

**The Influence of Local Sex Ratio on
Romantic Relationship Maintenance Processes**

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Dedications

To my parents. Of course.

To my fellow stragglers. Let's leap forward, together.

Abstract

Sex ratio is defined as the proportion of males to females in a given local environment, and it is a situational cue with profound implications for how humans approach their romantic relationships (Guttentag & Secord, 1983). According to theory, individuals in relationships should value their relationships more highly and engage in more behavior to maintain their relationships when faced with an unfavorable sex ratio (i.e., fewer opposite-sex members), relative to when they are faced with a favorable sex ratio (i.e., more opposite-sex members). However, no *experimental* work has examined the influence of sex ratio on romantic relationships. In the current dissertation, I addressed this gap in the literature by experimentally testing a series of predictions regarding the influence of sex ratio on how individuals think and behave within their relationships. The data supported the contention that individuals faced with a relatively unfavorable sex ratio value their relationships more highly and engage in more relationship maintenance behavior. However, men and women demonstrated different behavioral strategies given a relatively unfavorable sex ratio, with men engaging in direct intervention to fend off competitors and women engaging in more indirect behavior in service of maintaining relationship harmony. Moreover, given a relatively unfavorable sex ratio, men showed cognitive changes about their partner's likelihood of committing infidelity in a manner consistent with direct intervention, while women showed increases in other relationship domains consistent with their indirect behavioral strategy.

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The Influence of Sex Ratio on Romantic Relationship Maintenance Processes

In this dissertation, I examined how *sex ratio*, i.e., the ratio of men to women in the local environment, influences romantic relationships, specifically romantic-relationship maintenance. Existing social psychological theory suggests that behaviors related to *mating* should change as the ratio of men to women in the local environment changes (e.g., Guttentag & Secord, 1983; Kenrick, Li, & Butner, 2003). However, little research has examined whether or how sex ratio influences existing *relationships*, and almost no research has examined the impact of sex ratio in humans using *experimental* methods. Therefore, across three studies, I experimentally manipulated sex ratio to test the direct impact of sex ratio on romantic relationship outcomes.

What Is Sex Ratio?

Sex ratio is conceptualized as the proportion of males to females in a given local environment (Guttentag & Secord, 1983), and it is potentially a powerful situational cue with profound implications for myriad domains of human behavior. Researchers generally agree that sex ratio exerts its influence on human behavior via its implications for successful reproduction. This logic can be understood by considering both proximal and distal levels of analyses.

Using a more proximal level of analysis, sex ratio can be viewed through the lens of supply-and-demand principles, which are derived from microeconomics (Marshall, 1890). The laws of supply and demand dictate that, in

any marketplace in which a good is being sold (with “good” being broadly defined), a certain amount of that good will be available (i.e., supply) and a certain amount will also be desired (i.e., demand). To the extent that the *demand exceeds supply*, the good in question will be valued highly and suppliers of that good can set a higher price for it. However, to the extent that *supply exceeds demand*, the good in question will be devalued and suppliers of that good must set a lower price for it. Abstractly, the mating pool in any local environment resembles a marketplace, and males and females in this marketplace can be considered goods that are also subject to the laws of supply and demand (Baumeister & Vohs, 2004). The premium on female sexuality in this marketplace confers females with a higher baseline value than it does for males, but both males and females can have fluctuating value depending on assorted marketplace factors.

Sex ratio is an especially important marketplace factor that needs to be considered. To take the logic of supply-and-demand principles further, when there is a shift in the supply of a certain good and the value of that good shifts correspondingly, people should behave differently in order to obtain that good depending on its new value. More specifically, greater supply should require less expense (of time, effort, etc.), and less supply should require more expense. In fact, it has been well established in the social psychological literature on persuasion that merely changing perceptions of the scarcity of a good (i.e., its supply) can cause individuals to value that good to a greater extent and adjust

their behavior to increase their likelihood of obtaining it (see Cialdini, 2006, for a comprehensive review). If we extrapolate this logic to the mating marketplace, then shifting even the perception of the supply of either men or women should produce a corresponding change in their respective value, which should manifest itself in how people think and behave within the mating marketplace.

Using a more distal level of analysis, evolutionary psychology also offers insights into how imbalances in sex ratio can influence behavior. According to evolutionary psychology, any human characteristic—including behavior—is more likely to be present in the modern environment to the extent that it had adaptive value in the environment of evolutionary adaptedness, meaning that the characteristic in question increased the likelihood that our human ancestors from the Pleistocene era successfully passed on their genes to subsequent generations (see Tooby & Cosmides, 1992). The most direct method by which humans can propagate their genes is by engaging in successful mating and parenting, and evolutionary psychology posits that much of behavior is rooted in concerns about ensuring successful reproduction. Intuitively, successful mating should be easier when there are a greater number of opposite-sex members in the local environment, whereas successful mating should be more difficult when there are fewer members of the opposite sex in the environment. In fact, current theory and research in evolutionary psychology suggests that what is adaptive can be environmentally contingent, and that humans—both men and women—can deviate from what would normatively be considered adaptive when faced

with local environmental cues indicating that such deviation is necessary to maximize reproductive success (e.g., Buss & Schmitt, 1993; Crawford & Anderson, 1989; Gangestad & Simpson, 2000; Griskevicius, Delton, Robertson, & Tybur, 2011). Sex ratio should be one such environmental cue.

Sex ratio should have its greatest influence on behavior when there is a sex-ratio imbalance among *reproductive-aged* males and females specifically (James, 1987). Supply-and-demand principles delineate that men and women possess a certain value as reproductive partners in the local mating marketplace, which means that only the sex ratio of men and women who could be reproductive partners should matter. Likewise, evolutionary psychology argues that behavior is, at least unconsciously, often in the service of successful reproduction (Tooby & Cosmides, 1992). In that case, an imbalance in the sex ratio should only be influential to the extent that it exists among men and women who are considered to be viable reproductive partners. The specific ratio of reproductive-aged males to females in a population has been termed the *operational sex ratio* (Emlen & Oring, 1977; Kvarnemo & Ahnesjo, 1996).

Generally speaking, imbalances in the operational sex ratio should influence behavior because members of the overrepresented sex have fewer potential partners from whom they can choose and more same-sex rivals for the potential partners who exist. Therefore, people should adjust their behavioral strategies to ensure successful reproduction in the face of a more limited mating pool and a larger number of rivals. On the other hand, because members of the

underrepresented sex have more potential partners and fewer same-sex rivals for those partners, they do not have to adjust their behavioral strategies as much, and might even be able to adjust their behavioral strategies in the opposite direction. In terms of mating, members of the overrepresented sex should relax their standards when choosing partners and increase the frequency and intensity with which they engage in acts of competition. On the other hand, members of the underrepresented sex should find themselves in a relatively advantageous position, having more potential partners from whom to choose and less same-sex competition for those partners. In this scenario, they can achieve successful reproduction while enacting stricter standards with their partner choices and engaging in less intrasexual competition.

Imbalances in the local sex ratio do not disappear once mating occurs; they persist even after a partner is chosen. Therefore, just as imbalanced sex ratios should influence how humans ensure successful mate search, imbalanced sex ratios should also influence how humans ensure successful mate retention. This fact has received surprisingly little attention by theorists and researchers alike, and it is a gap in the literature that the current investigation will address.

Sex Ratio Influences Mating Behavior in Animals

Given that non-human animals reach reproductive age quickly, research on animals has greatly illuminated how operational sex ratio influences behavior to achieve successful reproduction. In fact, shifts in operational sex ratio across species are clearly linked to corresponding shifts in mating behavior, which is

seen in domains such as mate choice and competition with rivals for those mates (Taylor & Bulmer, 1980). Although a majority of animal research has focused on mate choice and search rather than mate retention—a point that will be revisited shortly—the literature is nonetheless valuable in establishing that imbalances in local sex ratio can influence behavior in the service of reproductive success. The crucial tenet underlying animal research on this topic is that males can enact their preferred mating strategy when the sex ratio is female-biased and in their favor (i.e., when there are more females than males), and females can enact their preferred mating strategy when the sex ratio is male-biased (i.e., when there are more males than females). However, as the local sex ratio becomes increasingly biased towards the same sex and successful mating becomes more difficult, males and females must shift their behavioral strategy so that it is better suited to a sex ratio that no longer provides favorable odds.

For example, experimental research on the katydid species illustrates how imbalanced sex ratios influence mate selection, in that males become more likely to reject potential female mates when there are fewer sexually active males in the local environment and females are more likely to reject potential male mates when the sex ratio is reversed (Gwynne & Simmons, 1990). There are also numerous examples of species where imbalanced sex ratios influence same-sex competition for the mates that are available. In fact, observational and experimental research consistently shows that male-male competition is intensified as the sex ratio becomes more male-biased and that female-female

competition is intensified as the sex ratio becomes more female-biased (e.g., Gwynne, 1991; Mills & Reynolds, 2003). In particular, Forsgren, Amundsen, Borg, and Bjelvenmark (2004) observed the two-spotted goby in their natural habitat and noted that male-male competition became increasingly prevalent and female-female competition became less prevalent as the sex ratio gradually moved from female-biased to male-biased across the goby mating season.

Guppies also provide an intriguing example of how males and females adjust their mating behavior depending on the operational sex ratio (Jirotkul, 1999). Male guppies can engage in two distinct behaviors to increase their chances of attaining a mate. They can engage in a highly specific courtship display to attract the female ("I'll have mine"), or they can interrupt other male guppies engaging in courtship displays ("You can't have yours"). Males are much less likely to engage in courtship displays when there are more males in the environment because they seem to "recognize" the inflated risk of being interrupted. Instead, they are more likely to engage in interference tactics themselves. However, when there are fewer males in the local environment, the prevalence of courtship displays increases and the prevalence of interference tactics decreases. Female guppies are typically attracted to male guppies with bright orange coloration, as this color is indicative of good genetic fitness. However, when there are fewer males in the environment, female guppies show a decreased preference for orange coloration because they can no longer afford to be as discriminating in their mate choices. To the extent that orange coloration

is considered “attractive,” female guppies faced with an unfavorable sex ratio seem to relax their standards, at least from a behavioral standpoint.

The *Panorpa* scorpionfly is another intriguing example of the influence of sex ratio (Thornhill, 1980). The male scorpionfly has two distinct mating tactics that it can utilize to attract a mate: 1) it can offer the female a nutritional gift (e.g., a dead insect) so that the female will choose to copulate with the resource-providing male, or 2) it can secure the female’s wings and instigate copulation against the female’s will. The gift-giving strategy is preferable because it ensures that the female is well nourished and more likely to produce viable offspring. However, the supply of dead insects in the local environment is often limited, and the search for dead insects can expose males to predatory threat. Thornhill (1980) points out that the forced-copulation strategy is more prevalent in environments where the sex ratio is male-biased and male-male competition is therefore rampant. Male-biased sex ratios mean that male scorpionflies are less likely to procure the resources (i.e., dead insects) required for the gift-giving strategy, which requires them to *adjust their behavioral strategies* so that they can achieve successful reproduction.

Sex Ratio Influences Animal Behavior Analogous to Relationship

Maintenance in Humans

The animal research on sex-ratio effects focuses primarily on mate choice and mate search. However, fewer studies have considered how sex ratio influences the extent to which non-human animals of various species engage in

monogamous behavior once a partnership has been formed. Clearly, one must be careful when drawing analogies between monogamous behavior in human relationships and the monogamous behavior of non-human animals, partly because human relationships have an emotional and cognitive complexity that is absent from animal pair-bonds (see Berscheid & Regan, 2005). Although a larger body of research covers the influence of sex ratio on mate search and mate choice, there is some animal research that provides valuable preliminary insights on how sex ratio may affect monogamous behavior.

In many species of birds, for example, males frequently engage in extra-pair mating, which usually precludes these males from aiding their female mates with the incubation of their eggs (Magrath & Komdeur, 2003). Even though females are primarily responsible for incubation, the level of male contribution to incubation fluctuates drastically depending on the local sex ratio. Specifically, Magrath and Elgar (1997) observed male fairy martins in their natural environment and discovered that male fairy martins expended significantly more effort towards incubation when there were fewer fertile females in the surrounding environment. Faced with a male-biased and unfavorable sex ratio, male fairy martins engage in monogamous behavior instead of the extra-pair mating typical of most bird species.

In an experimental example, Mathews (2002) obtained a sample of snapping shrimp, and then placed the shrimp in artificial habitats in which the sex ratio was manipulated to be either even between males and females (1:1) or

heavily female-biased (1:5). The snapping shrimp are ordinarily a socially monogamous and territorial animal, in which a single male and a single female establish a common habitat and defend it together. Although male shrimp are typically monogamous, the males in this experiment were more likely to abandon their female mates and their commonly established habitats when the local sex ratio was heavily female-biased. This is consistent with behavior seen in other aquatic species such as the rainbow cichlid (Keenleyside, 1983) and the Kentish plover (Székely, Cuthill, & Kis, 1999), and it demonstrates that favorable sex ratios can undermine monogamous behavior (or that unfavorable sex ratios encourage monogamy).

Kaitala and Miettinen (1997) examined how imbalanced sex ratios affected the monogamous behavior of the coreid bug. Insect eggs are generally vulnerable to predation, and different insects exhibit various behavioral strategies to protect their eggs. Specifically, the female coreid bug glues her eggs to the backs of conspecifics so her eggs are no longer stationary targets for potential predators. Female coreid bugs are not particularly choosy about the conspecifics that they utilize for this purpose. However, when the researchers manipulated the sex ratio so that it was male-biased and there were more males than females in the local environment, females were more likely to glue their eggs to the backs of their mates (i.e., the males who actually fertilized the eggs). Admittedly, it can be debated whether carrying eggs is similar to “parenting duty,” and it is uncertain if carrying eggs prevents male coreid bugs from pursuing extra-pair mates.

However, if carrying eggs is a form of monogamous behavior, then this is further evidence for how unfavorable sex ratios may encourage monogamy.

In order to maintain a monogamous bond with a single partner, animals must also defend against competitors that could steal their partners, which is a process known as *mate guarding* (Buss, 2002). Mate guarding is an especially important monogamous behavior because the current monogamous bond will end if a mate-poaching attempt is successful. To the extent that unfavorable sex ratios encourage monogamy, then unfavorable sex ratios should logically encourage mate-guarding behavior as well.

The Messmate pipefish is a seemingly counterintuitive example of this phenomenon because pipefish males engage in monogamous behavior despite the fact that the local sex ratio of the pipefish is often female-biased—and thus favorable to males—for most of the pipefish mating season (Matsumoto & Yanagisawa, 2001). However, this pattern of behavior makes sense once one considers the role of mate guarding. As one would expect given a female-biased sex ratio, unmated pipefish females often try to steal males from mated females. However, these attempts are almost always unsuccessful, not necessarily because the males are unreceptive, but because the mated females appear to be especially vigilant of these mate-poaching attempts and intrude on them accordingly.

Clark (1988) examined the water strider insect species to provide experimental evidence of how sex ratio could affect mate-guarding behavior. For

many insect species, long copulation times are a mate-guarding strategy that males use to ensure successful reproduction. If a male insect inseminates a female and then immediately ceases the act of copulation, then this allows another male to inseminate the female immediately afterwards, thus increasing the likelihood that the other male's sperm will fertilize the egg. However, if males continue to copulate even after insemination, then this effectively "guards" the female by literally blocking access until fertilization occurs. Clark (1988) obtained a sample of water striders and placed them in artificial habitats where the sex ratio was either three males to one female or one male to three females. As expected, time of copulation was significantly longer when the sex ratio was male-biased (and thus unfavorable to males) because the greater number of males increased the threat of sperm competition. Across many insect species, e.g., the ragwort seed bug (McLain, 1989), the carrion beetle (Knox & Scott, 2006), and the seed-feeding bug *dysdercus bimaculatus* (Carroll & Loye, 1990), researchers have observed longer copulation times in response to male-biased sex ratios. This provides further evidence that animals faced with an unfavorable sex ratio shift towards a monogamous behavioral strategy by ensuring that same-sex competitors are less likely to gain sexual access to their mates.

Sex Ratio Is Also Relevant to Humans

Given the preceding discussion of animal research, there is a danger of thinking that imbalanced sex ratios are a phenomenon limited to non-human animal species. However, in human societies, there are numerous historical and

current examples of environments with a marked imbalance in the operational sex ratio. For instance, Guttentag and Secord (1983) note that the marriageable sex ratio shifted dramatically near the end of World War II, with “marriageable” defined as the normative age at which people began to marry during that time period. For most of its history, the United States had a surplus of marriageable males due to selective migration (i.e., the fact that most immigrants were male). However, a surplus of marriageable women emerged after World War II for two reasons: 1) selective migration became less pronounced due to emerging egalitarian norms, and 2) there were fewer births during World War II due to males serving in the war, and because younger women tend to marry older men, women born during the post-war baby boom had a smaller cohort of potential mates from which to choose.

For a more recent example, China is encountering numerous issues brought about by an imbalanced sex ratio of approximately 120 males to every 100 females (Hesketh, 2009). The phenomenon first emerged in the 1980’s as an imbalance in the sex ratio at birth due to China’s one-child policy leading to a wave of sex-selective abortions, which was partly attributable to strong norms favoring the birth of sons versus daughters (Hesketh & Xing, 2006; Yi et al., 1993). This has translated into an imbalanced operational sex ratio in recent years as the infant girls of 1980 have become the reproductive-aged women of 2013. This resultant imbalanced sex ratio is likely to have profound implications

for China—and other regional areas facing a similar situation—in the future (Brooks, 2012).

Finally, in a more localized context, American college campuses have become increasingly female-based since the onset of the 21st century, with 57 percent of the current undergraduate enrollment now being female (Williams, 2010). Although emblematic of growing egalitarianism in the United States, this phenomenon also comes at a practical cost for college-aged women, as they find themselves faced with a more limited dating pool when obtaining a higher education. As reported by Williams (2010), one female co-ed laments that “if a guy is not getting what he wants, he can quickly and abruptly go to the next [female] because there are so many of us,” indicating that undergraduate females must often settle for less. Moreover, because there is considerable between-campus variability in sex ratios, relationship outcomes in institutions such as the College of Charleston (66 percent female) should be quite different than relationship outcomes in institutions such as the Rochester Institute of Technology (33 percent female). Regardless, sex-ratio imbalances on college campuses have received more popular attention in recent years, with many anecdotal accounts of the current plight of undergraduate women (e.g., Adshade, 2011; Findlay, 2010; Pegher, 2010; Regnerus, 2011). However, this popular attention has yet to be buttressed by scientific inquiry.

