractiveness ($ps > .26$). Although women with desirable partners wanted social distance from the ovulating Sara, it did not appear to be because ovulatory status enhances their perception of her physical attractiveness. We note, however, that composite faces tend to be viewed as highly attractive (e.g., Alley & Cunningham, 1991), perhaps reducing our ability to detect subtle shifts in attractiveness as a function of ovulation. We explore, more generally, the role of target attractiveness on mate guarding in Study 3.

Flirtatious. A woman's flirtatiousness is another potential indicator of her interest in one's partner, and skilled flirtation can increase a woman's effectiveness in enticing a man as well. There was a marginally significant main effect of Target Fertility, $t(33) = -1.87, p = .070, \beta = -.29$; women saw ovulating Sara (predicted $M = 5.74$) as marginally more flirtatious than nonovulating Sara (predicted $M = 4.90$), in line with Bobst and Lobmaier's (2012) finding that male participants rated the ovulating composite as more flirtatious. There was also a marginally significant main effect of Partner Mate-value, $t(33) = 1.83, p = .076, \beta = .48$; women with partners they perceived as more attractive saw Sara as more flirtatious. There was not, however, a significant interaction, suggesting that perceived flirtatiousness was not a mediator of the inclination of women with desirable mates to socially distance themselves from ovulating others.

Friendly, outgoing, and warm. No interaction effects were significant for any of these other characteristics ($ps > .38$). When ovulating targets evoked women's intentions to mate guard, it did not appear to be because they believed the ovulating targets possessed less desirable friendship qualities, in general.

Discussion

Study 1a tested the hypothesis that women—perhaps especially those with partners they believe to be highly desirable, for whom ovulating other women may present an especially credible threat to mate retention—would seek greater social distance between themselves and ovulating (but not nonovulating) targets. This hypothesis was supported, and held regardless of the partnered women's own mate-value. Despite the assumed inclination of both high and low mate-value men to experience increased attraction to women at peak

fertility, research suggests that, near ovulation, women's attractions increase only to men with markers of genetic quality (men who are in one way highly desirable). That only women partnered with men they view as highly desirable exhibited distancing responses to ovulating women suggests that women calibrate to the credibility of the potential mate retention threat. This sensitive calibration would seem well-placed, given that the potential opportunities female–female relationships afford cannot be realized when women avoid one another. To sacrifice such opportunities when mate poaching is unlikely could be quite costly.

To the extent that distancing oneself can keep potential mate poachers out of a woman's own social circle and thus, importantly, her partner's, distancing potential poachers would seem to be a subtle and covert means of facilitating a partner's continued fidelity and investment. That there was no statistically significant desire to engage in more direct means of keeping desirable partners and potential poachers apart was surprising. We note, however, that the observed pattern for direct mate guarding was the same as that for the indirect, social distancing measure, and that the sample was unintentionally small (see Footnote 3). In Study 1b, we again test the potential role of direct mate guarding, doing so in a larger sample.

What inferences do partnered women make about ovulating women that potentially mediate their desires to create social distance? Trustworthiness emerged as a strong candidate, with partners of men seen as desirable rating the ovulating target as less trustworthy. This finding is consistent with Bleske and Shackelford's (2001) hypothesis that individuals are inclined to invite into their social circles only those persons they believe can be trusted not to poach long-term partners (and to avoid those perceived as potentially untrustworthy on this dimension). We explore this further in Study 1b.

Study 1b: Do Women in Committed Relationships With Sexy Men Seek Social Distance From Ovulating Targets?

In Study 1b, we retested our hypotheses using a larger sample size. Moreover, we used an alternative operationalization of partner desirability—specifically, partner sexiness.

For men, desirability to the opposite sex may comprise multiple and somewhat distinct factors. Specifically, when seeking a po-

tential long-term partner, women are known to place high importance on a man's kindness, intelligence, and resources, but not necessarily his physical attractiveness (Buss, 1989; Li, Bailey, Kenrick, & Linsenmeier, 2002). By contrast, ovulating women are especially attracted to the positive affordances that short-term pairings with attractive, symmetrical, masculine-looking, and socially dominant (i.e., so-called sexy) men present (i.e., Cantu et al., 2014; Gangestad et al., 2007, 2004; Gangestad & Thornhill, 2008). In Study 1b we complement the previously used partner mate-value measure, which assesses a woman's perceptions of her partner's overall desirability to other women, with a measure of her perceptions of her partner's sexiness to other women.

Relatedly, we also address a second possible alternative explanation for our findings. One might argue that women partnered to men they rate as being especially desirable to the opposite sex may be more insecure about their relationships (e.g., these women may think that they care more about their romantic partners than those partners care about them). Perhaps, then, such women are especially worried about their high mate-value partners abandoning the relationship. Thus, women partnered with high mate-value men may be particularly likely to engage in mate-guarding behavior. Study 1b assesses women's worries about their romantic relationships to investigate whether the pattern seen in Study 1a is limited to individuals insecure about their relationships.

Method

Participants. There were 101 heterosexual engaged or married women from the MTurk online participant platform ($M_{\text{age}} = 33.6$, $SD_{\text{age}} = 11.1$) who took part in this study in return for compensation. Some participants failed to fill out focal items, leaving 95 women in our analyses.⁶

Procedure and materials. We replicated the procedure for Study 1a, adding an additional, complementary measure of partner desirability—partner sexiness—before participants reported judgments of focal traits and then completed the mate guarding measures. Participants also responded to a scale assessing their attachment to and security in their relationships with their partners.

Partner sexiness. We created a scale to assess how sexy a woman believes other women might find her romantic partner. Specifically, we asked, “How do you think another woman, upon just meeting your partner, would rate him on: *physical attractiveness, sexiness, masculinity, and dominance*”—all traits that women find especially attractive at high-fertility (reviewed in Gildersleeve, Haselton, & Fales, 2014). These four ratings were completed on 7-point scales (1 = *not at all* to 7 = *extremely*) and were averaged to form a single composite ($\alpha = .85$).

Relationship insecurity. To test the possibility that attachment anxiety (i.e., fear of rejection and abandonment by a current partner) might be driving mate guarding inclinations by women perceiving themselves to have desirable partners, we had participants fill out the 36-item Experiences in Close Relationships-Revised (ECR-R; Fraley, Waller, & Brennan, 2000) questionnaire measuring adult attachment—particularly one's romantic attachment anxiety (*Anxiety*; e.g., “When my partner is out of sight, I worry that he or she might become interested in someone else”), but also one's willingness to become close to her partner (*Avoidance*; e.g., “I find it difficult to allow myself to depend on romantic partners”). Participants here were instructed to think about their

specific, current romantic relationships when responding to each item, as measured on 7-point Likert scales (1 = *strongly disagree* to 7 = *strongly agree*). The 18 *Anxiety* items and the 18 *Avoidance* items were all presented in random order, and these subscales were each separately averaged to form composites ($\alpha = .92$ and $\alpha = .86$, respectively).

Results

Self-distancing mate guarding. As in Study 1a, we found a significant main effect of Partner Mate-value, $t(91) = -2.86$, $p = .005$, $\beta = -.45$, such that higher partner mate-value was associated with greater self-distancing intentions. As expected, this effect was qualified by the Target Fertility \times Partner Mate-value interaction, $t(91) = 2.86$, $p = .005$, $\beta = .44$.

We probed the interaction at 1 *SD* above and below the mean of partner mate-value. As predicted, women with partners they viewed as highly desirable wanted greater self-distance from the ovulating target (predicted $M = 2.96$) than from the nonovulating target (predicted $M = 3.82$), $t(91) = 1.99$, $p = .049$, $\beta = .28$. This was reversed for women with lower mate-value partners, who preferred less social distance from the high-fertility target (predicted $M = 4.31$) than from the low-fertility target (predicted $M = 3.40$), $t(91) = -2.05$, $p = .043$, $\beta = -.30$ (see Figure 2a).

This pattern largely replicates for the partner sexiness predictor. Regressing target fertility, partner sexiness, and the interaction term onto our measure of direct mate guarding, we found a significant main effect of Partner Sexiness, $t(91) = -3.35$, $p = .001$, $\beta = -.48$, such that higher partner sexiness was associated with greater self-distancing intentions. We also observed the predicted Target Fertility \times Partner Sexiness interaction, $t(91) = 2.44$, $p = .017$, $\beta = .35$: Whereas women with highly sexy partners desired marginally more social distance from an ovulating Sara (predicted $M = 2.81$) than a nonovulating Sara (predicted $M = 3.56$), $t(91) = 1.79$, $p = .077$, $\beta = .25$, women with less sexy partners exhibited no such inclination (predicted $M_{\text{ovulating}} = 4.28$; predicted $M_{\text{nonovulating}} = 3.57$), $t(91) = -1.66$, $p = .101$, $\beta = -.23$. Whether operationalized as being of high mate-value or as being highly sexy, women with partners they judged as highly desirable wanted more social distance between themselves and the ovulating (but not nonovulating) target.