As of now, academic attention to human sex ratio has been mostly theoretical in nature (e.g., Guttentag & Secord 1983; Kenrick, Li, & Butner, 2003).

Moreover, the extant research on sex ratio has been demographical rather than experimental, examining population trends within a given society and then determining whether or not they coincide with shifts in relevant outcomes on a societal level. Although these correlational studies do not allow for strong causal arguments, they offer a compelling rationale for future experimental work.

Demographical and Correlational Research Suggests that Sex Ratio Is Linked to Relationship Maintenance

For humans, romantic relationship maintenance should be a particularly important behavioral strategy for ensuring successful reproduction. Although the search for a high-quality mate can last an entire lifetime in some cases, a romantic involvement allows an individual to halt the search for a desirable mate and allocate effort towards successful childbearing and/or child rearing with a partner who has expressed willingness to reproduce (Kirkpatrick, 1998).

When the sex ratio is favorable and there are many members of the opposite-sex in the local environment, individuals should be more likely to continue the search for high-quality mates since the search has a greater likelihood of success. Moreover, if already in a relationship, individuals should be more willing to dissolve it if the prospect of a better relationship presents itself. However, when the sex ratio is unfavorable and there are fewer members of the opposite-sex, individuals should be more willing to commit to a romantic involvement as soon as possible since a prolonged search for a high-quality mate has a greater likelihood of failure. If already in a relationship, then

individuals should also engage in tactics to ensure that they can maintain it, thereby avoiding the search for another mate in an environment where the mating pool is relatively limited.

Demographical research on human sex ratio reveals strong associations between shifts in sex ratio and expected behavioral shifts by people in romantic relationships. For example, consider that men, relative to women, are typically inclined towards short-term mating strategies, and that women, relative to men, are typically inclined towards long-term mating strategies (Buss, 1989; 1994). Pedersen (1991) analyzed American sex-ratio trends over a century and found that sex ratios benefitting women (i.e., too many men) were associated with lower divorce rates and greater investment in child care, which makes sense considering that women in male-biased sex ratios should have more power to enact their long-term mating strategies with their partners. In the same vein, Pollet and Nettle (2008) examined the U.S. population of 1910 and found that male socioeconomic status was more predictive of marital success in states where the sex ratio was heavily male (i.e., too many men), indicating that women in male-biased sex ratios had the luxury of prioritizing financial status when the sex ratio was to their advantage. Finally, Lichter, Anderson, and Hayward (1995) followed a nationally representative sample of women over eight years. Using 1980 Census data from local metropolitan areas, they found that women were more likely to marry men of low socioeconomic status in areas where the local sex ratio was female-biased, but they were more likely to marry men of high

socioeconomic status—or even choose to marry no one at all—in areas where the local sex ratio was male-biased. Consistent with the animal literature, these studies elucidate how women can demand more in their romantic relationships when faced with a male-biased sex ratio. With fewer women in the environment (and thus fewer mating opportunities), men in romantic relationships must adjust their behavioral strategies to maintain the relationship and improve their chances of successful reproduction. On the other hand, Barber (2000) examined 85 countries and found that sex ratios with fewer men (i.e., too many women) had higher teen pregnancy rates, suggesting that women in female-biased sex ratios were engaging in earlier sexual onset and adopting an early childbearing strategy in the face of a female-biased sex ratio. In this context, men have the power to demand more from their partners, given that any female who fails to adjust her behavioral strategy is at greater risk of losing the relationship, as dissatisfied men can find another mate more easily than if the sex ratio was less female-biased.

Uecker and Regnerus (2010) addressed the phenomenon of imbalanced sex ratios on college campuses by administering a survey to a nationally representative sample of 1,000 undergraduate women. Even after controlling for relevant individual-level variables (such as age, race, and religiosity) and campus-level variables (such as regional location, college acceptance rate, and number of fraternities), they found convincing evidence that female-biased sex ratios on college campuses left undergraduate women with less power to navigate the college relationships market (see Williams, 2010). Specifically,

undergraduate females reported that they perceived males to be less trustworthy and less likely to commit in a romantic relationship, they had a harder time finding a steady boyfriend, they went on fewer traditional dates (instead settling for non-committed “hook-ups”), they were more likely to have had sexual intercourse in the previous month, and they were less likely to still be virgins. This is further evidence that many romantically involved undergraduate women must adjust to what their male partners want from a relationship, because failure to do so could result in their male partners ending the relationship and taking advantage of the favorable female-biased sex ratio to quickly find a “replacement” partner.

As more evidence, Kruger and Schlemmer (2009) examined the 50 largest metropolitan areas in the country. They found positive correlations between the local sex ratio and percentage of men married under the age of 30, and a negative correlation between the local sex ratio and percentage of men married over the age of 30. In other words, men were likely to get married earlier—indicative of the increased commitment preferred by women—when the sex ratio was male-biased and unfavorable to men, but they were likely to get married later—indicative of the decreased commitment preferred by men—when the sex ratio was female-biased and favorable to men.

Finally, consider that the states with the highest male-to-female sex ratios (i.e., too many men) were Alaska and Nevada, whereas the states with the lowest male-to-female sex ratios (i.e., too many women) were Massachusetts

and Rhode Island, according to the 2000 Census. According to a later survey by the Division of Vital Statistics (2002), Alaska and Nevada had among the highest divorce rates in the nation (ranked #1 and #13, respectively), whereas Massachusetts and Rhode Island had some of the lowest divorce rates in the nation (ranked #46 and #39, respectively). As another test of the association between state sex ratios and divorce rates, I ran a demographical analysis by obtaining: 1) the operational sex ratio for each state, defined as the ratio of unmarried males age 15+ to unmarried females age 15+, and 2) the statewide divorce rate for the 44 states that had the data available. The correlation between state sex ratio and statewide divorce rate was +.40 and was significant at $p < .008$, meaning that ratios of more males to females were associated with higher divorce rates (Kim, 2013). Obviously, further research is needed to control for potential confounds and third variables such as religiosity and socioeconomic status. However, if one considers that females usually initiate divorce (e.g., Zeiss, Zeiss, & Johnson, 1981), then these data suggest that females can demand from their current relationships—and may be more willing to leave their relationships—if they perceive that the sex ratio is conducive to finding another and perhaps better mate (i.e., if there are too many men).

There Is No Extant Experimental Work Examining Sex Ratio Effects on Relationship Maintenance

Non-experimental studies have provided a solid foundation for understanding the role of sex-ratio imbalance in determining adaptive strategies

in romantic relationships. However, experimental work is needed to test and establish causality and to clarify the nuances of sex-ratio effects. Currently, only two experimental studies investigating sex ratio exist in the literature.

Under the logic that immediate financial resources and conspicuous consumption are associated with being more attractive to potential mates, Griskevicius and colleagues (2012) manipulated sex ratio and found that men were more likely to make risky financial decisions, i.e., they were less likely to save money and more willing to incur debt to acquire immediate resources, when faced with an unfavorable (i.e., male-biased) sex ratio. Therefore, not only is high financial status important for men in attracting potential mates, but it is especially important for men faced with a male-biased sex ratio, because any time spent making prudent financial decisions and saving “for the future” is time during which same-sex competitors with more financial resources have already obtained the few mates that are available. Durante, Griskevicius, Simpson, Cantu, and Tybur (2012) manipulated sex ratio and found that women were much more likely to pursue careers instead of families given an unfavorable (i.e., female-biased) sex ratio. Under these conditions, women perceived themselves as less likely to find an acceptable mate in the current market, which necessitated that they achieve financial viability through other means. However, these experimental studies investigated outcomes related only to mate choice, not the domains of mate retention and relationship maintenance.

In this dissertation, I test a series of predictions across three experimental studies, using heterosexual samples, in which I hypothesize that manipulating perceptions of sex ratio will influence how heterosexual people think and behave in romantic relationships.¹ For purposes of clarity, I will present each hypothesis after explaining the relevant theory that lead to its derivation.

Sex Ratio Should Influence How Much Individuals Value Their Relationships

Guttentag and Secord (1983) derived specific hypotheses about the influence of sex ratio on how individuals value their romantic relationships by drawing upon principles of *equity theory* (Homans, 1961; Walster, Walster, & Berscheid, 1978) and *interdependence theory* (Kelley & Thibaut, 1978; Thibaut & Kelley, 1959).

According to equity theory (Adams, 1965; Walster et al., 1978), people are motivated to adhere to norms of fairness within their romantic relationships in order to achieve equity. Specifically, Walster et al. (1978) suggested that a relationship is equitable to the extent that Partner A's ratio of outcomes (i.e., benefits) to inputs (i.e., costs) is equal to Partner B's ratio of outcomes to inputs. However, if at least one partner feels a lack of equity, especially when that partner feels underbenefitted (Adams, 1965), then this should result in decreased relationship quality. Therefore, to ensure a high-quality relationship, individuals should strive to achieve equity in their relationships by ensuring that the cost-benefit ratios of both partners are roughly equivalent.

However, the perception of cost-benefit ratio is not immune to ecological factors. Recall the analogy in which the mating pool was likened to a marketplace and thus subject to supply-and-demand principles. This ties in neatly with equity notions of cost-benefit ratios, and this is where sex ratio should be especially relevant. Assume that men and women have a certain “price” that they can demand in the marketplace, and that any specific relationship involves a man “paying” the woman’s price and the woman “paying” the man’s price. When there is a shift in the local sex ratio, the laws of supply and demand specify that the price for men and women will shift accordingly, meaning that a relationship previously in an equitable state could now become one in which one partner is underbenefitted (i.e., one partner is “overpaying”). As a result, the underbenefitted partner—the female given a male-biased sex ratio, and the male given a female-biased sex ratio—should become less satisfied with the relationship. However, if we are making predictions based on equity theory, then we would hypothesize that the overbenefitted partner—i.e., the male given a male-biased sex ratio, and the female given a female-biased sex ratio—would also become less satisfied with the relationship. Although feeling overbenefitted should be a more satisfying state of affairs than being underbenefitted, it is still less satisfying than having a totally equitable relationship, according to equity theory (Adams, 1965; Walster et al., 1978).

Interdependence theory (Kelley & Thibaut, 1978; Thibaut & Kelley, 1959) offers more straightforward predictions regarding how sex ratio should influence

the extent to which individuals value their relationships. To fully appreciate the predictions borne from interdependence theory, one must understand the constructs of comparison level (CL) and comparison level of alternatives (CL_{alt}). Comparison level is defined as the level of outcomes (benefits) that one believes one deserves from a romantic relationship. Therefore, a relationship should be valued more highly to the extent that perceived outcomes are greater than CL, and lower to the extent that perceived outcomes are less than CL. Comparison level of alternatives is defined as the level of outcomes that one believes one could be receiving from the best possible relationship other than the current one. Hence, a relationship should be valued more highly to the extent that perceived outcomes are greater than CL_{alt}, and lower to the extent that perceived outcomes are less than CL_{alt} (for representative examples, see Le & Agnew, 2003, Rusbult, 1980, and Rusbult, 1983).

Intuitively, an imbalanced sex ratio in one's favor should *directly* influence comparison level of alternatives by providing a greater range of relationships that could be better than the current one. Moreover, an imbalanced sex ratio should *indirectly* influence relationship quality by effecting psychological changes in how one perceives their own comparison level, as individuals should not only be aware of their partner's value in the mating marketplace, but their own value as well.

Finally, we can consider the influence of sex ratio on the valuation of romantic relationships through the lens of evolutionary psychology. Although

evolutionary psychology is often considered to be the study of mating, the tenets underlying the field allow us to consider how *any* behavior may be valuable in the service of successful reproduction (Neuberg, Kenrick, & Schaller, 2010).

Recently, some evolutionary psychologists have argued that maintaining a pair-bond (i.e., a romantic relationship) is ultimately adaptive because it directs individuals: 1) to ensure mating with a willing mate rather than expend effort on unwilling mates, and 2) to optimize the survival of resulting offspring (see Kirkpatrick, 1998; Pillsworth & Haselton, 2006). As a result, when individuals value their relationships more, this serves as a “commitment device” that encourages individuals to prioritize the long-term rewards of relationship maintenance rather than pursuing the short-term rewards of possible alternative mates (Frank, 1988; Gonzaga, Haselton, Smurda, Davies, & Poore, 2008). Sex ratio is relevant to this process because it has direct bearing on the extent to which relationship maintenance is the optimal strategy to ensure reproduction. If imbalances in sex ratio result in more members of the opposite sex, then this may encourage individuals to be more receptive to pursuing alternative mates rather than fully committing to their current relationship, which could be manifested as decreased valuation of the current relationship. However, if there are fewer members of the opposite sex, then individuals might show increased valuation of their romantic partners and relationships, becoming less receptive to attractive alternatives and choosing to commit to their current relationship instead.

H1: Relative to perceiving a favorable sex ratio, perceiving an unfavorable sex ratio (i.e., fewer members of the opposite sex and more members of the same sex) will result in romantically involved individuals valuing their relationships more, i.e., feeling more satisfied with their relationships and feeling closer to their romantic partners.

Sex Ratio Should Affect Mate Guarding, Although There May Be Sex Differences

If people value their romantic relationships more highly, then they should be more likely to *behave* to maintain their romantic relationships (Gonzaga et al., 2008). However, it requires effort to successfully maintain a romantic relationship, and a particularly notable threat to any relationship is the possibility that romantic competitors might engage in mate poaching (i.e., steal one's partner) (Buss, 2002). Any behavior intended to prevent the relationship from dissolving due to mate-poaching threats can be classified as a form of mate guarding. In particular, the threat of mate poaching should be especially salient when there is an unfavorable sex ratio, given that one's partner should be even more valuable and there are more same-sex competitors for that valued commodity. Therefore, in response to an unfavorable sex ratio, individuals in relationships should shift behavioral tactics and demonstrate more mate-guarding behavior to deal with this salient threat.

Earlier, I discussed animal research indicating that both males and females engaged in more mate guarding when faced with an increasingly

unfavorable sex ratio (e.g., Clark, 1988; Matsumoto & Yanagisawa, 2001). In those studies, both males and females engaged in a similar form of mate-guarding behavior when faced with an unfavorable sex ratio that involved directly intervening and aggressively warding off threats. However, it is important to remember the profound differences between human and non-human animals in terms of cognitive capabilities. In particular, human beings have more developed frontal lobes compared to non-human animals, and humans have the largest proportion of cerebral cortex relative to body size. Considering that the cerebral cortex is the part of the brain that is primarily responsible for higher-level thought (Roth & Dicke, 2005), humans are capable of adopting much more nuanced behavioral strategies that non-human animals cannot enact. As such, even though non-human males and females appear to guard their mates in much the same way, male and female humans may diverge on how they guard their mates, based on differing relationship concerns.

Parental investment theory (Trivers, 1972) indicates that men and women should, in fact, have differing relationship concerns. According to parental investment principles, there are fundamental differences between men and women in mating behavior, due largely to differential parental investment. For humans in particular, initial female parental investment is much greater than initial male parental investment, given how women and men reproduce. Human gestation occurs within the female, and the female typically releases only one ovum per month for a limited period of her life. As a result, it is more costly for

women to choose unworthy mates, given the costs of wasting nine months that could have been spent pursuing better mates. Human males, on the other hand, have billions of sperm cells that are viable across their lifespans, and they do not gestate. From an evolutionary perspective, men suffer fewer consequences from an unwise choice of mates.

One implication of this reality is that women tend to be more oriented towards long-term mating strategies, whereas men tend to be more inclined towards short-term mating strategies (although the local environment can shift the mating strategies of women and men) (Buss & Schmitt, 1993). Women should be more discriminating when choosing mates, and they should tend to prefer mates who are more inclined to provide for their offspring. Men, on the other hand, should be relatively less choosy when selecting mates, especially short-term mates. Indeed, Buss (1989; 1994) has found that men, relative to women, are more attracted to markers of health and fertility (e.g., physical attractiveness), attributes that are not highly correlated with investment of parental effort by men. In contrast, because they invest relatively more in each of offspring, women are more attracted to markers of a male's ability and willingness to provide resources (e.g., financial wealth and social status). A rich body of literature has established this relative sex difference in which men are more inclined towards short-term mating and thus mindful of immediate reproduction goals, whereas women are more inclined towards long-term mating and thus mindful of long-term reproduction goals (e.g., Clark, & Hatfield, 1989;

Kenrick, Sadalla, Groth, & Trost, 1990; Li, Bailey, Kenrick, & Linsenmeier, 2002; Perilloux, Easton, & Buss, 2012).

Because men are more mindful of short-term mating outcomes and women are more mindful of long-term mating outcomes, men and women in romantic relationships should be differentially aware of potential threats to their relationships. In an illuminative example, research testing parental investment theory has revealed sex differences in feelings of jealousy. For example, Buss, Larsen, Westen, and Semmelroth (1992) found that, even though men and women both find sexual and emotional infidelity distressing, men report that sexual infidelity is more upsetting than emotional infidelity when forced to choose between the two, whereas women show the reverse pattern. Later research has revealed that this finding only emerges in forced-choice scenarios (DeSteno, Bartlett, Braverman, & Salovey, 2002), but the sex difference still demonstrates basic parental investment principles. Being more mindful of immediate reproduction goals, men should be more upset by sexual infidelity because it raises the possibility of cuckoldry and paternity uncertainty. Being more mindful of goals related to long-term reproduction, women should be more upset by emotional infidelity because such acts could be a precursor to relationship dissolution and resultant loss of resources.

Due to differential parental investment and its consequent implications for jealousy, men and women should enact different mate-guarding tactics when they perceive that their relationship may be threatened due to an unfavorable sex

ratio in the local environment. In an environment where there are fewer members of the opposite sex (and more members of the same sex), men should be aware of, and should try to ward off, advances from potential rivals given concerns about possible sexual infidelity. Although sexual infidelity does not necessarily indicate interest in pursuing a long-term relationship with the infidelity partner, even a single sexual indiscretion poses the possibility of paternity uncertainty. Because even one extra-pair sexual encounter can result in a pregnancy, men should be particularly vigilant when faced with a situation in which sexual infidelity is even a remote possibility.