Partner-distancing mate guarding. As in Study 1a, we regressed our second measure of mate guarding—participant inclinations toward keeping the target away from their partners—on target fertility, partner mate-value, and the interaction term. Replicating the pattern found in Study 1a, there was a significant main effect of Partner Mate-value, $t(91) = -2.08$, $p = .040$, $\beta = -.33$, such that higher partner mate-value was associated with greater partner-distancing intentions. Consistent with the pattern of data from Study 1a, this was qualified by a significant interaction of Target Fertility \times Partner Mate-value, $t(91) = 2.46$, $p = .016$, $\beta = .39$. As predicted, women with highly desirable partners reported greater desires to keep the ovulating target (predicted $M = 2.44$) versus the nonovulating target (predicted $M = 3.46$) away from

⁶ As with Study 1a, although we titled our online MTurk survey in such a way as to target recruitment toward engaged or married women, we anticipated and received participation from nontargeted women and men. See Footnote 3.

their partners, $t(91) = 2.04, p = .044, \beta = .29$. Women with lower mate-value partners showed no such difference (predicted $M_{ovulating} = 3.59$; $M_{nonovulating} = 2.84$), $t(91) = -1.42, p = .150, \beta = -.22$; see Figure 2b.

This pattern also largely replicated when substituting partner sexiness for partner mate-value. There was a significant main effect of Partner Sexiness, $t(91) = -3.52, p = .001, \beta = -.51$, such that higher partner sexiness was associated with greater partner-distancing intentions, and this was again qualified by the predicted Target Fertility \times Partner Sexiness interaction, $t(91) = 2.53, p = .013, \beta = .36$: Whereas women with partners they judged to be highly sexy desired more partner distancing from the ovulating target (predicted $M = 2.08$) than the nonovulating target (predicted $M = 3.07$), $t(91) = 2.08, p = .041, \beta = .28$, women with less sexy partners showed no such pattern (predicted $M_{ovulating} = 3.83$; predicted $M_{nonovulating} = 3.10$), $t(91) = -1.51, p = .136, \beta = -.21$. This, too, largely replicates the pattern found—using an alternative operationalization of partner desirability—in Study 1a.

Relationship insecurity. To determine whether self-reports of relationship attachment insecurity influenced women's mate guarding, we first asked if target fertility affected Anxiety or Avoidance scores. As it did not ($ps > .64$), we included Anxiety and Avoidance in regression models with partner mate-value (or partner sexiness), target fertility, and the resultant interaction term. For models predicting self-distancing mate-guarding, the effect of Anxiety was marginally significant when using partner mate-value, $t(92) = -1.92, p = .058, \beta = -.24$, or partner sexiness, $t(92) = -1.72, p = .089, \beta = -.22$, such that greater worry over a partner leaving the relationship was linked to increased desires to distance oneself from target women. Avoidance did not reach significance for models predicting self-distancing mate guarding, and, for models predicting partner-distancing mate guarding, neither Anxiety nor Avoidance reached significance ($ps > .28$). More important, in no regression model did the inclusion of Anxiety or Avoidance render the focal Target Fertility \times Partner Mate-value nonsignificant, suggesting that this interaction was robust against women's possible worries about their relationships.

Specific target characteristics. To test for candidate mediators to account for the inclination of women with desirable partners to distance themselves and their partners from ovulating others, we ran the same regressions on ratings of the target's characteristics as in Study 1a.

Trustworthy. "Trustworthy" ratings of the target followed the same pattern as those from Study 1a—that women with high mate-value partners rated the ovulating target as less trustworthy—although, here, the overall Target Fertility \times Partner Mate-value interaction was not statistically significant, $t(90) = 1.59, p = .115, \beta = .26$. However, women with very desirable partners did again judge the ovulating target (predicted $M = 3.33$) as significantly less trustworthy than the nonovulating target (predicted $M = 4.20$), $t(90) = 2.15, p = .034, \beta = .31$, and there were no such differences for women with less desirable partners (predicted $M_{ovulating} = 3.65$; predicted $M_{nonovulating} = 3.59$), $t(90) = -.13, p = .894, \beta = -.02$.

Similarly, although the overall Target Fertility \times Partner Sexiness interaction was not significant ($p = .23$), women with highly sexy partners rated the ovulating target (predicted $M = 3.18$) as

marginally significantly less trustworthy than the nonovulating target (predicted $M = 3.89$), $t(90) = 1.77, p = .080, \beta = .26$, and there were no differences for women with less desirable partners (predicted $M_{ovulating} = 3.78$; predicted $M_{nonovulating} = 3.79$), $t(90) = 0.34, p = .973, \beta = .01$.

Physically attractive. In Study 1a, unlike previous research demonstrating that both men and women rate targets as more attractive near peak fertility, there were no significant effects of target fertility or partner mate-value on ratings of the target's physical attractiveness. Here, however, there was a significant Target Fertility \times Partner Mate-value interaction, $t(90) = 2.22, p = .029, \beta = .35$. The simple effects for attractiveness ratings were not significant among women with either higher-desirability partners, $t(90) = .156, p = .122, \beta = .23$, or lower-desirability partners, $t(90) = -1.58, p = .117, \beta = -.24$, although this pattern was different than what one might expect, and quite different than the patterns observed for our mate guarding measures. Specifically, the pattern indicated that women with less desirable partners found ovulating (vs. nonovulating) targets more attractive, and women with more desirable partners found ovulating (vs. nonovulating) targets less attractive.

Similarly, when substituting partner sexiness for partner mate-value, we found a significant main effect of Partner Sexiness, $t(90) = -3.40, p = .001, \beta = -.48$, such that higher partner sexiness was associated with lower target attractiveness scores. We also observed a Target Fertility \times Partner Sexiness interaction, $t(90) = 3.57, p = .001, \beta = .50$. Women with highly sexy partners perceived the ovulating target (predicted $M = 4.23$) as *less* attractive than the nonovulating target (predicted $M = 5.27$), $t(90) = 2.49, p = .015, \beta = .34$, whereas women with less sexy partners perceived the ovulating target (predicted $M = 5.67$) as *more* attractive than the nonovulating target (predicted $M = 4.61$), $t(90) = -2.53, p = .013, \beta = -.36$. In concert with results from Study 1a, these findings further suggest that judgments of the ovulating target's physical attractiveness are unlikely to have mediated our participants' mate guarding inclinations.⁷

Flirtatious. There were no significant effects of target fertility, partner mate-value or sexiness, or their interaction on perceived flirtatiousness ($ps > .31$), again suggesting that judgments of Sara's flirtatiousness are unlikely to mediate women's target-directed mate guarding.

Tests of mediation. The mate guarding and ovulation literatures suggest a number of trait-level judgments that might account for the effect of target fertility on women's social distancing, including inferred (un)trustworthiness, increased physical attractiveness, and increased flirtatiousness. The results of Studies 1a and 1b indicate that physical attractiveness and flirtatiousness are not suitable mediators of this phenomenon, at least given our findings, as they did not show similar patterns to those seen for the mate-guarding measures. Our findings do suggest, however, that

⁷ Given that women who are perceived to be apt mate poachers may be more likely to face derision from other women, a possible explanation for this finding is that women are rating those targets they perceive as more apt mate poachers (i.e., ovulating women) as being lower in physical attractiveness as a means of derogating those targets. If so, this bolsters the argument that ovulating women incur selective intrasexual aggression, perhaps particularly from those other women by whom they are perceived to pose the greatest threats.

trustworthiness remains a potential candidate, as women with highly desirable partners tended to judge the ovulating target as less trustworthy than the nonovulating target. Thus, we performed a moderated-mediation analysis (Hayes, 2012) in which we tested whether participant ratings of target trustworthiness mediated our mate guarding measures (see Figure 3). The patterns of findings from Studies 1a and 1b were highly similar on the relevant measures, so to enable a more powerful test we aggregated across the two data sets for these analyses. Also, given that partner mate-value (but not partner sexiness) was measured in both studies, we used that variable in the following analyses.

Following Preacher and Hayes (2008), we estimated the *SD* of the indirect effect of our fertility manipulation on seeking distance between oneself and the potential poacher at 1 *SD* above and below the mean of partner mate-value for 5,000 bootstrapped samples. The indirect effect of the Fertility Status \times Partner Mate-value interaction was estimated to lie between .02 and .63 with 95% confidence interval (CI; $\beta = .30$, $SE = 0.15$). Because zero was not included in the 95% CI, this analysis demonstrates significant moderated mediation. At 1 *SD* above the mean (high partner mate-value), the indirect effect was estimated to lie between .28 and 1.55 with 95% CI ($\beta = .86$, $SE = 0.32$). At 1 *SD* below the mean (lower partner mate-value), the indirect effect was estimated to lie between $-.37$ and .48 with 95% CI ($\beta = .06$, $SE = 0.21$). The Target Fertility \times Partner Mate-value interaction altered participants' ratings of target trustworthiness, which, in turn, predicted participants' desire to maintain social distance between the high-fertility target and themselves.

We also tested this same moderated-mediation model for our measure of direct mate guarding—the desire to keep the target specifically away from one's partner. The indirect effect of the highest order interaction was estimated to lie between .03 and .66 with 95% CI ($\beta = .31$, $SE = 0.16$). At 1 *SD* above the mean (high partner mate-value), the indirect effect was estimated to lie between .32 and 1.68 with 95% CI ($\beta = .90$, $SE = 0.34$). At 1 *SD* below the mean (lower partner mate-value), the indirect effect was estimated to lie between $-.35$ and .50 with 95% CI ($\beta = .06$, $SE = 0.22$). The Target Fertility \times Partner Mate-value interaction altered participants' ratings of target trustworthiness, which, in turn, predicted participants' desire to maintain social distance between one's partner and the target.