However, when women face an environment with fewer members of the opposite sex, they might be more tolerant of rivals who represent short-term sexual threats if such tolerance facilitates the relationship's long-term stability and the threat of emotional infidelity is not present. Although this may seem counterintuitive, it is important to realize that: 1) this is not a choice between allowing sexual infidelity and potentially losing the relationship, but rather a choice between allowing *sexual infidelity risk* and potentially losing the relationship, and 2) this is a less-than-ideal choice for women that is made necessary because of the unfavorable sex ratio in the local environment. Women should not *encourage* sexual infidelity, but they may be willing to take the *risk* that sexual infidelity might occur (i.e., allow greater latitude under the assumption that sexual infidelity is unlikely to occur) if it makes them a more desirable romantic partner. Consider the alternative approach, in which women adopt an

increasingly vigilant and intrusive strategy in response to an unfavorable sex ratio. Women run the risk of adopting such a strategy when sexual infidelity was already unlikely to occur, and this hyper-intrusive strategy could have the ironic effect of undermining relationship stability, perhaps because these women come off as “smothering” or signifying to their partners a lack of trust.

There is some evidence that males and females do, in fact, use different mate-guarding tactics when faced with threats. Buss (1986) asked men and women what strategies they would use to ensure that their romantic partner, actual or hypothetical, would stay with them and not leave them for someone else. Both men and women reported explicit acts of love and caring, but they differed in the other actions that they would perform. Men were more likely than women to endorse violence toward same-sex competitors, whereas women were more likely than men to adopt an indirect strategy that kept their partners satisfied and the relationship amicable rather than engage in direct aggression. Men, therefore, responded to external relationship threats by becoming more vigilant, whereas women did not. Importantly, these patterns of behavior were found in both undergraduate dating relationships (Buss, 1986) and in marriages (Buss & Shackelford, 1997), indicating that this divergent nature of mate guarding does not change as relationships become more committed. This previously established sex difference should be especially evident in response to manipulated sex ratio, in that men and women should respond to the threat

implied by an unfavorable sex ratio by amplifying their mate-guarding behavioral strategy of choice.

H2: Relative to perceiving a favorable sex ratio, perceiving an unfavorable sex ratio (i.e., fewer members of the opposite sex and more members of the same sex) will result in romantically involved individuals engaging in more mate-guarding behavior. Due to differential parental investment, however, males should be more likely to engage in mate guarding that involves direct intervention, whereas women should be less likely to engage in mate guarding that involves direct intervention.

Sex Ratio Should Influence the Need for Cognitive-Behavioral Consistency

There can be danger in shifting behavioral strategies in response to an unfavorable sex ratio. Men who become increasingly vigilant risk alienating their partners by appearing too controlling, and women who become increasingly tolerant of potential partner transgressions (e.g., partner infidelity) might enable transgressions that would not have occurred otherwise. However, classic theories of cognitive consistency (see Aronson, 1968; Festinger, 1957) generally agree that it is unpleasant for individuals to engage in a behavior that does not match their cognitive appraisal of the situation, and that individuals strive to achieve consistency between their behavior and cognition whenever possible. Thus, if individuals shift their behavior in a mate-guarding situation based on an unfavorable sex ratio, then they logically should also shift their cognitive appraisal of the mate-guarding situation to justify that behavioral shift.

In fact, many relationships researchers have found evidence that individuals in romantic relationships generally shift their cognitive appraisals of various relationship scenarios—sometimes even inaccurately—in the service of relationship maintenance. For example, Gagne and Lydon (2001) asked individuals in romantic relationships about the likelihood that they would eventually break up with their partners, except these individuals differed on whether or not they had recently experienced an external event requiring a behavioral commitment to the relationship (i.e., they were moving out of town for college and had decided to attempt a long-distance relationship). Individuals were less likely to believe that their relationship would dissolve if they had just behaviorally committed to it, meaning that they were justifying their behavioral commitment by shifting their cognitive appraisal of the relationship's durability. In another example, a large body of literature has examined the affective forecasting error (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998), in which individuals overestimate the strength of their emotional responses to future events. With respect to romantic relationships, individuals in relationships tend to overestimate their negative emotional response post-breakup compared to their actual negative emotional response post-breakup, and affective forecasting errors are especially evident in individuals who value their relationships highly (Eastwick, Finkel, Krishnamurti, & Loewenstein, 2008; Gilbert et al, 1998; Tomlinson, Carmichael, Reis, & Aron, 2010). By shifting their cognitive appraisal of how they would respond to a potential breakup, individuals can better justify

maintenance efforts in light of the expected negative consequences that would otherwise supposedly occur.

In an especially illuminating example of this process, consider the unavoidable truth that, as romantic relationships develop, individuals inevitably discover attributes about their partners that are less than desirable, simply because of exposure to their partners' behavior in an expanding range of settings. For individuals to continue to behave in a way that maintains their romantic relationships, they must reconcile the fact that they are behaving to maintain a relationship with a partner who, on a purely objective level, is revealing him/herself as increasingly less desirable. Murray, Holmes, and Griffin (1996) have tested whether or not *positive illusions*—a cognitive process in which an individual perceives his/her romantic partner in a more positive light than the partner sees him/herself—predict better long-term relationship outcomes. They found that systematic inaccuracies in perceiving one's partner (i.e., positive illusions) predict greater relationship satisfaction and less destructive relationship conflict. A subsequent longitudinal analysis confirmed that positive illusions produce increases in satisfaction, but not vice versa (Murray & Holmes, 1997).

Admittedly, this research does not deal with mate guarding, but it is valuable in establishing that people shift their cognitive appraisals in their relationships to justify behavioral maintenance. This suggests that increased mate guarding—a form of behavioral maintenance—should elicit similar changes in cognitive appraisals. Given an imbalanced sex ratio, I previously hypothesized

that individuals should shift their behavior to maximize their chances of maintaining their romantic relationships. Following the logic of cognitive consistency, it follows that these individuals should also shift their cognitive appraisal of the mate-guarding situation to be in line with their shift in behavior.

Specifically, I propose that, if there is a sex difference in how individuals mate guard in response to an unfavorable sex ratio, then this should produce a similar sex difference in how these individuals cognitively appraise their partner's receptiveness to committing infidelity. For example, if men engage in a more vigilant mate-guarding strategy, then they might do so because they are more uncertain about their partner's faithfulness than might actually be deserved. Consistent with this logic, Buss and Shackelford (1997) found that males in romantic relationships were more likely to endorse aggressive mate guarding if they perceived their partners as more likely to commit infidelity. On the other hand, because women should engage in a more indirect mate-guarding strategy instead of a direct and aggressive one, shifts in their perceptions of partner infidelity are unnecessary.

There is a competing prediction when it comes to how females might shift perceptions of partner infidelity. We previously hypothesized that females would engage in an indirect mate-guarding strategy based on keeping their partners satisfied, meaning that they would provide their partners with increased latitude in mate-guarding scenarios in order to avoid being smothering or indicating a lack of trust. In that case, one could reasonably argue that females should

actually decrease their perceptions of partner infidelity in response to an unfavorable sex ratio, in order to cognitively justify such behavioral latitude. This is a very strong competing hypothesis, and could very well be what the data reveals. However, in the interests of making a single prediction, I believe that females are more likely to be unaffected by the manipulation, because their indirect strategy should be targeting the threat of potential relationship loss due to internal factors, not due to the external threat of infidelity.

H3: Relative to perceiving a favorable sex ratio, perceiving an unfavorable sex ratio (i.e., fewer members of the opposite sex and more members of the same sex) will result in romantically involved males perceiving their partners to be more likely to commit infidelity, thus justifying their more direct mate-guarding strategy described in Hypothesis 2. Women should not show any changes in perceptions of partner infidelity in response to sex ratio because their indirect mate-guarding strategy does not involve any cognitive inconsistency to resolve.

Analogous Forms of Relationship Maintenance: Accommodation

Finally, I will attempt to explore other relationship-maintenance behaviors besides mate guarding that may be influenced by an imbalanced sex ratio. If the previous hypotheses are supported, then this would indicate that men tend to engage in a more direct forms of relationship maintenance to fend off competitors, whereas women generally engage in a more indirect forms of relationship maintenance that involve “picking battles” and preserving

relationship harmony. If this conceptual distinction accurately captures how men and women engage in relationship maintenance, then this gender difference should manifest itself in other behavioral domains. Thus, I also examined how sex ratio might influence *accommodation* behaviors.

In romantic relationships, accommodation occurs when one partner transgresses (or is perceived to have transgressed) against the other partner, and the other partner must then decide how to respond. Generally speaking, an individual may be initially inclined to reciprocate negativity with negativity, which may be acceptable in interactions with strangers but is not an ideal strategy in close relationships (Gottman, 1994). Instead, in order to maintain the relationship, it is more effective to engage in accommodation, in which one inhibits the immediate impulse to respond destructively to a negative act and chooses to behave more constructively instead (Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991). Although there is some evidence that excessive accommodation can decrease relationship quality due to the danger of exploitation (McNulty, 2010), most research indicates that reasonable levels of accommodation are associated with greater relationship quality (e.g., Fincham, 2000; Finkel, Rusbult, Kumashiro, & Hannon, 2002; Rusbult et al., 1991; Weiselquist, Rusbult, Foster, & Agnew, 1999). To provide a conceptual example, accommodation of explicitly abusive behavior could be detrimental to relationship quality (although it might contribute to relationship maintenance), but it may be wise to simply ignore trivial transgressions (e.g., annoying but innocuous habits,

isolated episodes of being inconsiderate) because it may not be worthwhile to arouse the negative emotions for what ultimately amounts to a “non-issue.”

Therefore, given an unfavorable sex ratio, it may be wise for individuals to be especially accommodating, even at the risk of being exploited, because the potential negative consequences for *not* being accommodating and “pressing the issue” might be severe. If one is not accommodating and loses the relationship as a result, an unfavorable sex ratio would make it especially difficult for an individual to find a new romantic partner. Arguably, one could make the prediction that both men and women should show increasing accommodation in response to an unfavorable sex ratio, as there is no existing theory indicating that accommodation is linked to positive relationship outcomes for one sex more than the other. However, to the extent that men primarily choose a direct behavioral strategy and women primarily choose an indirect one, only women should increase accommodation—which is an indirect behavioral strategy—in response to an unfavorable sex ratio, even if members of both genders might benefit from such a behavioral shift.

H4: Relative to perceiving a favorable sex ratio, perceiving an unfavorable sex ratio (i.e., fewer members of the opposite sex and more members of the same sex) will result in females engaging in more accommodation, consistent with the logic that they respond to unfavorable sex ratios with indirect strategies intended to preserve relationship harmony. Males

should not show any difference in accommodation in response to sex ratio.

Study 1

Consistent with supply and demand principles delineated by Guttentag and Secord (1983) and evolutionary principles delineated by Tooby and Cosmides (1992), I hypothesized that perceiving an unfavorable sex ratio (i.e., fewer members of the opposite sex and more members of the same sex) would result in romantically involved individuals feeling more satisfied with their current relationships and feeling closer to their current romantic partners, relative to perceiving a favorable sex ratio (*H1*). Thus, when primed with fewer members of the opposite sex, romantically involved individuals should (perhaps unconsciously) perceive that they have fewer potential mates from which to choose if their current relationship ended. As such, the relationship should be perceived as a more “valued commodity,” and felt satisfaction and closeness should increase accordingly.

Methods

Participants

The sample in Study 1 consisted of 65 participants (18 males, 47 females) at a large public university, all of whom were in a romantic relationship at the time of the study. Before arriving at the final sample ($N = 65$), 11 participants were removed because they anticipated the hypotheses, and 2 participants were removed because they reported not being heterosexual. In terms of race, 69.2

percent of participants reported as Caucasian, 18.5 percent reported as Asian, and 12.3 percent reported as another racial category. In terms of relationship status, 81.6 percent of participants reported as being in a dating relationship, 9.2 percent reported as being engaged, and 9.2 percent reported as being married. The mean participation age was 21.69 years, and mean relationship length was 26.14 months. All participants received either course credit or \$10.00 for their participation.

Design and Procedure

Participants signed up for the study believing that it was about “memory and perception processes among romantic couples.” Approximately a week prior to the lab session, participants completed a short online questionnaire so the experimenters could supposedly determine the correct procedure for the participants once they arrived at the lab. In truth, all participants underwent the same procedure regardless of their answers to the online questionnaire. The questionnaire allowed us to obtain baseline measures of relationship satisfaction and relationship closeness, which were used in the analyses. Specifically, these were our Time 1 (T1) measures, the importance of which will become clear when I describe the data-analytic strategy. Distractor measures were also added to the questionnaire to bolster our cover story.

Once participants arrived at the lab session, they read a short news article about demographical trends on college campuses. To minimize suspicion about the true purpose of the experiment, participants were told that the article was

chosen because it was relevant to undergraduate students in general and because its length of 500 words was ideal for a memory study.

Immediately after reading the article, participants were told that some time needed to pass before the memory part of the study could be administered, so they would now answer some “unrelated” questions about their romantic relationships while waiting. At this point, participants answered the same questions about relationship satisfaction and closeness that they had answered for the online questionnaire. Specifically, these were our Time 2 (T2) measures, the importance of which will again become clear when I describe the data-analytic strategy.

Sex Ratio Manipulation. Participants were then given one of two versions of an article supposedly taken from the Des Moines Register, a reputable newspaper located in the general region of the university where the study was conducted. Depending on the condition to which each participant was randomly assigned (i.e., favorable sex ratio versus unfavorable sex ratio), the article stated that there was either an increasing number or a decreasing number of members of the opposite sex on most local college campuses nationwide, and that these trends were likely to continue into the future. In the unfavorable sex-ratio condition, the article emphasized that members of the opposite sex were becoming increasingly underrepresented on nearby college campuses. In the favorable sex-ratio condition, the article emphasized that members of the

opposite sex were becoming increasingly overrepresented on nearby college campuses. (See **Appendix A** for the articles used as primes.)

As a manipulation check to ensure that the manipulation was influencing perceptions of sex ratio as anticipated, participants were asked to estimate the sex ratio on local college campuses, with 1 = “many more women than men” and 7 = “many more men than women.” The manipulation check was significant, $F(1, 63) = 202.57, p < .01$, $M(\text{female}) = 2.34$, $M(\text{male}) = 5.73$, and successful.

Dependent Measures. The measure of relationship satisfaction was the four-item satisfaction subscale from the Investment Model Scales (Rusbult, Martz, & Agnew, 1998; see **Appendix B**). This measure was chosen because: 1) it contained relatively few items, and brevity was a priority to ensure that the prime remained effective, 2) this subscale was based on foundational research investigating the constructs of comparison level and comparison level of alternatives in romantic relationships (Rusbult, 1980; 1983), and 3) it has been well-validated in numerous studies examining relationship satisfaction. In this particular study, Cronbach’s alpha for this 4-item measure of satisfaction was .86.

The measure of felt closeness was the Inclusion of Other in the Self Scale (Aron, Aron, & Smollan, 1992; see **Appendix C**), which is a 1-item scale in which participants are given seven sets of increasingly overlapping circles and are asked to choose the one set that best represents how close they feel to their partners. Although this scale is only one item, it has been well validated and used

frequently in other research exploring romantic relationship quality, with studies frequently showing that people do demonstrate short-term shifts on this scale if exposed to the right manipulations. Furthermore, this one-item scale was ideal for Study 1 due to its brevity.

To create the dependent variables, I generated unstandardized residual scores, with each participant's post-manipulation satisfaction and closeness scores being regressed onto his or her pre-manipulation satisfaction and closeness scores, respectively. The pre-manipulation scores were the T1 measures collected during the initial online questionnaire, and the post-manipulation scores were the T2 measures collected immediately after the prime. This approach allowed me to estimate the extent to which the manipulation influenced changes in satisfaction and closeness, adjusting for baseline satisfaction and closeness.

Results and Discussion

Using a GLM analysis, I tested whether or not there was an effect of sex ratio on changes in how people valued their relationships pre-to-post manipulation (*H1*). The results supported this hypothesis, as the sex-ratio prime significantly influenced how people felt about their relationships, controlling for how people initially felt about their relationships according to the initial questionnaire (**Figure 1** for satisfaction; **Figure 2** for closeness). Specifically, people felt more satisfied with their relationships, $F(1, 63) = 4.48, p < .04, \eta_p^2 = .07$, and reported increased relationship closeness $F(1, 63) = 3.54, p < .07, \eta_p^2 =$

.05, when they were primed with the idea of fewer members of the opposite sex on local college campuses (satisfaction: $M = .32$, $SE = .10$; closeness: $M = .54$; $SE = .20$) relative to when they were primed with more members of the opposite sex (satisfaction: $M = 0.01$, $SE = .11$; closeness: $M = .00$, $SE = .21$). There was no support for the competing hypothesis based on equity principles, that individuals primed with fewer members of the opposite sex would report similar changes in satisfaction and closeness as individuals primed with many members of the opposite sex.

Although I did not expect an interaction involving participant sex, I ran a GLM analysis in which I entered the sex-ratio prime, participant sex, and the interaction term between the prime and participant sex to test if there were unhypothesized sex differences. The interaction terms for both analyses were non-significant, $F(1, 61) = .227$, $p < .64$, $\eta_p^2 = .00$, for satisfaction, and $F(1, 61) < .001$, $p < .99$ for closeness, $\eta_p^2 = .00$. Therefore, the data did not reveal any evidence of gender moderation.

Control Condition. I included a control condition in a preliminary attempt to see if the sex-ratio effects revealed in the data were driven by fewer members of the opposite sex, many members of the opposite sex, or both. Although not presented as part of my core analyses due to a lack of a priori hypotheses, I present the analyses here to begin to illuminate whether favorable sex ratios or unfavorable sex ratios—or both—are particularly influential in influencing relationship maintenance. Specifically, responses to the control condition were

compared to the many opposite-sex versus few opposite-sex conditions. If responses to the control condition were significantly different from responses to both experimental conditions, then one could conclude that both favorable and unfavorable sex ratios influence relationship maintenance. However, if responses to the control condition were only significantly different from one experimental condition but not the other, then one could conclude that it was only that former experimental condition that was driving changes in relationship perceptions or maintenance.