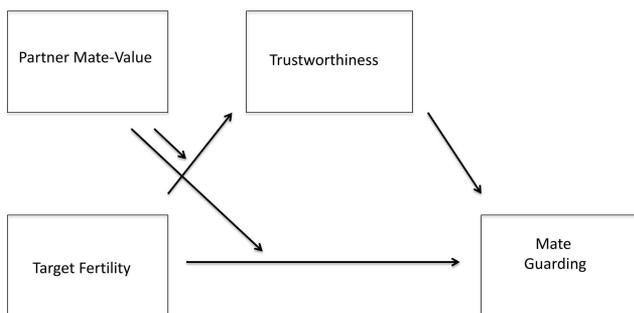


Figure 3. Posited moderated-mediation model. Women with highly desirable partners see ovulating targets as less trustworthy and, in turn, report intentions to distance ovulating targets from themselves and their partners.

Discussion

In Study 1b, we replicated and extended our main findings from Study 1a. Using a larger sample, we again showed that women with partners they perceive to be highly desirable wanted to distance ovulating targets. The pattern of findings largely replicated with an alternative operationalization of partner desirability (partner sexiness). Although the effect of partner mate-value and its interaction with target fertility only significantly predicted direct mate guarding here in Study 1b, the patterns and effect sizes are similar in both 1a and 1b; we present later an internal meta-analysis that demonstrates the reliability of these findings across all four reported replications.

One could reason that a woman's own mate-value might drive her mate-guarding intentions. However, in Study 1a, we found that these effects were robust against a woman's own mate-value. Similarly, one could reason that a woman's anxiety over the possible dissolution of her relationship (i.e., her high mate-value partner leaving her) might drive her mate-guarding intentions, but in Study 1b we found that these effects were also robust against a woman's relationship-related attachment anxiety (and avoidance).

Moreover, we again found that women with partners perceived to be highly desirable viewed the ovulating target as less trustworthy than the nonovulating target, and moderated mediation analyses revealed that these women's desire to distance ovulating targets from both themselves and their partners was mediated by perceptions of target (un)trustworthiness. The observed role of inferred trustworthiness is consistent with adaptationist theorizing on mate guarding (Bleske & Shackelford, 2001; Vrangalova et al., 2014), and with the literature on women's same-sex friendships, wherein trustworthiness of current and potential friends is of primary importance (e.g., Campbell, 2002).

Study 2: Contextual Costs and Benefits of Women's Social Distancing

By distancing themselves and their partners from seemingly credible poachers, women may reap the benefits of mate retention but at the costs of missing out on the benefits of affiliation. Mate retention efforts may be costly in other ways as well. For example, constantly scanning one's environment for potential interlopers consumes limited time and energy that one could otherwise deploy in pursuit of alternative and important goals (e.g., resource acquisition, childcare). Thus, women might engage a mate-guarding psychology selectively, and, indeed, the findings from Studies 1a and 1b—in which distancing was primarily directed only toward women who were ovulating and only by women with highly desirable partners—suggests that women are sensitive not only to what they might gain from social distancing but also to what they might lose. Whereas Studies 1a and 1b focused on how interpersonal perceptions of both target fertility and partner desirability influence a woman's inclinations toward other women, Study 2 focuses on the effects of more contextual factors: Both the situational context in which one encounters potential interlopers and the psychological salience of one's male partner might be expected to influence women's mate-guarding propensities.

Consider two features of the procedure from Studies 1a and 1b: First, participants 'encountered' the ovulating target in a situation that was inherently social (a party) and in which their highly

desirable mates were present. Second, participants had been asked to evaluate their partners' desirability and/or sexiness just before imagining their encounters with the target. It may be that these conceptually relevant considerations—a context that is inherently social, in which the potential poacher is seen to have access to one's highly desirable mate, and when the features of this mate are highly salient—aligned to create an especially great inclination toward mate guarding.

Under ancestral living arrangements, the phenomenon observed in Studies 1a and 1b may have been robust against changes in context; the women with whom one might forage or cooperatively rear children by day would have retired to the same small, multisex group area by night. Thus, cues observed in one setting suggesting that a woman might pose a mate-poaching threat would likely have been relevant to one's other life settings as well. We might therefore expect this inclination for women with highly desirable mates to distance themselves from ovulating women to hold across a range of settings. In contrast, modern women join the workforce in ever increasing numbers, and the women they work with are often not the same women to whom their partners are exposed. One might argue, then, that engaging in social distancing in the workplace is likely to be have relatively little payoff. The benefits of keeping a potential rival at arm's length only outweigh the costs of vigilance and potential lost opportunities when that rival could conceivably encounter and poach one's partner—and this is relatively unlikely when a potential mating rival exists only at one's workplace. Thus, whereas it might prove more beneficial for a woman with a desirable partner to distance both that partner and herself from an ovulating woman when attending a party, it might make less sense for this woman to act coolly to an ovulating woman whom she meets at work.

Moreover, social situations afford multiple challenges and opportunities—mate retention is only one of them and, perhaps, usually not the most important of them at any moment. Holding constant a potential competitor's access to one's partner, mate-guarding inclinations may be more likely to the extent that thoughts of one's mate are salient. Such thoughts are often made salient, especially in social settings, for instance when information about one's partner is shared with others in conversation. So in the absence of contextual cues of mate-retention threat—such as a woman in physical proximity to and physically touching one's partner, which were present in previous vignettes—and in the absence of reminders of one's (desirable) partner, one might not expect otherwise threatening rivals to evoke women's mate guarding psychology. In contexts, then, that do not readily indicate either partner-access or mate-poaching threat—like modern workplaces—the engagement of a mate-guarding psychology may require that one's (desirable) partner already be salient in mind. We investigate these possibilities in Study 2.

For Study 2, we first modified the vignette, removing references to participants' partners and explicit cues of mate-poaching threats. Specifically, this new vignette places the participant and the female target in a workplace. Whereas in the previous "party" vignette the target was ambiguously flirtatious, in the new vignette, the target was a coworker with no immediate proximity or acquaintanceship with the participant's partner. Moreover, we presented the target as a fellow new hire in the workplace, thereby enhancing the likelihood that she might even be viewed as a potential ally. We also explicitly placed the target in a different

department so that there would be no indications that the women would have to compete for promotions and the like. Additionally, we randomly assigned half the participants to complete the partner mate-value scale *before* giving their first impressions of the target and half to complete the partner mate-value scale only *after* giving their first impressions of the target, thereby systematically varying the psychological salience of the partner and his mate-value. If women's mate-guarding psychology is especially evoked when one's partner is salient, only those participants with desirable partners who fill out the partner mate-value scale before the first impressions task will seek distance from the (ovulating) target.

Method

Participants. There were 173 heterosexual engaged or married women from the MTurk online participant platform ($M_{\text{age}} = 39.45$, $SD_{\text{age}} = 12.65$) who took part in this study in return for compensation. Some of these participants failed to fill out all variables; for each item, all participants who completed the item are included in analyses.

Procedure and materials. The procedure followed that of Studies 1a and 1b, with the following changes. Half of the participants followed the earlier procedure and were randomly assigned to fill out demographic information first, including partner desirability questions, before completing the "first impression" task (*partner-salient condition*); the other participants first performed the first-impressions task before filling out demographic variables, including partner mate-value (*partner not-salient condition*).

As in Studies 1a and 1b, the first impressions task involved participants viewing either the ovulating or nonovulating photo of Sara, reading a vignette, and responding to the focal mate guarding questions. The new "workplace" vignette did not mention the participant's partner and did not make salient any potential mate-poaching inclinations of Sara. Instead, we asked the participant to imagine herself at an office luncheon where both she and Sara were new employees—ones in different departments and noncompetitors with one another. At this luncheon, Sara was chatting with the participant's male coworker at the other side of the table (see [Appendix B](#))

Mate guarding. As in previous studies, we measured both self-distancing mate guarding (i.e., the extent to which participants wanted to distance Sara) and partner-distancing mate guarding (i.e., the extent to which participants wanted to distance Sara specifically from their partners).

Results

Self-distancing mate guarding. We regressed desires for social distance onto Target Fertility, Partner Mate-value, Partner Salience, and the resultant interaction terms. We found a significant three-way interaction, $t(165) = 2.94$, $p = .014$, $\beta = .19$. (No other interactions or main effects reached significance; $ps > .105$.) We replicated our findings from Studies 1a and 1b among women whose partner concept was made salient, finding a significant Target Fertility \times Partner Mate-value interaction, $t(75) = 2.62$, $p = .011$, $\beta = .28$. As predicted, women with desirable partners preferred greater social distance from the ovulating target (predicted $M = 4.39$) than the nonovulating target (predicted $M = 5.31$), $t(75) = 2.71$, $p = .008$, $\beta = .43$, whereas women with less

desirable partners preferred similar distances from the ovulating and nonovulating targets, (predicted $M_{ovulating} = 4.87$; predicted $M_{nonovulating} = 4.52$), $t(75) = -1.03$, $p = .308$, $\beta = -.16$.

By contrast, among women whose partner concept was not made salient, no variable emerged as a significant predictor of indirect mate guarding ($ps > .29$), suggesting that women do not automatically engage mate-guarding intentions, even when thinking about ovulating coworkers; in this study, the salience of one's (desirable) mate was a prerequisite for evoking the intention to indirectly mate guard.

Partner-distancing mate-guarding. There was a significant interaction of Partner Mate-value and Partner Salience, $t(164) = -2.09$, $p = .038$, $\beta = -.16$, and also a significant three-way interaction of Target Fertility, Partner Mate-value, and Partner Salience, $t(164) = 2.14$, $p = .033$, $\beta = .16$. Among women whose partners were made salient, we again replicated our findings from Studies 1a and 1b, as revealed by a significant Target Fertility \times Partner Mate-value interaction, $t(75) = 2.74$, $p = .008$, $\beta = .30$. As predicted, whereas women with highly desirable partners had a stronger desire for social distance between their partners and the target when she was ovulating (predicted $M = 3.28$) than when she was not (predicted $M = 4.81$), $t(75) = 2.90$, $p = .005$, $\beta = .46$, women with lower mate-value partners showed no such preference (predicted $M_{ovulating} = 3.94$; predicted $M_{nonovulating} = 3.41$), $t(75) = -1.02$, $p = .313$, $\beta = -.16$. By contrast, for those women whose partners were not made salient, no variables (or their interactions) emerged as significant predictors ($ps > .20$).

Trustworthiness. There was a significant main effect of Target Fertility, $t(165) = 2.80$, $p = .006$, $\beta = .20$, such that nonovulating targets were seen as more trustworthy than ovulating targets. There was also a significant interaction of Target Fertility and Partner Mate-value, $t(165) = 2.58$, $p = .011$, $\beta = .14$, replicating the pattern found in previous studies, a significant interaction of Partner Mate-value and Partner Salience, $t(165) = -2.87$, $p = .005$, $\beta = -.21$, and a marginally significant interaction of Target Fertility and Partner Salience, $t(165) = 1.96$, $p = .051$, $\beta = .14$. These were qualified, however, by a significant three-way interaction, $t(165) = 3.52$, $p = .001$, $\beta = .25$.

Among women whose partners were made salient, we found a significant Target Fertility \times Partner Mate-value interaction, $t(75) = 4.21$, $p < .001$, $\beta = .42$, as well as significant main effects of Target Fertility, $t(75) = 2.92$, $p = .005$, $\beta = .29$, and Partner Mate-value, $t(75) = -2.41$, $p = .018$, $\beta = -.24$. As seen in Studies 1a and 1b, women with highly desirable partners perceived the ovulating target (predicted $M = 2.67$) as less trustworthy than the nonovulating target (predicted $M = 4.50$), $t(75) = 5.04$, $p < .001$, $\beta = .72$, whereas women with less desirable partners exhibited no differences in perceptions of the target's trustworthiness, (predicted $M_{ovulating} = 4.21$; predicted $M_{nonovulating} = 3.87$), $t(75) = -0.96$, $p = .342$, $\beta = -.14$. For women whose partners were not made salient, no variable reached significance ($ps > .11$).

Discussion

Studies 1a and 1b showed that women's inclinations to mate guard were sensitive to factors signaling other women's potential threat credibility: Potential poachers who were ovulating and had access to one's (desirable) partner were especially likely to be

socially distanced. Study 2 showed that women's mate guarding was selectively deployed as a function of another factor as well; when contextual factors rendered mate poaching unlikely, women's mate-guarding intentions depended on how psychologically salient their (desirable) partners were.

Today's coworkers often have little contact with each other's mates, meaning that the threat of mate poaching is presumably low—certainly lower than at a social gathering wherein one's partner is chatting with the possible poacher (Studies 1a and 1b). In such a context, our participants partnered to desirable men wanted distance from ovulating women only when their own partners were already on their minds. In ancestral contexts, only rarely could women be sure that their partners and the women with whom they shared daily activities would naturally be kept apart. Mate retention required both vigilance and action. In modern contexts wherein segregation of one's mate from other women is a greater possibility, however, one might expect mate guarding vigilance to be less acute; after all, the costs of avoiding a potential ally in modern work contexts are likely to outweigh the benefits resulting from (likely unnecessary) mate-guarding efforts. It is interesting that even this relatively low-threat environment can engage women's mate guarding, as long as their (desirable) partners are on their minds at the time. It seems that having high mate-value partners be psychologically salient can calibrate women's threat-detection and management systems to be sensitive to even low levels of actual risk.

Study 3: Physical Attractiveness and Partner-Directed Mate Guarding

The previous studies demonstrated that women's mate guarding is sensitive to the credibility of a potential threat, as revealed by women's use of another woman's ovulatory status and their own partner's desirability to calibrate their use of social distancing. In Study 3, we explore an additional cue suggesting that another woman poses a credible mate-poaching threat—her physical attractiveness.

In general, women perceive physically attractive targets to be especially credible rivals for their romantic partners (e.g., Vaillancourt, 2013). Not only do men seek physical attractiveness in a female partner, but more desirable men seek more attractive women (e.g., Alvarez & Jaffe, 2004; Buss, 1988; Thiessen & Gregg, 1980). Unattractive women may be perceived as less credible threats. Given the benefits of female–female relationships (and costs of unnecessarily distancing oneself from those potential benefits), unattractive (ovulating) women may fail to evoke partnered women's desires for social distance.

In Studies 1–2, we used facial morphs of 25 women while ovulating versus not. Because morphed faces—whether ovulating or not—tend to be physically attractive (e.g., Alley & Cunningham, 1991), those faces do not allow us to test this attractiveness hypothesis. Thus, Study 3 uses photographs of real (nonmorphed) women varying in physical attractiveness, taken at peak and low fertility. If women use the physical attractiveness of others—especially those who might otherwise be deemed credible poachers (i.e., ovulating others)—to calibrate their mate-guarding inclinations, then we predict that we will replicate our findings from previous studies: Partners of desirable men will seek social distance from ovulating targets, especially when those targets are

attractive. We also considered the possibility that, because highly desirable men tend to have higher expectations for physical attractiveness in a mate, and thus, may have little interest in unattractive women, women with highly desirable partners would not view physically unattractive women as a potential threat. Our findings may be able to differentiate these possibilities.

Study 3 additionally investigates a different tactic women may use to facilitate mate retention when confronted by a potentially threatening rival. Successful mate retention means solving two primary challenges—avoiding partner poaching (our focus to this point) and maintaining partner investment (e.g., Buss, 1988). Here, we additionally explore a tactic geared toward retaining partner investment—engaging in sexual activity with one's partner. Specifically, we raise the possibility that, when faced with a credible rival for their partner's attentions, women's sexual interest in their desirable partners might increase. Increased sexual interest could serve mate retention in two ways. First, it could strengthen the relationship bond by increasing a partner's interest (e.g., Grebe, Gangestad, Garver-Apgar, & Thornhill, 2013), perhaps, for instance, as by indicating that the man's mating effort will likely be rewarded or by cuing the woman's fidelity to her partner. Second, given the finite nature of men's time and sexual energy, a woman's increased sexual interest in her partner (and resultant sexual activity with him) could potentially lessen the likelihood of his infidelity.

One might predict that women with highly desirable partners will be especially likely to express sexual interest in those partners when confronted by ovulating, physically attractive women. Alternatively, because sex with a long-term, desirable partner is a relatively low-cost behavior, this tactic may be engaged when confronting even a low likelihood of mate-poaching threat—as when even unattractive ovulating women are viewed talking with one's high-value mate. It could be that another woman's fertility status alone—regardless of her attractiveness—is sufficient to engage the desire to have sex with one's partner, in the service of mate retention.

Method

Participants. There were 174 engaged or married heterosexual women who were recruited from Amazon's Mechanical Turk (MTurk) online participant platform ($M_{age} = 36.8$, $SD_{age} = 11.2$) and took part for monetary compensation. Some participants failed to fill out all variables. For each item, all participants who completed the item are included in analyses.

Procedure and materials. We used the "first impressions task" cover story and vignette from Studies 1a and 1b, collecting demographic information and information about partner desirability (i.e., partner mate-value) before participants completed the focal dependent mate-guarding measures.

Target faces. Participants were randomly assigned to view one of 12 versions of a target (labeled as Sara). The facial photographs of six young women—taken at high and low fertility—were chosen based on their physical attractiveness (three *attractive*, three *unattractive*). These photographs were taken as part of a previously published study by Puts and colleagues (2013). In that study, 202 normally cycling women (mean age 19.6 ± 1.6 years) were photographed at both peak and low fertility, producing in total 404 photographs. Fertility was assessed via salivary samples;

for further information, see Puts et al. (2013). There were 558 additional female participants—each of whom viewed approximately 24 photographs—rating the photographs for how physically attractive the women would be *to men*, using 7-point Likert scales. Each photograph received approximately 19 ratings, from which the first 15 were averaged to produce an overall measure of perceived attractiveness to men. No participant saw a target more than once. From those targets rated most attractive to men, we selected 3 women (mean attractiveness to men = 5.23) to serve as our physically attractive stimuli. From among those rated least attractive to men, we selected 3 women (mean attractiveness to men = 1.47) to serve as physically less attractive stimuli. All chosen targets were White. The less attractive targets did not possess any additional cues that might otherwise evoke social distancing (e.g., poor skin).