For Study 1, 37 participants were asked to read a neutral article specifically chosen because it should not have primed any concepts relevant to sex ratio and romantic relationships. (See **Appendix D** for the control article.) When including the control condition in our analyses, there was still a marginally significant effect of sex ratio on satisfaction, $F(2, 98) = 2.43, p < .10, \eta_p^2 = .05$, and a marginally significant effect of sex ratio on closeness, $F(2, 99) = 2.47, p < .09, \eta_p^2 = .05$. However, when comparing the marginal means, the data revealed inconsistencies in terms of interpretation. For satisfaction (**Figure 3**), the control condition resembled the many-opposite sex condition and differed markedly from the few opposite-sex condition, indicating that unfavorable sex ratios were responsible for driving sex-ratio effects. However, for closeness (**Figure 4**), the data revealed the opposite pattern, in which the control condition resembled the few opposite-sex condition and differed markedly from the many opposite-sex condition, indicating that favorable sex ratios were driving the effects.

In summary, Study 1 generally documented that perceived sex ratio can have real effects on romantic-relationship perceptions. Specifically, individuals faced with an unfavorable sex ratio had a more positive view of their romantic relationships than did individuals faced with a favorable sex ratio. A sex ratio with fewer members of the opposite sex conveys fewer mating opportunities and greater mating competition; accordingly, people become increasingly satisfied with their “valued commodity” and feel closer to their partners as a result, which is consistent with both supply-and-demand principles (Cialdini, 2006; Guttentag & Secord, 1983; Marshall, 1890) as well as evolutionary psychology principles (Tooby & Cosmides, 1992).

The inclusion of a control condition was meant to address the question of whether favorable or unfavorable sex ratios were driving sex-ratio effects. However, there was an inconsistent pattern of results across outcome variables when the control condition was considered, leaving me unable to make any theoretically based interpretations about whether participants were more affected by favorable versus unfavorable sex ratios.

Study 2

Study 1 examined how individuals valued their romantic relationships in response to shifting sex ratios, demonstrating that unfavorable sex ratios lead to increased feelings of relationship satisfaction and closeness. That is, when individuals in romantic relationships are faced with a sex ratio in which relatively few members of the opposite sex are present and the overall mating pool is

limited, they value their relationships more than when there are relatively more members of the opposite sex present.

Following from these findings, if a person comes to see his/her relationship as an especially valued commodity, he/she should be motivated to shift his/her behavioral strategies to ensure that the relationship remains intact. Specifically, one should see increased mate-guarding behaviors in response to the increased threat represented by a sex ratio with fewer members of the opposite sex, and thus more members of the same sex who could potentially steal the partner away (Buss, 2002).

Moreover, in line with parental investment theory (Buss et al., 1992; Trivers, 1972), men and women should use different mate-guarding strategies. When men are faced with a sex ratio with fewer members of the opposite sex (i.e., too many men), they should be more likely to engage in intrusive behaviors designed to prevent immediate sexual infidelity. However, when men are faced with a sex ratio with more members of the opposite sex (i.e., too many women), they should be less likely to engage in intrusive behaviors because the local environment is less threatening. When women are faced with a sex ratio with fewer members of the opposite sex (i.e., too many women), they should engage in a more indirect strategy, relative to men, that overlooks the increased possibility of sexual infidelity, perhaps to maintain relationship harmony and long-term relationship stability. However, when women are faced with a sex ratio with more members of the opposite sex (i.e., too many men), they should be less

likely to look the other way since the local environment makes this risky mate-guarding strategy unnecessary.

Study 2 sought to experimentally test if shifting relationship valuation in response to sex ratio is accompanied by shifting behavioral strategies. I hypothesized that romantically involved individuals would be more likely to engage in mate guarding if faced with an unfavorable sex ratio versus a favorable one. However, consistent with extant theory, I also expected a sex difference in which men would be more intrusive in potential mate-guarding scenarios when faced with an unfavorable sex ratio, whereas women faced with an unfavorable sex ratio would be less intrusive in potential mate-guarding scenarios (*H2*).

Methods

Participants

I recruited a final sample of 97 participants (34 males, 63 females) at a large public university, all of whom reported being in a romantic relationship at the time of the study. In terms of race, 70.2 percent of participants reported as Caucasian, 22.3 percent reported as Asian, 5.4 percent reported as another racial category, and 2.1 percent did not report their race. In terms of relationship status, 91.2 percent of participants reported as being in a dating relationship, 2.2 percent reported as being engaged, and 6.6 percent reported as being married. All participants received either course credit or \$10.00 for their participation. 8

participants were removed because they accurately anticipated our hypothesis, which left 97 participants.

Design and Procedure

Once again, participants signed up for the study believing that it was about “memory and perception processes among romantic couples.” At the lab session, they were told that, as part of the memory and perception study, they would look at a series of photo arrays consisting of faces that were a representative sample of the local community. Participants then viewed photo arrays of the local environment that varied on sex ratio (see Griskevicius et al., 2012). For the memory task, participants were instructed to memorize the number of male faces and the number of female faces in each array, and then report their answers immediately after seeing each array.

Immediately after the photo-array task, participants were told that some time needed to pass before the memory part of the study was administered, so they would now answer some “unrelated” questions about their romantic relationships while waiting. At that time, participants were instructed to answer the dependent measures of interest.

Sex Ratio Manipulation. All participants viewed three arrays of 18 faces, with photographs being obtained via internet from the public domain. Participants were told that the first photo array consisted of photos downloaded from a university-sponsored dating website, the second photo array was randomly taken from recent graduates of the local university who were still living in the area, and

the third photo array was taken in a heavily frequented building on the local college campus. Participants first saw each array for 1 second and were asked to write down how many men and women appeared in each array. Participants then viewed the same arrays again for 15 seconds each, ostensibly so they could check the accuracy of their initial perceptions. After this second viewing, participants once again recorded the number of men and women in each array.

Sex ratio was manipulated by varying the ratio of male photographs to female photographs in each array. In the “many opposite-sex people” condition, participants saw arrays of 12 opposite-sex people versus 6 same-sex people, 13 opposite-sex people versus 5 same-sex people, and 11 opposite-sex people versus 7 same-sex people. In the “few opposite-sex people” condition, participants saw arrays of 6 opposite-sex people versus 12 same-sex people, 5 opposite-sex people versus 13 same-sex people, and 7 opposite-sex people versus 11 same-sex people. (See **Appendix E** for sample photo arrays)

Dependent variables. Participants answered three face-valid items measuring the likelihood that they would directly intervene (i.e., “do something”) in situations where the threat of infidelity was present (1 = I would not intervene at all, 9 = I would definitely intervene). The three items asked people about their likelihood of intervening: 1) if they were at a party and saw their partner talking to another man/woman, 2) if their partner had made plans to go a singles bar with friends, and 3) if their partner made plans with an ex-boyfriend/ex-girlfriend. Higher mate-guarding scores on this scale indicated the use of more direct mate-

guarding tactics related to confrontation, whereas lower mate-guarding scores indicated more indirect mate-guarding tactics related to “looking the other way.” Cronbach’s alpha for these three items was .63.

Results and Discussion

I ran a GLM analysis with the composite mate-guarding score as the dependent variable, condition and sex as fixed factors, and an interaction term between condition and sex. The results provided support for *H2*. The main effect for condition was insignificant, $F(1, 93) = .09, p < .77, \eta_p^2 = .00$. There was a significant main effect for sex, $F(1, 93) = 4.496, p < .04, \eta_p^2 = .05$, with females being more likely to use direct mate guarding tactics and males more likely to use indirect mate guarding tactics. However, further analyses revealed that the main effect told an incomplete story, as there was also a significant interaction between condition and sex, $F(1, 93) = 7.859, p < .01, \eta_p^2 = .08$. After plotting the marginal means (see **Figure 5**), men were more likely to endorse direct intervention tactics when there were fewer members of the opposite sex ($M = 2.96, SD = .85$) than when there were more members of the opposite sex ($M = 2.46, SD = .89$), whereas women were less likely to endorse direct intervention tactics when there were fewer members of the opposite sex ($M = 2.85, SD = .78$) than when there were more members of the opposite sex. ($M = 3.26, SD = .64$) These results run counter to the competing prediction that males and females would engage in similarly direct mate-guarding behavior in response to an unfavorable sex ratio.

Follow-up analyses revealed a significant simple effect for females, $F(1, 93) = 5.22, p < 0.03$, and a marginally significant simple effect for males, $F(1, 93) = 3.32, p < 0.08$.

Control Condition. 42 participants were given the same photo-array prime that was described in the Methods section, but were given photo arrays of a) nine men versus nine women, b) eight men versus ten women, and c) ten men versus eight women, thus priming a relatively equal sex ratio. When including the control condition in our analyses, the interaction between sex ratio and participant sex remained statistically significant, $F(2, 134) = 4.24, p < .02, \eta_p^2 = .06$. After plotting the marginal means (**Figure 6**), I found that both males and females in the control conditions responded to our mate-guarding measure similarly to males and females in the few opposite-sex condition, and differently from males and females in the many opposite-sex condition, thus indicating that favorable sex ratios were driving the results.

In summary, Study 2 documented that individuals faced with an unfavorable sex ratio were more like to behave in the service of maintaining their relationships, especially when faced with an ambiguous mate-guarding threat. However, a sex difference emerged regarding the exact behavioral strategy enacted. Consistent with parental investment principles (Trivers, 1972), men responded to potential mate-guarding threats by reporting that they would be more likely to intervene, whereas women responded by reporting that they would be less likely to intervene.

Although some may question the lack of specificity to the wording of “intervene” and “do something,” it was important to establish that sex-ratio manipulations would generally influence behavior before focusing attention on specific enacted behaviors. Admittedly, the vague item wording has potential implications regarding how we can interpret the results of Study 2, depending on whether or not men and women are conceptualizing the item wording similarly. Perhaps men and women have different thresholds for what is considered to be intervening behavior, especially in light of the fact that women are generally more inclined towards subtlety within relationships (Acitelli & Young, 1996). For example, making a disapproving remark without explicitly forbidding the scenario from happening could be considered “intervening” by men but simply par for the course by women. Perhaps men consider any form of change in behavior—direct or indirect—to be a form of intervention, while women only consider change in direct behavior to be a form of intervention. Study 3 uses more specific wording to address this concern.

Also, I again included a control condition to address the question of whether favorable or unfavorable sex ratios were driving sex-ratio effects. Although the data in Study 2 suggested that sex-ratio effects are driven by favorable sex ratios, any attempt to extrapolate our interpretation of the control condition from Study 2 to make more general conclusions is problematic, in light of the inconsistencies that emerge by considering Study 1 and Study 2 together.

Study 3

Studies 1 and 2 provided promising evidence that the manipulation of sex ratio influences romantic-relationship perceptions and maintenance behaviors. Together, the results indicate that individuals faced with an unfavorable sex ratio value their relationships more highly than do individuals faced with a favorable sex ratio, and they adjust their behaviors to ensure the maintenance of the relationship in question. In addition, men adopt a more direct strategy in response to a male-biased sex ratio, whereas women favor an indirect strategy characterized by providing more latitude in response to a female-biased sex ratio. Study 3 was designed to extend the conclusions of Study 2 in three important ways.

Replication of Study 2

The maintenance strategy adopted by females might seem somewhat counterintuitive, given that a more indirect strategy could enable infidelity that might not have occurred otherwise. Moreover, the vague item wording in Study 2, although intentional, nonetheless invites concerns related to interpreting the findings. Thus, it is important to replicate the results of Study 2 with different item wording and ensure that they are not a methodological artifact. In Study 3, I hypothesize that men will also endorse a direct strategy and that women will continue to endorse an indirect strategy in the face of an unfavorable sex ratio, even when using a different sex-ratio manipulation and different dependent measures (*H2, replication*).

Perceptions of partner infidelity

Men who become more intrusive following an unfavorable sex ratio risk alienating their partners by appearing overly controlling. As such, men must cognitively justify that the benefits of becoming more intrusive outweigh potential costs. Specifically, men can justify increased intrusiveness in the face of an unfavorable sex ratio if they believe that there is a greater likelihood that their partners will commit an act of infidelity. In this scenario, it makes sense for men to adopt an especially intrusive mate-guarding strategy given an unfavorable sex ratio (relative to a favorable one) because infidelity threats should be more salient and need to be prevented. Because women do not endorse a more intrusive strategy when faced with an unfavorable sex ratio, they should not show any increases in beliefs regarding partner infidelity because there is no cognitive need to do so (*H3*). I also acknowledge the strong possibility of a competing finding, that females will actually decrease perceptions of partner infidelity given an unfavorable sex ratio, to be consistent with providing partners the latitude associated with an indirect mate-guarding strategy.

Accommodation

Women who become less intrusive following an unfavorable sex ratio are essentially adopting a more indirect strategy in which they retain their romantic relationship by keeping their partner satisfied and relationship harmonious, rather than by driving away competitors. If women are becoming more lenient to make themselves more attractive as romantic partners, then this leniency should translate to other scenarios beyond mate guarding. Specifically, this indirect

strategy of leniency should be witnessed in accommodation actions, which are defined as the inhibition of destructive responses to destructive events (i.e., being lenient when confronted with partner transgressions) (Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991). To the extent that women adopt an indirect strategy in their relationships to increase their flexibility as romantic partners and maintain harmony in the existing relationship, they should also report increased accommodation following an unfavorable sex ratio. Conversely, because men do not endorse a more indirect strategy following an unfavorable sex ratio, they should not show any increase in accommodation because their preferred strategy is not consistent with accommodative behavior (*H4*).

Methods

Participants

I recruited 70 romantic couples from a metropolitan Midwestern city, with most participants coming from the local college community. After removing participants who provided incomplete data or anticipated the hypotheses, I had a final sample of 112 participants (55 males, 57 females).

In terms of race, 69.1 percent of males and 71.9 percent of females reported as Caucasian, 16.4 percent of males and 19.3 percent of females reported as Asian, and 14.5 percent of males and 8.8 percent of females reported as another racial category. In terms of relationship status, 89.3 percent of couples reported as being in a dating relationship, 1.8 percent reported as being engaged, and 8.9 percent reported as being married. Mean participation

age was 22.7 years for males and 20.8 years for females. Mean relationship length was 25.4 months. All couples received either course credit or \$25.00 for their participation.

Design and Procedure

The design and procedure, including the sex-ratio manipulation, were basically identical to the design and procedure reported in Study 1, including the pre-post design. The only differences were that: 1) both romantic partners participated in the experiment, and 2) participants provided answers on different dependent measures (see below). Importantly, within each couple, both partners were exposed to the same sex-ratio manipulation, meaning that either: 1) both the male and the female read an article about a male-biased sex ratio, or 2) both read an article about a female-biased sex ratio. Because later questions asked about how individuals thought their partners would behave, this allowed me to directly compare an individual's cognitive appraisal of their partner's likely behavior given a certain sex ratio versus what their partner said they would do in that same sex ratio.

Dependent Variables. To replicate the findings of Study 2, I once again asked participants, pre and post-manipulation, how they would react if: 1) their partner was having a conversation with an attractive member of the opposite sex, 2) their partner was spending a lot of time at a singles bar with his/her friends, and 3) if their partner was going to meet with an ex-boyfriend/girlfriend. To ensure that the results of Study 2 were not an artifact of item wording, I also

asked participants *how much they would pay attention* in these three scenarios.

Cronbach's alpha for these three items was .69.

No measure of perceptions of partner infidelity has been validated in the literature. Therefore, for the measure of partner infidelity, I administered a scale containing six highly face-valid items, pre and post-manipulation, that represented typical scenarios in which an individual might believe that their partner could commit an episode of infidelity. Specifically, I asked the following questions: 1) *Imagine that your partner is away on a work-related trip, and she meets an attractive man who is really interested in her. Would your partner be interested in talking to this man?* 2) *Imagine that your partner is away on a work-related trip, and she meets an attractive man who is really interested in her. Would your partner flirt with this woman?* 3) *Imagine that your partner is away on a work-related trip, and she meets an attractive man who is really interested in her. Would your partner consider having sex with this woman?* 4) *Imagine that your partner has a colleague at work who is an attractive woman. Would your partner consider being friends with this woman?* 5) *Imagine that your partner has a colleague at work who is an attractive woman. Would your partner consider having lunch with this woman on a regular basis?* 6) *Imagine that your partner has a colleague at work who is an attractive woman. Would your partner consider talking to this woman on the phone on weekends, even if the conversation would be about personal things and have nothing to do with work?* Each question was worded with the appropriate gender in each role, and responses were made on a

1 (would definitely not [engage in behavior]) to 9 (would definitely [engage in behavior]) Likert-type scale.

Cronbach's alpha for the six-item scale was .81. However, when creating this scale, I also allowed for the possibility of two distinct subscales capturing different components of infidelity. Consistent with parental investment principles (Trivers, 1972) and previously established gender differences in felt jealousy (Buss et al., 1992), I designed the first three items to capture forms of sexual infidelity and the last three items to capture forms of emotional infidelity. Cronbach's alpha was .64 for the first three items, and it was .77 for the last three items.

For the dependent variable, I wanted to compare how individuals perceived their partners' likelihood of committing infidelity versus how likely their partners were to commit infidelity. Therefore, I also asked all participants, pre and post-manipulation, to answer the same questions from the scale measuring perceptions of partner infidelity, but reworded to ask about their *own* likelihood of committing infidelity in the exact same scenarios. For example, Item 2 was reworded: "*Imagine that you are away on a work-related trip, and you meet an attractive woman who is really interested in you. Would you flirt with this woman?*" (All six items underwent similar wording changes.) For all six items measuring self-reported likelihood of infidelity, Cronbach's alpha was .78. Cronbach's alpha was .59 for the first three items and .73 for the last three items.

For the measure of accommodation, I asked six face-valid items, pre and post-manipulation, designed to capture common real-life scenarios in which accommodation would be necessary: 1) *Imagine that your partner arrives very late for a date, after hanging out with friends without telling you.* 2) *Imagine your partner picks up a new habit that you find annoying.* 3) *Imagine that you accomplish something important to you, but your partner fails to show interest in it.* 4) *Imagine that your partner confronts you because you arrive very late for a date, after hanging out with friends.* 5) *Imagine that your partner confronts you about a new habit.* 6) *Imagine that your partner confronts you because you didn't show enough interest in something that your partner accomplished.* After each item, individuals reported "how upset [he/she] would be" using a 1 (not at all upset) to 9 (extremely upset) Likert-type scale. Cronbach's alpha for the six-item accommodation scale was .44. (I acknowledge the low reliability of this scale, and consider the issue further in the General Discussion.)

Results and Discussion

Replication of Hypothesis 2

As in Study 1, I created residual scores by regressing post-manipulation scores on the items involving paying attention on to pre-manipulation scores on those very same items, which provided me with an estimate of the extent to which the manipulation influenced responding on these items. To replicate the findings of Study 2 (*H2, replication*), I ran a GLM analysis with the residual score of the paying-attention composite as the dependent variable, condition and sex

as fixed factors, and an interaction term between condition and sex. The results provided qualified support for replicating *H2*.

There were no significant main effects of condition, $F(1, 108) = .41, p < .53, \eta_p^2 = .00$, or sex, $F(1, 108) = .10, p < .93, \eta_p^2 = .00$. However, further analyses revealed a marginally significant interaction between condition and sex, $F(1, 108) = 3.43, p < .07, \eta_p^2 = .03$. After plotting the marginal means (see **Figure 7**), men were more likely to pay attention in mate-guarding scenarios when there were fewer members of the opposite sex ($M = .13, SE = .20$) than when there were more members of the opposite sex ($M = -.26, SE = 0.21$), whereas women were less likely to pay attention in mate-guarding scenarios when there were fewer members of the opposite sex ($M = -.12, SE = .20$) than when there were more members of the opposite sex ($M = .23, SE = .20$).

Follow-up analyses revealed a non-significant simple effect for males, $F(1, 108) = 1.80, p < .19$, and a non-significant simple effect for females, $F(1, 108) = 1.55, p < .22$. Although trending in the predicted direction, the simple effects did not reach statistical significance.

Hypothesis 3

To test *H3*, I created a residual score that regressed perceptions of partner infidelity (post-manipulation) on to the partner's self-reported infidelity (post-manipulation). Conceptually, if one accepts the partner's self-reported infidelity as "reality" (as has often been done; see Murray et al., 1996; 1996), then this residual score captures the extent to which individuals are correctly (or

incorrectly) perceiving their partner's infidelity.

However, there is a methodological issue that must be taken into account. I could not simply regress one partner's data on the other partner's data because romantic couples are naturally interdependent. Thus, I used the Actor-Partner Interdependence Model (APIM; Kashy & Kenny, 2000; Kenny, Kashy, & Cook, 2006) to create these residual scores. The APIM allows one to estimate the degree to which dyad members' responses or behaviors are associated with factors attributable to the actor (the individual providing the response/behavior) and to the actor's partner. The APIM, therefore, estimates both actor effects (the effect that an individual's predictor variable score has on his/her own outcome score) and partner effects (the effect that an individual's partner's predictor variable score has on the actor's outcome score). Because the APIM models the statistical interdependence that exists between relationship partners, it provides separate and statistically independent tests of actor and partner paths. Specifically, the effects of the actor's independent variable score on the actor's dependent measure control for the partner's independent variable score, and vice versa. Using this approach, the dyad is treated as the unit of analysis, and actor and partner effects are tested with the proper degrees of freedom. In this study, I used the APIM to regress partner perceptions of infidelity on to partner's self-reported infidelity.

To test the influence of sex ratio on perceptions of partner infidelity (relative to actual likelihood of partner infidelity), I ran a GLM analysis with the

aforementioned residual score as the dependent variable, condition and sex as fixed factors, and an interaction term between condition and sex. The results provided qualified support for *H3*.

For the residual score of all six items related to fidelity, there were no significant main effects of condition, $F(1, 59.39) = 1.50, p < .23, \eta_p^2 = .02$, or sex, $F(1, 59.39) < .01, p < .97, \eta_p^2 = .00$. The interaction term was also non-significant, $F(1, 52.12) = .37, p < .55, \eta_p^2 = .00$. For the residual score of the three sexual fidelity items, there were no significant main effects of condition, $F(1, 59.73) = .68, \eta_p^2 = .01, p < .42$, or sex, $F(1, 59.73) < .01, p < 0.96, \eta_p^2 = .00$. The interaction term was also non-significant, $F(1, 50.61) = 2.55, p < .12, \eta_p^2 = .01$. For the residual score of the three emotional infidelity items, there were no significant main effects of condition, $F(1, 59.54) = 1.93, p < .17, \eta_p^2 = .02$, or sex, $F(1, 59.54) < .01, p < .98, \eta_p^2 = .00$. The interaction term was also non-significant, $F(1, 55.92) = .06, p < .81, \eta_p^2 = .00$.

Because the model using the residual score of sexual infidelity revealed an interaction term that trended towards significance, I plotted the simple slopes at one standard deviation above and below the mean (see **Figure 8**). Men were more likely to perceive partner infidelity, relative to the actual likelihood of infidelity reported by their partners, when there were fewer members of the opposite sex ($M = 0.28, SE = 0.26$) than when there were more members of the opposite sex ($M = -0.22, SE = 0.28$). Women were not influenced by sex ratio on

this outcome variable (fewer opposite-sex: $M = -.05$, $SE = .27$, more opposite-sex: $M = .02$, $SE = .27$).

Follow-up analyses revealed a non-significant simple slope for males, $t(1, 50.61) = -1.52$, $p < .14$, and a non-significant simple slope for females, $t(1, 50.61) = .01$, $p < .99$. Although trending in the right direction, the simple slope for men did not reach statistical significance. The simple slope for women did not trend towards statistical significance.

Thus, I did not find convincing evidence for the hypotheses with the a priori scales. However, I was not using a previously validated scale, and some of the items may not have tapped this construct well. As an exploratory measure, I ran a separate GLM analysis for each sexual fidelity item. The analyses for both Item 1 and Item 3 revealed non-significant interactions. However, the analysis using Item 2 as the dependent variable revealed an interesting pattern.

Specifically, Item 2 asked: *“Imagine that your partner is away on a work-related trip, and he/she meets an attractive man who is really interested in him/her. Would your partner flirt with this man/woman?”*

There were no significant main effects of condition, $F(1, 56.97) = 1.62$, $p < .21$, $\eta_p^2 = .01$, or sex, $F(1, 56.91) < .01$, $p < .95$, $\eta_p^2 = .00$, for this item. However, further analyses revealed a marginally significant interaction between condition and sex, $F(1, 49.76) = 3.58$, $p < .07$, $\eta_p^2 = .02$. After plotting the simple slopes at one standard above and below the mean (see **Figure 9**), men were more likely to perceive that their partner would commit infidelity when there were

fewer members of the opposite sex ($M = .56$, $SE = .37$) than when there were more members of the opposite sex ($M = -.38$, $SE = .39$), whereas sex ratio did not influence women's perceptions of their partner's infidelity (many opposite sex: $M = -.02$, $SE = .38$, few opposite-sex: $M = .01$, $SE = .38$).

Follow-up analyses revealed a significant simple slope for males, $t(1, 49.76) = -2.05$, $p < .05$, and a non-significant simple slope for females, $F(1, 49.76) = -.18$, $p < .86$. Across analyses, I did not find evidence for the competing hypothesis that females would decrease perceptions of partner infidelity given an unfavorable sex ratio.

Hypothesis 4

As in Study 1, I created residual scores by regressing post-manipulation scores on the items involving accommodation on to pre-manipulation scores on those same items, providing me with an estimate of the extent to which the manipulation influenced responding on these items. To test *H4*, I ran a GLM analysis with the residual score of the accommodation composite as the dependent variable, condition and sex as fixed factors, and an interaction term between condition and sex. There were no significant main effects of condition, $F(1, 108) = 0.06$, $p < 0.82$, $\eta_p^2 = .00$, or sex, $F(1, 108) = 2.06$, $p < 0.16$, $\eta_p^2 = .02$. Moreover, the interaction term was not significant, $F(1, 108) = 0.14$, $p < 0.71$, $\eta_p^2 = .00$.

I did not find evidence for the hypotheses with the a priori scales. However, as with the previous scale measuring perceptions of infidelity and

likelihood of infidelity, I was not using a validated scale on accommodation, and some of the items might not have tapped accommodation tendencies very well. (Recall that Cronbach's alpha for these items was quite low.) As a purely exploratory measure, I then ran GLM analyses with the individual accommodation items as well as various sub-composites of the items. The most promising results came from the analysis looking at the composite of Items 1 and 5 ($r = .09$ for the two items). These items asked individuals how upset they would be if their partners "arrived very late for a date, after hanging out with friends without telling [him/her]" and if their partners "confront[ed] [him/her] about a new habit."

The results provided qualified support for H4, although with limitations. There were no significant main effects of condition, $F(1, 108) = 1.40, p < .24, \eta_p^2 = .01$, or sex, $F(1, 108) = 1.63, p < .21, \eta_p^2 = .01$. However, further analyses revealed a trending—although not statistically significant—interaction between condition and sex, $F(1, 108) = 2.53, p < .12, \eta_p^2 = .02$. After plotting the marginal means (see **Figure 10**), women were more likely to engage in accommodation behavior (i.e., less likely to get upset) when there were fewer members of the opposite sex ($M = -.16, SE = .21$) than when there were more members of the opposite sex ($M = .43, SE = .21$), whereas sex ratio did not influence men's accommodation behavior (many opposite-sex: $M = -.18, SE = .22$, few opposite-sex: $M = -.09, SE = .21$).

Follow-up analyses revealed a significant simple effect for females, $F(1, 108) = 3.85, p = .05$, and a non-significant simple effect for females, $F(1, 108) = .06, p < .82$.

General Discussion

Across three experimental studies, I tested the general hypothesis that an imbalanced sex ratio influences perceptions and maintenance behaviors within romantic relationships. Specifically, I hypothesized that an unfavorable sex ratio, relative to a favorable one, would cause romantically involved individuals to value their relationships more highly, which would lead them to engage in more mate-guarding behavior and shift their cognitive appraisals to match that shift in behavior. I found at least preliminary support for most of my hypotheses. However, some of the conclusions that I draw from my data come with caveats, particularly for Study 3.

In Study 1, I established that individuals placed greater value in their romantic relationships (i.e., become more satisfied and feel closer to their partners) when they perceived sex-ratio imbalances that were unfavorable. Consistent with extant theory and demographical research, when individuals perceived fewer members of the opposite sex, they reported greater relationship satisfaction and relationship closeness relative to individuals who perceived more members of the opposite sex. Although the main effect for relationship closeness was marginally significant, the effect for closeness is straightforward and intuitive.

When considered along with the statistically significant main effect for relationship satisfaction, the data for Study 1 revealed good support for *H1*.

In Study 2, I hypothesized that individuals should act in the service of maintaining their romantic relationships (i.e., engage in mate-guarding behavior) when they perceived sex-ratio imbalances that were increasingly unfavorable. However, consistent with parental investment principles (Trivers, 1972), I also hypothesized that there would be a sex difference in the nature of the mate-guarding behaviors reported. Because men and women have differential concerns in terms of what they desire from their relationships—at least from an evolutionary standpoint—I predicted that men in a male-biased sex ratio would become more directly intrusive when faced with a potentially threatening mate-guarding situation, and women in a female-biased sex ratio would become less directly intrusive in order to maintain relationship harmony. That was what the data for Study 2 revealed. Given an unfavorable sex ratio, men adopted direct behavioral strategies in mate-guarding situations (i.e., more intervention than usual), whereas women adopted indirect behavioral strategies in mate-guarding situations (i.e., less intervention than usual).

A competing prediction was that both men and women would take an increasingly direct mate-guarding approach in response to an unfavorable sex ratio (i.e., that there would be a main effect of sex ratio rather than an interaction between sex ratio and participant sex). On the surface, it would appear obvious that a person should take more direct action when a competitor is potentially

trying to undermine one's relationship, but it is less obvious why a person would take less direct action in that situation. Although further research is needed, the current investigation did not provide support for this competing hypothesis. I found a statistically significant crossover interaction between sex ratio and gender, with statistically significant (or close to significant) simple effects for both men and women in the expected directions. Realizing that this might be a less intuitive prediction, I conceptually replicated this interaction in Study 3 utilizing a different prime and reframing the dependent variable in a theoretically consistent manner—as “paying attention” rather than “intervening”—although the simple effects only trended towards statistical significance.

Finally, in Study 3, I discovered a cognitive mechanism that could potentially underlie the effects of Study 2. Specifically, I found that males, but not females, justified their increasingly direct behavioral strategies by shifting their cognitive appraisals of their partners' likelihood to commit infidelity if potentially given the opportunity. Specifically, I asked both partners in each couple to report on their own likelihood to commit infidelity when going on a “work trip,” and I also asked them to report on each other's likelihood to commit infidelity. I then examined the extent to which sex ratio influenced people's estimations of their partner's likelihood to commit infidelity relative to what was actually warranted according to their partner's reports.

The results must be interpreted with caution. For the items capturing both self-reported likelihood of infidelity and partner perceptions of infidelity, I

purposefully presented a range of behaviors that I believed were potentially representative of infidelity, with three items being sexual in nature (talking, flirting, and having sex with an attractive person during a work trip) and three items being emotional in nature (befriending, eating lunch, and having personal phone calls with an attractive co-worker). Using the residual scores of partner-report on self-report as the outcome variable, I found the hypothesized interaction between sex ratio and participant sex, but only for the behavior of "flirting with an attractive member of the opposite sex during a work trip." Specifically, given an unfavorable sex ratio, men were more likely to think that their partners would flirt with another man, whereas women were not influenced by sex ratio in regards to thinking their partners would flirt with another woman.

Without further replication and validation, I cannot know for certain if the items I created for Study 3 were actually perceived by participants as representative of infidelity. However, beyond the possible explanation that my infidelity items had low validity, there are other reasons to expect that I should have found the hypothesized effect only for flirting behavior. Based on previous research on jealousy (Buss et al., 1992), men should not have shown movement on the items tapping emotional infidelity. The logic behind Hypothesis 3 was that men, but not women, would have concerns about paternity uncertainty, and thus men would be more likely to worry about the possibility of only sexual infidelity in response to an unfavorable sex ratio. From this logic, it makes sense that men showed no movement on the items meant to capture emotional infidelity in

response to the sex-ratio manipulation. Some scholars have argued that people automatically conflate sexual and emotional forms of infidelity instead of disentangling the two (DeSteno & Salovey, 1996). Nevertheless, it should require more cognitive effort to perceive emotional infidelity and draw the indirect connection between emotional and sexual infidelity rather than perceive sexual infidelity directly.

For the sexual fidelity items, it is possible that the framing of Item 1 as “talking” was not viewed as sufficiently threatening because it might have been considered excessive to perceive the simple act of talking as a potential act of infidelity, even in the face of an unfavorable sex ratio. On the other hand, the framing of Item 3 as “having sex” should have been perceived as directly threatening and, consequently, responses to this item might have been rife with social desirability biases. The framing of Item 2 as “flirting” might have achieved a happy medium between these two extremes, being sufficiently threatening to be susceptible to manipulated sex ratio, but also being unthreatening enough so that participants were willing to report honestly. However, we are currently limited to conjecture until more research is performed.

A competing prediction was that women would actually perceive decreased likelihood of infidelity by their partners than warranted in response to an unfavorable sex ratio. If women are using a more indirect mate-guarding strategy that prioritizes relationship harmony at the increased risk of enabling sexual infidelity, then perhaps they must also shift cognitive appraisals to match

their behavioral strategy, but in the direction of underperceiving likelihood of infidelity. The data did not provide support for this competing prediction, but replication is needed to provide further evidence for the hypothesis supported in the current investigation, over the competing hypothesis which is otherwise quite logical as well.

Finally, I found preliminary evidence that females, but not males, accommodate more in response to an unfavorable sex ratio (*Hypothesis 4; H4*). The underlying logic of *H2* and *H3* was that males respond to an unfavorable sex ratio with a direct strategy based on immediately warding off competitors, whereas females respond to an unfavorable sex ratio with an indirect strategy that allows their partners greater latitude, ostensibly to maintain relationship harmony and perhaps increase their own appeal as a mate. Following this logic, females who are exposed to an unfavorable sex ratio should respond similarly in other relationship situations that involve the maintenance of relationship harmony and becoming more appealing to their partners. Specifically, accommodation situations are, by their very nature, situations in which individuals can choose to give their romantic partners more latitude for the purposes of maintaining relationship harmony. As such, if females provide their partners greater latitude in mate-guarding situations, then this indirect strategy of providing latitude is likely to translate to accommodation situations as well.

However, the hypothesis for the influence of sex ratio on female accommodation emerged only in certain accommodation situations. Specifically,

when women could choose how to react in response to: 1) their partners arriving late for a date and 2) their partners confronting them about an annoying habit, they were more likely to become accommodating when faced with an unfavorable sex ratio by being less upset in those situations. The interaction between sex ratio and participant sex only trended towards significance, but the simple effect for females was statistically significant. However, this finding must be interpreted with caution, because it came from a series of exploratory analyses and there was no theoretical reason to believe that the two accommodative situations would have been especially susceptible to the sex-ratio manipulation, as opposed to the other four accommodative situations which were not affected. Nonetheless, I believe that extant theory predicts a clear sex difference in accommodation following an unfavorable sex ratio, and the current findings are a starting point to systematically examine the specific scenarios in which changes in accommodative behavior due to imbalanced sex ratios are most likely to occur.

Contribution to the Existing Literature

The current investigation makes a significant contribution to the literature in certain crucial ways. Foremost, this research is a rare experimental demonstration of how sex ratio influences cognition and behavior in humans. Aside from Durante et al. (2012) and Griskevicius et al. (2012), no other studies on human subjects have demonstrated a link between manipulated sex ratio and theoretically expected outcomes. As such, this research buttresses the general

contention that sex ratio is a powerful environmental influence on human psychology—a contention heretofore limited to demographical studies, animal research, and pop-science articles in mainstream publications—with experimental evidence that allows us to infer a cause-and-effect relation between sex ratio and relevant outcomes.