Mate guarding measures. After participants viewed a randomly assigned photograph within the context of the "first impressions" procedure, we measured both self-distancing mate guarding (i.e., the amount of contact they would like to have with the target) and partner-distancing mate guarding (i.e., their willingness to let the target be friends with their own romantic partner), as in the previous studies. Participants then answered four questions created to assess one form of partner-directed mate guarding—*sexual interest*. Recall that the vignette is about meeting Sara at a friend's party; participants were asked to indicate on 7-point scales (1 = *not at all likely*; 7 = *very likely*) their likelihood of engaging in several sexual activities involving both the acceptance and initiation of partner-directed sexual activity, after arriving home from that party (e.g., ". . . have sexual intercourse with your partner?"; $\alpha = .91$). We expected that women with desirable partners would be especially likely to report a greater likelihood of engaging in sexual activity after viewing attractive, ovulating targets.

Results

Self-distancing mate guarding. Regressing self-distancing mate guarding onto Target Fertility, Partner Mate-value, Target Attractiveness, and the interaction terms, we found a significant interaction of Target Fertility and Partner Mate-value, $t(166) = 2.26$, $p = .025$, $\beta = .26$, as well as a marginally significant Target Fertility \times Target Attractiveness interaction, $t(166) = -1.83$, $p = .069$, $\beta = -.14$.

Although the three-way interaction was not statistically significant, $t(166) = -0.64$, $p = .523$, $\beta = -.05$, we felt comfortable exploring the Target Fertility \times Partner Mate-value interaction separately for physically attractive and less attractive targets, given that this interaction was observed in Studies 1 and 2 with morphed (i.e., attractive) faces as stimuli. Indeed, for participants viewing attractive targets, there was a statistically significant main effect of Partner Mate-value, $t(83) = -2.05$, $p = .043$, $\beta = -.32$, which was qualified by a significant Target Fertility \times Partner Mate-value interaction, $t(83) = 2.04$, $p = .044$, $\beta = .31$. As seen in the previous studies, women with highly desirable partners wanted more social distance from the attractive ovulating targets (predicted $M = 2.69$) than the attractive nonovulating targets (predicted $M = 3.84$), $t(83) = 2.47$, $p = .015$, $\beta = .38$, whereas women with less desirable partners showed no difference in their social distancing inclinations (predicted $M_{ovulating} = 3.63$; pre-

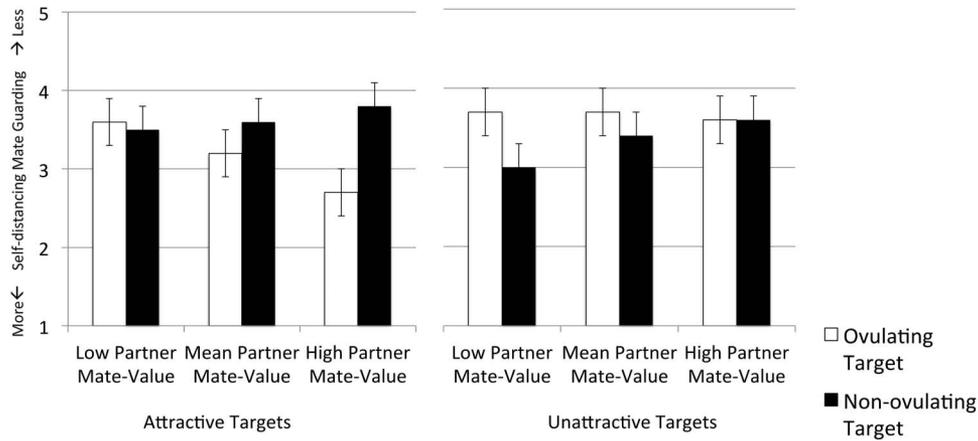


Figure 4. Women's desires for social distance between themselves and ovulating and nonovulating targets as a function of target attractiveness (attractive, unattractive) and partner mate-value. Error bars reflect SEs.

dicted $M_{nonovulating} = 3.51$, $t(83) = -.28$, $p = .779$, $\beta = -.04$, see Figure 4.

By contrast, for those women seeing unattractive targets, no predictors reached significance ($ps > .20$). Although one should interpret these noneffects cautiously given the lack of a significant three-way interaction, the overall pattern of findings from this study are consistent with the broad argument that, because the costs of lost female–female affiliations can potentially be great, only highly credible threats to mate retention (i.e., attractive, ovulating women) are likely to engage indirect mate guarding from women with high mate-value partners.

Partner-distancing mate guarding. Regressing the extent to which women seek social distance between their partners and the target onto Target Fertility, Partner Mate-value, Target Attractiveness, and the resultant interaction terms, we found no significant effects—only the three-way interaction approached significance, $t(166) = -1.62$, $p = .108$, $\beta = -.13$.

As above, to test the specific prediction that women with highly desirable partners are especially likely to seek social distance

between their partners and *attractive* ovulating targets, we regressed our measure of partner-distancing mate guarding onto Target Fertility, Partner Mate-value and the interaction terms separately for those in the attractive target condition and those in the less attractive target condition.

For participants viewing attractive targets, we found the predicted Target Fertility \times Partner Mate-value interaction, $t(83) = 2.45$, $p = .017$, $\beta = .37$, and a significant main effect of Partner Mate-value, $t(83) = -2.27$, $p = .026$, $\beta = -.35$. Those women with desirable partners wanted distance between their partners and ovulating attractive targets (predicted $M = 2.21$) to a marginally greater extent than that wanted between their partners and non-ovulating attractive targets (predicted $M = 3.21$), $t(83) = 1.98$, $p = .051$, $\beta = .30$. Women with less desirable partners exhibited no differences in social distancing preferences (predicted $M_{ovulating} = 3.35$; predicted $M_{nonovulating} = 3.71$), $t(83) = -1.36$, $p = .176$, $\beta = -.19$, see Figure 5.

By contrast, for those women seeing unattractive targets, no variables reached significance ($ps > .65$), again supporting the

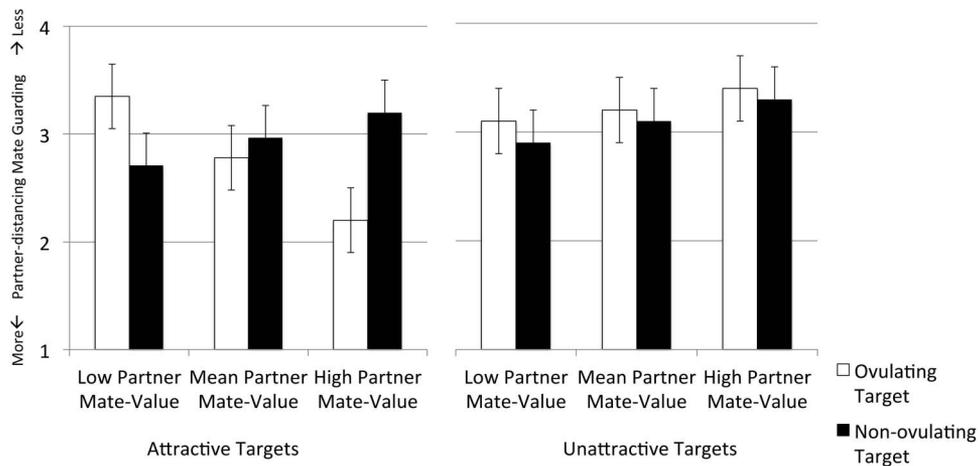


Figure 5. Women's desires for social distance between their partners and ovulating and nonovulating targets as a function of target attractiveness (attractive, unattractive) and partner mate-value. Error bars reflect SEs.

view that only especially credible threats to mate retention are likely to engage women's direct mate guarding.

Partner-directed mate guarding: Sexual interest. We then tested whether women's partner-directed mate guarding, as operationalized by participants' sexual interest in their partners, followed the same pattern as target-directed mate guarding. Thus, we regressed our participants' sexual interest in their partners onto Target Fertility, Partner Mate-value, Target Attractiveness, and the interaction terms. The three-way interaction did not approach significance ($p = .75$). We did find significant main effects of Partner Mate-value, $t(166) = 5.18, p < .001, \beta = .56$, such that women with higher mate-value partners reported greater sexual interest, and Target Fertility, $t(166) = -2.67, p = .008, \beta = -.19$, such that viewing an ovulating target (vs. a nonovulating target) led women to be more sexually interested in their partners.

More relevant to our hypotheses, we also observed a significant Target Fertility \times Partner Mate-value interaction, $t(166) = -2.57, p = .011, \beta = -.27$ (see Figure 6). For consistency, as above, we investigated the focal effect separately in women who had seen attractive and unattractive targets. For women who viewed attractive targets, we see significant main effects of Target Fertility, $t(83) = -2.08, p = .041, \beta = -.21$, such that women indicated greater sexual interest in their partners after seeing the ovulating target, and Partner Mate-value, $t(83) = 3.39, p = .001, \beta = .51$, such that higher partner mate-value engendered greater partner-directed sexual interest, as one might expect. More important, we also see a Target Fertility \times Partner Mate-value interaction, $t(83) = -2.07, p = .042, \beta = -.31$. Women with desirable partners reported greater sexual interest in their partners after viewing attractive, ovulating targets (predicted $M = 5.24$) than after viewing attractive, nonovulating targets (predicted $M = 3.99$), $t(83) = -2.82, p = .006, \beta = -.42$. There was no such difference among women with less desirable partners, $t(83) = -0.06, p = .951, \beta = -.01$.