Going forward, these findings, coupled with Durante et al. (2012) and Griskevicius et al. (2012), should provide researchers interested in sex ratio with greater confidence that this phenomenon can be captured in laboratory settings. Specifically, this research establishes a clearer causal link between sex ratio and how people actually think, feel, and behave in ongoing romantic relationships, an assertion implied in the current literature (e.g., Barber, 2000; Kruger & Schlemmer, 2009; Lichter et al., 1995), but now supported by experimental data. Generally, we would expect that romantically involved individuals faced with a sex ratio with fewer members of the opposite would think and behave more strongly in the service of maintaining their romantic relationships relative to if they were faced with a sex ratio with more members of the opposite sex. This phenomenon was demonstrated in these experiments, indicating that sex-ratio effects romantic perceptions and behavior relevant to relationship maintenance.

Although the current set of experiments are novel in establishing sex-ratio effects on cognition and behavior using experimental methods, they also advance the literature in more nuanced—but still important—ways. In this dissertation, I melded theory from traditional approaches and evolutionary

approaches to relationships research to generate and test my hypotheses. In doing so, my results inform both approaches.

Importantly, the current research also advances the field by examining people already in romantic relationships. Although the field of romantic relationships enjoys widespread attention, there is a lack of attention to romantic relationships among many evolutionary psychologists, who have predominantly been interested in investigating relationship initiation and mate preference effects. Even though it is important to consider relationship outcomes separately from general mating outcomes (see Pillsworth & Haselton, 2006), this discussion has heretofore been limited to theory rather than actual practice. The implicit assumption in the evolutionary literature, based on a scanning of methodological approaches employed by researchers, is that romantically involved individuals can be treated as equivalent to romantically unattached individuals in that they ultimately share the same mating concerns. However, even from an evolutionary perspective, this logic is fallacious because romantically unattached individuals are looking for the opportunity to reproduce while individuals in romantic relationships are already partnered with a mate with whom reproduction is more likely. Therefore, by engaging in traditional mate-search strategies, romantically attached individuals actually risk the loss of an existing mating opportunity, a risk that romantically unattached individuals do not share. In fact, the current investigation revealed that individuals in romantic relationships were engaging in cognition and behavior in the service of maintaining their romantic relationships

when faced with an unfavorable sex ratio, which would seemingly undermine mate-search attempts. It is possible that individuals facing an unfavorable sex ratio are motivated to both maintain their currently relationships and to look for other potential mates who might be more attractive. However, the existing literature clearly indicates that increased relationship maintenance is negatively related to the continued search for alternative mates (e.g., Maner, Rouby, & Gonzaga, 2008; Simpson, Gangestad, & Lerma, 1990). Moreover, even if a romantically involved individual were to simultaneously pursue mate search and engage in relationship maintenance, the effort expended towards mate search would necessarily be effort that could not be used to maintain the relationship more effectively (Kaplan & Gangestad, 2005).

For traditional relationships researchers, the current research is illuminative because it reemphasizes the power of situations in influencing relationship outcomes. Although this may seem like a strange argument considering that social psychology is the study of situations, there has recently been concern among some relationships researchers that the term “situation” has taken on increasingly nebulous borders (see Berscheid, 1999 and Reis, 2008, for a comprehensive review of this debate). Although relationships researchers often suggest that the relationship itself is an extraordinarily powerful situation (Reis, Collins, & Berscheid, 2000), this has caused some researchers to ignore how “purely” external situations (i.e., the environment outside the dyad) also impacts romantic outcomes (Karney & Bradbury, 2005). Sex ratio is an

especially powerful external situation, which the current research reveals to have sizable effects on within-relationship processes. A traditional relationships approach would have considered construal of the environment (e.g., the interdependence principles of comparison level and comparison level of alternatives; Kelley & Thibaut, 1978; Thibaut & Kelley, 1959) to be a sufficient proxy for the external environment, regardless of whether or not perception accurately reflected the reality of the external situation. This dissertation represents a return to studying the purely situational forces that can impact romantic relationships, but have been largely overlooked by researchers up to now, much to the detriment of the field (see Berscheid, 1999).

Limitations and Future Directions

Although the current research makes an important contribution to the field, it is one of the first attempts to study the phenomenon of sex-ratio effects experimentally, and it is therefore necessary to point out caveats, weaknesses, and remaining gaps that future research must consider. I have already detailed the need for validating items that accurately tap certain constructs. However, there are other issues that must also be addressed.

I established that sex-ratio manipulations influence romantic relationship perceptions and maintenance, but future research needs to clarify whether favorable sex ratios (i.e., more members of the opposite sex) and unfavorable sex ratios (i.e., fewer members of the opposite sex) exert equal influence, or if imbalances in sex ratios only exert effects due to a single directional skew. My

core analyses did not utilize the control condition, and I acknowledge that this disallows me from interpreting the effects as occurring in the favorable sex-ratio or unfavorable sex-ratio conditions. Throughout the dissertation, I have been careful to frame my predictions and results as relative phenomena, i.e., that individuals faced with unfavorable sex ratios think or behave in a certain way *relative* to individuals faced with favorable sex ratios, not that individuals faced with unfavorable sex ratios simply think or behave in a certain way. It was important to adopt such a framework due to the aforementioned methodological limitations of the current investigation.

Although not part of my core analyses, I included a control condition in Studies 1 and 2 as a preliminary attempt to see if the sex-ratio effects revealed in the data were driven by fewer members of the opposite sex, many members of the opposite sex, or both. Ideally, across studies and outcome variables, participants in the control condition would have demonstrated similar cognitive and behavioral tendencies with either participants in the many opposite-sex condition or participants in the few opposite sex condition. However, the current data paint an admittedly mixed picture in trying to answer this question. If the control condition of Study 1 had painted a consistent picture between the two outcome variables of interest, then I might have been able to conjecture that the change in prime was responsible for the inconsistency in results. The control condition in Study 1 was meant to be neutral so that no constructs were primed and it would instead reflect the individual's construal of what the current sex ratio

in the local environment is, while the control condition in Study 2 primed a 1:1 sex ratio and could have produced differential findings from Study 1 due to the fact that it simply primed the very idea of sex ratio. However, there is no reason, according to extant theory, why satisfaction and closeness in Study 1 should have been differentially affected by the same control condition.

In short, this issue must be clarified by continuing to systematically include control conditions in replication attempts. An argument could be made for either explicitly priming a 1:1 sex ratio or priming neutral stimuli that would then rely on an individual's own conception of the sex ratio in his or her current local environment. Priming a 1:1 sex ratio allows the researcher to make inferences about the specific sex ratio that the participant is considering, but the control condition could then be conflated with an experimental condition if participants enter the study already conceptualizing the current sex ratio to be biased towards one sex. As such, I would be inclined towards using neutral primes like those used in Studies 1 and 3. (The prime in Study 2 could have been made similarly neutral by changing the arrays from photos of faces to photos of innocuous objects.) Although this type of control condition adds noise due to the inability to make inferences about the specific sex ratio that participants are considering, it also removes the risk of falsely imposing a mindset that may not actually reflect baseline reality. By wording the article primes deliberately to focus on *relative trends* rather than *absolute numbers*—which the article primes used in this investigation attempted to do—then we can ensure that the experimental stimuli

prime sex ratios that deviate from sex ratios primed by the control condition, even if the exact sex ratio primed by the control condition is unknown. At the very least, it is important to remain consistent across studies, as it is likely that changing the prime from neutral in Study 1 to explicitly 1:1 in Study 2 may have contributed to the inconsistency of the control-condition data.

In subsequent programs of research, one should also determine how the perception of sex ratio influences actual behavior within ongoing romantic relationships. For example, are the effects of sex ratio driven by perceptions of the mating pool, perceptions of competition, or both? Sex ratio is unique because it has simultaneous implications for both the size of the mating pool *and* the amount of competition for the pool. It will be important going forward to extricate the influence of these two aspects of sex ratio. It is possible that sex ratio is influencing behavior within romantic relationships because romantically involved individuals are focusing on the number of available mates rather than the competition for them. Basic supply-and-demand principles dictate that the number of available mates should be inversely related to the demand for any particular available mate (Marshall, 1890), increasing the likelihood that an individual will have a higher comparison level of alternatives (Kelley & Thibaut, 1978; Thibaut & Kelley, 1959). It is also possible that sex ratio is influencing behavior within romantic relationships because romantically involved individuals are focusing on the number of competitors rather than the sheer number of available mates. Research has consistently shown that activating schemas

related to competition can influence behavior in the service of successful mating (e.g., Griskevicius et al., 2009). These are not mutually exclusive explanations for how sex ratio impacts relationship-maintenance behavior. In fact, sex ratio may be a powerful influence on behavior precisely because it activates *both* mating schemas and competition schemas, with the two interacting to produce especially powerful effects.

Another future direction is to go beyond the current reliance on self-report outcomes, many of which are meant to be proxies for actual behavior (i.e., “behavioroid” measures). Although the social-cognition literature shows a positive correlation between intended behavior and actual behavior (Ajzen, 1991), intended behavior and actual behavior are not interchangeable. Researchers are currently debating the extent to which this state of affairs is a major problem, with some scholars arguing for a renewed focus on actual behavior (see Baumeister, Vohs, & Funder, 2007), but most members of the field continuing to rely heavily on behavioroid measures. For the current research, collecting actual behavioral measures would have been very difficult. As an example, consider Study 2, during which participants were asked about their intention to intervene in hypothetical scenarios where competitors were potentially attempting to undermine their relationships. The most direct behavioral measure to test the hypothesis would be to: 1) artificially create a scenario in which a confederate was being flirtatious with one member of the romantic dyad and 2) observe the extent to which the other member of the dyad actually engaged in intervention

behavior. This design, although feasible, would be very labor-intensive and it might raise ethical problems. In future replication attempts, researchers should consider expending the additional effort to collect measures of actual behavior when possible.

Furthermore, researchers should also explore variables that may moderate the effect of sex ratio on relationship maintenance behavior. Although sex ratio should generally exert effects on people's behavior in romantic relationships, it is likely that there are large individual differences in how influential sex ratio actually is on different partners in different relationships.

There are many possible individual-difference moderators, but it is especially worth considering how basic demographical variables might influence the extent to which individuals are susceptible to sex-ratio manipulations. For example, participant age may moderate sex-ratio effects. Typically, an individual's frontal lobe does not fully mature until approximately age 25, and this lack of frontal lobe development has been associated with a decreased ability to control impulses and make rational decisions (Giedd et al., 1999). Because the sample mostly comprised younger college-aged students under the age of 25, it is possible that I oversampled individuals who were more prone to impulsive decision making and thus more likely to react (and perhaps overreact) to fluctuations in sex ratio. Future research should purposefully include older individuals over the age of 25 in their samples, as older individuals with more

rational and less impulsive decision-making capabilities may be less reactive to perceived changes in sex ratio in the environment.

Race is also another demographical variable to explore as a potential moderator. My photo-array prime for Study 2 explicitly utilized faces of Caucasian descent, and although my article primes for Study 1 and Study 3 did not make explicit mention of any particular race, my participants—primarily college students—should have already been aware that Caucasians are overrepresented on college campuses. I made the assumption that individuals exposed to the experimental conditions would take information about sex-ratio trends involving Caucasians, and extrapolate those trends across racial groups. Although this could be the case, it is also possible that individuals of racial backgrounds other than Caucasian might consider sex ratio among Caucasians and sex ratio among people of their own race to be orthogonal trends. Therefore, they may be relatively unaffected by the sex-ratio manipulation, considering that individuals often demonstrate same-race preference when choosing potential relationship partners (e.g., Kurzban & Weeden, 2005).

Sexual orientation may also moderate the effects of sex ratio. The current investigation utilized heterosexual samples in service of methodological ease, but I acknowledge that our effects may not be generalizable to homosexual individuals. For heterosexual individuals, sex ratio should be a powerful situational cue because it has *contrasting* implications for the number of potential mates and the number of potential competitors for those mates (i.e., fewer men

necessitates more women competing for those available men, and fewer women necessitates more men competing for those available women). However, for homosexual individuals, fluctuations in sex ratio have *corresponding* implications for the number of potential mates and the number of competitors for those mates. A sex ratio increasingly biased towards members of the same sex is favorable for homosexual individuals to the extent that it increases the number of potential mates. However, a sex ratio with more members of the same sex also means more competitors for the mates that are available, meaning that sex-ratio manipulations are unlikely to affect the relationships of homosexual individuals because the benefits and costs of fluctuations in sex ratio “wash out” in terms of simple mathematics.

Beyond basic demographics, another important individual-difference moderator to consider is mate value, which is the extent to which individuals see themselves as desirable to potential mates across myriad dimensions, such as physical attractiveness, intelligence, and social capital. Logically, one might expect that individuals who perceive themselves as being high in mate value may be less influenced by sex-ratio imbalances, as they should feel more confident in their ability to attract a suitable mate, even when in an environment that is unfavorable to fellow members of the same sex. Consistent with this logic, Durante et al. (2012) found that self-reported mate value moderated sex-ratio effects, at least when it came to female preference for careers versus families, with low mate-value females being especially susceptible to sex-ratio

manipulations and high mate-value females demonstrating little-to-no susceptibility. Researchers should explore the extent to which mate value moderates sex-ratio effects in other cognitive and behavioral domains, including romantic relationship maintenance.

Life-history theory (Kaplan & Gangestad, 2005) also provides an interesting avenue for examining what variables might moderate sex-ratio effects. Life-history theory is based on the idea that all animals—including humans—have limited resources at their disposal and are faced with tradeoffs in how they utilize those limited resources. For example, both men and women might have to make a tradeoff between mating effort and relationship effort, as effort expended on one domain is necessarily effort that cannot be expended on the other domain. Although covering the entirety of life-history theory is beyond the scope of this dissertation, researchers using a life-history framework have conceptualized human beings as falling somewhere on a continuum between having a “fast” strategy or a “slow” strategy (e.g., Dillon, Adair, Wang, & Johnson, 2013; Ellis, Figueredo, Brumbach, & Schlomer, 2009; Figueredo et al., 2005; White, Li, Griskevicius, Kenrick, & Neuberg, 2013). Generally speaking, individuals who display a fast strategy prioritize immediate benefits at the expense of long-term benefits and engage in more frequent and less discriminate mating, whereas individuals who enact a slow strategy delay gratification at the expense of short-term rewards, and display less frequent and more discriminate mating patterns.

I hypothesized that individuals would engage in more relationship maintenance in response to an unfavorable sex ratio relative to a favorable one. However, because maintaining a relationship at the expense of continuing to search for mates reflects a slow strategy, one might expect that only individuals who have a fast strategy will be influenced by sex ratio when it comes to relationship maintenance due to the fact that slow strategists are already inclined towards increased relationship maintenance. Specifically, it is hypothesized that the “speed” of one’s strategy is determined in large part by the environment in which one was raised, given that human beings are sensitized to the quality of their childhood environments which then guide them towards a development trajectory (Belsky, Houts, & Fearon, 2010; Belsky, Steinberg, & Draper, 1991). Researchers have started to utilize childhood socioeconomic status (SES) as a proxy for “fast” versus “slow” life-history strategies (e.g., Griskevicius et al., 2011), and childhood SES is also worth exploring as a moderator variable in future research on sex-ratio effects for the reasons already stated.

Beyond looking at individual differences, researchers should consider relationship-level variables that may moderate sex-ratio effects. Specifically, relationship commitment could potentially moderate the extent to which individuals are influenced by sex-ratio manipulations. Commitment is defined as an individual’s intention to stay in a given romantic relationship (Rusbult, 1980; 1983), and individuals who are highly committed to their relationships may be relatively unaffected by the manipulation of sex ratio—or at least influenced by

sex-ratio manipulations to a lesser degree—because they are already inclined towards relationship maintenance . Moreover, the basic logic behind sex-ratio effects is that individuals faced with an unfavorable sex ratio recognize their decreased value as relationship partners relative to when they are faced with a favorable sex ratio, and they accordingly increase their efforts to maintain their relationship, which has now become more valuable. However, researchers have shown that increased relationship commitment is linked to a shift from exchange norms to communal norms within relationships, which essentially means that partners become increasingly less likely to compare each other's value as relationship partners as the relationship progresses (Clark & Mills, 1979; 1993). To the extent that “value” is less relevant in highly committed relationships, sex ratio should also be less relevant in influencing those same relationships.

Finally, future research should consider additional outcome variables related to relationship maintenance. Beyond mate guarding and accommodation, the relationships literature is incredibly rich and has identified myriad other processes that contribute to the maintenance of relationships. For example, relationship quality is consistently linked to how partners in relationships handle conflict situations in which partners hold competing interests (Gottman, 1994). Relationships that remain intact are characterized by conflict in which partners avoid destructive patterns of behavior (e.g., personal attacks or dismissing the partner's concerns) and display more constructive strategies instead (Gottman, Coan, Carrere, & Swanson, 1998; Rusbult, Zembrodt, & Gunn, 1982). If the local

sex ratio becomes increasingly unfavorable and the relationship is seen as increasingly valuable, then individuals in romantic relationships might engage in even more positive conflict-resolution strategies that promote rather than undermine relationship health. Likewise, relationships that remain intact are also characterized by the provision of social support in which partners both offer comfort when partners are undergoing times of stress (e.g., Simpson, Rholes, & Nelligan, 1992) and provide additional encouragement (i.e., *capitalize*) when partners are experiencing positive life events (Gable, Reis, Impett, & Asher, 2004). Again, if the local sex ratio becomes unfavorable and the relationship is seen as more valuable, individuals in romantic relationships might provide even better or more consistent social support to keep their partners happy and thereby ensuring that the relationship remains intact.

Conclusion

With a proper consideration of sex ratio, individuals might be able to make better decisions in the interests of maintaining healthy romantic relationships. For example, although some individuals in romantic relationships might be *consciously* motivated to engage in relationship maintenance behaviors, the local sex ratio might be *unconsciously* discouraging those very same behaviors. If individuals are made aware of the extent to which the local sex ratio can influence how they think, feel, and behave within their romantic relationships, then they can take countermeasures to prevent the local sex ratio from exerting a negative influence on their relationships. Relatedly, there could be interesting

therapeutic implications. For instance, marital therapists might want to modify their approaches depending on whether they are practicing in a male-biased region (e.g., Denver) or a female-biased region (e.g., Birmingham), with the knowledge that individuals might be less disposed to relationship maintenance if the local sex ratio is in their favor.