Among women who viewed unattractive targets, we saw a main effect of Partner Mate-value, $t(83) = 4.00, p < .001, \beta = .62$, such that women with higher mate-value partners reported greater sexual interest, and a marginally significant main effect of Target Fertility, $t(83) = -1.68, p = .098, \beta = -.16$, such

that viewing an ovulating (vs. nonovulating) target led women to be more sexually interested in their partners. And, although we did not find a significant Target Fertility \times Partner Mate-value interaction, $t(83) = -1.59, p = .117, \beta = -.25$, the pattern of data was similar to that found among women viewing attractive targets. Indeed, even those women who viewed unattractive targets reported greater sexual interest in their highly desirable partners after viewing the ovulating (predicted $M = 5.46$) versus the nonovulating target (predicted $M = 4.50$), $t(83) = -2.44, p = .018, \beta = -.32$. There was no such difference among women with less desirable partners, $t(83) = 0.48, p = .962, \beta = .01$, indicating that ovulating targets seemed to evoke partner-directed sexual interest regardless of their physical attractiveness.

Discussion

Study 3 replicated our previous findings—that women with desirable partners wish to socially distance themselves and their partners from ovulating others—and extended them in important ways. First, only the attractive (but not the unattractive) ovulating targets evoked social distancing intentions among women partnered to highly desirable men. Men are more willing to engage in extrapair sex with attractive women—perhaps especially when those women are near peak fertility (e.g., Bobst & Lobmaier, 2012; Haselton & Gildersleeve, 2011)—implying that attractive ovulating women may have an easier time successfully poaching highly desirable men (e.g., Schmitt & Buss, 2001). By contrast, physically unattractive women are considered less desirable as sexual partners, especially by highly desirable men (e.g., Buss, 1989)—and this may be the case even when these women are near peak fertility. That participants with desirable partners reserved their social distancing for cases in which the ovulating target was also physically attractive further suggests, alongside Studies 1a and 1b, that women's mate guarding is selectively and strategically calibrated based on interpersonal cues to threat credibility.

Study 3 also demonstrated that women seek to deploy partner-directed mate-guarding tactics. Specifically, women with desirable partners reported that they would show increased sexual interest in

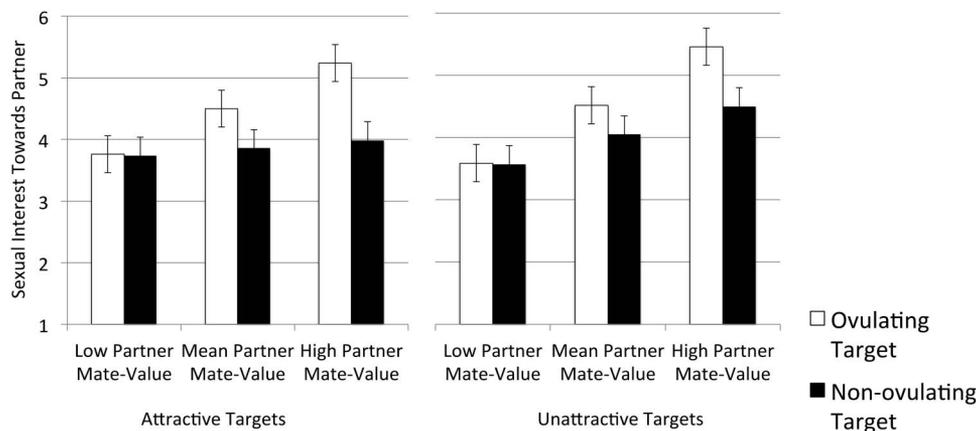


Figure 6. Women's reports of sexual interest toward their partners after seeing ovulating and nonovulating, attractive and unattractive targets. Error bars reflect SEs.

their partners after viewing a high-fertility target, regardless of how attractive that target was. Why, though, was sexual engagement with one's partner somewhat less sensitive to the physical attractiveness of the ovulating interloper?

Because the costs of sexual engagement—especially with a long-term, highly desirable partner—are relatively low, perhaps sexual interest as a mate-guarding strategy requires lower levels of mate-poaching threat to be engaged; even a potential threat of relatively low credibility (e.g., when the ovulating potential poacher is relatively unattractive) may increase sexual activity with a partner, given its low costs (and other benefits). By contrast, and as discussed above, the costs of target-directed mate guarding in the form of social distancing can be large, possibly leading to the loss of potentially valuable affiliations and longer-term friendships (e.g., Campbell, 2002). When the probability of successful mate poaching is relatively low (e.g., when one's partner is highly desirable and the ovulating potential poacher is unattractive), it may make less sense to engage in such potentially costly behaviors. Thus, some tactics of target-directed mate guarding—even relatively covert, indirect forms of it such as social distancing—may be reserved for instances in which the probability of successful mate poaching is relatively high (e.g., when one's partner is desirable and the potential poacher is highly attractive and/or near peak fertility).

Continuously Cumulating Meta-Analysis

The phenomenon we report—that women with desirable partners selectively guard those partners from ovulating women via two forms of mate guarding—largely (but not entirely) replicated across four experiments; not all studies demonstrated statistically significant differences in the intentions of women (with desirable partners) to distance ovulating versus nonovulating targets. To assess the reliability of these findings, we take a Continuously Cumulating Meta-analytic Approach (CCMA): We compile data from Study 1a and all its replication attempts to provide a better understanding of the consistency and overall size of the focal effect (e.g., Braver, Thoenmes, & Rosenthal, 2014; Rosenthal, 1990). In the words of Braver et al. (2014),

instead of misleadingly noting simply whether each replication attempt did or did not reach significance, we *combine* the data from all the studies completed so far and compute various meta-analytic indexes to index the degree of confidence we can have that a bona fide phenomenon is being investigated. (p. 334)

Taking a CCMA approach allows us to determine whether results that would be considered nonreplications by traditional standards of null hypothesis significance testing (NHST) are nonetheless of similar effect sizes as those results deemed significant in NHST terms. If the effect sizes are not heterogeneous across replication attempts and the pooled overall effect size is well above zero, then we can have additional confidence that the focal effect is real.

Thus, we compiled results for partner-distancing mate guarding⁸ from Studies 1a and 1b, as well as results from the replication conditions of Study 2 (when participants were “primed” with partner salience before the filling out dependent variables) and Study 3 (when participants viewed attractive targets). We then calculated the effect size of the focal effect (i.e., the difference in behavioral intentions to distance ovulating vs. nonovulating targets) for women with desirable partners (1 *SD* on partner mate-

value); we did this separately for each of the four replications. We used Cumming and Finch's (2011) Exploratory Software for Confidence Intervals (ESCI), imputing the effect size data gleaned from each individual replication attempt into the ESCI software for meta-analysis of Cohen's *d* for two groups to obtain an index of effect-size heterogeneity. Across compiled replications, Cohen's $d = .45$ (LCI = 0.224, UCI = 0.675), revealing that the overall pooled effect size is different from zero and is of a small- to moderately sized effect. Moreover, $Q(3) = 1.45$, $p = .693$, indicating that the effect sizes are largely similar across all studies. These findings provide additional confidence in the reliability and veracity of the focal phenomenon (see Figure 7).

General Discussion

Across four experiments, using varied measures and manipulations, we found that women partnered with highly desirable men want to socially distance themselves and their partners from ovulating women. This social distancing was robust against the partnered women's perceptions of their own desirability and against their more chronic anxiety about their current relationships.

The specificity of our findings suggests that women's mate guarding inclinations are sensitive to the costs and benefits of engaging in different tactics. Although a woman could greatly reduce the threat of mate defection by indiscriminately distancing all other women from herself and her partner, doing so would also preclude the many benefits of women's same-sex alliances (e.g., Campbell, 2002). It is instructive that the women in our studies focused their avoidance only on those viewed as most likely to pose credible mate-retention threats, thereby potentially helping them to maximize the benefits of same-sex social relationships while minimizing costs associated with partner defection.

Indeed, consider that women partnered to less desirable men did not seek to create distance from ovulating women; because ovulating women are particularly attracted and open to sexual activity with *desirable* men (e.g., Gangestad & Thornhill, 2008; Penton-Voak et al., 1999; Puts, 2005), ovulating women pose relatively little poaching threat to women partnered with less desirable men. For women with less desirable partners, the costs of social distancing from ovulating women (e.g., lost potential friendships and affiliations) may weigh heavier than the small risk of having such women poach their mates.

Consider also that women partnered to desirable men did not seek to create distance from ovulating but unattractive women. Men especially desire sex with attractive women (e.g., Buss, 1989), and, by virtue of what they themselves have to offer to women, high mate-value men may be better able to realize this

⁸ Our self- and partner-distancing forms of mate guarding are highly correlated with one another ($r = .593$ across compiled replications). Replicating the findings of the meta-analysis for one form of mate guarding with the other form of mate guarding may be spuriously interpreted as even further increasing confidence in the focal effect. To avoid this, we focus on the most germane, proximate dependent variable in assessing women's mate guarding, women's reported behavioral intentions to distance targets from their partners. However, we do find that, for the self-distancing form of mate guarding, that Cohen's $d = .56$ (LCI = 0.238, UCI = 0.891), $Q(3) = 5.71$, $p = .127$ across compiled replications, indicating that, for this dependent variable as well, (a) effect sizes for the focal phenomenon are largely similar across all studies and (b) the overall pooled effect size is different from zero.

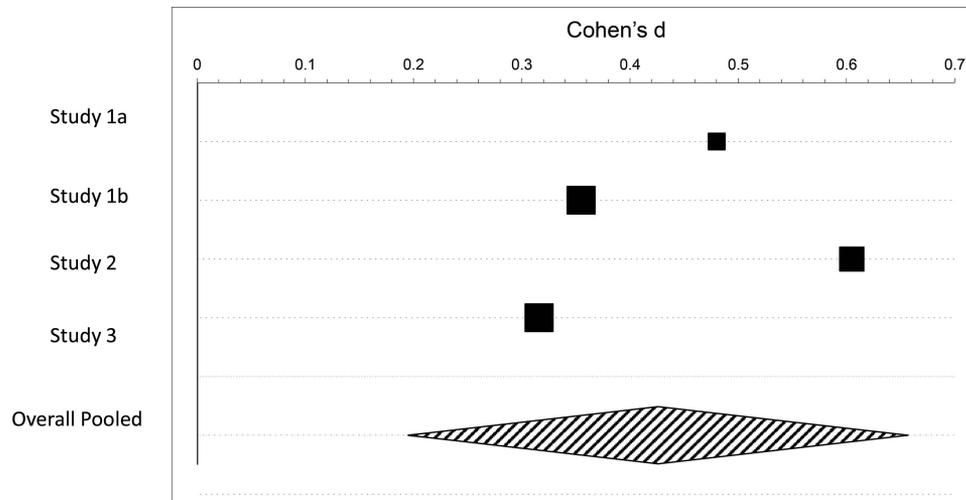


Figure 7. Weighted effect sizes (Cohen's d) for women's partner-distancing mate guarding across replications. The striped diamond represents the computed overall pooled effect size, with ends representing lower and upper confidence intervals.

desire. Because unattractive women are generally less likely to garner the sexual interest of high mate-value men, even when ovulating, partners of high mate-value men may also be less likely to view unattractive women as mate-poaching threats. Even for women with highly desirable partners, the costs of socially distancing unattractive, ovulating women (e.g., lost potential friendships and affiliations) may outweigh the relatively small risk that their partners would be interested in such women.

Women's mate guarding intentions are sensitive not only to interpersonal features of their partners and other women, but also to context. Proximity of one's partner to a potential poacher may render that poacher a more credible mate-retention threat. Although modern contexts allow for the segregation of one's same-sex allies at work from one's partner at home, such segregation is unlikely to have been possible in ancestral environments. Rather, those with whom one cooperatively reared children and foraged by day likely retired to the same small area at night. Study 2 showed some sensitivity to context, in that when women's desirable partners were not salient in mind, they did not create social distance from ovulating women who were presented as coworkers in a workplace. These findings contrast with the findings of Studies 1a and 1b in which the ovulating women were encountered at a social gathering. However, when their desirable partners were salient in mind, ovulating women encountered even in this distal workplace context were socially distanced. This is what one might predict if, ancestrally, segregation of partners from other women was difficult.

In summary, the specificity of findings suggests that women's mate-guarding inclinations are sensitive to the varying costs and benefits of engaging in different mate-guarding tactics. Factors that might render another woman a more credible mate poacher—the other woman's ovulatory phase and attractiveness, one's own partner's mate-value and sexiness, and the salience of one's partner—increased the likelihood that women wanted greater social distance from the potential interloper.

Alternative Forms of Women's Mate Guarding

Women's mate guarding can take multiple forms. We focused primarily on one type of poacher-directed mate guarding—social distancing. If a potentially credible interloper can be kept from encountering a woman's mate, then the interloper cannot poach him. In Study 3, however, we also assessed one type of partner-directed mate guarding—sexual interest in one's partner. An interesting find was that women were less selective in their intentions to deploy partner-directed sexual interest than in their intentions to deploy poacher-directed social distancing: Whereas only physically attractive ovulating women evoked desires for social distance, both physically attractive and unattractive ovulating targets led women to report increased sexual interest in their partners. Why? Socially distancing another woman might mean the loss of potentially fruitful same-sex alliances. In contrast, partner-directed mate guarding—at least in the form of sexual engagement—would seem to be relatively low-cost. Thus, the benefits for women of engaging in this type of partner-directed mate guarding in response to even a relatively weak mate-poaching threat (i.e., from an unattractive, ovulating woman) likely outweighs the typically low costs of doing so.

Mediating Perceptions

Women partnered to men they find highly desirable tended to rate the ovulating (vs. the nonovulating) target as less trustworthy, and these judgments statistically mediated women's mate-guarding intentions. This finding supports previous adaptationist theories of mate guarding, which have emphasized the perceived trustworthiness of those in one's social circle. For instance, Bleske and Shackelford (2001) suggested a "suite of mechanisms . . . designed to help us select as same-sex friends those people we can trust not be rivalrous with us or to steal our long term mates" (p. 408).

One could also hypothesize from the ovulation literature that ovulating women's increased attractiveness to men, and/or their

flirtatiousness toward particularly desirable men (e.g., [Welling & Puts, 2014](#)) could also elicit partnered women's mate guarding. Moreover, because ovulating women are more likely to act competitively toward other women (e.g., derogating and dehumanizing them; [Fisher, 2004](#); [Piccoli et al., 2013](#)), one might hypothesize that ovulating women would be perceived as less friendly, creating a desire for other women to distance themselves from them. Although perceived attractiveness, flirtatiousness, and friendliness did not mediate the mate guarding observed here, they may nevertheless be important factors in understanding how women behave toward other, ovulating women.

Implications, Limitations, and Future Directions

We indexed partner desirability via women's assessments of their partner's mate-value (as well as via partner sexiness in Study 1b). Such assessments are shaped not only by objective criteria (e.g., how often other women truly notice and desire their partners), but also by more subjective features of their respective romantic relationships (e.g., [Berscheid & Fei, 1977](#); [Simpson et al., 1995](#)). Indeed, people tend to idealize their romantic partners ([Murray, Holmes, & Griffin, 1996](#)), and idealization may be linked to better relationship satisfaction and quality (e.g., [Murray et al., 2011](#)). It is possible, therefore, that women's assessments of their partners' sexiness or mate-value reflect not just other women's judgments of their own partners but also their own motivated biases to view their partners favorably. For example, women may tend to see their partners as more appealing to other women if they perceive heavy costs of losing that partner, or if they have heavily invested in the relationship.

Functionality of women's mate guarding tactics. The present work did not directly address a potentially important question in women's mate guarding: Do these covert tactics (e.g., the social distancing of potential poachers) actually work? Addressing the functionality of women's mate guarding—whether social distancing, partner-directed sexual interest, or other tactics not explored here—is beyond the scope of the current paper. However, our results may begin to speak to this question. Consider a woman who precludes her desirable partner from encountering those women who are perhaps especially likely and motivated to poach him. She would likely have attenuated the odds of her partner's infidelity, at least in comparison to a woman who failed to keep her partner and likely poachers apart. However, her success may depend on her ability to enact this form of mate guarding covertly. That is, indiscriminant or otherwise obvious social distancing of other women in the service of mate guarding may cause friction in the woman's romantic relationship. For instance, indiscriminately distancing other women may cue potentially undesirable aspects of the woman as a potential partner (e.g., that she is noncommunal). Moreover, her partner may resent being so obviously sequestered from other women, as it may communicate a broader lack of trust. Thus, it may be particularly women who are able to covertly distance other women from their partners—rather than acting on their partners to keep them apart from other women—who find social distancing tactics efficacious forms of mate guarding.

Addressing a gap in research on the ovulatory cycle. The current research addresses a lesser-studied question in the growing literature on women's ovulatory cycles. Evolutionary logic previously predicted—and found evidence for—women's own percep-

tions, cognitions, and behaviors shifting in potentially adaptive ways during their short windows of peak fertility (e.g., by being more desirous of sexual encounters with particularly so-called sexy men with 'good genes'; e.g., [Gangestad et al., 2005](#); [Garver-Apgar et al., 2008](#)). Building upon this, research has shown that men's perceptions of and behaviors toward women shift in potentially adaptive ways as a function of women's cyclic phases (e.g., men often find women to be more attractive nearer to peak fertility; e.g., [Bobst & Lobmaier, 2012](#); [Roberts et al., 2004](#)). However, research exploring women's perceptions of and behaviors toward ovulating women is nascent (e.g., [Maner & McNulty, 2013](#)).