On an ideological note, a better understanding of the influence of sex ratio on romantic relationships might also allow us to gain deeper insight into how this proximal-level phenomenon can, in the aggregate, have drastic societal implications. For example, the media commonly cites the statistic that the divorce rate in the United States today is higher than ever before (Westphal, 2002). From the logic of sex ratio, we could posit that this may be due to women settling for less desirable partners during college, where the sex ratio is more female-biased, and then becoming less motivated to maintain their relationships once they leave college and move to a location that is significantly less female-biased. On the other hand, recall the example of China, in which the sex ratio has become increasingly male-biased to the tune of 120 males for every 100 females. We might predict the emergence of more egalitarian norms in what has been a historically patriarchal society, with men being more motivated to maintain their romantic relationships and being more willing to grant their female partners “concessions” than if the sex ratio was more balanced.

These are just two specific examples of how the influence of sex ratio of romantic relationship can have widespread and pervasive effects. However,

there are numerous other cases of imbalanced sex ratios throughout the world, and historical trends suggest that wild variations in sex ratio will continue to occur (Guttentag & Secord, 1983). Sex ratio is, therefore, an issue that is currently relevant and will continue to be relevant in the future. Therefore, a better understanding of sex-ratio effects becomes all the important, not only to gain deeper insight into romantic relationships, but also to understand future shifts that occur within cultures as a whole.

Endnotes

¹ I utilized exclusively heterosexual samples for methodological ease, as much of my item wording relied on gendered pronouns and specific references to “men” and “women.” Because of technological and time limitations, it would have been excessively difficult to create conditions in which item wording was tailored to the relationship preferences of homosexual individuals, especially considering that the goal of this dissertation was merely to establish the existence of sex-ratio effects. However, I readily acknowledge that homosexual individuals may not respond to manipulations of sex ratio in a manner similar to heterosexual individuals and that sexual orientation should be considered as an important moderator variable, for reasons that I will detail in the General Discussion.

² I believed that a bipolar scale was more appropriate than two orthogonal unipolar scales since people cannot reasonably enact both strategies in a specific situation.

³ Although reasonably high, this value does not reach the 0.70 benchmark that is typically considered to indicate sufficient reliability (Nunnally, 1978). However, I feel that the alpha is sufficiently close to 0.70 considering that 1) there were a small number of items by design, 2) this represented an exploratory attempt to capture mate-guarding behavior, 3) the items are highly face-valid, and 4) the items were intentionally wide-ranging to capture a gamut of scenarios in which mate guarding might occur. (See Schmitt, 1996 for a detailed discussion of when low alphas might be acceptable.)

Table 1

Means of Study 2 infidelity items, both perceptions of partners and self-reported, separated by condition and sex. (Standard deviations reported in parentheses.)

Many opposite-sex
(Favorable sex ratio)

	Male perceptions of female infidelity	Female self-reported infidelity	M-F difference	Female perceptions of male infidelity	Male self-reported infidelity	F-M difference
Talk on a work trip	5.27 (1.87)	6.35 (1.72)	-1.08	5.46 (1.91)	6.14 (1.80)	-.68
Flirt on a work trip	3.42 (1.68)	4.69 (2.15)	-1.27	4.25 (2.07)	4.50 (1.86)	-.25
Have sex on a work trip	1.65 (1.35)	1.46 (.86)	.19	1.75 (1.71)	1.82 (1.66)	-.07
Befriend a co-worker	6.08 (2.19)	6.81 (1.81)	-.73	5.93 (2.00)	6.46 (2.03)	-.53
Lunch with a co-worker	4.50 (2.12)	4.77 (2.29)	-.27	4.07 (1.98)	5.11 (2.08)	-1.04
Phone with a co-worker	2.81 (2.14)	2.69 (1.78)	.12	2.43 (1.57)	2.64 (1.93)	-.21

Few opposite-sex
(Unfavorable sex ratio)

	Male perceptions of female infidelity	Female self-reported infidelity	M-F difference	Female perceptions of male infidelity	Male self-reported infidelity	F-M difference
Talk on a work trip	5.69 (2.05)	5.66 (2.19)	.03	5.28 (2.22)	6.32 (1.91)	-1.04
Flirt on a work trip	4.10 (1.95)	3.97 (2.40)	.14	4.14 (2.23)	4.57 (2.28)	-.43
Have sex on a work trip	1.48 (.74)	1.69 (1.77)	-.21	1.69 (1.23)	1.79 (1.91)	-.10
Befriend a co-worker	6.41 (2.03)	6.21 (2.13)	.20	6.14 (2.07)	6.11 (2.33)	.03
Lunch with a co-worker	4.86 (2.18)	4.48 (2.61)	.38	4.38 (2.09)	4.43 (2.39)	-.05
Phone with a co-worker	3.00 (1.83)	2.69 (2.16)	.31	2.72 (1.69)	2.25 (1.53)	.47

Figure 1
Association between sex ratio condition and satisfaction change (Study 1)

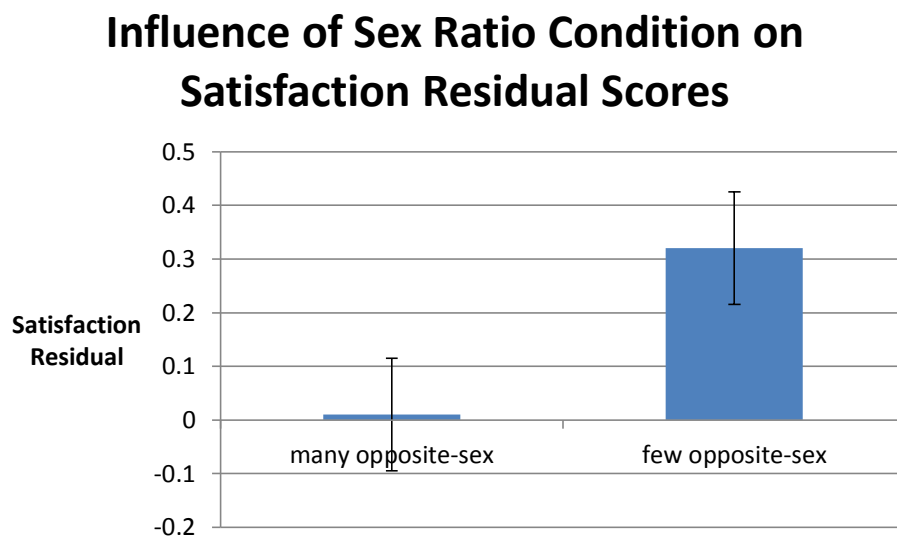


Figure 2
Association between sex ratio condition and satisfaction change (Study 1)

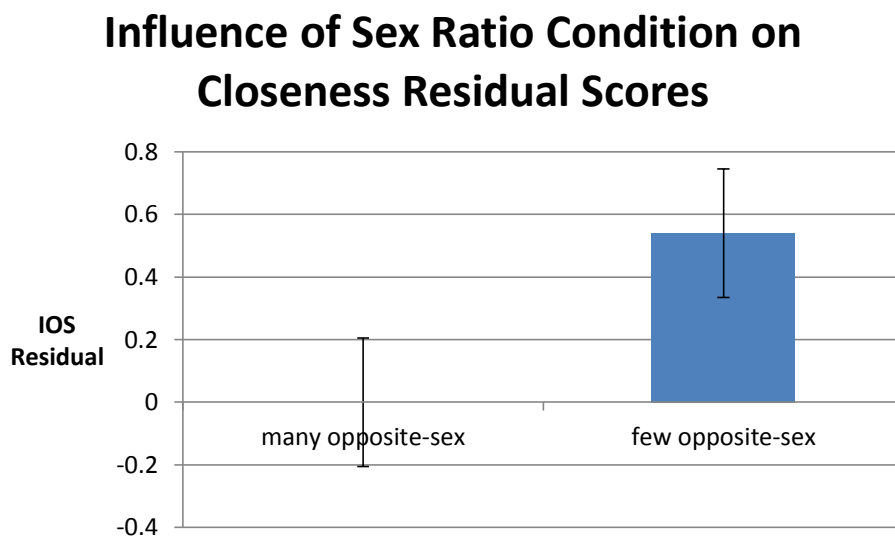


Figure 3
Association between sex ratio condition and satisfaction change, with control condition (Study 1)

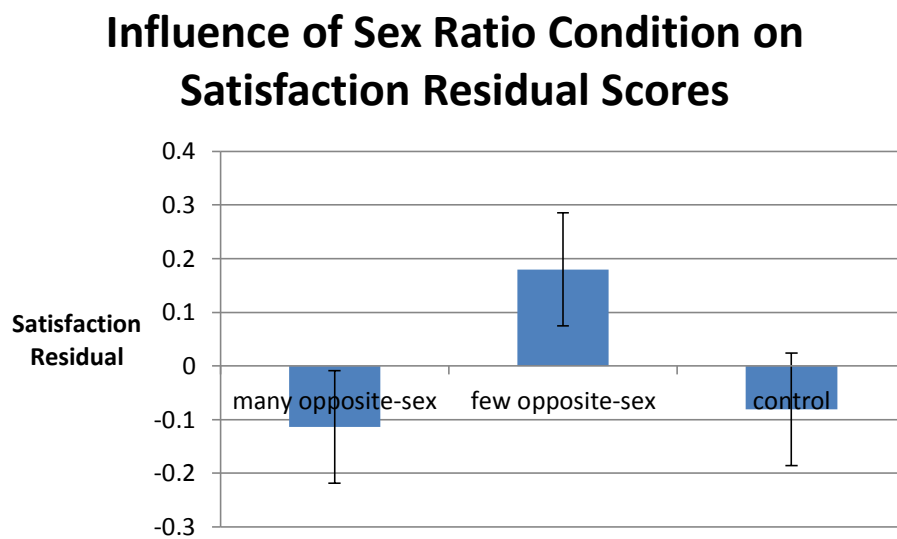


Figure 4
Association between sex ratio condition and closeness change, with control
condition (Study 1)

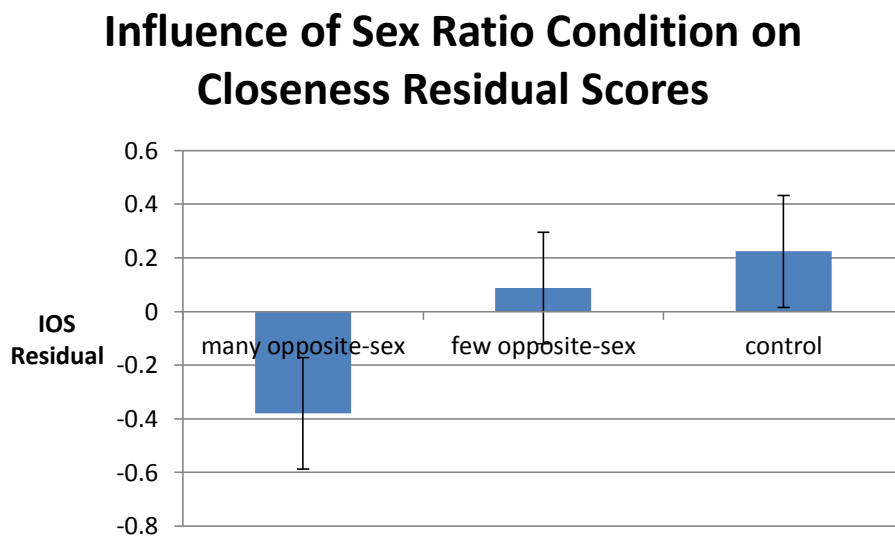


Figure 5

Association between sex ratio condition, participant sex, and maintenance behavior, i.e., “intervening” (Study 2). Marginal means are plotted.

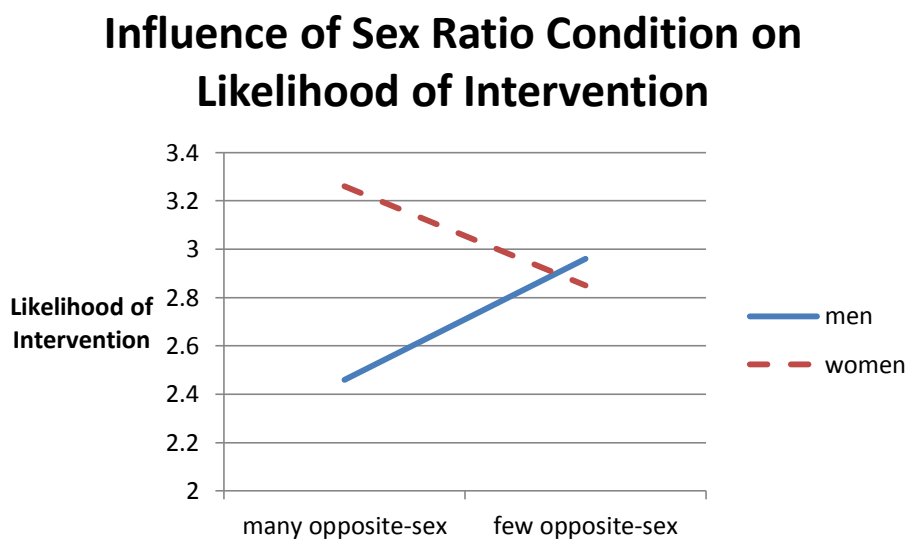


Figure 6

Association between sex ratio condition, participant sex, and maintenance behavior, i.e., “intervening,” with control condition (Study 2). Marginal means are plotted.

Influence of Sex Ratio Condition on Likelihood of Intervention

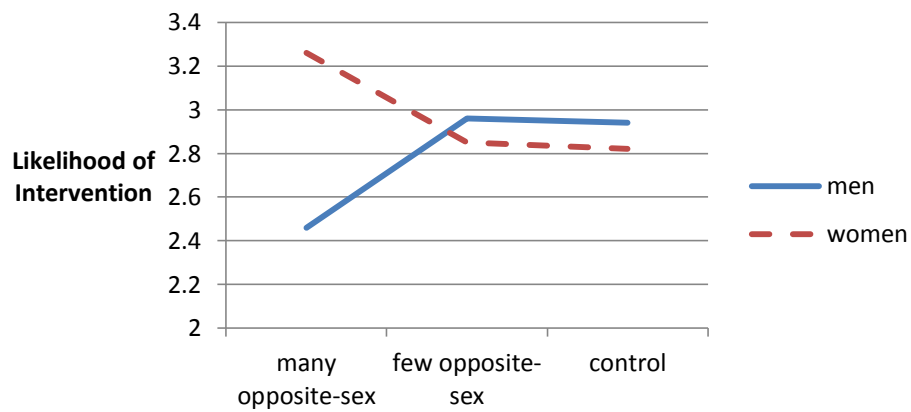


Figure 7

Association between sex ratio condition, participant sex, and maintenance behavior, i.e., “paying attention” (Study 3). Marginal means are plotted.

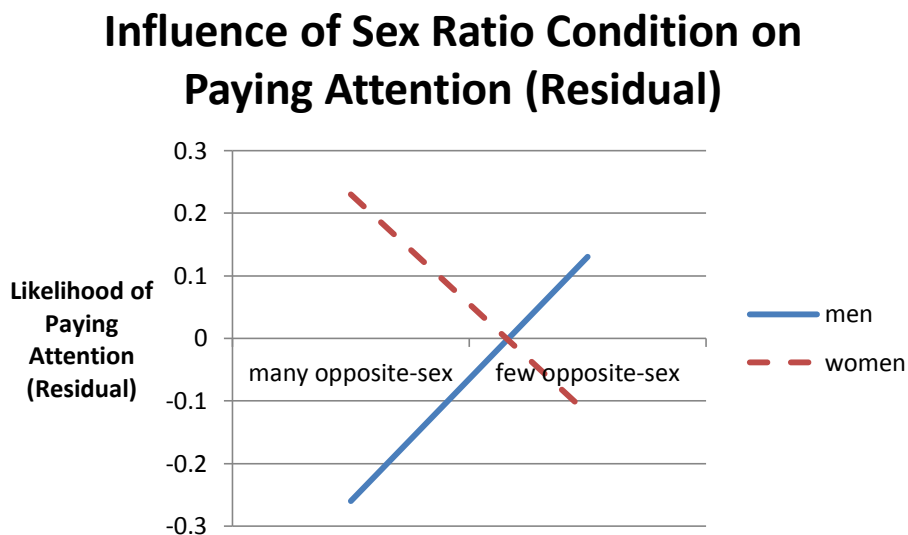


Figure 8

Association between sex ratio condition, participant sex, and perceptions of partner's likelihood of sexual infidelity (Items 1, 2, 3) above and beyond partner's self-reported likelihood of sexual infidelity (Study 3). Predictor -1 SD = few opposite-sex. Predictor +1 SD = many opposite-sex. Moderator -1 SD = women. Moderator +1 SD = men. Simple slopes are computed at 1 SD above and below the mean.