Our findings suggest that women's perceptions and behavioral intentions toward other, ovulating women might also facilitate potentially adaptive ends. That is, if ovulating women might be especially likely and effective mate poachers—who might particularly target desirable men—then the committed partners of those desirable men could benefit by being sensitive to cues of fertility in other women, and acting on those cues to prevent poaching. Women partnered to desirable men consistently responded to nonobvious cues of fertility in other women by desiring social distance from them, and women partnered to desirable men also responded to fertility cues by increasing their sexual interest in their committed partners. Preventing partner defection and maintaining partner investment are the two central challenges of mate retention. The successful resolution of these challenges (e.g., as with women's mate guarding) may facilitate a woman's own reproductive fitness (e.g., [Hill & Hurtado, 1996](#)).

A novel benefit of concealed ovulation? Our findings have potential implications for understanding the evolution of human females' 'concealed' ovulation. In contrast to some other female primates, cues of women's ovulation are considered comparatively concealed. There are several possible (and not mutually exclusive) theories about why women's ovulation has become comparatively concealed (for a review, see [Thornhill & Gangestad, 2008](#)). The predominant account asserts that concealed ovulation functions to allow females to retain partner investment and protection throughout the ovulatory cycle, rather than only during days of peak fertility, when males would otherwise be most interested in investing in and protecting females ([Alexander & Noonan, 1979](#); see also [Strassmann, 1981](#)). Other accounts have largely focused on the alternative benefits concealing ovulation may have conferred on ancestral women in the context of intersexual relationships (e.g., facilitating female's covert extrapair copulation; [Benshoof & Thornhill, 1979](#); helping females trade sexual access for material goods; [Symons, 1979](#)). Our finding that (some) partnered women selectively aggress against ovulating targets suggests that damping cues to ovulation could have conferred benefits on females within the context of their *intrasexual* relationships as well. In our studies, ovulating women were targeted for social rejection from (certain) other women. Ancestrally, such exclusion could have cut off one's access to life-sustaining resources and may often have been lethal for women or their offspring (e.g., [Benenson, 2014](#); [Campbell, 2002](#)). In modern contexts, such exclusion is known to have significant consequences, particularly for young females ([Benenson et al., 2013](#); [Campbell, 2002](#); [Vaillancourt, 2013](#)). Thus, perhaps females with damped ovulatory cues were better able to avoid costly intrasexual aggression than were females with overt ovulatory cues. If so, and if avoiding intrasexual aggression thereby conferred survival and/or reproductive advantages, then this may

have contributed to the evolution of comparatively concealed ovulation.

Ovulating friends and kin? In the present research, all targets (i.e., all potential mate poachers) were portrayed as novel acquaintances—acquaintances who were either friends of friends (Studies 1a, 1b, and 4) or nonrivalrous coworkers (Study 2)—rather than women who were already embedded in participants' social networks (i.e., friends, kin, in-laws). There is good reason to believe that, throughout evolutionary history, coming into contact with other female strangers and acquaintances would not have been uncommon, given the likelihood of patrilocal marriage and wife raiding in ancestral environments (e.g., Barnes, 1999; Pasternak, Ember, & Ember, 1997; Rodseth, Wrangham, Harrigan, & Smuts, 1991). Nonetheless, our data cannot directly address how partnered women might respond toward same-sex *friends* or *kin* as a function of those other women's fertility. One might speculate, however, that to attain friend status one must be deemed trustworthy and unlikely to attempt to poach one's partner (e.g., Bleske & Shackelford, 2001). If perceptions of potential poachers' trustworthiness mediate the relationship between their fertility and their social exclusion, and friends are already trusted, then perhaps women do not selectively and strategically avoid their attractive friends during the few days when those friends happen to be ovulating.

In contrast, even friends, when ovulating, may become relatively more physically attractive to men and may behave more flirtatiously. If so, then one might expect partnered women to temporarily avoid even those women who are already trusted friends. In this light, it is interesting that young females' closest same-sex friendships tend to be less stable and enduring than young males' friendships (Benenson & Christakos, 2003). One might speculate that this relative instability could be fostered, to some (small) extent, by ovulation-linked increases in intrasexual competition for mates. This suggests that female–female friendships may be especially fraught if and when friends ovulate at the same time—when both friends are more likely to be sexually motivated, flirtatious, and intrasexually aggressive. Assessing questions of how women behave toward ovulating friends would be a useful future direction for work on both women's strategic mate guarding and also on women's responses to ovulation in other women in general.

The issue of mate-guarding relations among female kin (e.g., sisters) may be more complex, given that such relationships are also characterized by genetic relatedness (whereas friendships are typically not). Because the reproductive success of one sister increases the inclusive fitness of the other sister, sisters may be less motivated to mate-guard when a sister is ovulating. After all, offspring resulting from an ovulating woman's affair with her sister's husband increases the cheated-on sister's inclusive fitness. Indeed, in some ecological circumstances, sororal polygyny (i.e., two sisters sharing one male partner) could be a favored strategy (Ember, 1974). That said, being cheated on by one's sister (or any woman) may impede a wife's reproductive efforts (and thus, decrease her potential inclusive fitness) by, for example, diverting the husband's resources away from the wife and her offspring or by causing the dissolution of her relationship and the preclusion of the wife having future children with that partner. Hence, partnered women may be attuned to the mate-poaching potential of ovulating sisters just as they are to the mate-poaching potential of unrelated women within their social networks.

Additionally, such work examining how female friends and sisters behave toward one another as a function of the ovulatory cycle could further inform the literature on female intrasexual aggression. Perhaps at peak fertility (vs. low fertility) women themselves experience more social rejection and/or other forms of indirect aggression from other women—whether from same-sex friends, strangers, or both. Because victimization by indirect intrasexual aggression takes an especially heavy toll on young women (e.g., Vaillancourt, 2013), understanding when women might be at greatest risk for victimization and consequent self-harm could have valuable practical implications.

Of course, women's intrasexual competition to retain mates is just one component of their intrasexual mating competition more broadly. Women must often compete to attract desired partners; only after a woman has successfully attracted a committed partner can she compete to retain that partner. Here, we have shown that partnered women use covert tactics in the competition to retain mates, echoing existing work on women's preferential use of covert tactics (i.e., indirect aggression) in the competition to obtain mates (e.g., Vaillancourt, 2013). We would expect that these covert mate-retention tactics seen here as being enacted toward ovulating potential poachers would not be unique to partnered women; rather, we would expect that single women have the same capacity to detect and respond to ovulating women in similarly functional ways that are contextually appropriate. Two studies presented in the Supplementary Material begin to address this with regard to a mate retention context. Additionally, in one of the few existing studies focusing on women's behavioral intentions toward ovulating targets, Maner and McNulty (2013) found that women may ready themselves for competition in response to the odor of ovulating versus nonovulating targets. However, the question of how single women might act toward ovulating women in the competition to attract mates largely remains an open one.

Finally, we are not suggesting that women's friendship decisions are either conscious or driven primarily by concerns related to mate retention, with women befriending only those who score below some threshold of threat. The desire to befriend (or avoid) another person is shaped by many factors, as the literature clearly shows. Similarly, literature on women's intrasexual friendships is replete with ways in which these relationships are positive, protective, and often fitness-enhancing (e.g., Campbell, 2002). We are suggesting, however, that mate retention concerns—and other women's ovulation cues—play some role in women's prosociality, which can be selective and strategic. Women are able to use potential cues of mate-poaching threat (i.e., another woman's fertility) to navigate their same-sex relationships in ways that might facilitate adaptive outcomes (i.e., mate retention).

Conclusion

Partnered women face a complex problem in navigating their same-sex relationships: Close, cooperative relationships with other women pose both important advantages and possible threats, specifically to mate retention. We reasoned that women's mate guarding would be functionally flexible, selectively evoked, and strategically deployed to help women maximize the benefits and minimize the costs of same-sex social relationships. Akin to wom-

en's preferred tactics of aggression in pursuing mates (e.g., Vail-lancourt, 2013), women's tactics of guarding mates are subtle and indirect. Partnered women reported intentions to render desirable partners inaccessible to other women deemed credible mate poachers. The current set of studies identifies a novel cue (i.e., other women's fertility) that women use to determine the perceived credibility of potential poachers, shows that cues of ovulation in other women evoke a mate-guarding psychology in those partnered women to whom they might pose more serious mate-retention threats (i.e., to women partnered to desirable men), and suggests that women's mate-guarding intentions are sensitive to the costs and benefits of distinct mate-guarding tactics.

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Appendix A

Vignette 1 (Party)

Imagine that you are at a small housewarming party of friends and acquaintances of a new friend of yours. While you're getting a drink and chatting with your new friend, you look across the room and see your significant other chatting with Sara and another woman. You can tell he's in the middle of a story, gesticulating

wildly. You see them laugh at his story; Sara puts her hand on his arm and the other woman covers her face, laughing. He seems to be getting along with these new people well, but before you can walk over and introduce yourself, your new friend pulls you over to meet her cousin and get a glass of wine.

Appendix B

Vignette 2 (Workplace)

Imagine that you've recently switched jobs and moved into a new office. Things are going well and you're making friends with your co-workers. Your boss decides to take you out to lunch to meet the rest of the team. While there, your boss points out Sara, another woman who recently started at the company—but in another division. She is talking with a close co-worker of yours who seems to be gesticulating wildly. You see Sara and another person laugh at your co-worker's story; Sara puts her hand on his

arm and the other woman covers her face, laughing. He seems to be getting along with these people well, but before you can walk over and actually introduce yourself, your boss pulls out a chair for you at the table and orders everyone some wine.

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