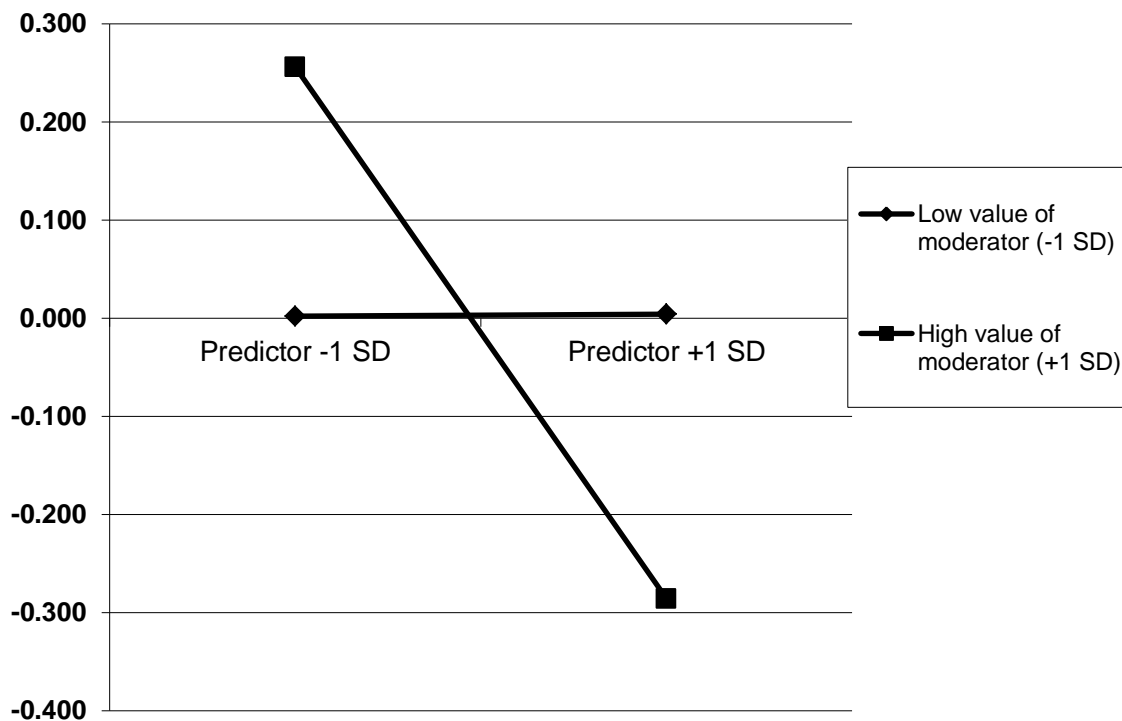


Figure 9

Association between sex ratio condition, participant sex, and perceptions of partner's likelihood of flirting (Item 2) above and beyond partner's self-reported likelihood of flirting (Study 3). Predictor -1 SD = few opposite-sex. Predictor +1 SD = many opposite-sex. Moderator -1 SD = women. Moderator +1 SD = men. Simple slopes are computed at 1 SD above and below the mean.

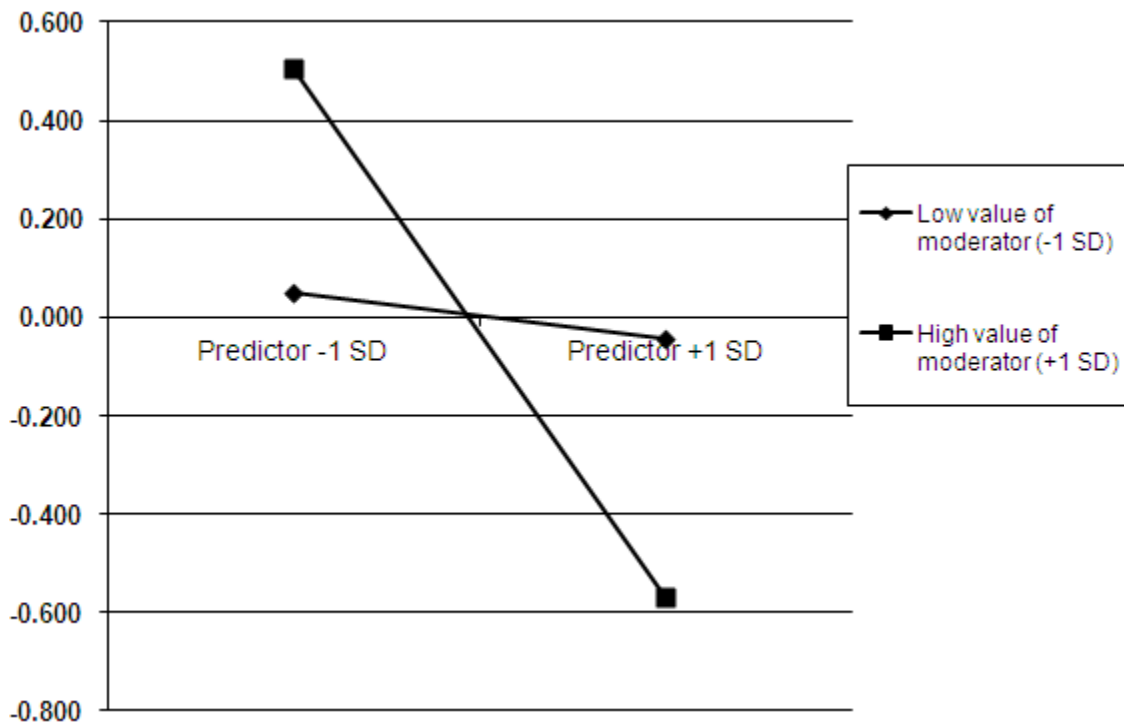
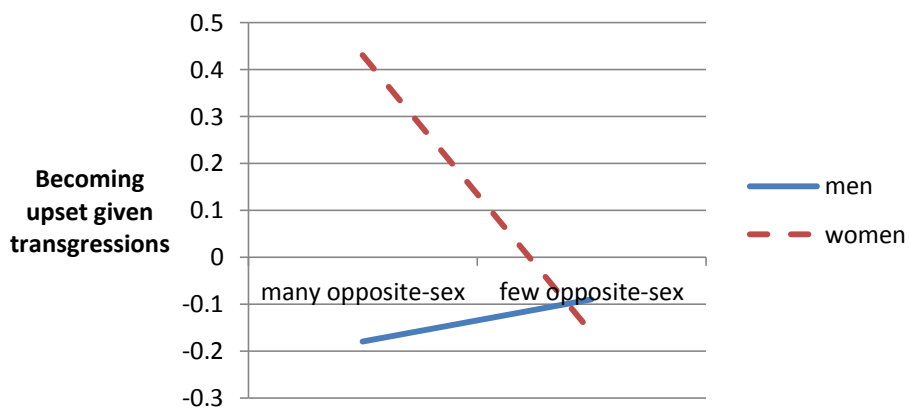


Figure 10

Association between sex ratio condition, participant sex, and accommodation items 1 and 5 (Study 3). Marginal means are plotted.

Influence of Sex Ratio Condition on Accommodation (Items 1 and 5)



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Appendix A Study 1 article primes

Men, few opposite-sex

DesMoinesRegister.com

March 6, 2009

Much Fewer Women on Campuses Nationwide

By PAMELA WAGNER
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There was once a time when the average college student could look around campus and expect to see an even number of males and females among his peers. However, those times are changing quite rapidly, according to research currently being conducted by sociologists around the country. Today's college men should expect to see much fewer women during their time at university than the college men before them.

The U.S. Department of Education has recently released statistics of current enrollment patterns at national universities. The trends show that significantly less than half the incoming students across the country are women. "It is astounding," says Susan Rice, the chief admissions officer at the University of North Carolina. "College campuses used to be overflowing with young women, but that is just not the case anymore."

Across the universities of the Big Ten, in particular, many co-ed dorms have fewer women than men this year. Yet researchers are not surprised by this phenomenon. "I do not think there is anything wrong with this," says Ryan Connick, a sociologist at the University of Minnesota. "Students should not be surprised if they are walking into a new class or any social place on campus, and they see fewer females."

Interestingly, students do not appear to notice the skew against females unless it is made explicit to them. In an unofficial study conducted by the Register at the University of Iowa, several students were asked simply to observe the people around them for five minutes. Chris Jenkins, a first-year student at the University of Iowa, quickly noticed the trend. "I thought I would see more women, but I really was surprised that I didn't," said Jenkins, summarizing the reaction by most of the students surveyed. "I really was shocked that so few girls were around. I guess I better get used to this."

Demographers note that this trend is likely to continue into the near future. "Looking at high schools right now," observes Connick, "it is pretty clear that fewer women will be applying to college in the next few years." Although some pundits believe that there are too few women on college campuses, most researchers are not overly concerned. "Sometimes there are more men, and other times, there are more women," notes Connick. "Right now and for the next few years, there are going to be fewer women attending our universities."

Sociologists across the country note that the student sex ratio has looked different in the past, and will likely look different again in the future. However, they note that even the smallest societal shift occurs gradually, and students are thus more likely to see fewer women than men for the foreseeable future. Indeed, in the coming years, the dearth of women should soon fail to elicit any significant surprise.

Men, many opposite-sex

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The U.S. Department of Education has recently released statistics of current enrollment patterns at national universities. The trends show that significantly more than half the incoming students across the country are women. "It is astounding," says Susan Rice, the chief admissions officer at the University of North Carolina. "College campuses seem to be overflowing with young women."

Across the universities of the Big Ten, in particular, many co-ed dorms have more women than men this year. Yet researchers are not surprised by this phenomenon. "I do not think there is anything wrong with this," says Ryan Connick, a sociologist at the University of Minnesota. "Students should not be surprised if they are walking into a new class or any social place on campus, and they see mostly females."

Interestingly, students do not appear to notice the skew towards females unless it is made explicit to them. In an unofficial study conducted by the Register at the University of Iowa, several students were asked simply to observe the people around them for five minutes. Chris Jenkins, a first-year student at the University of Iowa, quickly noticed the trend. "Everywhere I looked, there seemed to be women," said Jenkins, summarizing the reaction by most of the students surveyed. "I really was shocked that so many girls were around. I guess I better get used to this."

Demographers note that this trend is likely to continue into the near future. "Looking at high schools right now," observes Connick, "it is pretty clear that more women will be applying to college in the next few years." Although some pundits believe that there are too many women on college campuses, most researchers are not overly concerned. "Sometimes there are more men, and other times, there are more women," notes Connick. "Right now and for the next few years, there are going to be more women attending our universities."

Sociologists across the country note that the student sex ratio has looked different in the past, and will likely look different again in the future. However, they note that even the smallest societal shift occurs gradually, and students are thus more likely to be surrounded by women than men for the foreseeable future. Indeed, in the coming years, the abundance of women should soon fail to elicit any significant surprise.

Women, few opposite-sex

DesMoinesRegister.com

March 6, 2009

Much Fewer Men on Campuses Nationwide

By *PAMELA WAGNER*

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There was once a time when the average college student could look around campus and expect to see an even number of males and females among his peers. However, those times are changing quite rapidly, according to research currently being conducted by sociologists around the country. Today's college women should expect to see much fewer men during their time at university than the college women before them.

The U.S. Department of Education has recently released statistics of current enrollment patterns at national universities. The trends show that significantly less than half the incoming students across the country are men. "It is astounding," says Susan Rice, the chief admissions officer at the University of North Carolina. "College campuses are overflowing with young women, and it seems like men are nowhere to be seen."

Across the universities of the Big Ten, in particular, many co-ed dorms have fewer men than women this year. Yet researchers are not surprised by this phenomenon. "I do not think there is anything wrong with this," says Ryan Connick, a sociologist at the University of Minnesota. "Students should not be surprised if they are walking into a new class or any social place on campus, and they see fewer males."

Interestingly, students do not appear to notice the skew against males unless it is made explicit to them. In an unofficial study conducted by the Register at the University of Iowa, several students were asked simply to observe the people around them for five minutes. Christina Jenkins, a first-year student at the University of Iowa, quickly noticed the trend. "I thought I would see more men, but I really was surprised that I didn't," said Jenkins, summarizing the reaction by most of the students surveyed. "I really was shocked that so few boys were around. I guess I better get used to this."

Demographers note that this trend is likely to continue into the near future. "Looking at high schools right now," observes Connick, "it is pretty clear that fewer men will be applying to college in the next few years." Although some pundits believe that there are too few men on college campuses, most researchers are not overly concerned. "Sometimes there are more men, and other times, there are more women," notes Connick. "Right now and for the next few years, there are going to be fewer men attending our universities."

Sociologists across the country note that the student sex ratio has looked different in the past, and will likely look different again in the future. However, they note that even the smallest societal shift occurs gradually, and students are thus more likely to see fewer men than women for the foreseeable future. Indeed, in the coming years, the dearth of men should soon fail to elicit any significant surprise.

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The U.S. Department of Education has recently released statistics of current enrollment patterns at national universities. The trends show that significantly more than half the incoming students across the country are men. "It is astounding," says Susan Rice, the chief admissions officer at the University of North Carolina. "College campuses used to be overflowing with young women, but the men have really caught up."

Across the universities of the Big Ten, in particular, many co-ed dorms have more men than women this year. Yet researchers are not surprised by this phenomenon. "I do not think there is anything wrong with this," says Ryan Connick, a sociologist at the University of Minnesota. "Students should not be surprised if they are walking into a new class or any social place on campus, and they see mostly males."

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Appendix B
Satisfaction subscale (Rusbult et al., 1998)

Satisfaction Level Facet and Global Items

2. I feel satisfied with our relationship (please circle a number).

0	1	2	3	4	5	6	7	8
Do Not Agree At All				Agree Somewhat			Agree Completely	

3. My relationship is much better than others' relationships.

0	1	2	3	4	5	6	7	8
Do Not Agree At All				Agree Somewhat			Agree Completely	

4. My relationship is close to ideal.

0	1	2	3	4	5	6	7	8
Do Not Agree At All				Agree Somewhat			Agree Completely	

5. Our relationship makes me very happy.

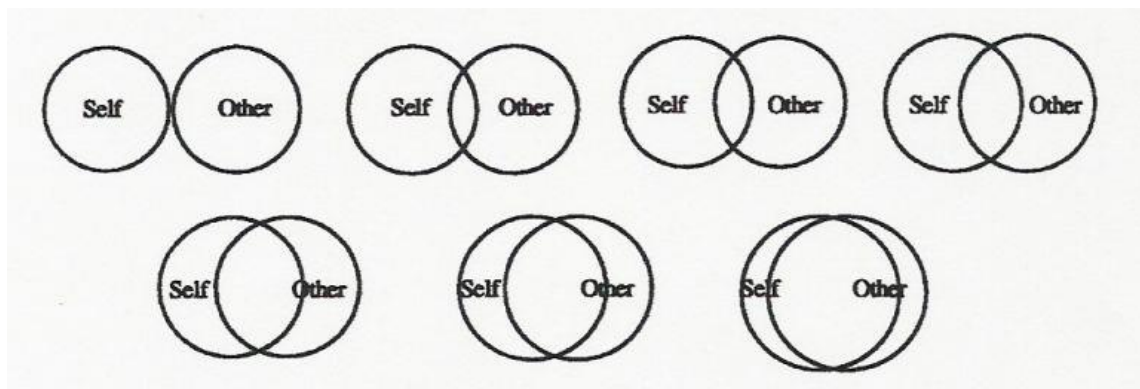
0	1	2	3	4	5	6	7	8
Do Not Agree At All				Agree Somewhat			Agree Completely	

6. Our relationship does a good job of fulfilling my needs for intimacy, companionship, etc.

0	1	2	3	4	5	6	7	8
Do Not Agree At All				Agree Somewhat			Agree Completely	

Appendix C
Inclusion of Other in the Self Scale (Aron et al., 1992)

INSTRUCTIONS: Please circle the picture below that best describes your relationship.



Appendix D

Study 1 control article

January 16, 2011

Routine, Routine, Routine

By Jesse Reilly

Imagine that today you need to do laundry. You haven't done laundry in a while, so you have a lot of clothes, towels, and other things that need to be washed. You begin the task by sorting all of your dirty laundry from the hamper into piles. After everything is sorted, you take the laundry to the washing machine. Piece by piece you fill up the washer with a full load. You look through your cleaning products for the laundry detergent, and carefully measure the right amount of detergent for the load into the washer. You pour the detergent into the machine and check the setting. After making sure that you have the right setting, you turn on the washer.

After the washer finishes with your load, you check the dryer to make sure that it's empty. Opening the washing machine, you take each piece of clothing, shake it out, and put it into the dryer. You pull a sheet of fabric softener out of the box and toss it in with the clothes in the dryer. You look at the dial on the dryer and set it to the correct time and setting. Finally, you turn on the dryer.

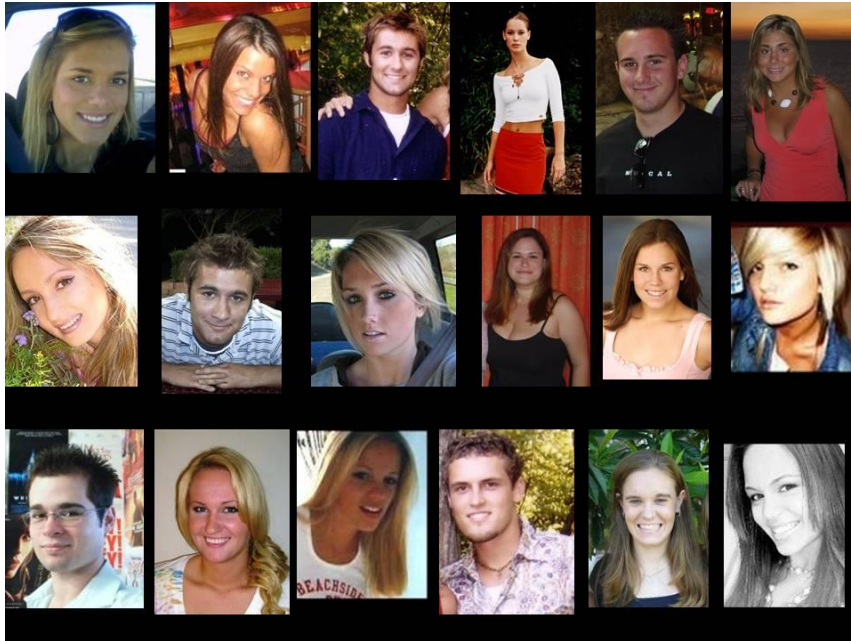
As your first load is drying, you begin putting a second load of laundry into the washer. Again, you empty your pile of clothes into the washer until it's full. You measure the right amount of detergent and put it in the washer. Before starting, you change the setting on the washer to better fit this particular load. Finally, you turn on the washer.

The dryer soon finishes drying your first load. You open it and put your hand inside to make sure that everything is dry—it is. You take the clothes out of the dryer and put them into a basket. You go back to the dryer and check to make sure that there is nothing left—there isn't. Because the dryer is now empty and your second load of laundry finished washing, you transfer the second load from the washer to the dryer. When all the clothes have been moved to the dryer, you check the dryer's settings, close the door, and turn the dryer on.

As the second load dries, you bring the basket with the already dry clothing from the first load to a table. You clear up some space and fold the clothes, sorting them into new piles to make it easier for when you'll be putting them away later. Taking your folded clothes, you go to put them away in their rightful place.

Appendix E
Study 2 photo prime

Many women, few men



Many men, few women

